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Contents of Volume 2

List of Figures

The figures in this thesis include output from the UDEC computer simulation software. Most of the UDEC output is in the form of two-dimensional model block plots. The units of the horizontal and vertical axes are metres. The labelled notation ($\times 10^1$) indicates that the axis values need to be multiplied by 10. The legend includes an indication of the type of output plot, model cycle count and the model time, which is unrelated to real time. Where block velocity vectors are plotted, the scale is presented with units of m s^{-1} . The notation 1E 1 on the scale means that the scale is $1 \times 10 \text{ m s}^{-1}$ long. Again, the values of velocity do not relate to real velocity. Where UDEC plots of the history of total unbalanced forces for a model run are presented, the x-axis is model time (s), and the y-axis is force (kg m s^{-2}).

Chapter 2

2.1:	Links between engineering and geomorphology (Allison, 1997).	261
2.2:	Geomorphological interactions between processes, landforms and materials (Allison, 1996a).	262
2.3:	Graphs of published relationships for the conversion of Schmidt hammer rebound values (R) into uniaxial compressive strength.	263
2.4:	Separate graphs of published relationships for the conversion of Schmidt hammer rebound values (R) into uniaxial compressive strength.	264
2.5:	Four similar relationships for the conversion of Schmidt hammer rebound values (R) into uniaxial compressive strength.	265
2.6:	Three similar relationships for the conversion of Schmidt hammer rebound values (R) into Young's modulus.	265
2.7:	Three basic failure mechanisms of rock masses under gravitational forces.	266
2.8:	Basic conditions controlling rock mass block toppling.	267



24 FEB 1999 - i -

Chapter 3

3.1:	Calculation cycle for the distinct element method.	268
3.2:	UDEC block plot of demonstration slope at equilibrium (10,000 steps).	269
3.3:	UDEC history plot of total unbalanced forces for demonstration slope at equilibrium (10,000 steps).	270
3.4:	UDEC block plot of demonstration slope at 105,000 steps.	271
3.5:	UDEC block plot of demonstration slope at 955,000 steps.	272

Chapter 4

4.1:	Single block geometrical parameters.	273
4.2:	Limiting conditions for sliding, toppling and stable rock blocks.	273
4.3a:	UDEC block plot of toppling single block ($b/h = 0.8$, $\alpha = 39^\circ$).	274
4.3b:	UDEC block plot of stable single block ($b/h = 1.0$, $\alpha = 39^\circ$).	275
4.3c:	UDEC block plot of sliding single block ($b/h = 1.0$, $\alpha = 41^\circ$).	276
4.3d:	UDEC block plot of toppling and sliding single block ($b/h = 0.8$, $\alpha = 41^\circ$).	277
4.4:	Rock mass block geometrical parameters.	278
4.5:	Limiting conditions for sliding, toppling and stable rock masses.	278
4.6:	Limiting conditions for the failure of a rock mass compared with the limiting conditions for the failure of a single block.	279
4.7a:	UDEC block plot of a sliding rock mass ($b/h = 1.4$, $\alpha = 60^\circ$).	280
4.7b:	UDEC block plot of a stable rock mass ($b/h = 2.0$, $\alpha = 25^\circ$).	281
4.7c:	UDEC block plot of a toppling rock mass ($b/h = 0.3$, $\alpha = 35^\circ$).	282
4.7d:	UDEC block plot of a sliding and toppling rock mass ($b/h = 0.3$, $\alpha = 48^\circ$).	283
4.8a:	UDEC history plot of total unbalanced forces for a sliding rock mass.	284
4.8b:	UDEC history plot of total unbalanced forces for a toppling rock mass.	285
4.8c:	UDEC history plot of total unbalanced forces for a toppling and sliding rock mass.	286
4.9:	UDEC history plot of the log of total unbalanced forces for a sliding	287

4.10:	UDEEC history plot of the log of an individual total unbalanced force peak for a sliding rock mass.	287
4.11:	UDEEC history plot of the log of part of an individual total unbalanced force peak for a sliding rock mass.	288
4.12:	UDEEC block plot of a toppling rock mass with the b/h ratio varied with height ($b/h = 2.0$, $\alpha = 25^\circ$).	289
4.13:	Limiting conditions for sliding, toppling and stable rock masses which contain rectangular blocks.	290
4.14:	Limiting conditions for the failure of a rock mass which contains rectangular blocks, compared with the limiting conditions for the failure of the limestone rock mass.	291
4.15a:	UDEEC block plot of a toppling and sliding rock mass which contains rectangular blocks ($b/h = 3.2$, $\alpha = 50^\circ$).	292
4.15b:	UDEEC block plot of a sliding rock mass which contains rectangular blocks ($b/h = 3.6$, $\alpha = 50^\circ$).	293
4.16:	Limiting conditions for sliding, toppling and stable rock masses which have a friction angle of 20° .	294
4.17:	UDEEC block plot of a creep toppling and stabilising rock mass which has a friction angle of 20° ($b/h = 1.4$, $\alpha = -40^\circ$).	295
4.18:	Limiting conditions for the failure of rock masses which have a friction angle of 20° compared with the limiting conditions for the failure of the limestone rock masses which have a friction angle of 40° .	296
4.19:	Limiting conditions for sliding, toppling and stable rock masses which have a friction angle of 60° .	297
4.20:	Limiting conditions for the failure of rock masses which have a friction angle of 60° compared with the limiting conditions for the failure of the limestone rock masses which have a friction angle of 40° .	298

4.21:	Limiting conditions for the failure of rock masses which have a friction angle of 20° and 60° compared with the limiting conditions for the failure of the limestone rock masses which have a friction angle of 40°.	299
4.22:	Limiting conditions for sliding, toppling and stable sandstone rock masses.	300
4.23:	Limiting conditions for the failure of sandstone rock masses compared with the limiting conditions for the failure of the limestone rock masses.	301
4.24a:	UDEC block plot of a toppling and sliding sandstone rock mass ($b/h = 0.2, \alpha = 50^\circ$).	302
4.24b:	UDEC block plot of a sliding sandstone rock mass ($b/h = 1.2, \alpha = 40^\circ$).	303
4.24c:	UDEC block plot of a toppling sandstone rock mass ($b/h = 0.6, \alpha = -20^\circ$).	304
4.25:	Limiting conditions for sliding, toppling and stable granite rock masses.	305
4.26:	Limiting conditions for the failure of granite rock masses compared with the limiting conditions for the failure of the limestone rock masses.	306
4.27:	Limiting conditions for the failure of granite rock masses compared with the limiting conditions for the failure of sandstone rock masses.	307
4.28:	Limiting conditions for the failure of granite and sandstone rock masses compared with the limiting conditions for the failure of the limestone rock masses.	308
4.29a:	UDEC block plot of a toppling granite rock mass ($b/h = 1.8, \alpha = 30^\circ$).	309
4.29b:	UDEC history plot of total unbalanced forces for a toppling granite rock mass.	310
4.29c:	UDEC block plot of a sliding granite rock mass ($b/h = 0.8, \alpha = 60^\circ$).	311
4.29d:	UDEC block plot of a toppling and sliding granite rock mass ($b/h = 0.4, \alpha = 60^\circ$).	312

4.29e:	UDEC history plot of total unbalanced forces for a toppling and sliding granite rock mass.	313
4.30:	Limiting conditions for sliding, toppling and stable sandstone rock masses which contain deformable blocks.	314
4.31:	Limiting conditions for the failure of sandstone rock masses containing deformable blocks compared with the limiting conditions for the failure of the limestone rock masses.	315
4.32:	Limiting conditions for the failure of sandstone rock masses containing deformable blocks compared with the limiting conditions for the failure of the sandstone rock masses.	316
4.33a:	UDEC block plot of a toppling sandstone rock mass which contains deformable blocks ($b/h = 0.6$, $\alpha = -30^\circ$).	317
4.33b:	UDEC block plot of a toppling sandstone rock mass showing zones for deformable blocks.	318
4.33c:	UDEC history plot of total unbalanced forces for a toppling sandstone rock mass which contains deformable blocks.	319
4.33d:	UDEC block plot of a toppling sandstone rock mass which contains deformable blocks ($b/h = 1.8$, $\alpha = 10^\circ$).	320
4.33e:	UDEC block plot of a stable sandstone rock mass which contains deformable blocks ($b/h = 2.6$, $\alpha = 20^\circ$).	321
4.33f:	UDEC history plot of total unbalanced forces for a stable sandstone rock mass which contains deformable blocks.	322
4.33g:	UDEC block plot of a sliding sandstone rock mass which contains deformable blocks ($b/h = 2.4$, $\alpha = 30^\circ$).	323
4.33h:	UDEC block plot of a sliding sandstone rock mass which contains deformable blocks ($b/h = 1.0$, $\alpha = 40^\circ$).	324
4.33i:	UDEC history plot of total unbalanced forces for a sliding sandstone rock mass which contains deformable blocks.	325
4.33j:	UDEC block plot of a toppling and sliding sandstone rock mass which contains deformable blocks ($b/h = 0.8$, $\alpha = 40^\circ$).	326
4.33k:	UDEC history plot of total unbalanced forces for a toppling and sliding sandstone rock mass which contains deformable blocks.	327

4.34:	Limiting conditions for sliding, toppling and stable granite rock masses which contain deformable blocks.	328
4.35:	Limiting conditions for the failure of granite rock masses containing deformable blocks compared with the limiting conditions for the failure of the limestone rock masses.	329
4.36:	Limiting conditions for the failure of granite rock masses containing deformable blocks compared with the limiting conditions for the failure of the granite rock masses.	330
4.37a:	UDEC block plot of a toppling granite rock mass which contains deformable blocks ($b/h = 0.4$, $\alpha = 0^\circ$).	331
4.37b:	UDEC block plot of a toppling granite rock mass showing zones for deformable blocks.	332
4.37c:	UDEC block plot of a toppling and sliding granite rock mass which contains deformable blocks ($b/h = 0.8$, $\alpha = 60^\circ$).	333
4.38:	Limiting conditions for sliding, toppling and stable rock masses which contain variable discontinuity spacings.	334
4.39:	Limiting conditions for the failure of rock masses containing variable discontinuity spacings compared with the limiting conditions for the failure of the limestone rock masses.	335
4.40a:	UDEC block plot of a toppling rock mass which contains variable discontinuity spacings ($b/h = 0.8$, $\alpha = 0^\circ$).	336
4.40b:	UDEC block plot of a stable rock mass which contains variable discontinuity spacings ($b/h = 1.0$, $\alpha = 0^\circ$).	337
4.40c:	UDEC block plot of a sliding rock mass which contains variable discontinuity spacings ($b/h = 0.4$, $\alpha = 60^\circ$).	338
4.40d:	UDEC block plot of a toppling and sliding rock mass which contains variable discontinuity spacings ($b/h = 0.6$, $\alpha = 50^\circ$).	339
4.41:	Limiting conditions for sliding, toppling and stable rock masses which contain variable discontinuity dip values.	340
4.42:	Limiting conditions for the failure of rock masses containing variable discontinuity dip values compared with the limiting conditions for the failure of the limestone rock masses.	341

4.43a:	UDEC block plot of a toppling rock mass which contains variable discontinuity dip values ($b/h = 1.6, \alpha = 20^\circ$).	342
4.43b:	UDEC history plot of total unbalanced forces for a toppling rock mass which contains variable discontinuity dip values.	343
4.43c:	UDEC block plot of a toppling and sliding rock mass which contains variable discontinuity dip values ($b/h = 1.4, \alpha = 45^\circ$).	344
4.43d:	UDEC history plot of total unbalanced forces for a toppling and sliding rock mass which contains variable discontinuity dip values.	345
4.44:	Limiting conditions for sliding, toppling and stable rock masses which contain impersistent discontinuities.	346
4.45:	Limiting conditions for the failure of rock masses containing impersistent discontinuities compared with the limiting conditions for the failure of the limestone rock masses.	347
4.46:	Limiting conditions for sliding, toppling and stable rock masses which contain a water table set to 35 metres.	348
4.47:	Limiting conditions for the failure of rock masses containing a water table set to 35 metres compared with the limiting conditions for the failure of the limestone rock masses.	349
4.48a:	UDEC block plot of a toppling rock mass which contains a water table set to 35 metres ($b/h = 1.6, \alpha = 20^\circ$).	350
4.48b:	UDEC flow rate plot of a toppling rock mass which contains a water table set to 35 metres.	351
4.48c:	UDEC pore water pressure plot of a toppling rock mass which contains a water table set to 35 metres.	352
4.48d:	UDEC flow rate plot of a stable rock mass which contains a water table set to 35 metres ($b/h = 2.0, \alpha = 20^\circ$).	353
4.48e:	UDEC pore water pressure plot of a stable rock mass which contains a water table set to 35 metres.	354
4.49:	Limiting conditions for sliding, toppling and stable rock masses which contain a water table set to 50 metres.	355

4.50:	Limiting conditions for the failure of rock masses containing a water table set to 50 metres compared with the limiting conditions for the failure of the limestone rock masses.	356
4.51:	Limiting conditions for the failure of rock masses containing a water table set to 50 metres compared with the limiting conditions for the failure of rock masses containing a water table set to 35 metres.	357
4.52a:	UDEC block plot of a toppling and sliding rock mass which contains a water table set to 50 metres ($b/h = 4.4$, $\alpha = 41^\circ$).	358
4.52b:	UDEC flow rate plot of a toppling and sliding rock mass which contains a water table set to 50 metres.	359
4.52c:	UDEC pore water pressure plot of a toppling and sliding rock mass which contains a water table set to 50 metres.	360
4.52d:	UDEC history plot of total unbalanced forces for a toppling and sliding rock mass which contains a water table set to 50 metres.	361
4.53:	Limiting conditions for sliding, toppling and stable rock masses which have joint stiffness values set to 5 GPa.	362
4.54:	Limiting conditions for the failure of rock masses which have joint stiffness values set to 5 GPa compared with the limiting conditions for the failure of the limestone rock masses.	363
4.55:	Limiting conditions for sliding, toppling and stable rock masses bounded by a wave cut platform.	364
4.56:	Limiting conditions for the failure of rock masses bounded by a wave cut platform compared with the limiting conditions for the failure of the limestone rock masses.	365
4.57a:	UDEC block plot of a toppling rock mass bounded by a wave cut platform ($b/h = 0.4$, $\alpha = -10^\circ$).	366
4.57b:	UDEC block plot of a sliding rock mass bounded by a wave cut platform ($b/h = 0.4$, $\alpha = 60^\circ$).	367
4.57c:	UDEC block plot of a toppling and sliding rock mass bounded by a wave cut platform ($b/h = 0.2$, $\alpha = 60^\circ$).	368
4.58:	UDEC block plot of a limestone rock mass above a clay base showing zones for deformable blocks.	369

4.59:	Limiting conditions for sliding, toppling and stable rock masses above a clay base.	370
4.60:	Limiting conditions for the failure of rock masses above a clay base compared with the limiting conditions for the failure of the limestone rock masses.	371
4.61a:	UDEC block plot of a toppling rock mass above a clay base ($b/h = 1.6$, $\alpha = 20^\circ$).	372
4.61b:	UDEC history plot of total unbalanced forces for a toppling rock mass above a clay base.	373
4.61c:	UDEC block plot of a slumping rock mass above a clay base ($b/h = 0.6$, $\alpha = 40^\circ$).	374
4.61d:	UDEC block plot of a toppling rock mass above a clay base ($b/h = 1.0$, $\alpha = 0^\circ$).	375
4.61e:	UDEC block plot of a toppling rock mass above a clay base ($b/h = 2.0$, $\alpha = 50^\circ$).	376

Chapter 5

5.1:	Location map of the Isle of Purbeck.	377
5.2a:	The Jurassic stratigraphic column in Dorset.	378
5.2b:	The Cretaceous stratigraphic column in Dorset.	379
5.3:	Geology of the Isle of Purbeck.	380
5.4:	Classification of the Portland Beds.	381
5.5:	Map of the Isle of Purbeck showing the axis of the Purbeck Monocline and the distribution of the Portland Limestone.	382
5.6:	The structural setting of the east Dorset coastline.	383
5.7:	Geological cross-sections along the Purbeck Coast.	384
5.8:	Map of the Isle of Purbeck showing the location of field sites.	385
5.9:	Location map of the Colorado Plateau.	386
5.10:	The Colorado Plateau stratigraphic column.	387
5.11:	A summary of slope development studies on the Colorado Plateau.	388
5.12:	Location map of Dead Horse Point State Park and the Island in the Sky Mesa.	389

5.13:	Scarp plan at Dead Horse Point State Park.	390
5.14:	A profile of the cliffs at Dead Horse Point State Park.	391
5.15:	A profile of the cliffs at the Colorado National Monument.	392
5.16:	Scarp plan at the Colorado National Monument.	393

Chapter 6

6.1:	Polar projection for the discontinuities in the Portland Limestone at Winspit.	394
6.2:	Polar projection for the discontinuities in the Portland Limestone at Fossil Forest.	385
6.3:	Polar projection for the discontinuities in the Portland Limestone at Lulworth Cove.	396
6.4:	Polar projection for the discontinuities in the Portland Limestone at Durdle Door.	397
6.5:	Frequency distribution of Winspit joint spacing readings.	398
6.6:	Frequency distribution of Fossil Forest joint spacing readings.	398
6.7:	Frequency distribution of Lulworth Cove joint spacing readings.	399
6.8:	Frequency distribution of Durdle Door joint spacing readings.	399
6.9:	A quantile-quantile plot for joint spacing readings from Winspit and Fossil Forest.	400
6.10:	A quantile-quantile plot for joint spacing readings from Fossil Forest and Lulworth Cove.	400
6.11:	A quantile-quantile plot for joint spacing readings from Lulworth Cove and Durdle Door.	401
6.12:	A cumulative distribution function of joint spacing readings for Winspit, Fossil Forest, Lulworth Cove and Durdle Door.	401
6.13:	A sketch of the Durdle Promontory from the south-west, seaward side showing visible discontinuities.	402
6.14:	Profile of the sea floor offshore from Tillywhim.	403
6.15:	Profile of the sea floor offshore from Winspit.	403
6.16:	Profile of the sea floor offshore from Pondfield.	404
6.17:	Profile of the sea floor offshore from Bacon Hole.	404

6.18:	Profile of the sea floor offshore from Fossil Forest.	405
6.19:	Profile of the sea floor offshore from Potter's Hole.	405
6.20:	Profile of the sea floor offshore from Lulworth Cove.	406
6.21:	Profile of the sea floor offshore from Stair Hole.	406
6.22:	Profile of the sea floor offshore from Durdle Door.	407
6.23:	Offshore profiles for the sites at the eastern end of the Isle of Purbeck.	407
6.24:	Offshore profiles for the sites in the central part of the Isle of Purbeck.	408
6.25:	Offshore profiles for the sites at the western end of the Isle of Purbeck.	408
6.26:	Mohr's circles of stress from tests conducted at confining pressures (σ_3) of 15 MPa, 30 MPa and 60 MPa.	409
6.27:	Changes in rock strength for the Portland Limestone along the Isle of Purbeck coast.	410
6.28:	Groupings of sites classified by geotechnical characteristics.	411
6.29:	UDEC block plot of the Durdle Door sea arch at equilibrium (6,000 steps).	412
6.30:	UDEC block plot of the eastern part of the Durdle Promontory at equilibrium (6,000 steps).	413
6.31:	UDEC block plot of the western part of the Durdle Promontory at equilibrium (6,000 steps).	414
6.32:	UDEC block plot of the Lulworth Cove pincer at equilibrium (6,000 steps).	415
6.33:	UDEC block plot of the Lulworth Cove cliff at equilibrium (6,000 steps).	416
6.34:	UDEC block plot of Fossil Forest at equilibrium (6,000 steps).	417
6.35:	UDEC block plot of the quarried Winspit section at equilibrium (6,000 steps).	418
6.36:	UDEC block plot of Winspit cliff at equilibrium (6,000 steps).	419
6.37:	UDEC history plot of total unbalanced forces for the quarried Winspit section at equilibrium (6,000 steps).	420
6.38a:	UDEC block plot of the quarried Winspit section at 10,000 steps.	421
6.38b:	UDEC block plot of the quarried Winspit section at 30,000 steps.	422
6.38c:	UDEC block plot of the quarried Winspit section at 90,000 steps.	423

6.38d:	UDEC block plot of the quarried Winspit section at 150,000 steps.	424
6.38e:	UDEC block plot of the quarried Winspit section at 190,000 steps.	425
6.38f:	UDEC block plot of the quarried Winspit section at 390,000 steps.	426
6.39:	UDEC history plot of total unbalanced forces for the quarried Winspit section at 390,000 steps.	427
6.40a:	UDEC block plot of the quarried Winspit section after removal of debris at 170,000 steps.	428
6.40b:	UDEC block plot of the quarried Winspit section after removal of debris at 530,000 steps.	429
6.41a:	UDEC block plot of the Winspit cliff at 100,000 steps.	430
6.41b:	UDEC block plot of the Winspit cliff at 750,000 steps.	431
6.41c:	UDEC block plot of the Winspit cliff at 2,400,000 steps.	432
6.42:	UDEC history plot of total unbalanced forces for Fossil Forest at equilibrium (6,000 steps).	433
6.43a:	UDEC block plot of Fossil Forest at 14,000 steps.	434
6.43b:	UDEC block plot of Fossil Forest at 100,000 steps.	435
6.43c:	UDEC block plot of Fossil Forest at 200,000 steps.	436
6.43d:	UDEC block plot of Fossil Forest at 400,000 steps.	437
6.44:	UDEC history plot of total unbalanced forces for Fossil Forest at 400,000 steps.	438
6.45:	UDEC block plot of Fossil Forest after removal of debris at 454,000 steps.	439
6.46:	UDEC history plot of total unbalanced forces for the Lulworth Cove pincer at equilibrium (6,000 steps).	440
6.47a:	UDEC block plot of the Lulworth Cove pincer at 10,000 steps.	441
6.47b:	UDEC block plot of the Lulworth Cove pincer at 20,000 steps.	442
6.47c:	UDEC block plot of the Lulworth Cove pincer at 40,000 steps.	443
6.47d:	UDEC block plot of the Lulworth Cove pincer at 60,000 steps.	444
6.47e:	UDEC block plot of the Lulworth Cove pincer at 100,000 steps.	445
6.48:	UDEC history plot of total unbalanced forces for the Lulworth Cove pincer at 100,000 steps.	446

6.49:	UDEC history plot of total unbalanced forces for the Lulworth Cove cliff at equilibrium (6,000 steps).	447
6.50a:	UDEC block plot of the Lulworth Cove cliff at 14,000 steps.	448
6.50b:	UDEC block plot of the Lulworth Cove cliff at 54,000 steps.	449
6.50c:	UDEC block plot of the Lulworth Cove cliff at 200,000 steps.	450
6.50d:	UDEC block plot of the Lulworth Cove cliff at 600,000 steps.	451
6.51:	UDEC history plot of total unbalanced forces for the Lulworth Cove cliff at 600,000 steps.	452
6.52:	UDEC history plot of total unbalanced forces for the eastern Durdle Promontory section at equilibrium (6,000 steps).	453
6.53a:	UDEC block plot of the eastern Durdle Promontory section at 10,000 steps.	454
6.53b:	UDEC block plot of the eastern Durdle Promontory section at 20,000 steps.	455
6.53c:	UDEC block plot of the eastern Durdle Promontory section at 50,000 steps.	456
6.53d:	UDEC block plot of the eastern Durdle Promontory section at 100,000 steps.	457
6.53e:	UDEC block plot of the eastern Durdle Promontory section at 200,000 steps.	458
6.53f:	UDEC block plot of the eastern Durdle Promontory section at 470,000 steps.	459
6.54:	UDEC history plot of total unbalanced forces for the eastern Durdle Promontory section at 470,000 steps.	460
6.55:	UDEC history plot of total unbalanced forces for the western Durdle Promontory section at equilibrium (6,000 steps).	461
6.56a:	UDEC block plot of the western Durdle Promontory section at 10,000 steps.	462
6.56b:	UDEC block plot of the western Durdle Promontory section at 20,000 steps.	463
6.56c:	UDEC block plot of the western Durdle Promontory section at 50,000 steps.	464

6.56d:	UDEC block plot of the western Durdle Promontory section at 100,000 steps.	465
6.56e:	UDEC block plot of the western Durdle Promontory section at 200,000 steps.	466
6.57:	UDEC history plot of total unbalanced forces for the western Durdle Promontory section at 200,000 steps.	467
6.58:	UDEC history plot of total unbalanced forces for the Durdle Door sea arch at equilibrium (6,000 steps).	468
6.59a:	UDEC block plot of the Durdle Door sea arch at 10,000 steps.	469
6.59b:	UDEC block plot of the Durdle Door sea arch at 20,000 steps.	470
6.59c:	UDEC block plot of the Durdle Door sea arch at 60,000 steps.	471
6.59d:	UDEC block plot of the Durdle Door sea arch at 100,000 steps.	472
6.59e:	UDEC block plot of the Durdle Door sea arch at 110,000 steps.	473
6.60:	UDEC history plot of total unbalanced forces for the Durdle Door sea arch at 110,000 steps.	474
6.61a:	Three-dimensional image of the western part of the present-day Durdle Promontory from the south-west.	475
6.61b:	Three-dimensional image of the western part of the Durdle Promontory from the south-west after 100,000 model cycles.	476
6.62a:	Three-dimensional image of the western part of the present-day Durdle Promontory from the north-west.	477
6.62b:	Three-dimensional image of the western part of the Durdle Promontory from the north-west after 100,000 model cycles.	478
6.63a:	Three-dimensional image of the western part of the present-day Durdle Promontory from the north-east.	479
6.63b:	Three-dimensional image of the western part of the Durdle Promontory from the north-east after 100,000 model cycles.	480

Chapter 7

7.1:	Polar projection for the discontinuities in the Kayenta Formation at site DH4E.	481
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7.2:	Polar projection for the discontinuities in the Kayenta Formation at site DH5H.	482
7.3:	Polar projection for the discontinuities in the Kayenta Formation at site DH7E.	483
7.4:	Polar projection for the discontinuities in the Kayenta Formation at site DH11H.	484
7.5:	Polar projection for the discontinuities in the Kayenta Formation for all of the headland sites at Dead Horse Point.	485
7.6:	Polar projection for the discontinuities in the Kayenta Formation for all of the embayment sites at Dead Horse Point.	486
7.7:	Frequency distribution of the total joint spacing readings from Dead Horse Point.	487
7.8:	The distribution of joint spacing readings from site DH2E against the average for Dead Horse Point.	487
7.9:	A quantile-quantile plot for total joint spacing readings from DH2E and DH3H.	488
7.10:	A quantile-quantile plot for total joint spacing readings from all headland sites and all embayment sites at Dead Horse Point.	488
7.11:	Plan of the cliffs at Dead Horse Point State Park showing the surface joint geometry for the field sites.	489
7.12:	Frequency distribution of total Schmidt hammer readings from Dead Horse Point.	490
7.13:	The distribution of Schmidt hammer readings from site DH1H against the average for Dead Horse Point.	490
7.14:	A quantile-quantile plot for Schmidt hammer readings from DH1H and DH2E.	491
7.15:	A quantile-quantile plot for total Schmidt hammer readings from all headland sites and all embayment sites at Dead Horse Point.	491
7.16:	Frequency distribution of total Schmidt hammer readings from Canyonlands National Park.	492
7.17:	A quantile-quantile plot for total Schmidt hammer readings from all headland sites and all embayment sites at Canyonlands National Park.	492

7.18:	The distribution of Schmidt hammer readings on each of the five rock surfaces at site CA1H.	493
7.19:	Frequency distributions of Schmidt hammer readings for each rock surface at site CA1H.	494
7.20:	The distribution of Schmidt hammer readings on each of the five rock surfaces at site CA6H.	495
7.21:	Frequency distributions of Schmidt hammer readings for each rock surface at site CA6H.	496
7.22:	Polar projection for the discontinuities in the Kayenta Formation at site CO19E.	497
7.23:	Polar projection for the discontinuities in the Kayenta Formation at site CO9E.	498
7.24:	Polar projection for the discontinuities in the Kayenta Formation at site CO56H.	499
7.25:	Polar projection for the discontinuities in the Kayenta Formation at site CO12E.	500
7.26:	Frequency distribution of the total joint spacing readings from the Colorado National Monument.	501
7.27:	The distribution of joint spacing readings from site CO12H against the average for the Colorado National Monument.	501
7.28:	A quantile-quantile plot for total joint spacing readings from CO12H and CO19E.	502
7.29:	A quantile-quantile plot for total joint spacing readings from all headland sites and all embayment sites at the Colorado National Monument.	502
7.30:	Plan of the cliffs at the Colorado National Monument showing the surface joint geometry for the field sites.	503
7.31:	Frequency distribution of total Schmidt hammer readings from the Colorado National Monument.	504
7.32:	The distribution of Schmidt hammer readings from site CO12H against the average for the Colorado National Monument.	504

7.33:	A quantile-quantile plot for Schmidt hammer readings from CO12H and CO19E.	505
7.34:	A quantile-quantile plot for total Schmidt hammer readings from all headland sites and all embayment sites at the Colorado National Monument.	505
7.35a:	UDEC block plot of DH4E at equilibrium (10,000 steps).	506
7.35b:	UDEC block plot of DH4E at 100,000 steps.	507
7.35c:	UDEC block plot of DH4E at 200,000 steps.	508
7.35d:	UDEC block plot of DH4E at 500,000 steps.	509
7.36a:	UDEC block plot of the southwest-northeast profile of DH5H at equilibrium (10,000 steps).	510
7.36b:	UDEC block plot of the southwest-northeast profile of DH5H at 100,000 steps.	511
7.36c:	UDEC block plot of the southwest-northeast profile of DH5H at 200,000 steps.	512
7.36d:	UDEC block plot of the southwest-northeast profile of DH5H at 500,000 steps.	513
7.37a:	UDEC block plot of the northwest-southeast profile of DH5H at equilibrium (10,000 steps).	514
7.37b:	UDEC block plot of the northwest-southeast profile of DH5H at 100,000 steps.	515
7.37c:	UDEC block plot of the northwest-southeast profile of DH5H at 200,000 steps.	516
7.37d:	UDEC block plot of the northwest-southeast profile of DH5H at 500,000 steps.	517
7.38a:	UDEC block plot of DH7E at equilibrium (10,000 steps).	518
7.38b:	UDEC block plot of DH7E at 100,000 steps.	519
7.38c:	UDEC block plot of DH7E at 200,000 steps.	520
7.38d:	UDEC block plot of DH7E at 500,000 steps.	521
7.39a:	UDEC block plot of the east-west profile of DH11H butte at equilibrium (10,000 steps).	522

7.39b:	UDEC block plot of the east-west profile of DH11H butte at 100,000 steps.	523
7.39c:	UDEC block plot of the east-west profile of DH11H butte at 200,000 steps.	524
7.39d:	UDEC block plot of the east-west profile of DH11H butte at 500,000 steps.	525
7.40a:	UDEC block plot of the north-south profile of DH11H butte at equilibrium (10,000 steps).	526
7.40b:	UDEC block plot of the north-south profile of DH11H butte at 100,000 steps.	527
7.40c:	UDEC block plot of the north-south profile of DH11H butte at 200,000 steps.	528
7.40d:	UDEC block plot of the north-south profile of DH11H butte at 500,000 steps.	529
7.41a:	UDEC block plot of CO56H at equilibrium (10,000 steps).	530
7.41b:	UDEC block plot of CO56H at 100,000 steps.	531
7.41c:	UDEC block plot of CO56H at 200,000 steps.	532
7.41d:	UDEC block plot of CO56H at 500,000 steps.	533
7.42a:	UDEC block plot of CO9E at equilibrium (10,000 steps).	534
7.42b:	UDEC block plot of CO9E at 100,000 steps.	535
7.42c:	UDEC block plot of CO9E at 200,000 steps.	536
7.42d:	UDEC block plot of CO9E at 500,000 steps.	537
7.43a:	UDEC block plot of CO19E at equilibrium (10,000 steps).	538
7.43b:	UDEC block plot of CO19E at 100,000 steps.	539
7.43c:	UDEC block plot of CO19E at 200,000 steps.	540
7.43d:	UDEC block plot of CO19E at 500,000 steps.	541
7.44a:	UDEC block plot of CO12E / CO13E neck at equilibrium (10,000 steps).	542
7.44b:	UDEC block plot of CO12E / CO13E neck at 100,000 steps.	543
7.44c:	UDEC block plot of CO12E / CO13E neck at 200,000 steps.	544
7.44d:	UDEC block plot of CO12E / CO13E neck at 500,000 steps.	545

List of Plates

Chapter 5

5.1:	The western pincer at the entrance to Lulworth Cove.	547
5.2:	Portland Limestone reef across St. Oswald's Bay.	549
5.3:	Durdle Door arch and the western part of the Durdle Promontory.	551
5.4:	Portland Limestone cliffs at Stair Hole and the Lulworth Crumple in the Purbeck Beds.	553
5.5:	The field site on the eastern pincer at Lulworth Cove.	555
5.6:	The Portland Limestone outcrop at Fossil Forest.	557
5.7:	The Portland Limestone sea cliffs at the western entrance to Bacon Hole.	559
5.8:	The field sites at Worbarrow Tout (left) and Pondfield (right).	561
5.9:	The quarried Portland Limestone outcrop at Winspit.	563
5.10:	The Portland Limestone sea cliffs at Seacombe.	565
5.11:	The horizontally bedded Portland Limestone outcrop at Tillywhim.	567
5.12:	A toppling block of Portland Limestone embedded within the Kimmeridge Clay at St. Alban's Head.	569
5.13:	Typical view of the Colorado Plateau in the Canyonlands region.	571
5.14:	White Rim Sandstone scarp plan form in the Canyonlands region.	573
5.15:	The Chinle Formation / Wingate Sandstone / Kayenta Formation cliffs at Dead Horse Point State Park.	575
5.16:	Headland site DH6H at Dead Horse Point State Park.	577
5.17:	Embayment site DH2E at Dead Horse Point State Park.	579
5.18:	Butte and site DH11H at Dead Horse Point State Park.	581
5.19:	The Chinle Formation / Wingate Sandstone / Kayenta Formation cliffs at Fruita Canyon, Colorado National Monument.	583
5.20:	Weathering of unprotected Wingate Sandstone at the Coke Ovens, Colorado National Monument.	585
5.21:	Monument Canyon, Colorado National Monument.	587
5.22:	Headland site CO11H at the Colorado National Monument.	589
5.23:	Independence Monument, Colorado National Monument.	591

- 5.24: Discontinuities in the Winspit Member of the Portland Limestone at Winspit. 593
- 5.25: Discontinuities in the Kayenta Formation at Dead Horse Point State Park. 595

Chapter 6

- 6.1: A toppling block of Portland Limestone at Winspit. 597
- 6.2: The top of the Durdle Door sea arch. Note the almost vertical bedding of the rock. 599

Chapter 7

- 7.1: The east-west profile of the modelled butte from site DH11H at Dead Horse Point State Park. 601

List of Appendices

All appendices are to be found on the disk which is attached to the back cover of this volume. The file name corresponds with the appendix number. For the UDEC input files, where the letter 'v' is used, values are varied for different model runs.

Chapter 3

- 3.1: Program for calculating the angle of intersection between a joint plane and a UDEC mesh.

Chapter 4

- 4.1: UDEC input command file used to simulate four single blocks standing on inclined planes.
- 4.2: UDEC input command file used to simulate sliding, toppling and stable rock masses.
- 4.3: UDEC input command file used to simulate sliding, toppling and stable rock masses which contain joints with a friction angle of 20°.
- 4.4: UDEC input command file used to simulate sliding, toppling and stable rock masses which contain joints with a friction angle of 60°.
- 4.5: UDEC input command file used to simulate sliding, toppling and stable sandstone rock masses.
- 4.6: UDEC input command file used to simulate sliding, toppling and stable granite rock masses.
- 4.7: UDEC input command file used to simulate sliding, toppling and stable sandstone rock masses which contain deformable blocks.
- 4.8: UDEC input command file used to simulate sliding, toppling and stable granite rock masses which contain deformable blocks.
- 4.9: UDEC input command file used to simulate sliding, toppling and stable rock masses which contain variable joint dip values.
- 4.10: UDEC input command file used to simulate sliding, toppling and stable rock masses which contain variable joint spacing values.

- 4.11: UDEC input command file used to simulate sliding, toppling and stable rock masses which contain impersistent joints.
- 4.12: UDEC input command file used to simulate sliding, toppling and stable rock masses which have joint stiffness values set to 5 GPa.
- 4.13: UDEC input command file used to simulate sliding, toppling and stable rock masses which contain a water table at a height of 35 metres.
- 4.14: UDEC input command file used to simulate sliding, toppling and stable rock masses which contain a water table at a height of 50 metres.
- 4.15: UDEC input command file used to simulate sliding, toppling and stable rock masses which are bounded by a 50 metre wide wave cut platform.
- 4.16: Failure mechanism type, b/h ratio and α for models run to define the boundary conditions between failure mechanisms for a jointed rock mass.
- 4.17: UDEC input command file used to simulate sliding, toppling and stable rock masses which have varied block height.
- 4.18: Failure mechanism type, b/h ratio and α for models run to define the boundary conditions between failure mechanisms for a jointed rock mass with varied block height.
- 4.19: UDEC input command file used to simulate sliding, toppling and stable rock masses which have rectangular blocks.
- 4.20: Failure mechanism type, b/h ratio and α for models run to define the boundary conditions between failure mechanisms for a jointed rock mass with rectangular blocks.
- 4.21: Failure mechanism type, b/h ratio and α for models run to define the boundary conditions between failure mechanisms for a jointed rock mass which contains joints with a friction angle of 20° .
- 4.22: Failure mechanism type, b/h ratio and α for models run to define the boundary conditions between failure mechanisms for a jointed rock mass which contains joints with a friction angle of 60° .
- 4.23: Failure mechanism type, b/h ratio and α for models run to define the boundary conditions between failure mechanisms for a sandstone jointed rock mass.
- 4.24: Failure mechanism type, b/h ratio and α for models run to define the boundary conditions between failure mechanisms for a granite jointed rock mass.

- 4.25: Failure mechanism type, b/h ratio and α for models run to define the boundary conditions between failure mechanisms for a sandstone jointed rock mass which contains deformable blocks.
- 4.26: Failure mechanism type, b/h ratio and α for models run to define the boundary conditions between failure mechanisms for a granite jointed rock mass which contains deformable blocks.
- 4.27: Failure mechanism type, b/h ratio and α for models run to define the boundary conditions between failure mechanisms for a jointed rock mass which contains variable joint spacing values.
- 4.28: Failure mechanism type, b/h ratio and α for models run to define the boundary conditions between failure mechanisms for a jointed rock mass which contains variable joint dip values.
- 4.29: Failure mechanism type, b/h ratio and α for models run to define the boundary conditions between failure mechanisms for a jointed rock mass which contains impersistent joints.
- 4.30: Failure mechanism type, b/h ratio and α for models run to define the boundary conditions between failure mechanisms for a jointed rock mass which contains a water table at a height of 35 metres.
- 4.31: Failure mechanism type, b/h ratio and α for models run to define the boundary conditions between failure mechanisms for a jointed rock mass which contains a water table at a height of 50 metres.
- 4.32: Failure mechanism type, b/h ratio and α for models run to define the boundary conditions between failure mechanisms for a jointed rock mass which has joint stiffness values set to 5 GPa.
- 4.33: Failure mechanism type, b/h ratio and α for models run to define the boundary conditions between failure mechanisms for a jointed rock mass which is bounded by a 50 metre wide wave cut platform.
- 4.34: UDEC input command file used to simulate sliding, toppling and stable rock masses above a clay base.

- 4.35: Failure mechanism type, b/h ratio and α for models run to define the boundary conditions between failure mechanisms for a jointed rock mass above a clay base.

Chapter 6

- 6.1: Program for calculating the angle of intersection between two joint planes.
- 6.2: UDEC input command file used to simulate the Durdle Door sea arch.
- 6.3: UDEC input command file used to simulate the eastern part of the Durdle Promontory.
- 6.4: UDEC input command file used to simulate the western part of the Durdle Promontory.
- 6.5: UDEC input command file used to simulate the Lulworth Cove pincer.
- 6.6: UDEC input command file used to simulate the Lulworth Cove cliff.
- 6.7: UDEC input command file used to simulate Fossil Forest.
- 6.8: UDEC input command file used to simulate the quarried Winspit section.
- 6.9: UDEC input command file used to simulate the Winspit cliff.

Chapter 7

- 7.1: UDEC input command file used to simulate Dead Horse Point site DH4E.
- 7.2: UDEC input command file used to simulate Dead Horse Point site DH5H.
- 7.3: UDEC input command file used to simulate Dead Horse Point site DH7E.
- 7.4: UDEC input command file used to simulate the east-west profile of the DH11H butte.
- 7.5: UDEC input command file used to simulate the north-south profile of the DH11H butte.
- 7.6: UDEC input command file used to simulate Colorado National Monument site CO56H.
- 7.7: UDEC input command file used to simulate Colorado National Monument site CO9E.
- 7.8: UDEC input command file used to simulate Colorado National Monument site CO19E.

7.9: UDEC input command file used to simulate the neck at Colorado National Monument sites CO12E / CO13E.

Figures

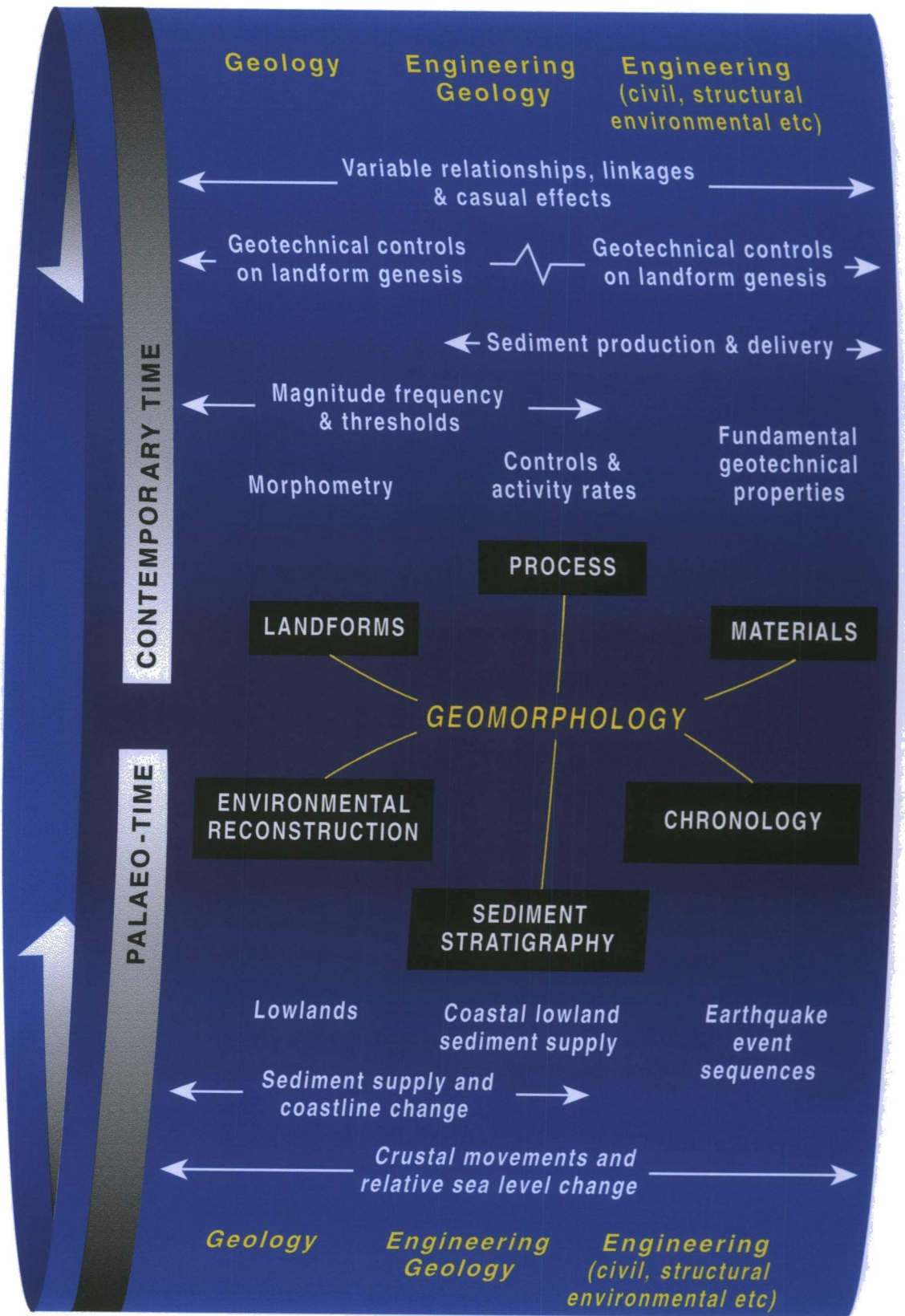


Figure 2.1: Links between engineering and geomorphology (from Allison, 1997)

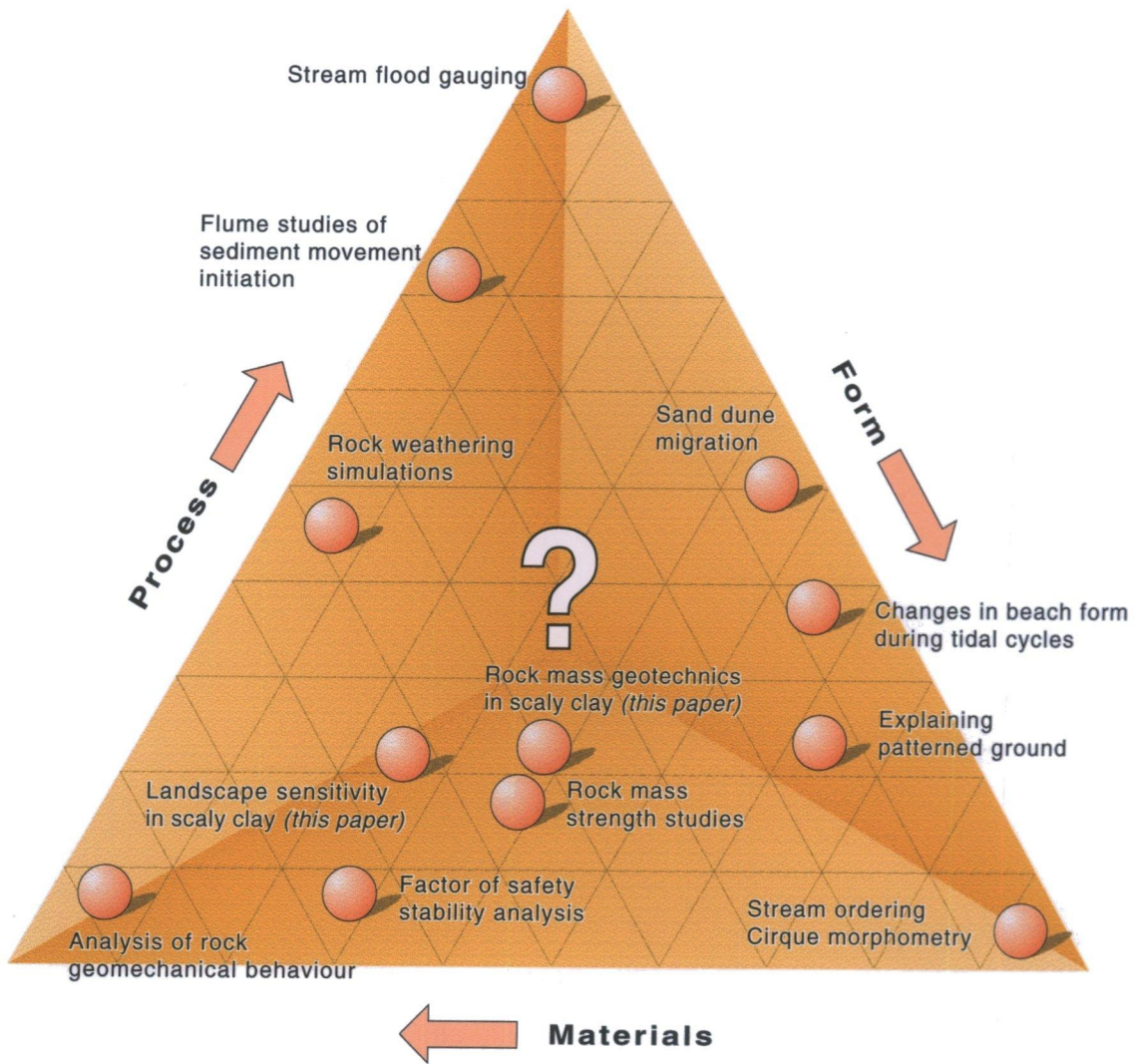


Figure 2.2: Geomorphological interactions between processes, landforms and materials (from Allison, 1996a)

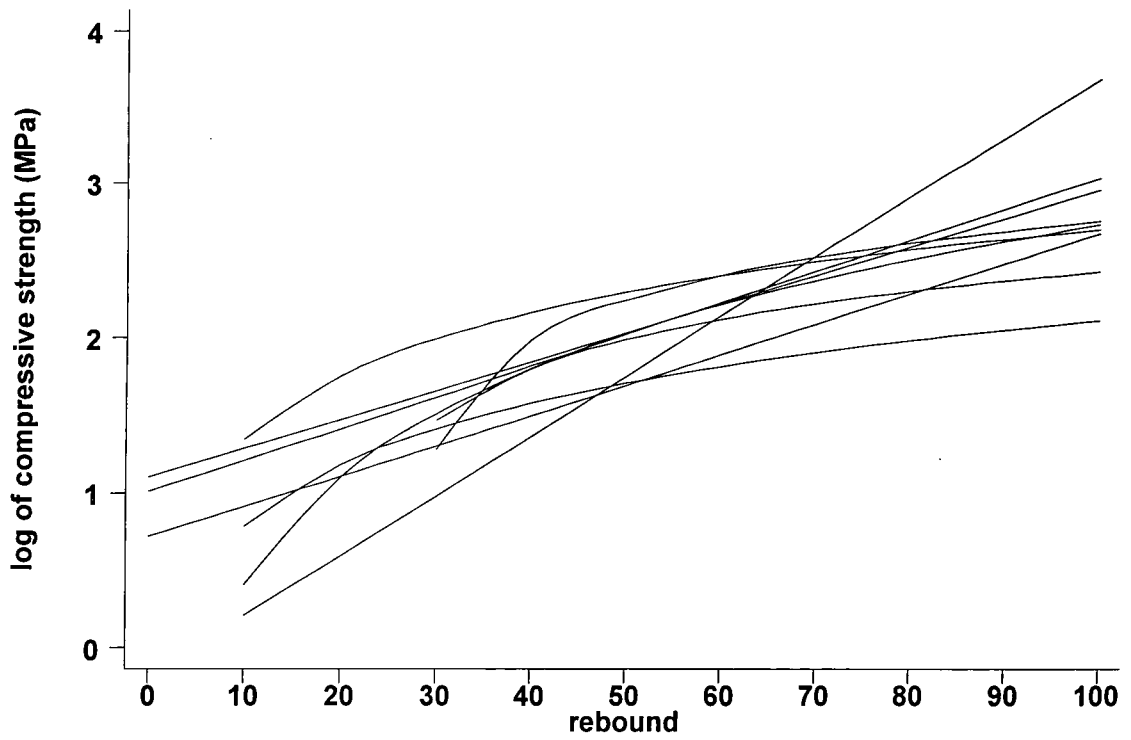


Figure 2.3: Graphs of published relationships for the conversion of Schmidt hammer rebound values (R) into uniaxial compressive strength.

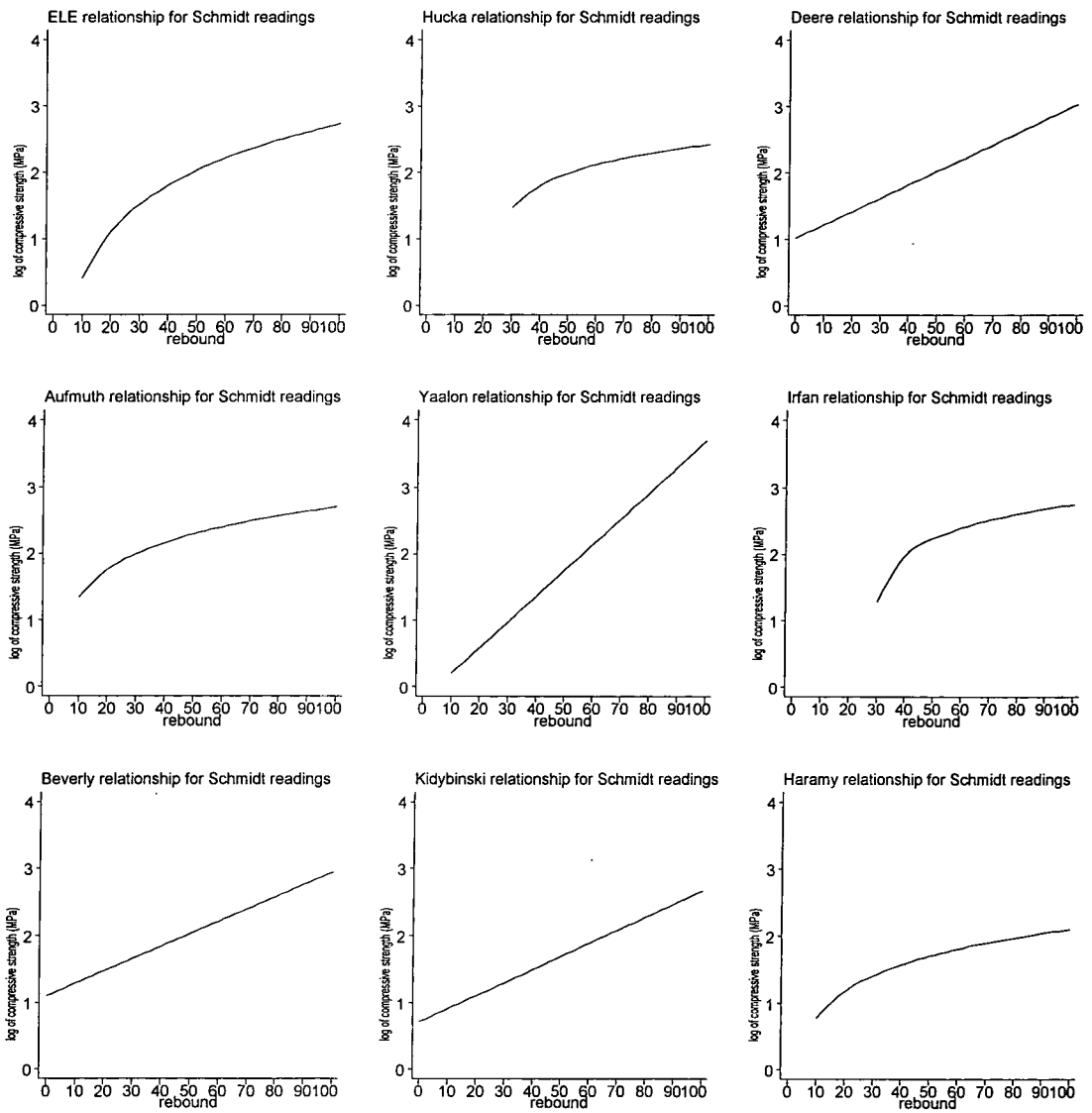


Figure 2.4: Separate graphs of published relationships for the conversion of Schmidt hammer rebound values (R) into uniaxial compressive strength.

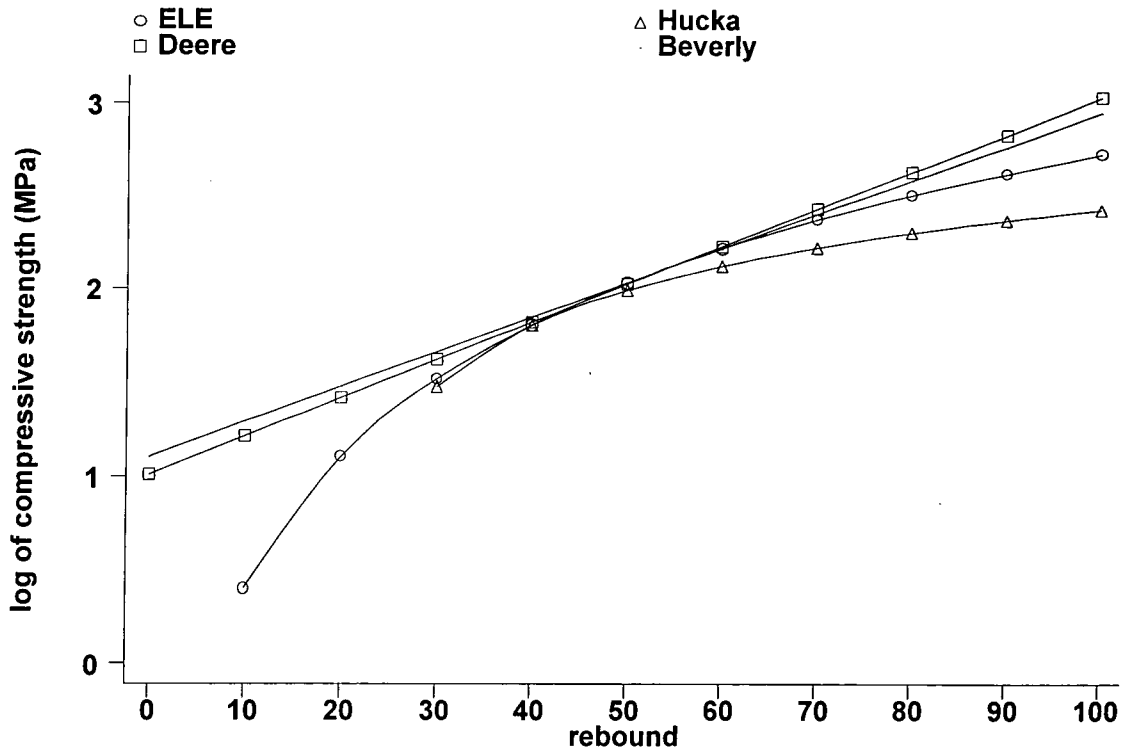


Figure 2.5: Four similar relationships for the conversion of Schmidt hammer rebound values (R) into uniaxial compressive strength.

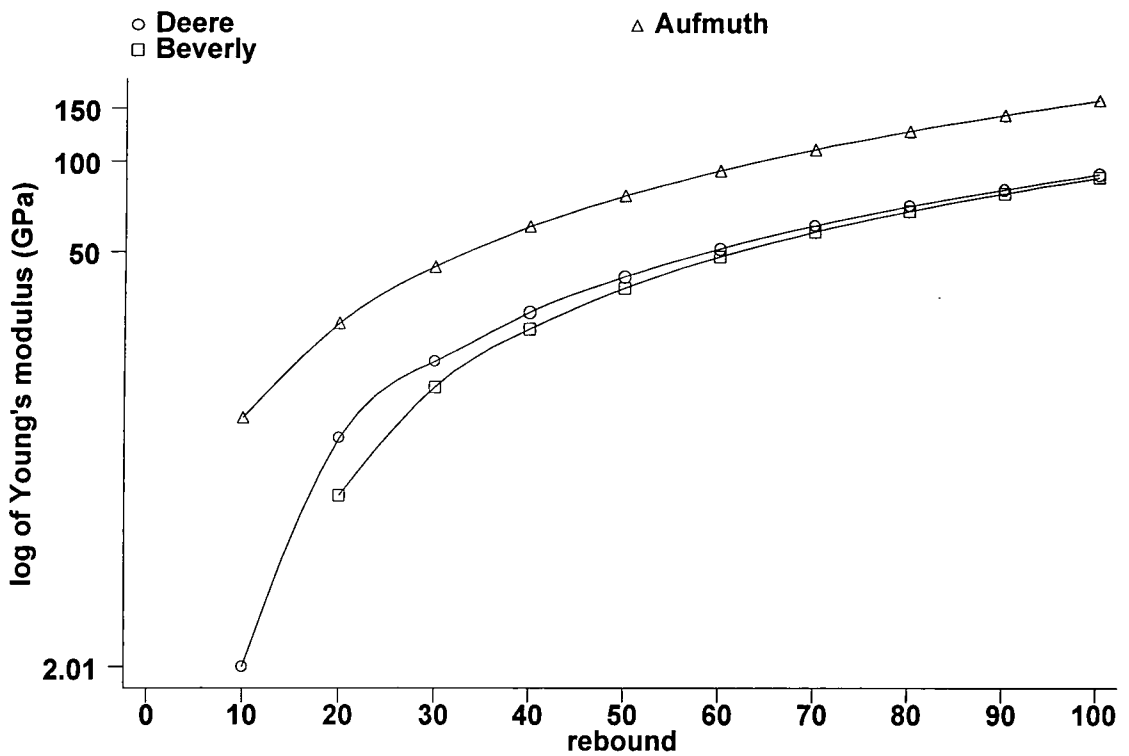


Figure 2.6: Three similar relationships for the conversion of Schmidt hammer rebound values (R) into Young's modulus.

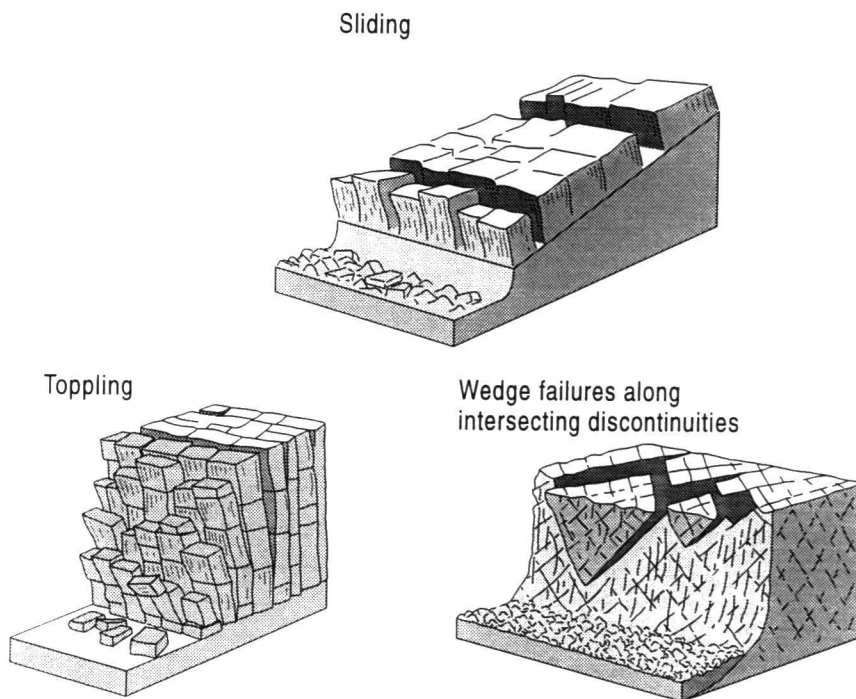


Figure 2.7: Three basic failure mechanisms of rock masses under gravitational forces.

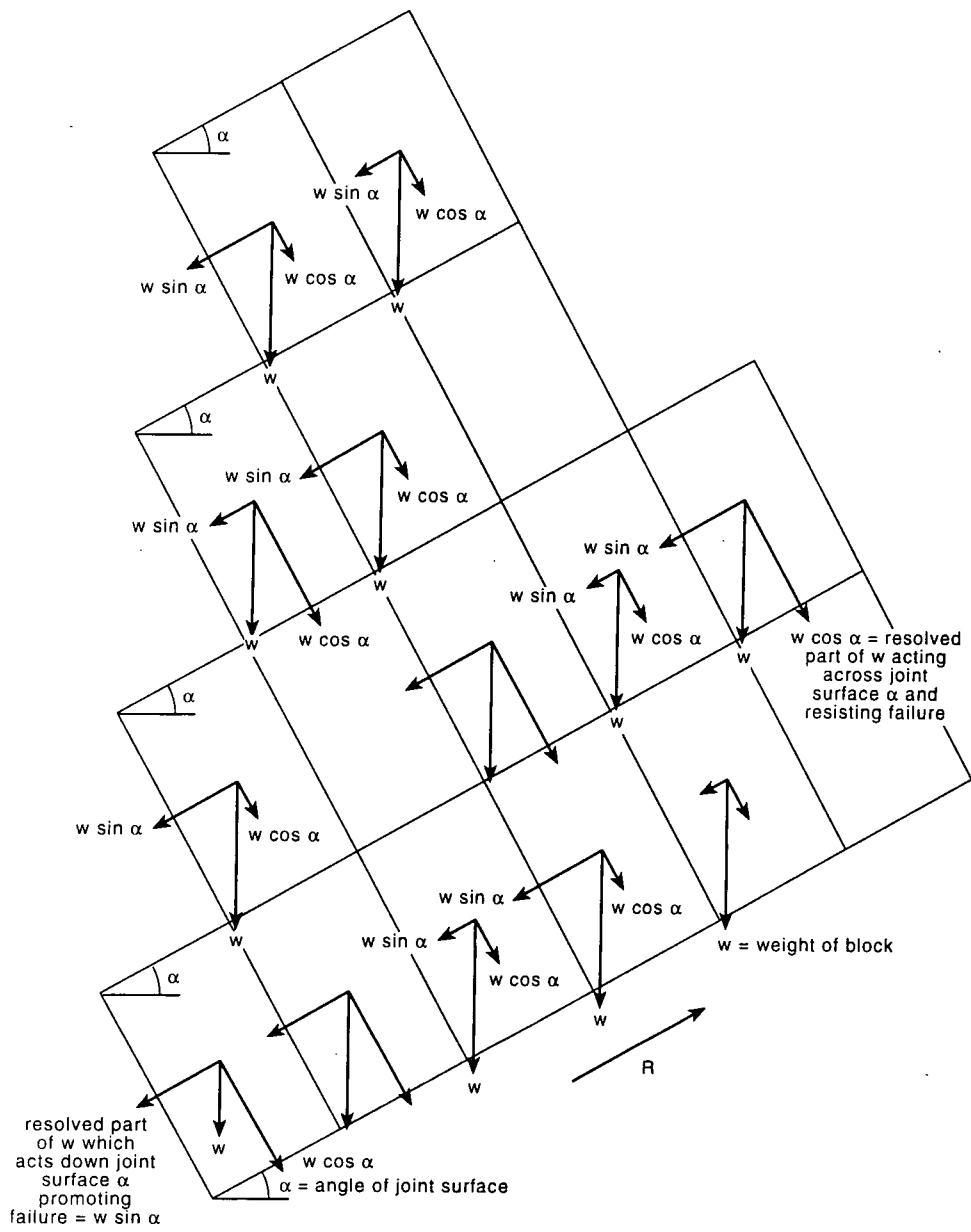


Figure 2.8: Basic conditions controlling rock mass block toppling.

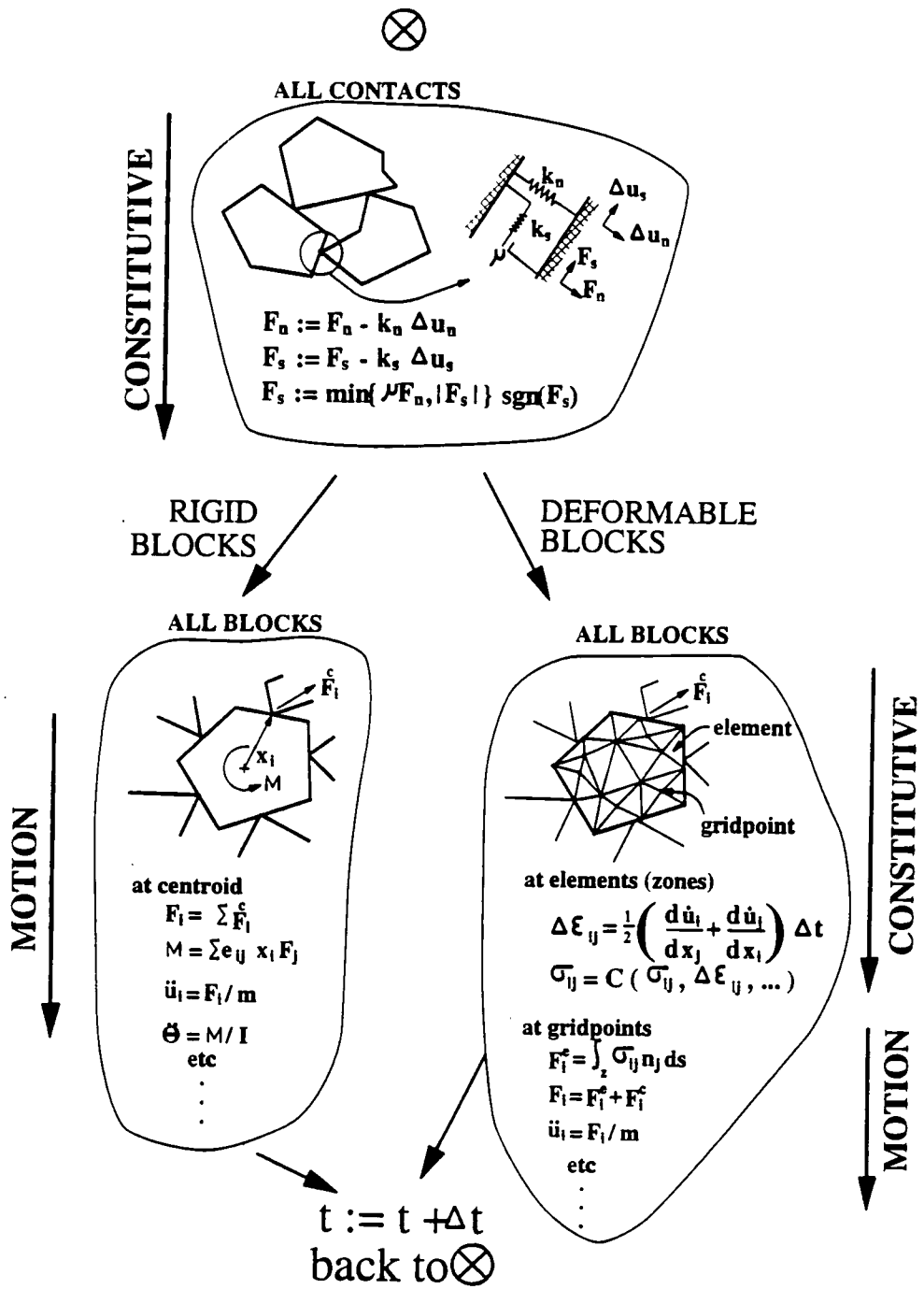


Figure 3.1: Calculation cycle for the distinct element method.

JOB TITLE : Figure 3.2: Block plot of demonstration slope at equilibrium.

UDEC (Version 2.00)

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8/25/1998 14:16

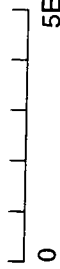
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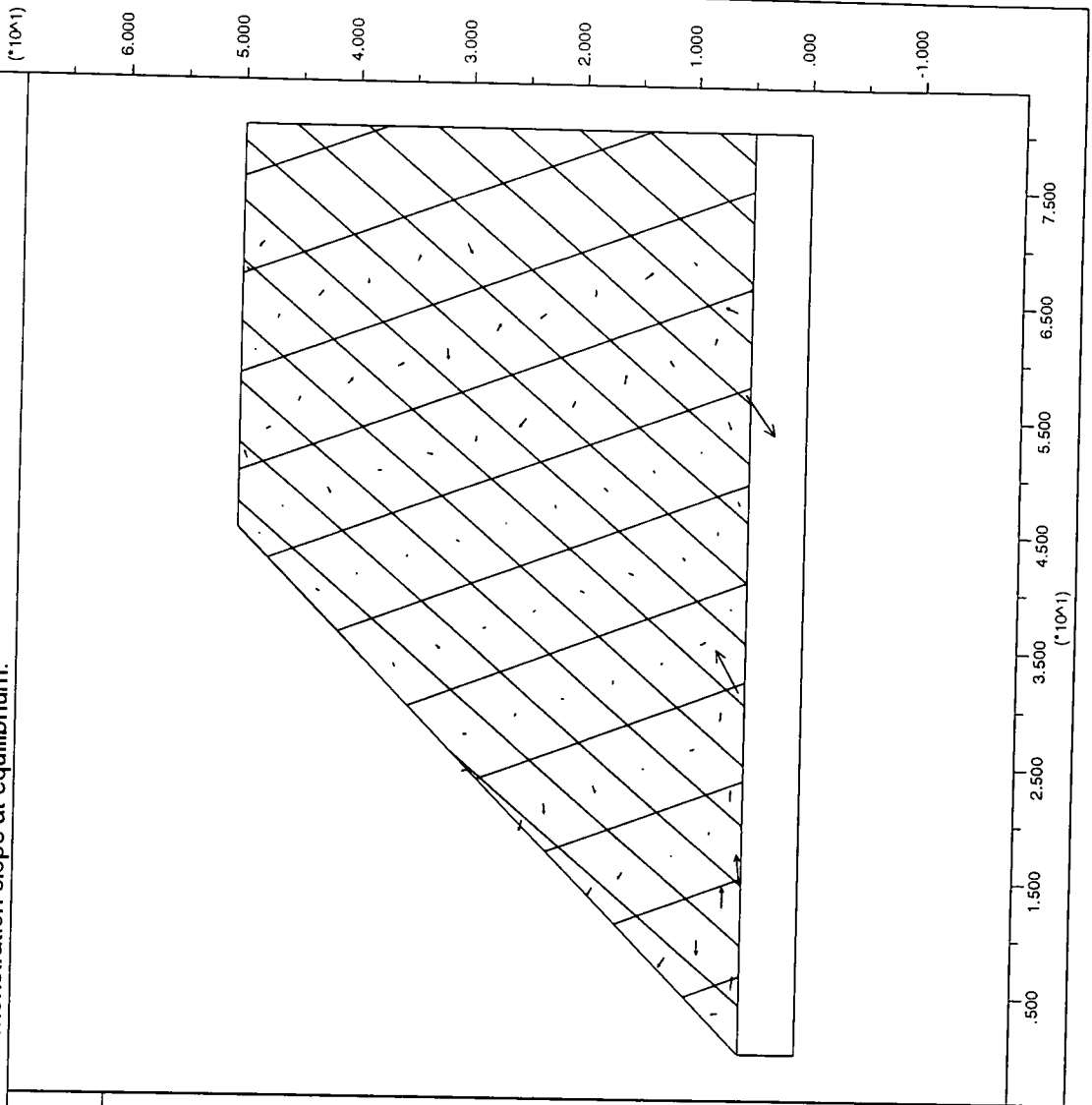
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JOB TITLE : Figure 3.3: Total forces for demonstration slope at equilibrium.

UDEC (Version 2.00)

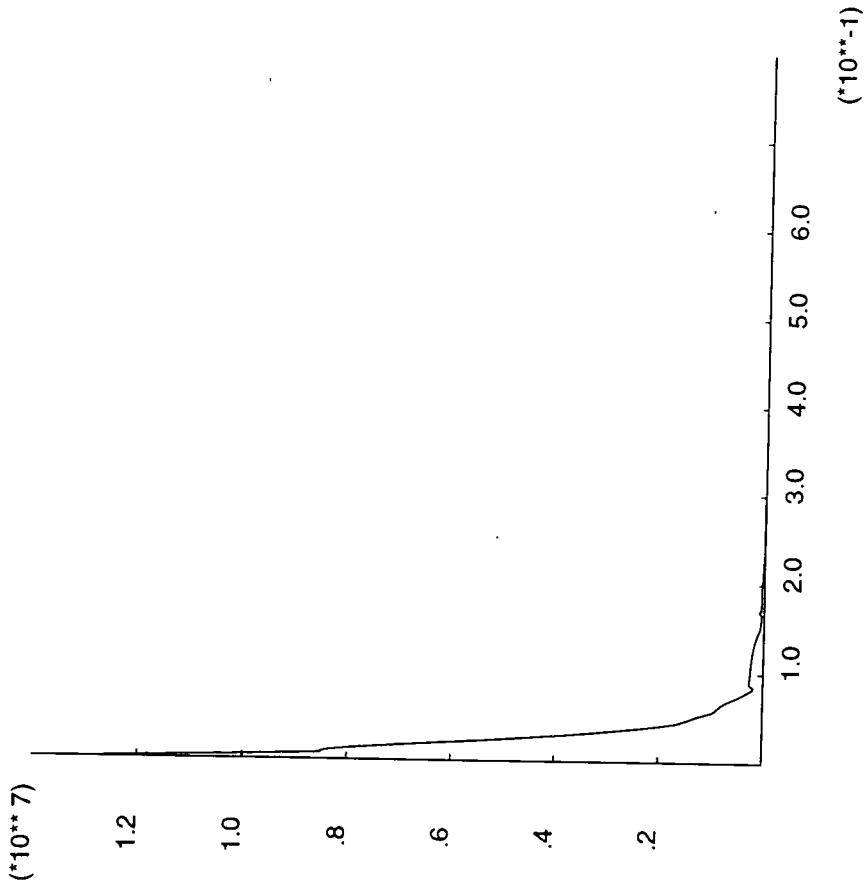
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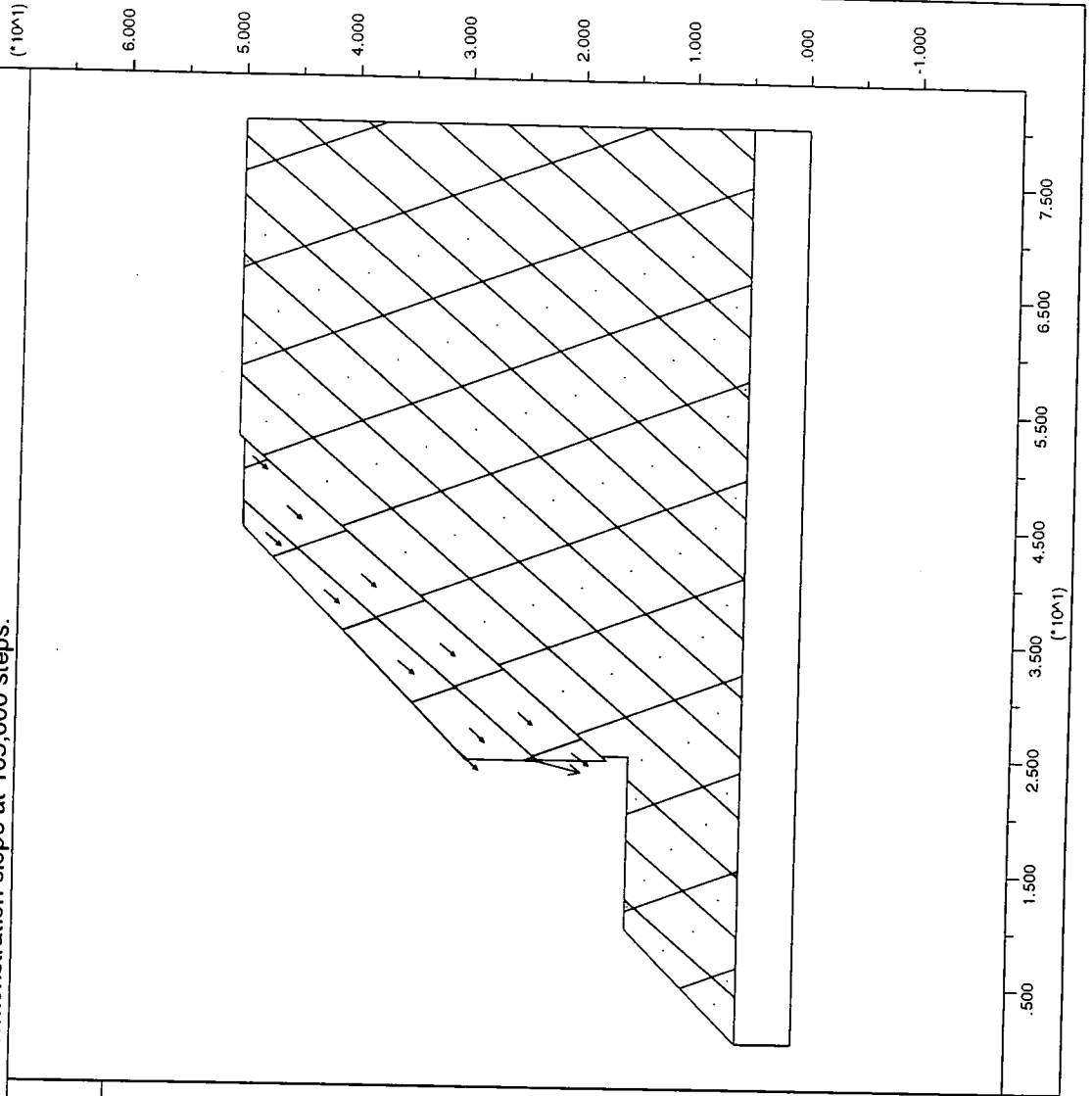
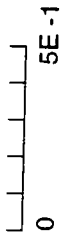
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UDEC (Version 2.00)

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velocity vectors
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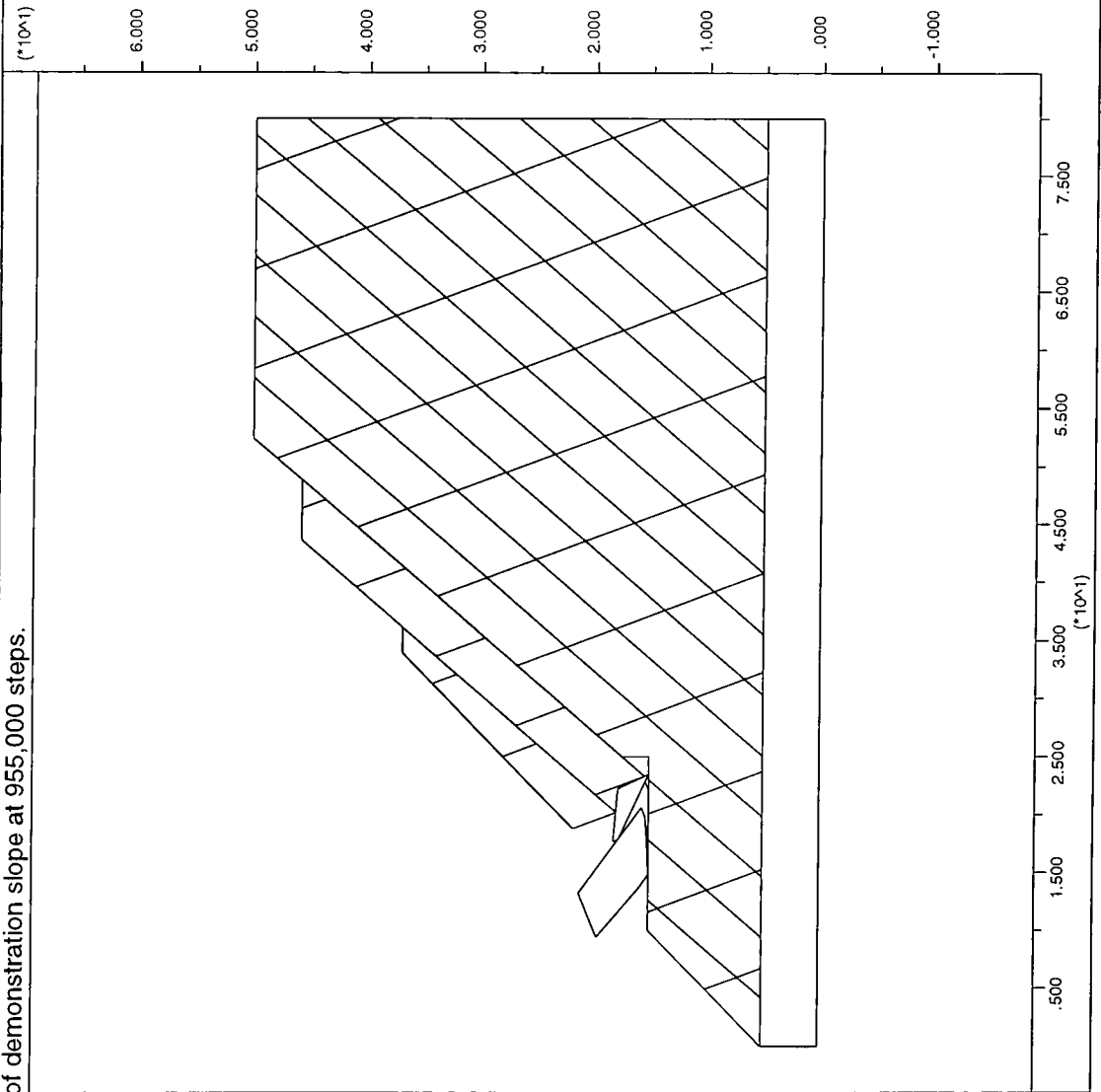
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JOB TITLE : Figure 3.5: Block plot of demonstration slope at 955,000 steps.

UDEC (Version 2.00)

LEGEND

11/23/1998 17:39
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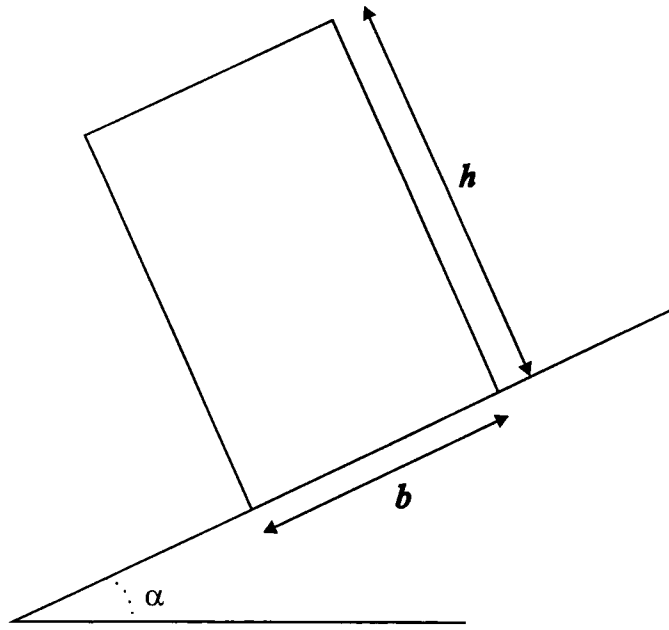


Figure 4.1: Single block geometrical parameters.

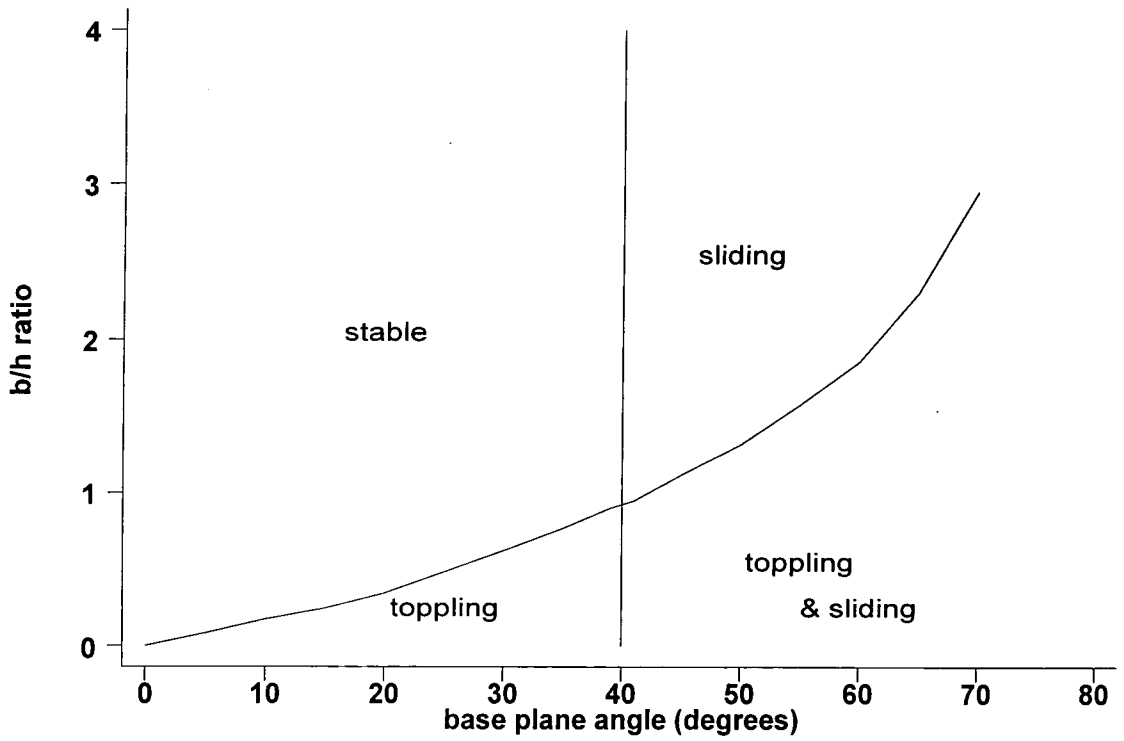


Figure 4.2: Limiting conditions for sliding, toppling and stable rock blocks (from DeFreitas and Watters, 1973).

JOB TITLE : Figure 4.3b: Block plot of a stable single block.

UDEEC (Version 2.00)

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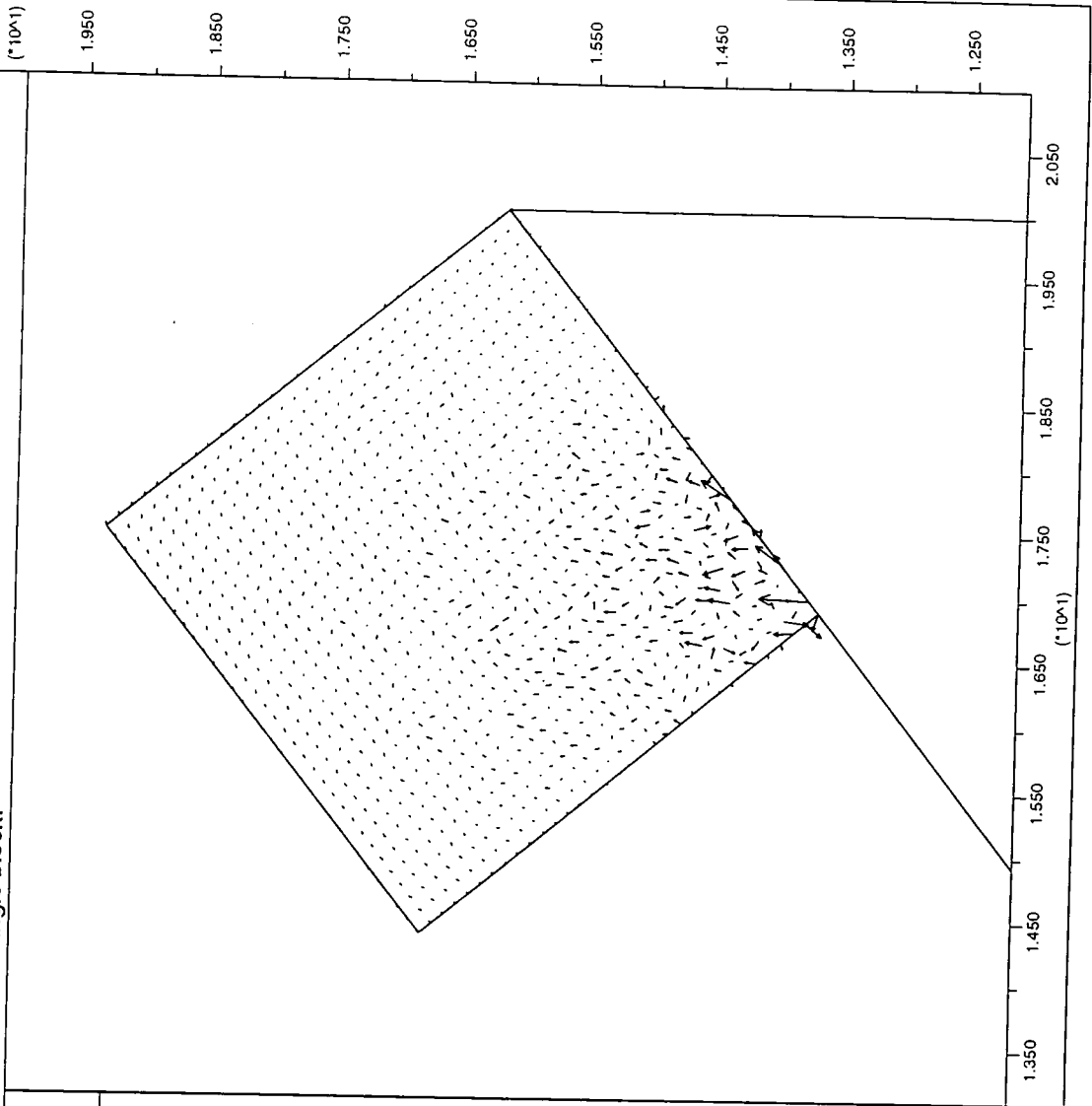
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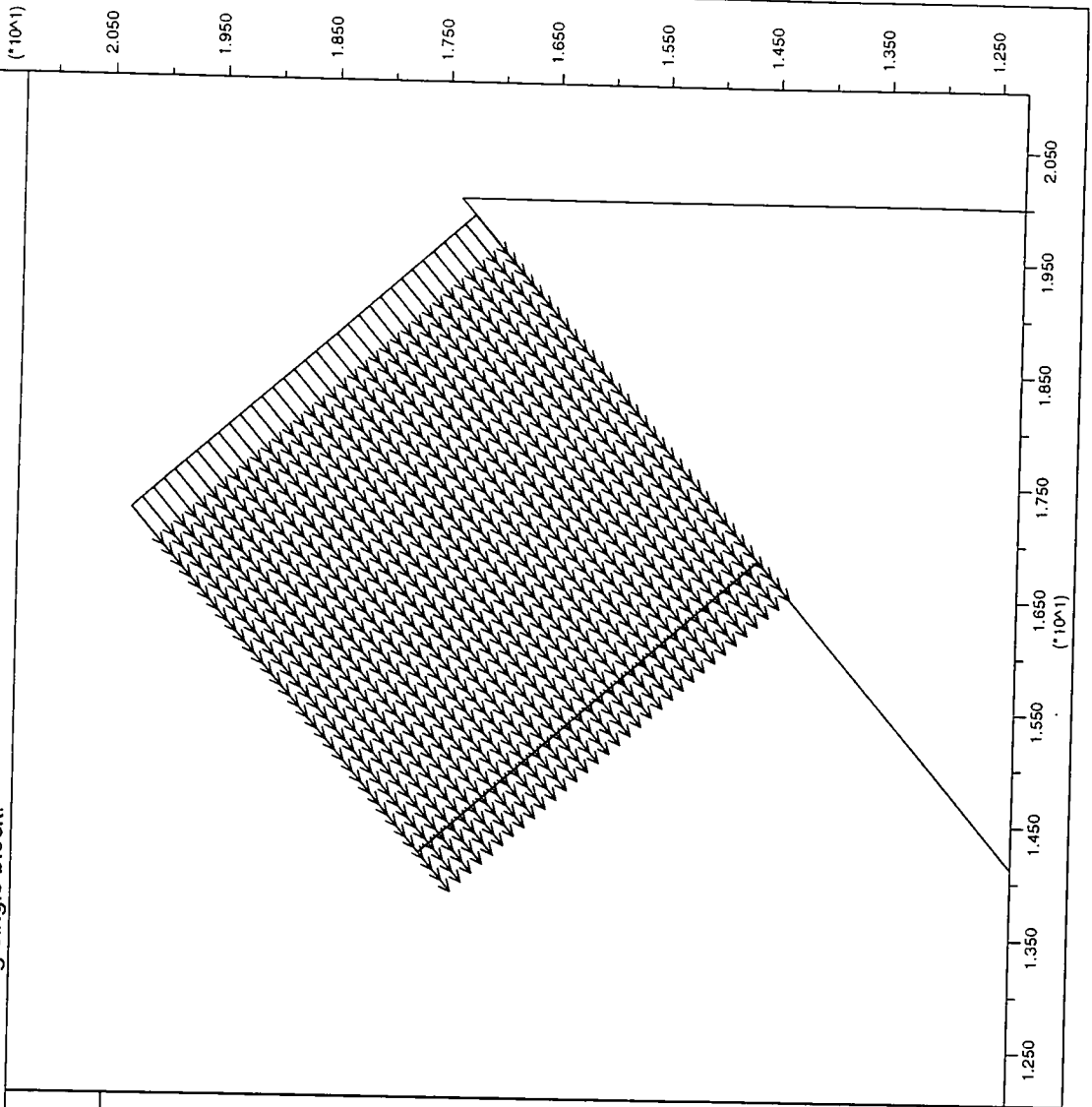
JOB TITLE : Figure 4.3c: Block plot of a sliding single block.

UDEC (Version 2.00)

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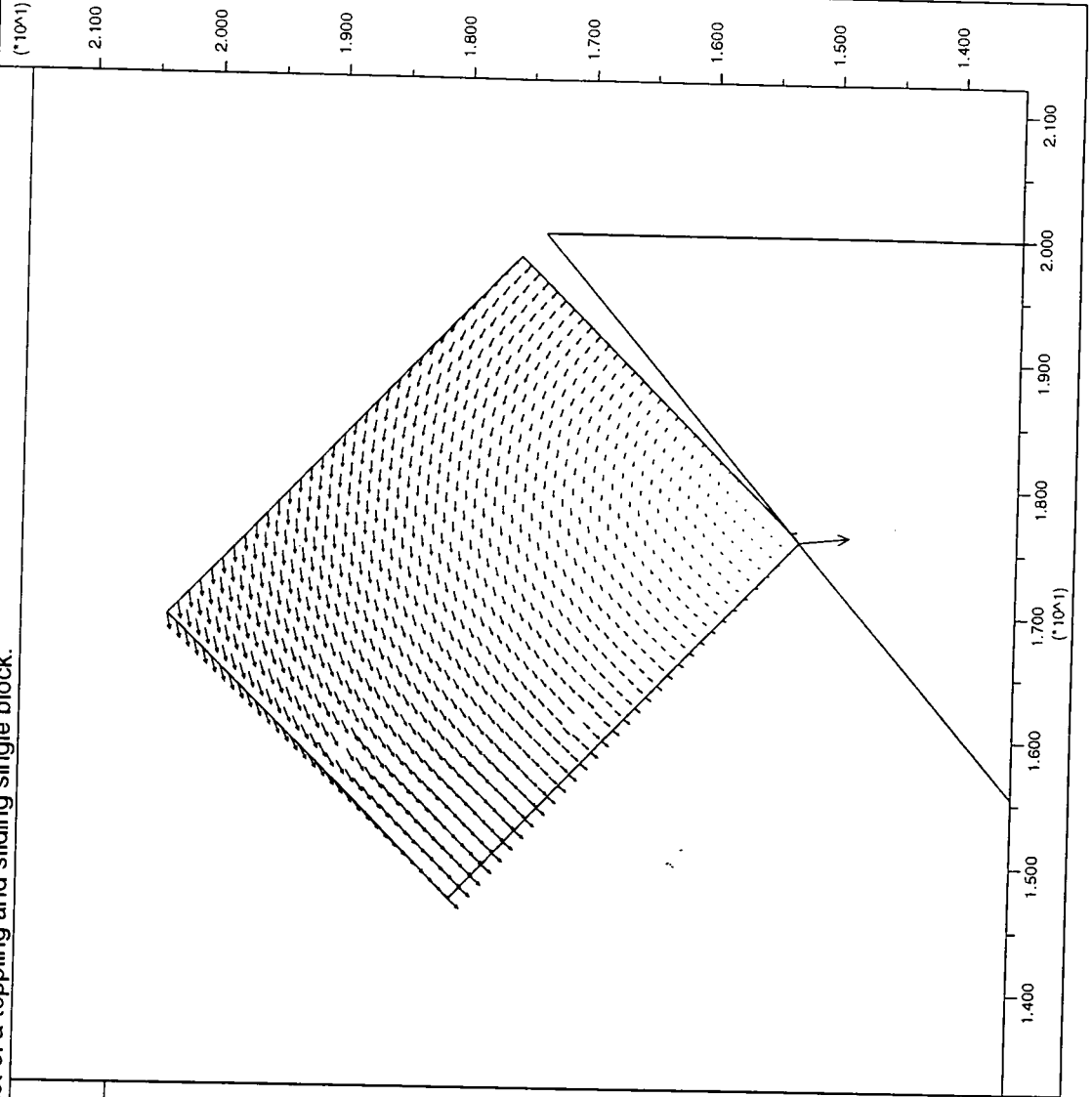
JOB TITLE : Figure 4.3d: Block plot of a toppling and sliding single block.

UDEC (Version 2.00)

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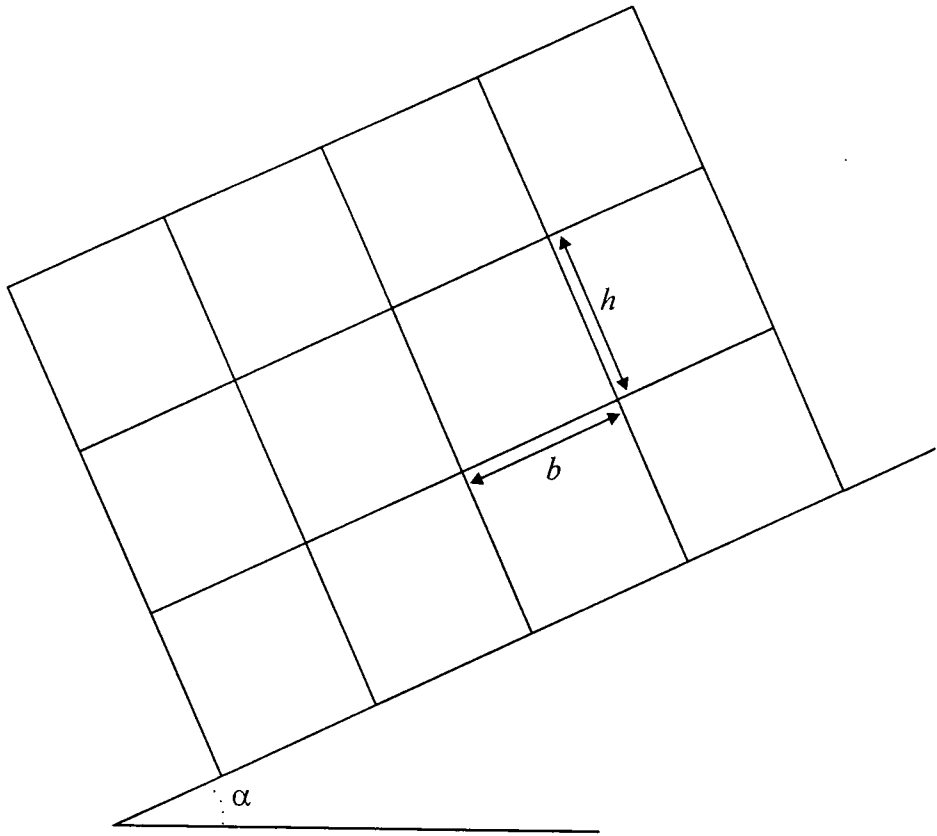


Figure 4.4: Rock mass block geometrical parameters.

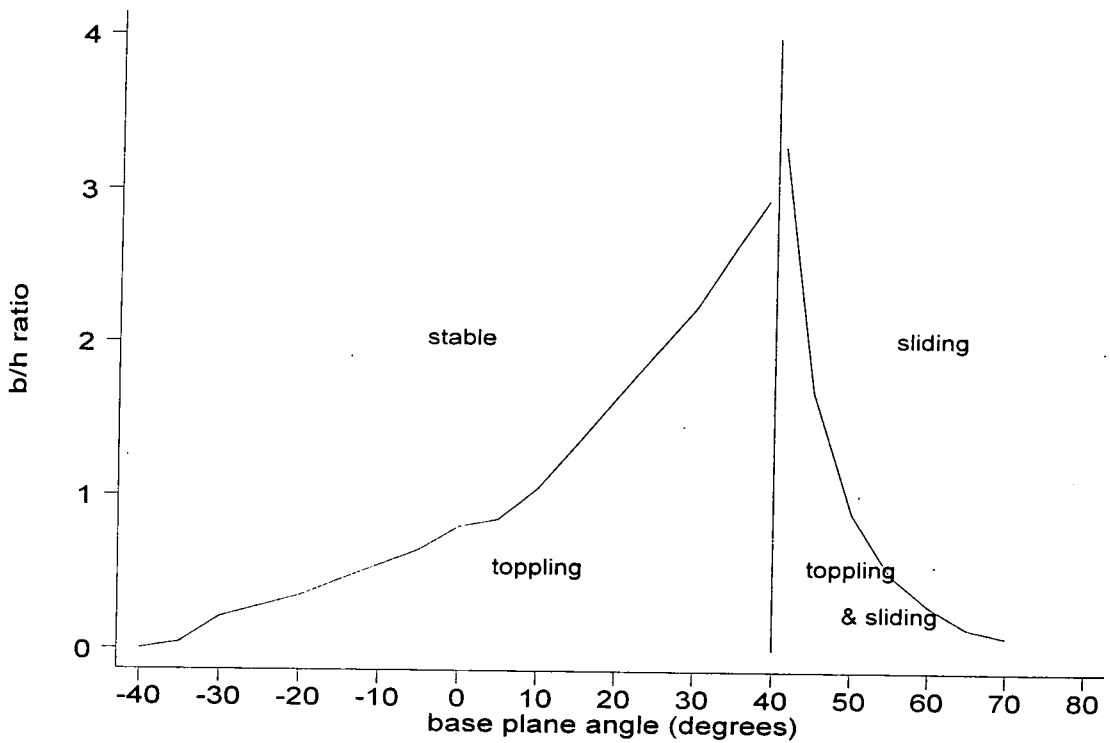


Figure 4.5: Limiting conditions for sliding, toppling and stable rock masses.

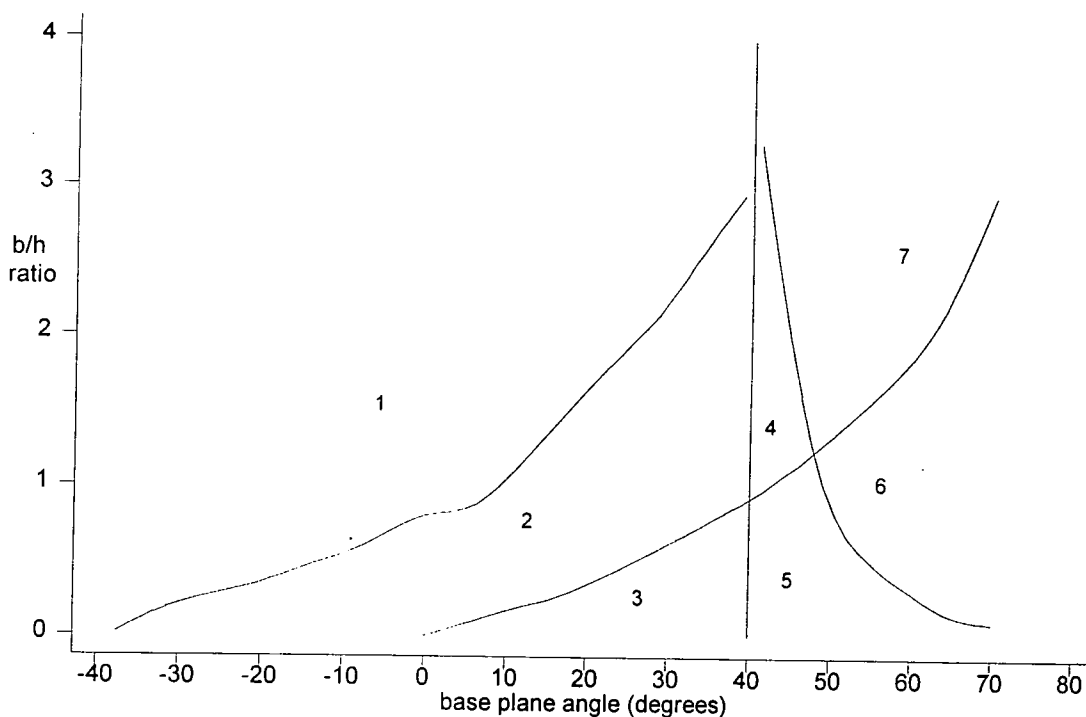


Figure 4.6: Limiting conditions for the failure of a rock mass compared with the limiting conditions for the failure of a single block.

The boundaries between the mechanisms of failure are taken from Figures 4.2 and 4.5.

Zones on the graph are delimited by the boundary lines:

Zone	Rock mass	Single block
1	Stable	Stable
2	Toppling	Stable
3	Toppling	Toppling
4	Toppling-and-sliding	Sliding
5	Toppling-and-sliding	Toppling-and-sliding
6	Sliding	Toppling-and-sliding
7	Sliding	Sliding

JOB TITLE : Figure 4.7a: Block plot of a sliding rock mass.

UDEC (Version 2.00)

LEGEND

8/25/1998 15:38

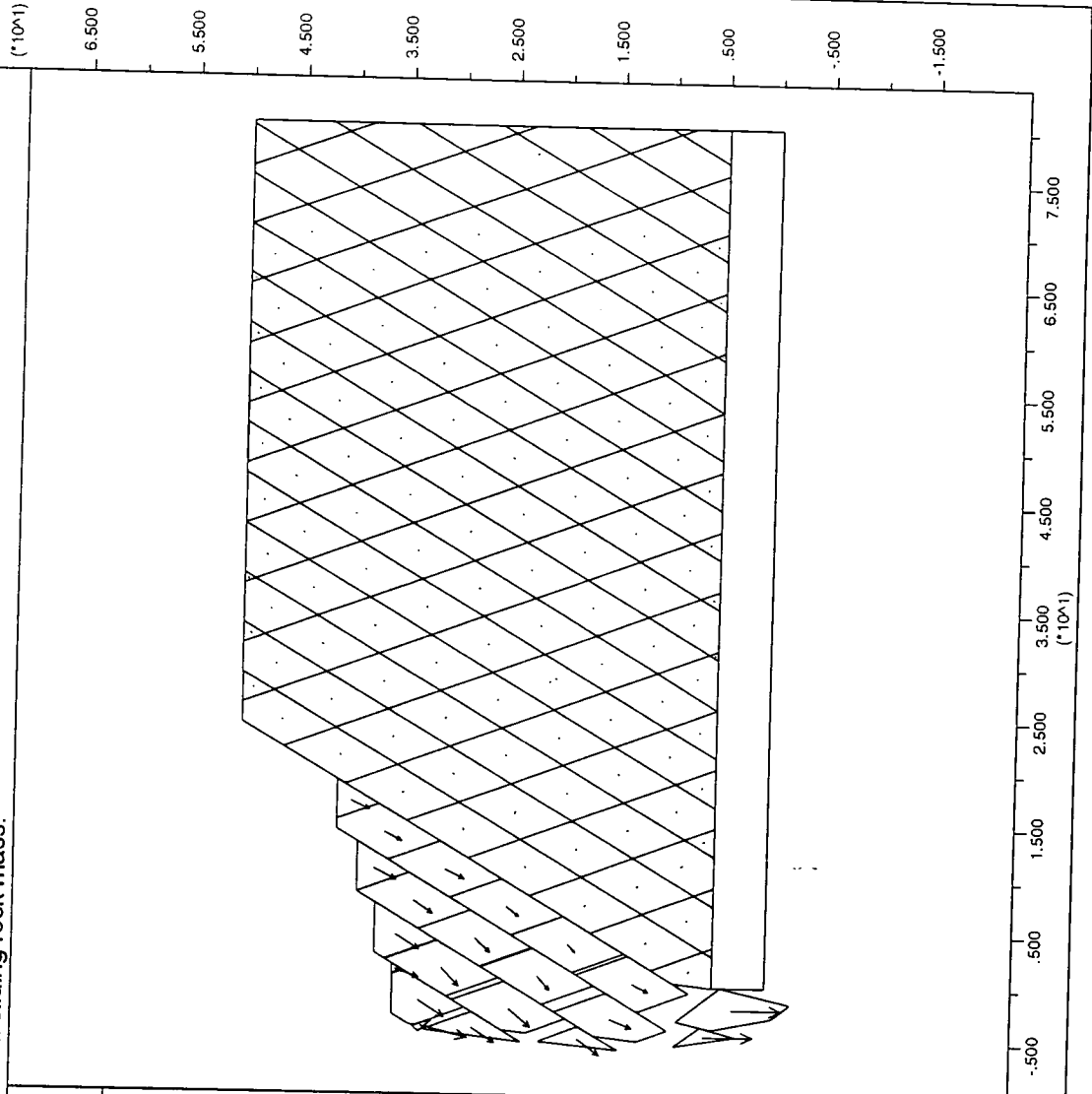
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block plot

velocity vectors

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JOB TITLE : Figure 4.7b: Block plot of a stable rock mass.

UDEC (Version 2.00)

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8/25/1998 15:40

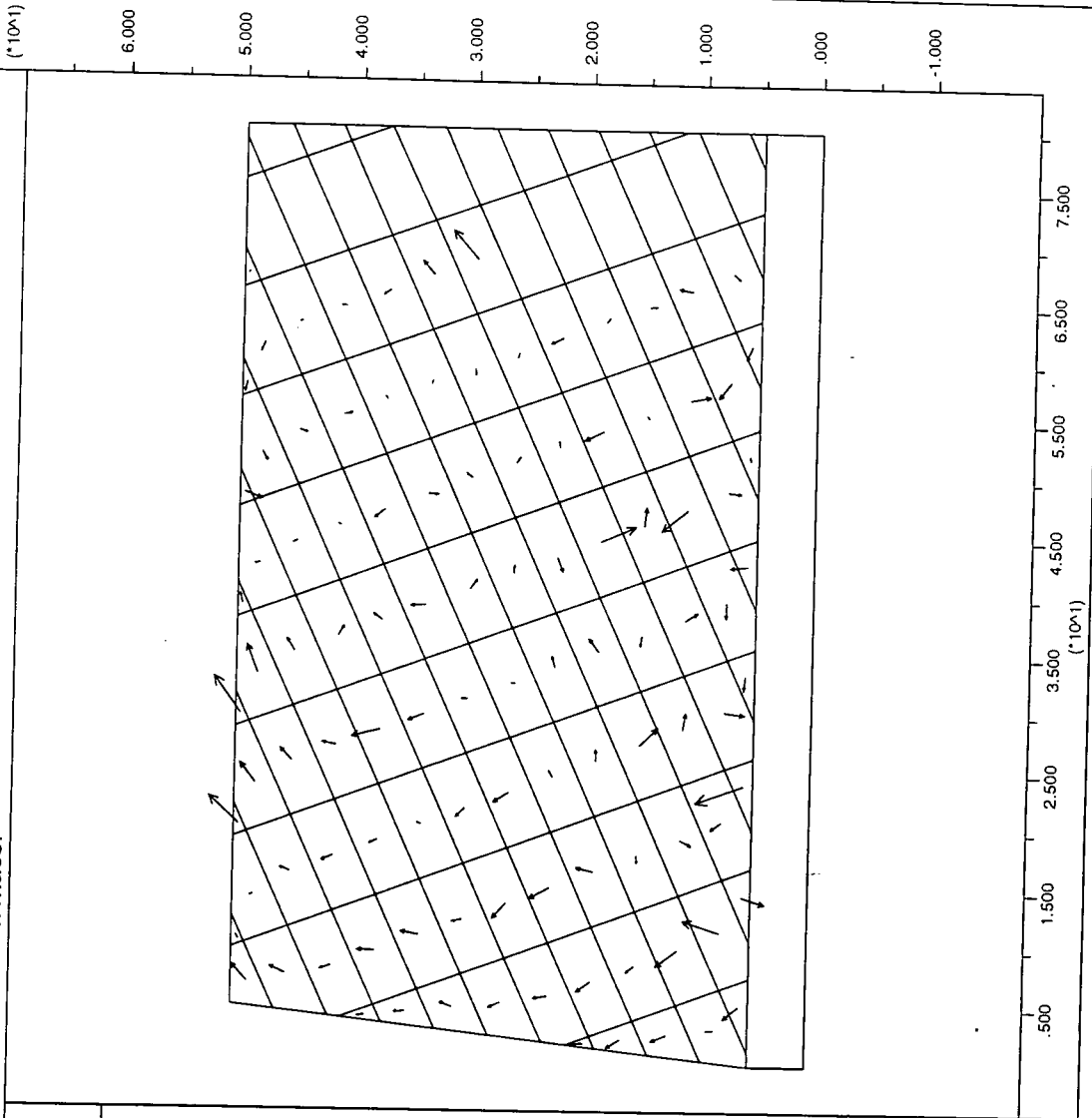
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velocity vectors

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JOB TITLE : Figure 4.7c: Block plot of a toppling rock mass.

UDEC (Version 2.00)

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8/25/1998 15:42

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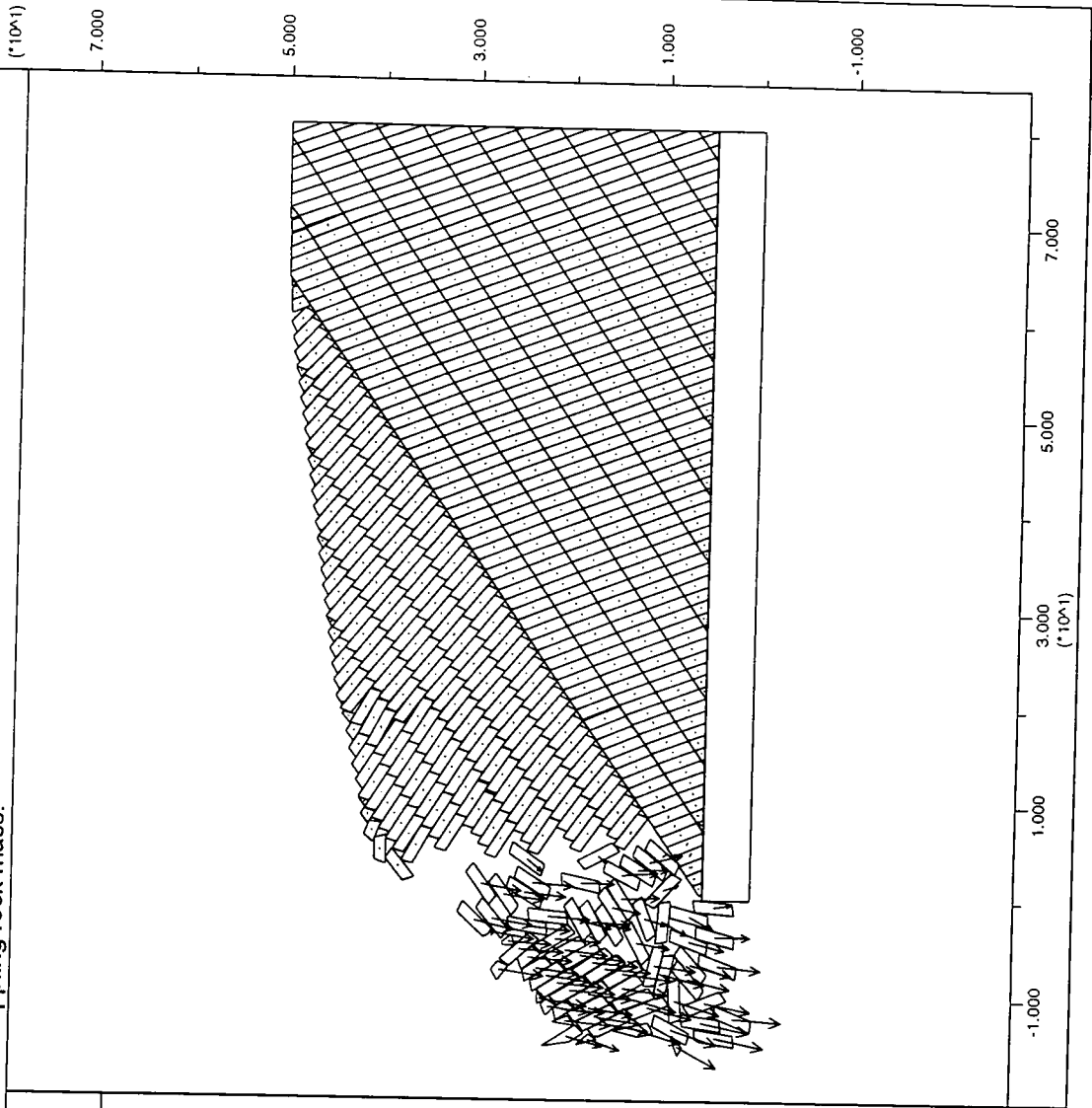
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0 2E 1

0 2E 1



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JOB TITLE : Figure 4.7d: Block plot of a sliding-and-topping rock mass.

UDEC (Version 2.00)

LEGEND

8/25/1998 15:45

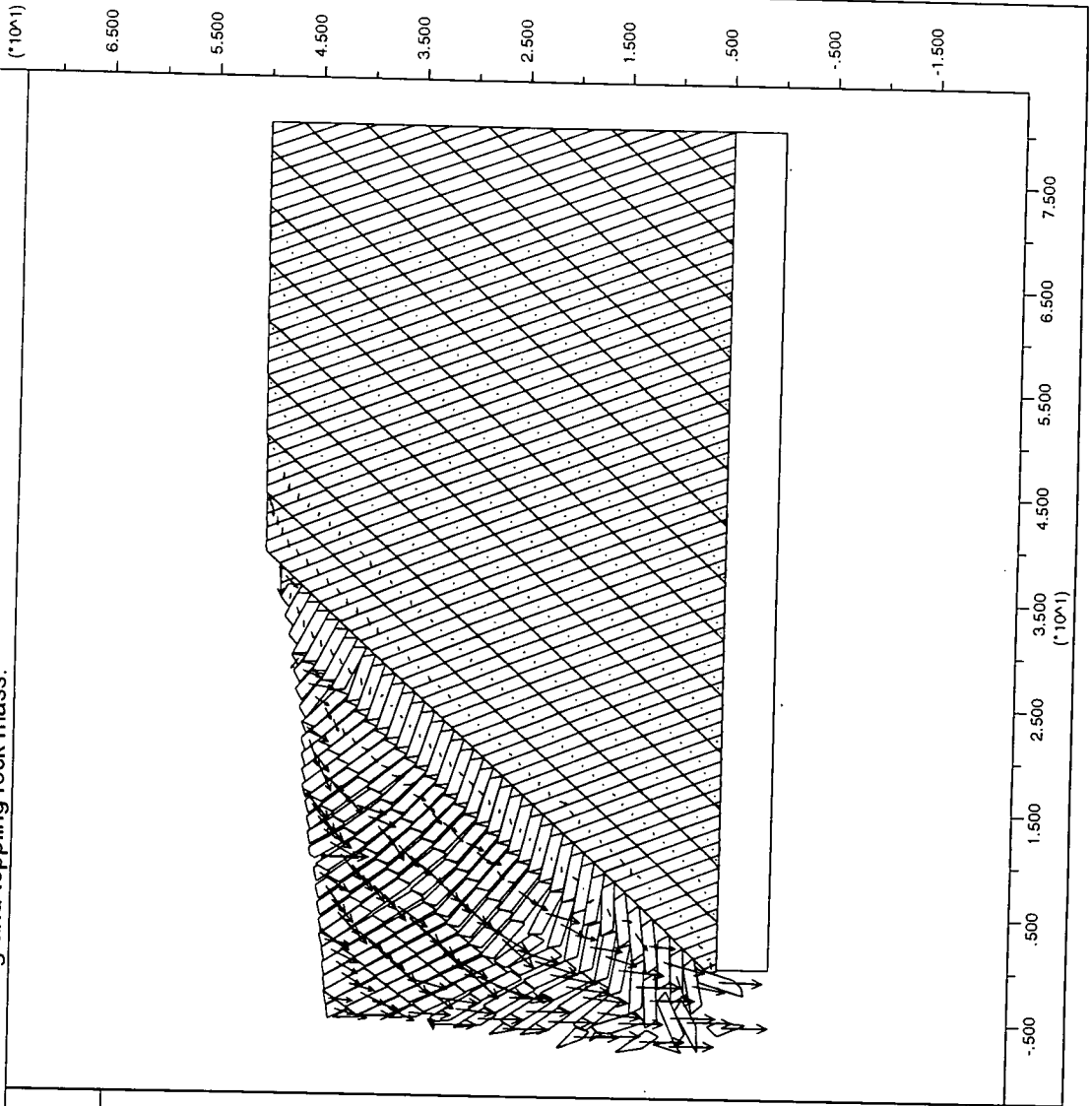
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JOB TITLE : Figure 4.8a: History plot of forces for a sliding rock mass.

UDEC (Version 2.00)

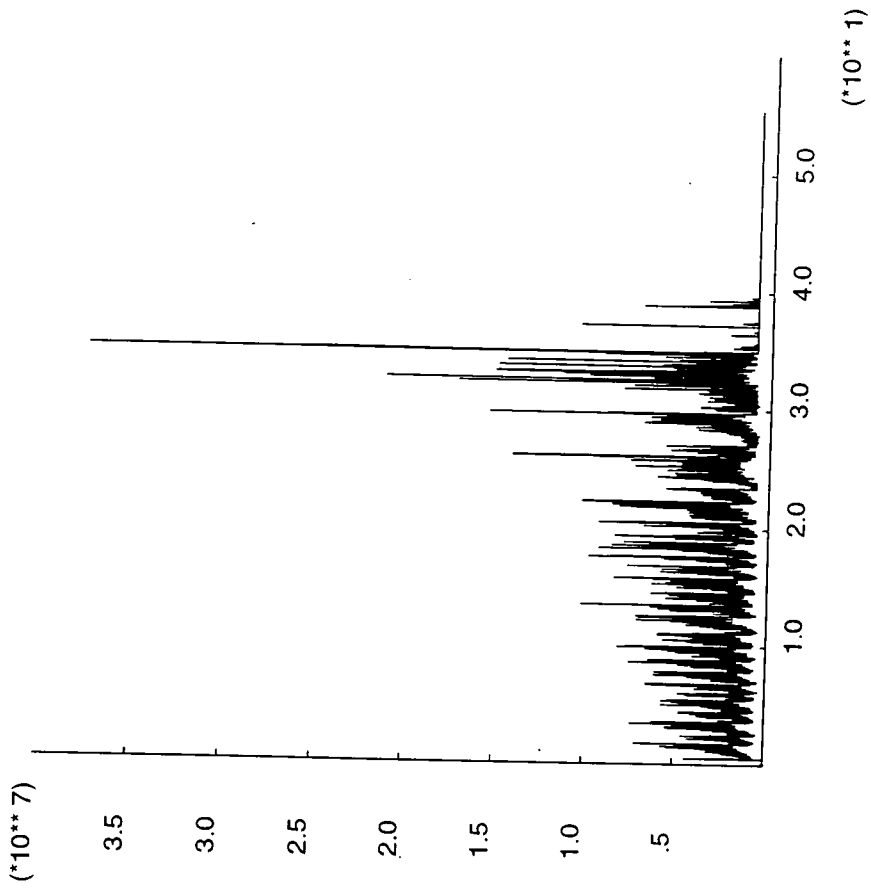
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8/25/1998 15:57

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JOB TITLE : Figure 4.8b: History plot of unbalanced forces for a toppling rock mass.

UDEC (Version 2.00)

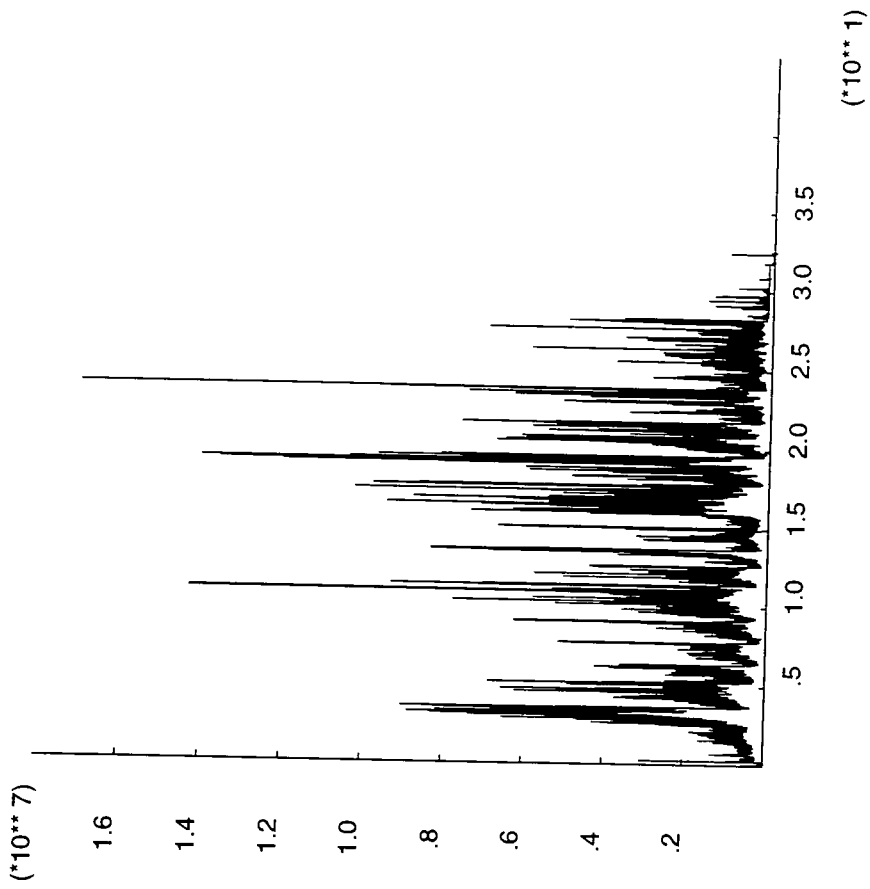
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JOB TITLE : Figure 4.8c: History plot of forces for a toppling-and-sliding rock mass

UDEC (Version 2.00)

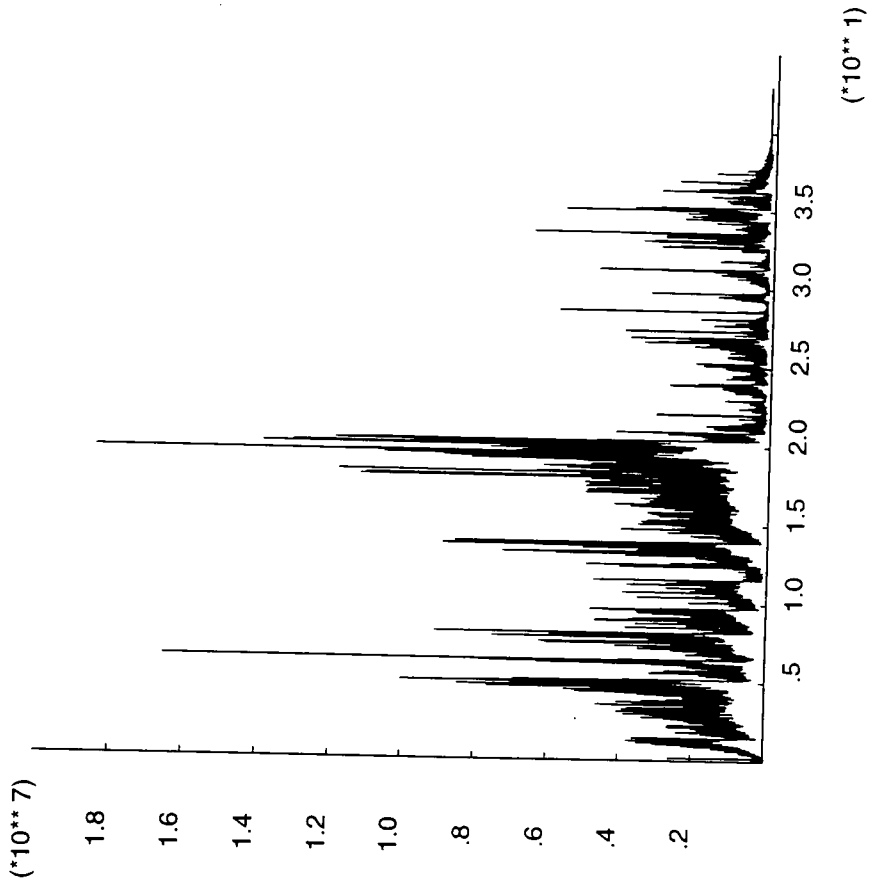
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8/25/1998 16:02

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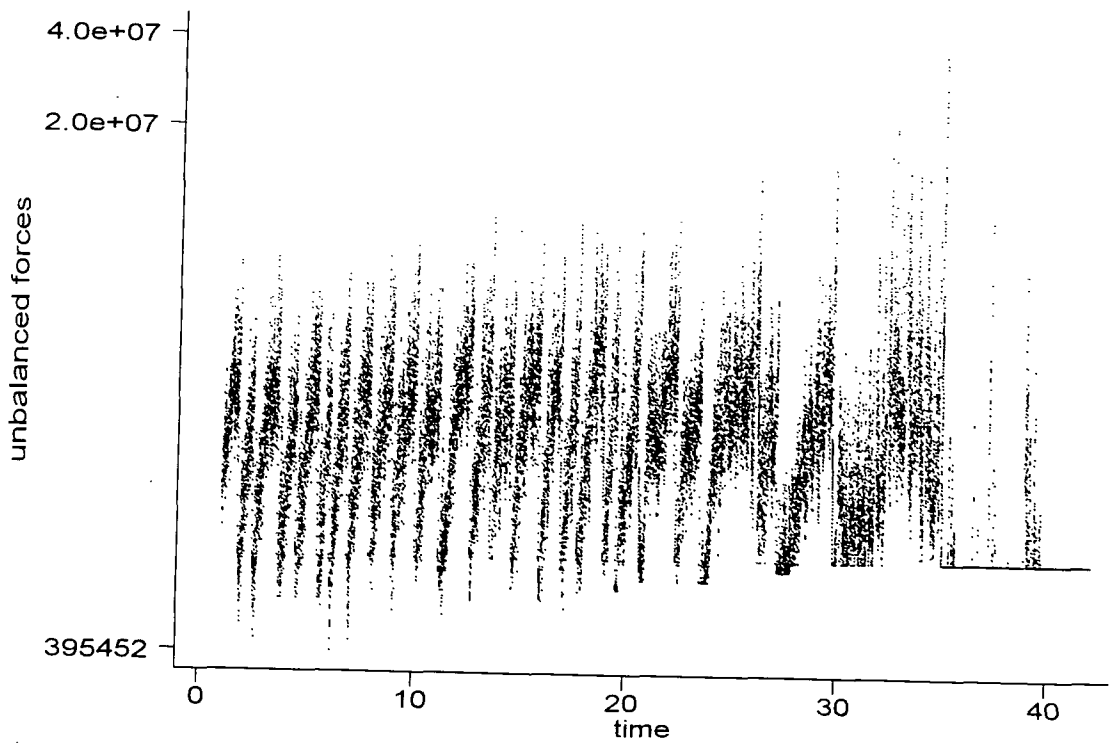


Figure 4.9: UDEC history plot of the log of total unbalanced forces for a sliding rock mass.

A log scale is used for the y-axis.

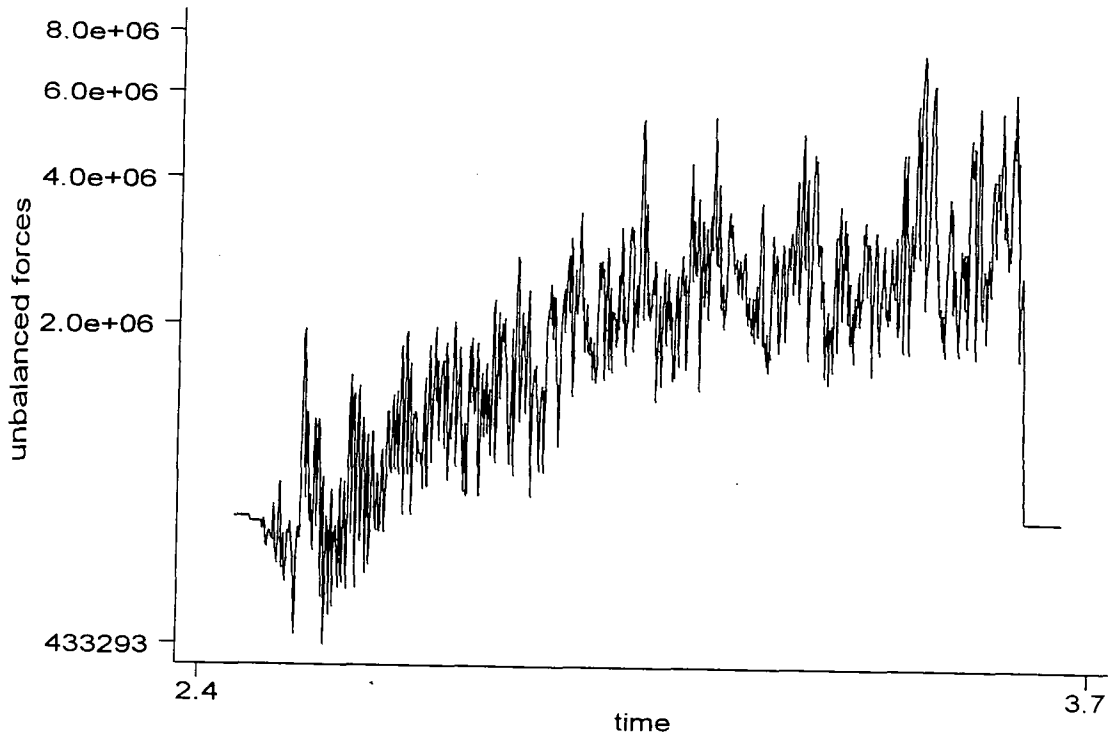


Figure 4.10: UDEC history plot of the log of an individual total unbalanced force peak for a sliding rock mass.

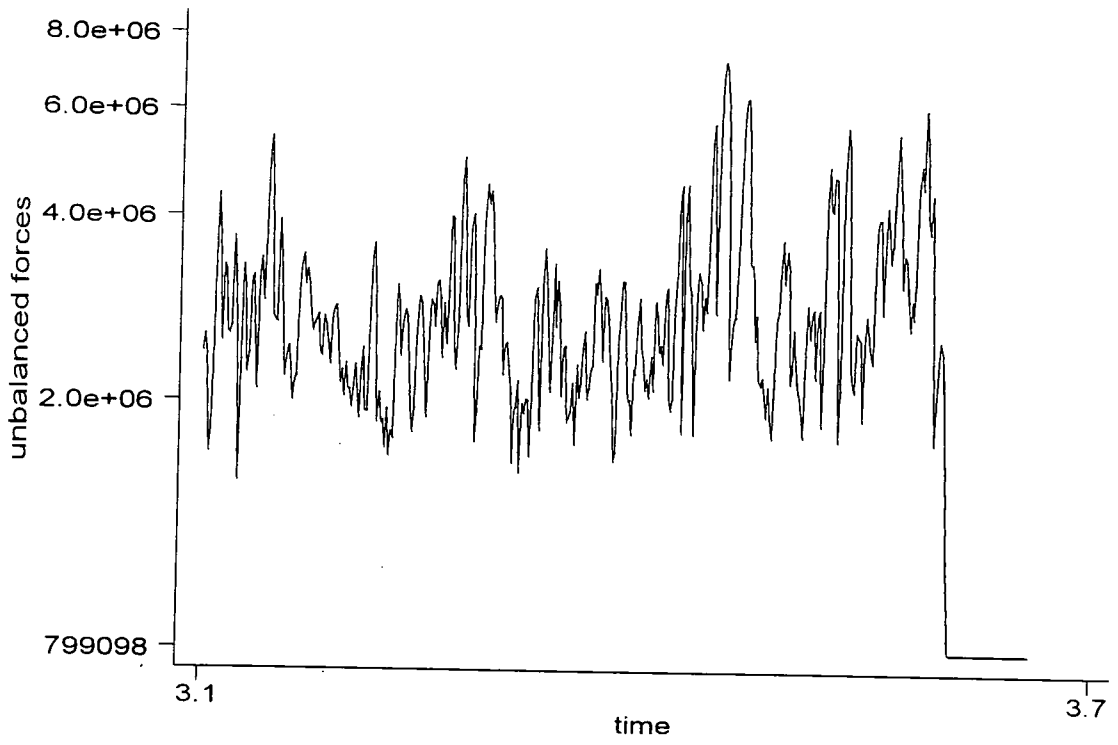


Figure 4.11: UDEC history plot of the log of an individual total unbalanced force peak for a sliding rock mass.

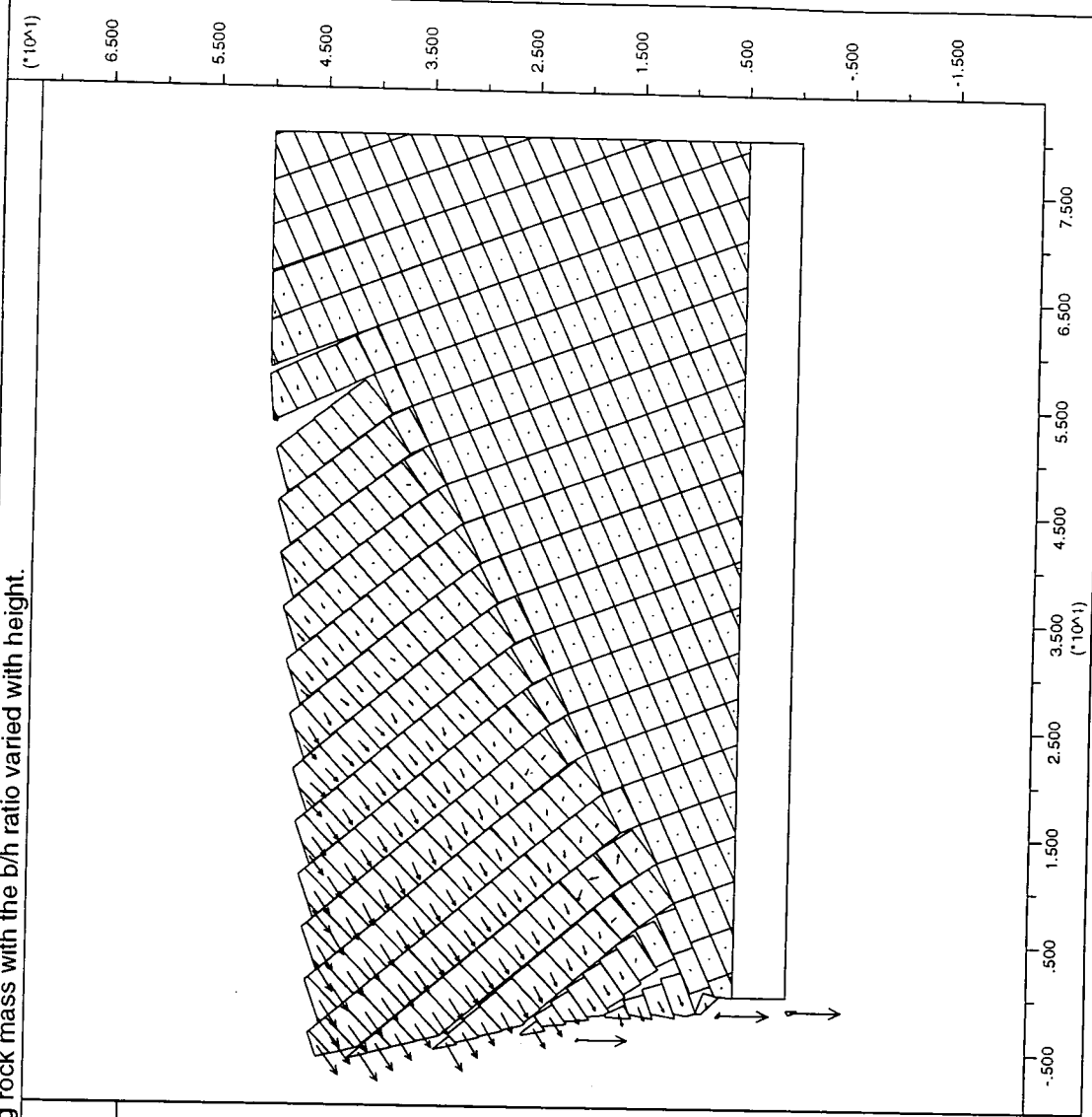
JOB TITLE : Figure 4.12: Toppling rock mass with the b/h ratio varied with height.

UDEC (Version 2.00)

LEGEND

8/25/1998 16:52
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block plot
velocity vectors
maximum = 4.561E+00



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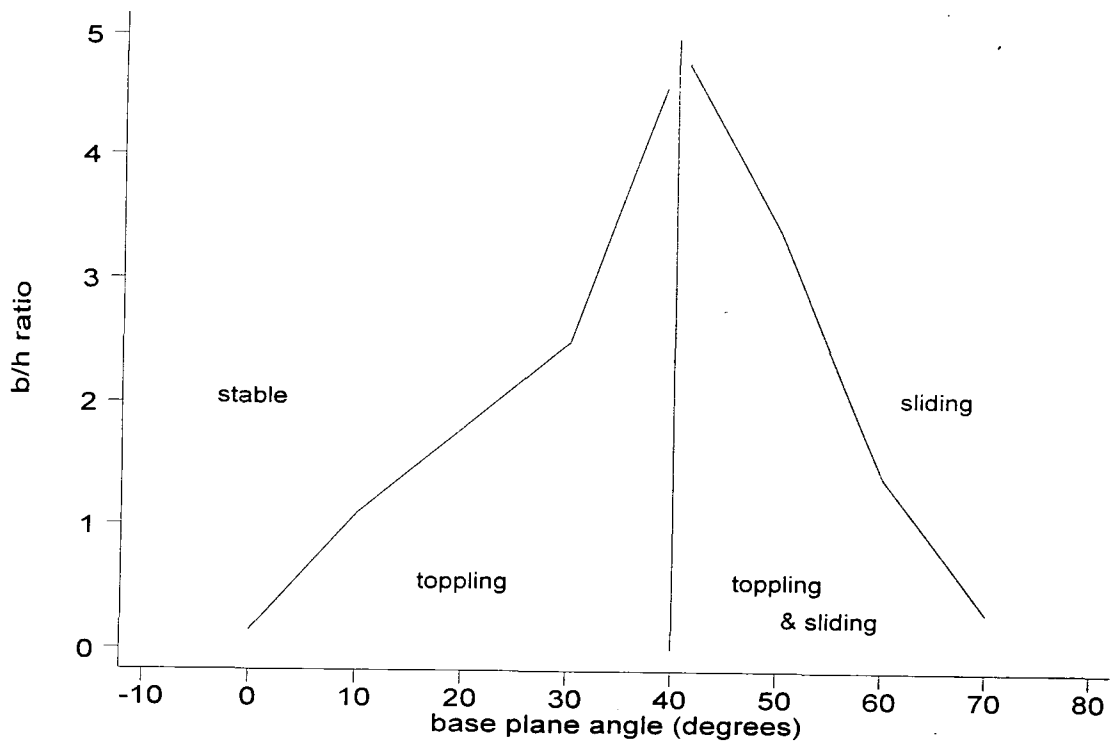


Figure 4.13: Limiting conditions for sliding, toppling and stable rock masses which contain rectangular blocks.

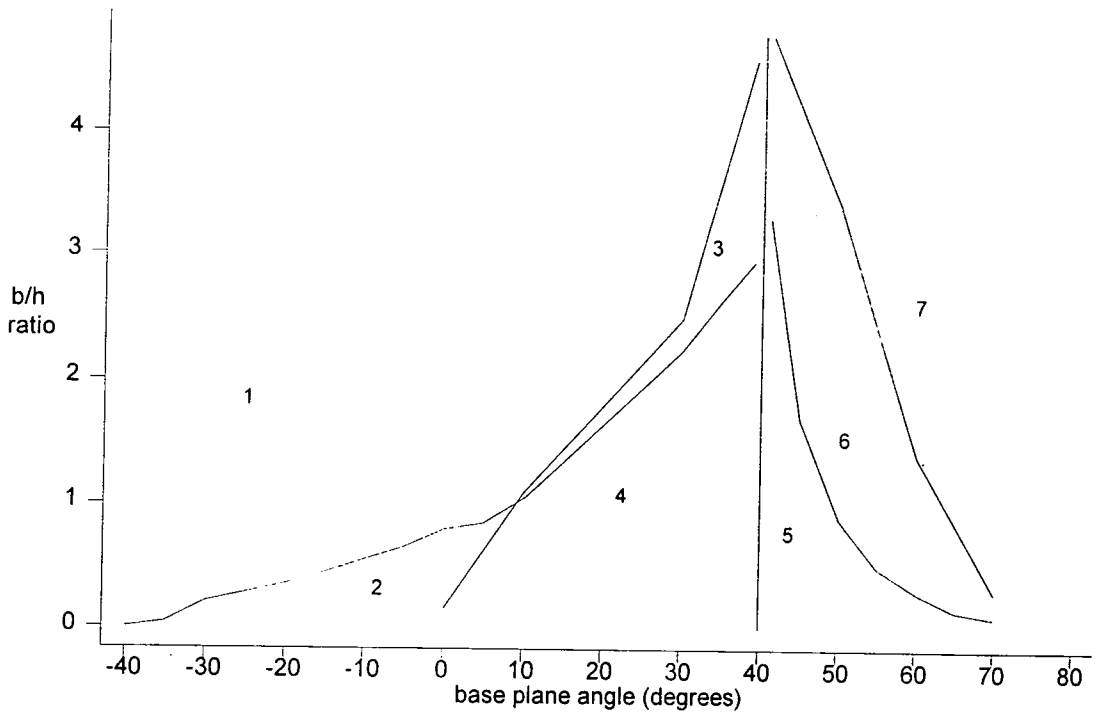


Figure 4.14: Limiting conditions for the failure of a rock mass which contains rectangular blocks compared with the limiting conditions for the failure of the limestone rock mass.

The boundaries between the mechanisms of failure are taken from Figures 4.5 and 4.13. Zones on the graph are delimited by the boundary lines:

Zone	Limestone rock mass	Rectangular blocks
1	Stable	Stable
2	Toppling	Stable
3	Stable	Toppling
4	Toppling	Toppling
5	Toppling-and-sliding	Toppling-and-sliding
6	Sliding	Toppling-and-sliding
7	Sliding	Sliding

JOB TITLE : Figure 4.15a: Toppling-and-sliding rock mass with rectangular blocks.

UDEC (Version 2.00)

LEGEND

8/25/1998 17:21

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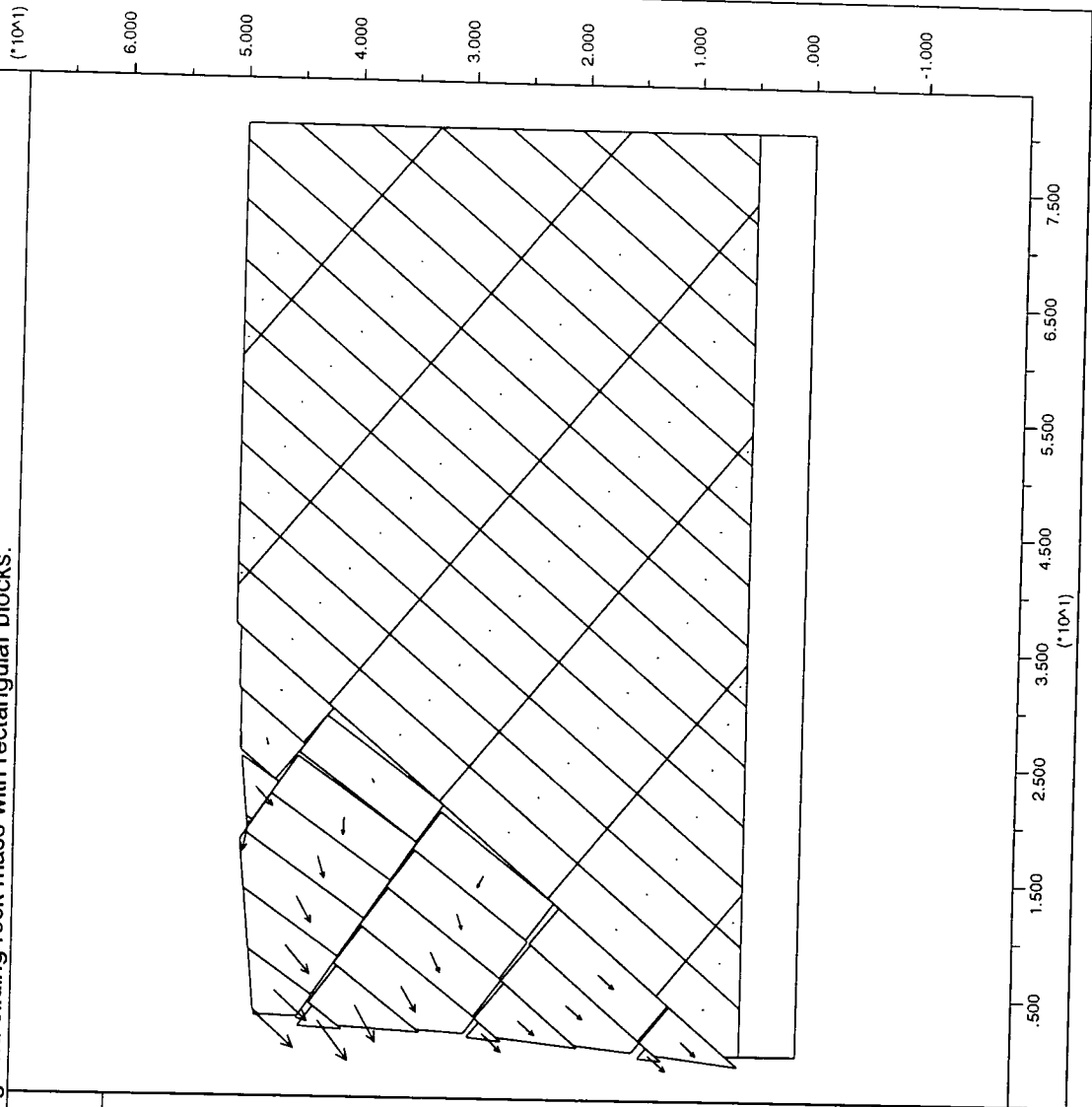
velocity vectors

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|||||

0

2E 0



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JOB TITLE : Figure 4.15b: Sliding rock mass which contains rectangular blocks.

UDEC (Version 2.00)

LEGEND

8/25/1998 17:22

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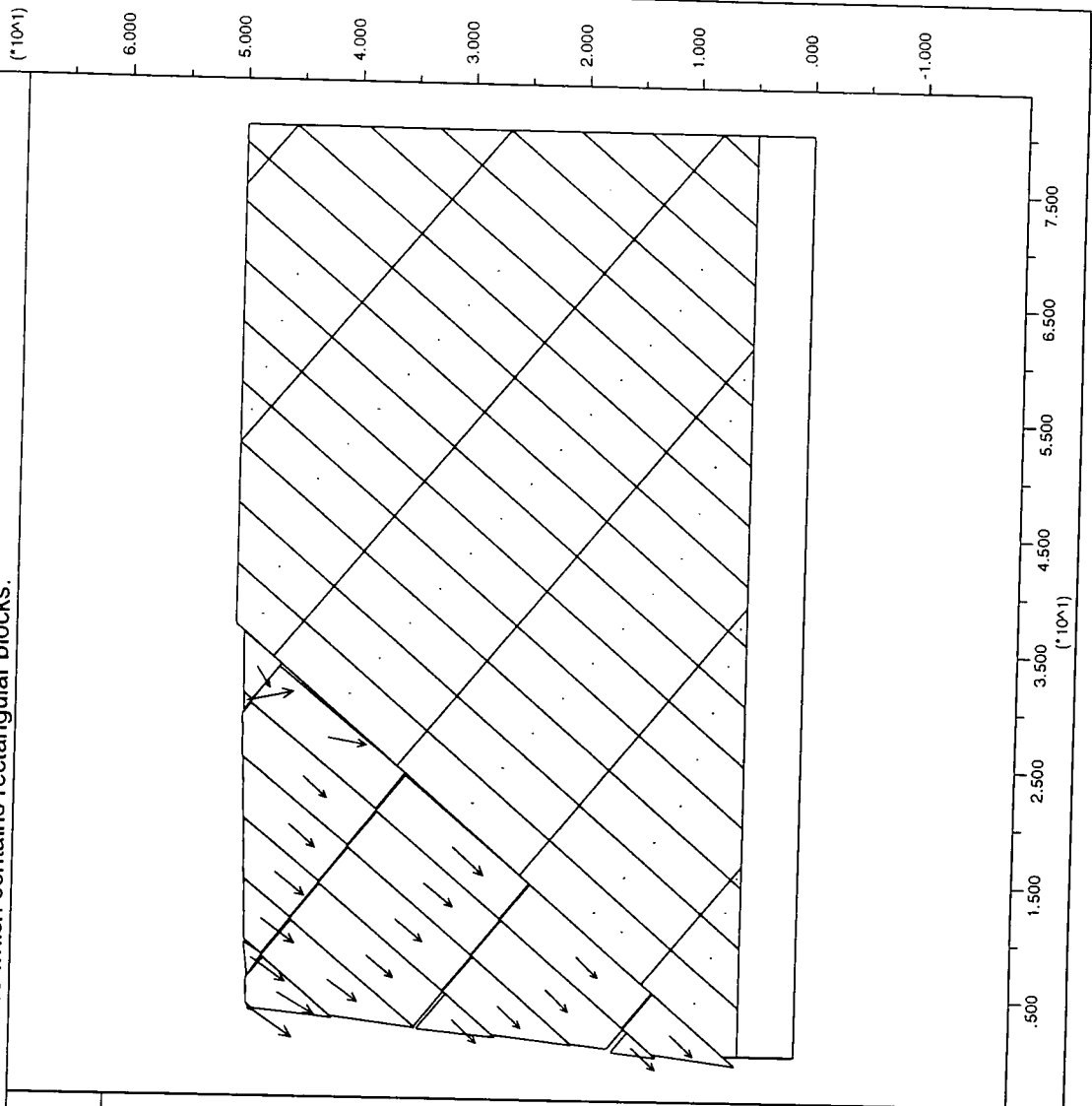
block plot

velocity vectors

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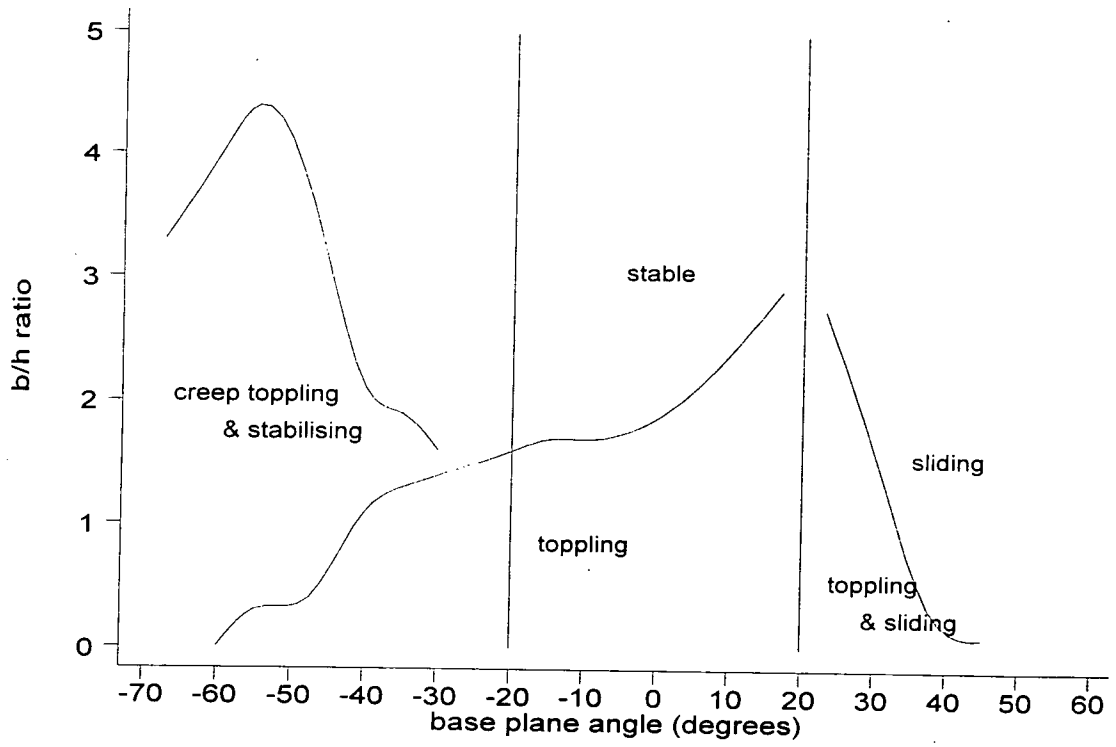


Figure 4.16: Limiting conditions for sliding, toppling and stable rock masses which have a friction angle of 20°.

JOB TITLE : Figure 4.17: Creep toppling and stabilising rock mass.

UDEC (Version 2.00)

LEGEND

1/04/1980 22:30

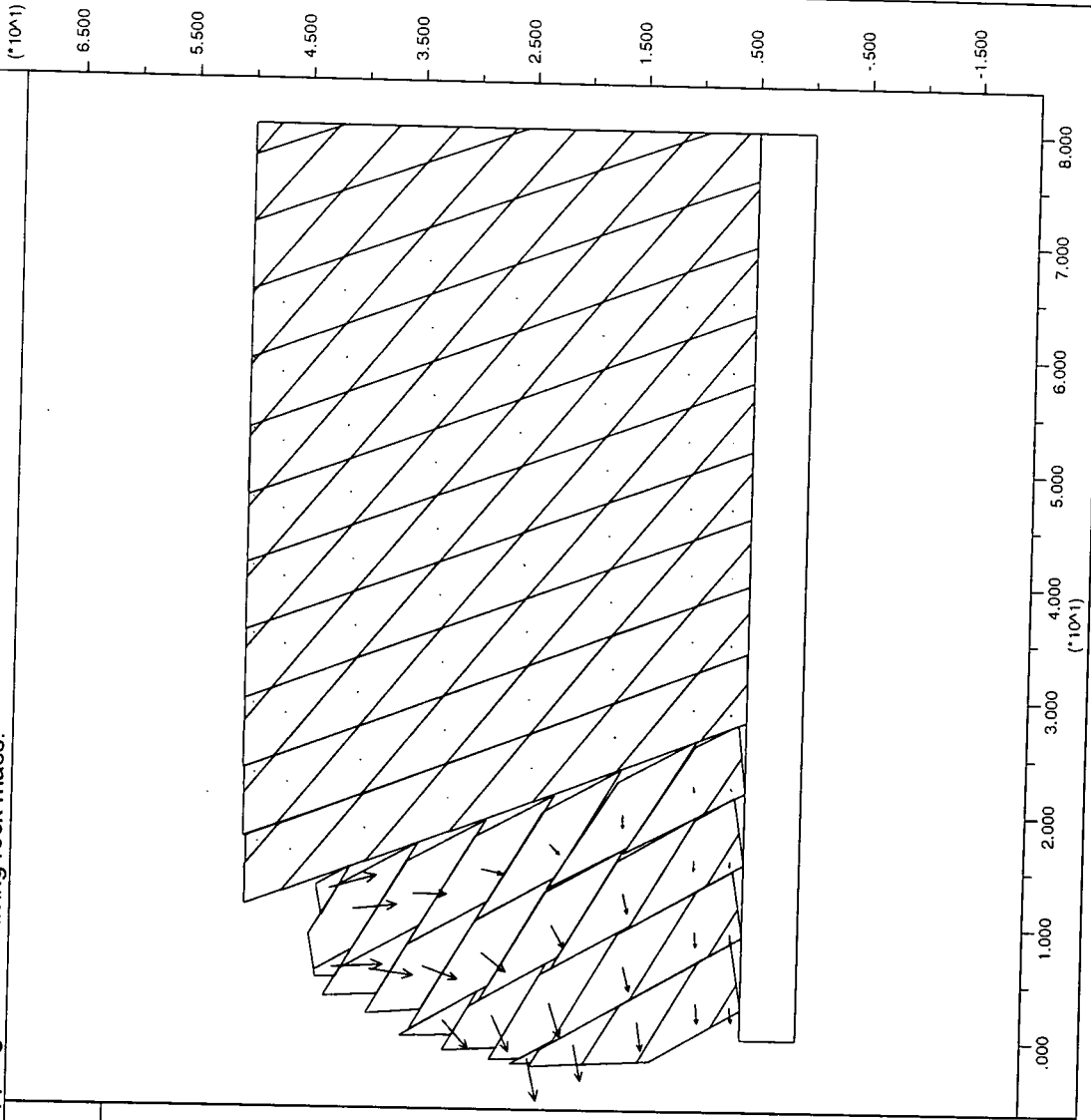
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block plot

velocity vectors

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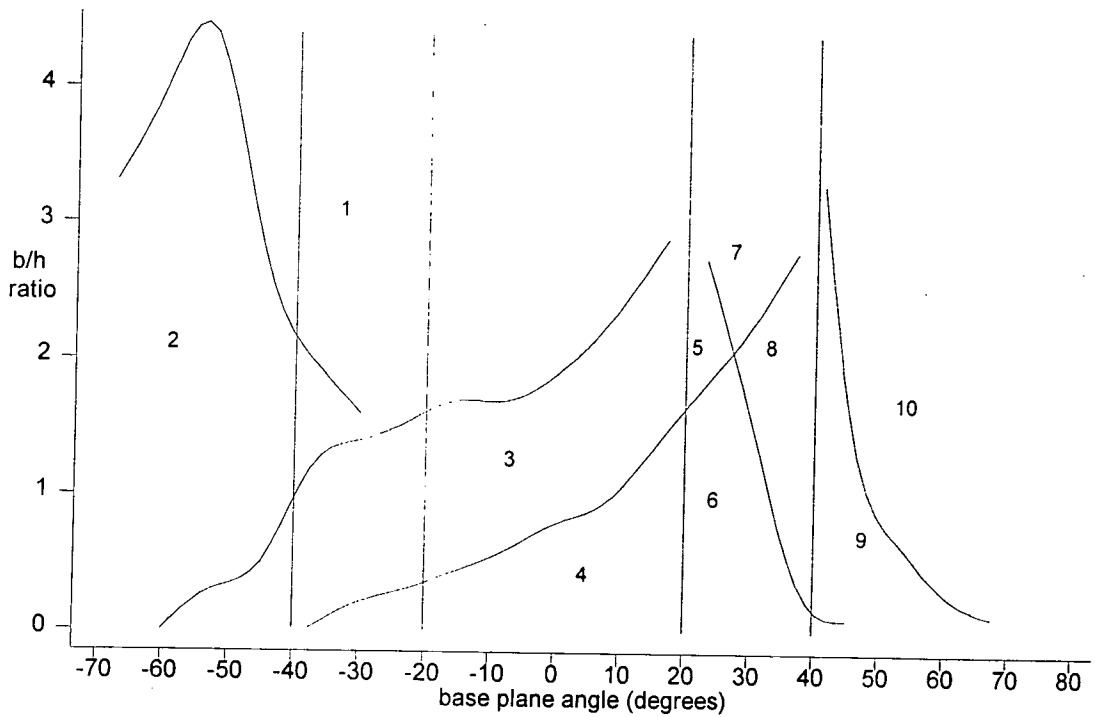


Figure 4.18: Limiting conditions for the failure of rock masses which have a friction angle of 20° compared with the limiting conditions for the failure of the limestone rock masses which have a friction angle of 40° .

The boundaries between the mechanisms of failure are taken from Figures 4.5 and 4.16.

Zones on the graph are delimited by the boundary lines:

Zone	40° friction angle	20° friction angle
1	Stable	Stable
2	Stable	Creep toppling and stabilising
3	Stable	Toppling
4	Toppling	Toppling
5	Stable	Toppling-and-sliding
6	Toppling	Toppling-and-sliding
7	Stable	Sliding
8	Toppling	Sliding
9	Toppling-and-sliding	Sliding
10	Sliding	Sliding

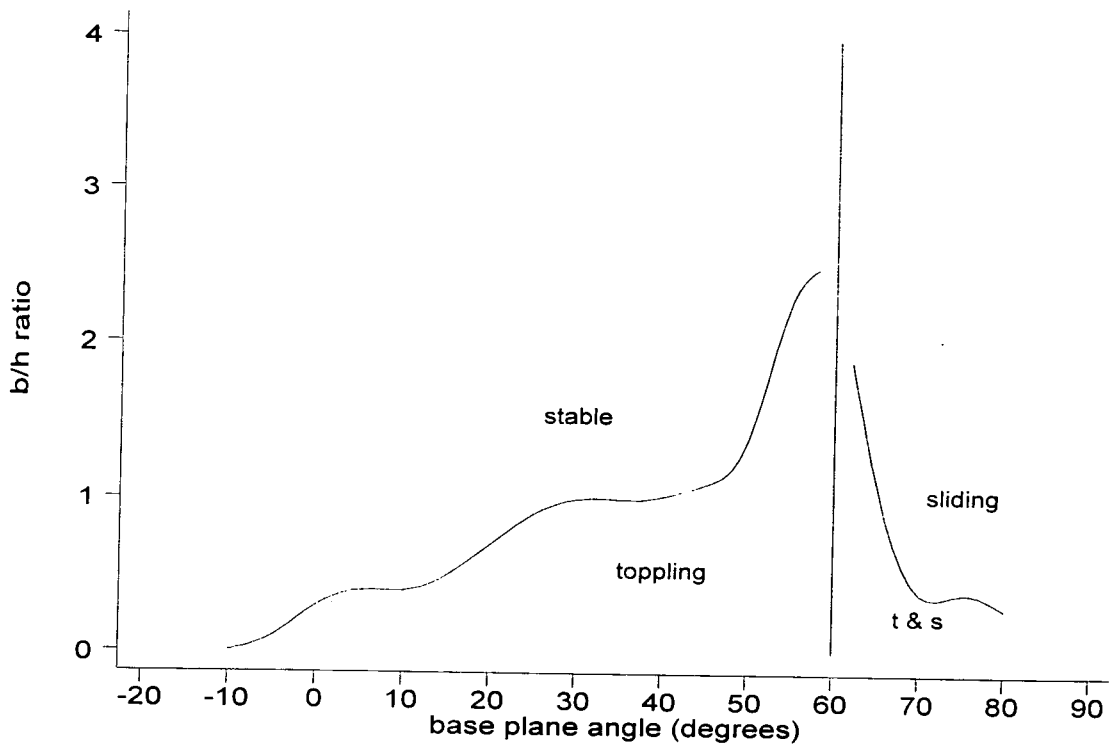


Figure 4.19: Limiting conditions for sliding, toppling and stable rock masses which have a friction angle of 60° .

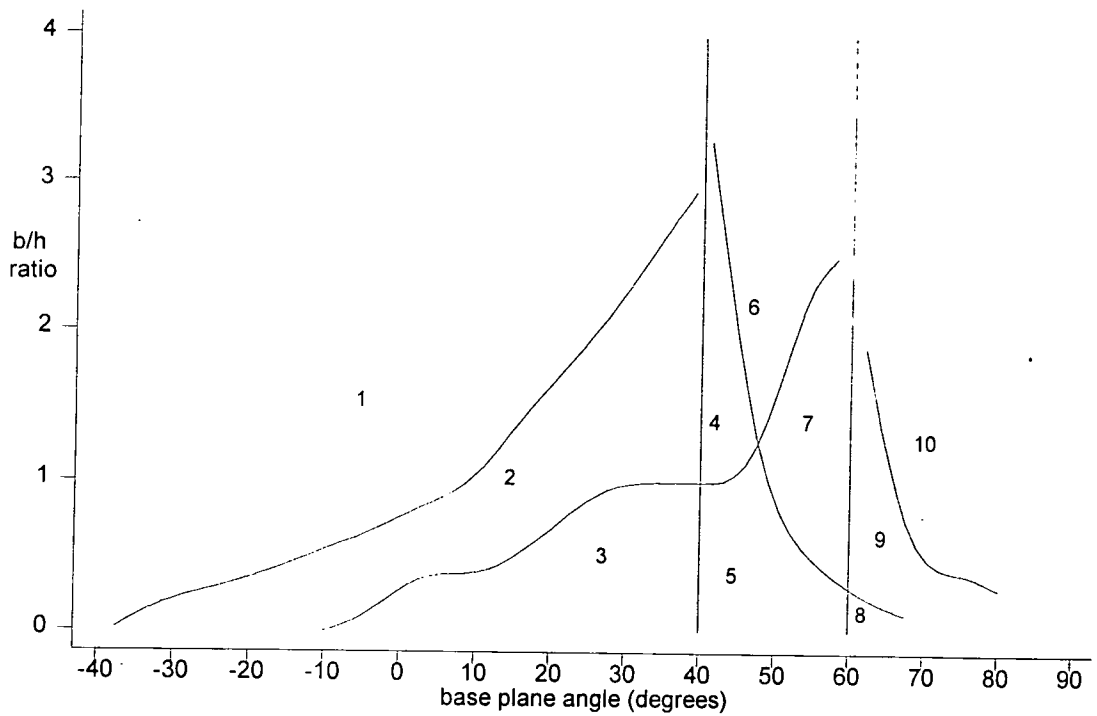


Figure 4.20: Limiting conditions for the failure of rock masses which have a friction angle of 60° compared with the limiting conditions for the failure of the limestone rock masses which have a friction angle of 40° .

The boundaries between the mechanisms of failure are taken from Figures 4.5 and 4.19. Zones on the graph delimited by the boundary lines:

Zone	40° friction angle	60° friction angle
1	Stable	Stable
2	Toppling	Stable
3	Toppling	Toppling
4	Toppling-and-sliding	Stable
5	Toppling-and-sliding	Toppling
6	Sliding	Stable
7	Sliding	Toppling
8	Toppling-and-sliding	Toppling-and-sliding
9	Sliding	Toppling-and-sliding
10	Sliding	Sliding

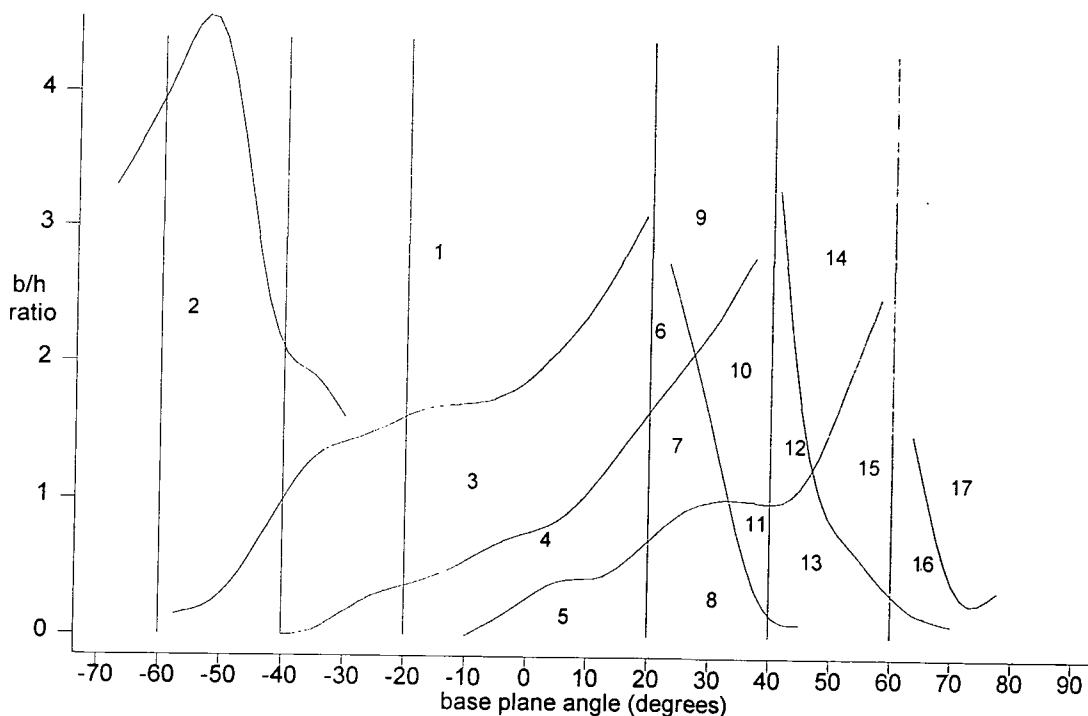


Figure 4.21: Limiting conditions for the failure of rock masses which have a friction angle of 20° and 60° compared with the limiting conditions for the failure of the original limestone rock masses which have a friction angle of 40° .

The boundaries between the mechanisms of failure are taken from Figures 4.5, 4.16 and 4.19. Zones on the graph are delimited by the boundary lines:

Zone	40° friction angle	20° friction angle	60° friction angle
1	Stable	Stable	Stable
2	Stable	Creep toppling and stabilising	Stable
3	Stable	Toppling	Stable
4	Toppling	Toppling	Stable
5	Toppling	Toppling	Toppling
6	Stable	Toppling-and-sliding	Stable
7	Toppling	Toppling-and-sliding	Stable
8	Toppling	Toppling-and-sliding	Toppling
9	Stable	Sliding	Stable
10	Toppling	Sliding	Stable
11	Toppling	Sliding	Toppling
12	Toppling-and-sliding	Sliding	Stable
13	Toppling-and-sliding	Sliding	Toppling
14	Sliding	Sliding	Stable
15	Sliding	Sliding	Toppling
16	Sliding	Sliding	Toppling-and-sliding
17	Sliding	Sliding	Sliding

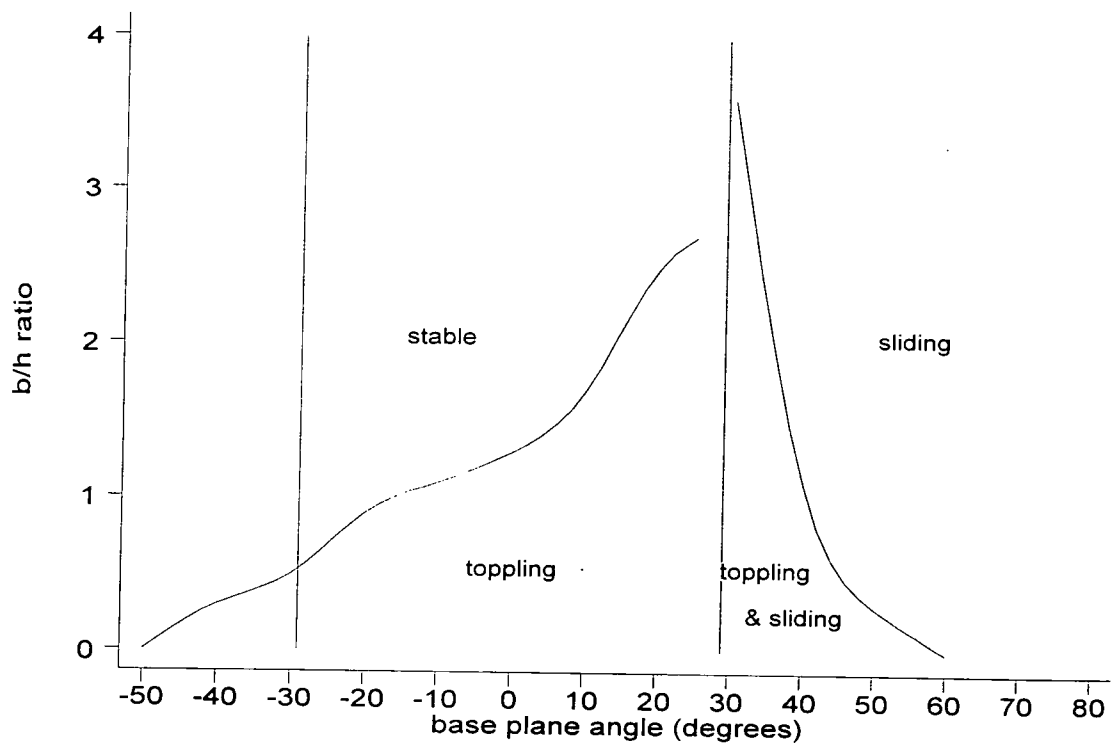


Figure 4.22: Limiting conditions for sliding, toppling and stable sandstone rock masses.

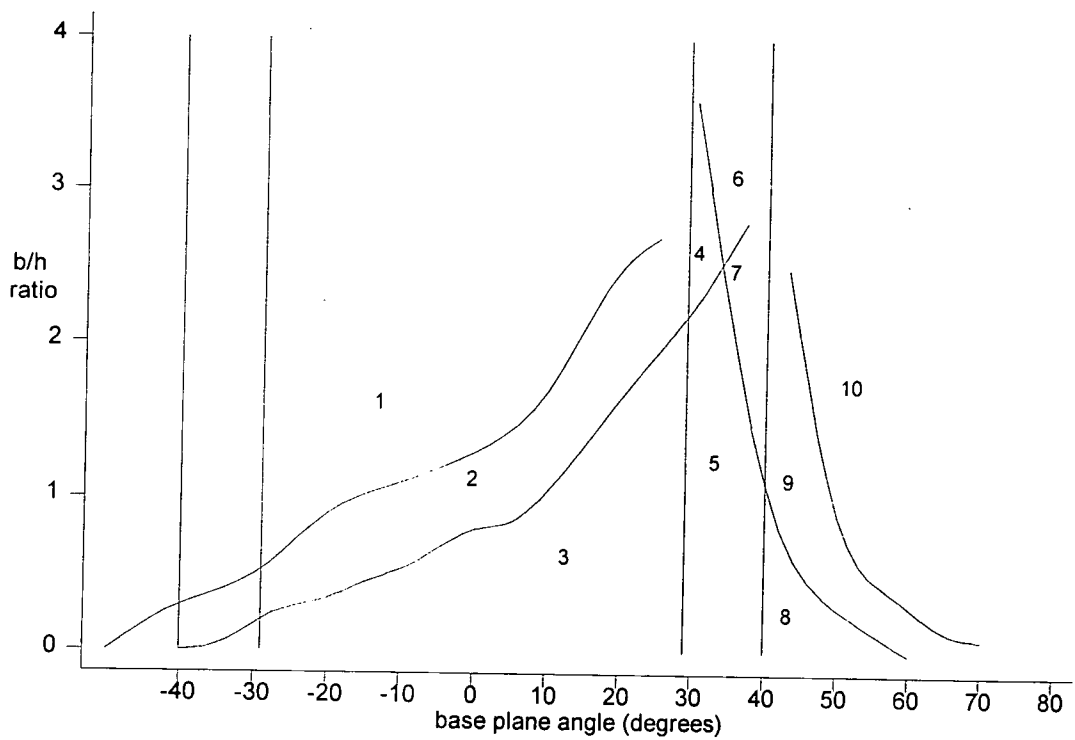


Figure 4.23: Limiting conditions for the failure of sandstone rock masses compared with the limiting conditions for the failure of the limestone rock masses.

The boundaries between the mechanisms of failure are taken from Figures 4.5 and 4.22.

Zones on the graph are delimited by the boundary lines:

Zone	Limestone	Sandstone
1	Stable	Stable
2	Stable	Toppling
3	Toppling	Toppling
4	Stable	Toppling-and-sliding
5	Toppling	Toppling-and-sliding
6	Stable	Sliding
7	Toppling	Sliding
8	Toppling-and-sliding	Toppling-and-sliding
9	Toppling-and-sliding	Sliding
10	Sliding	Sliding

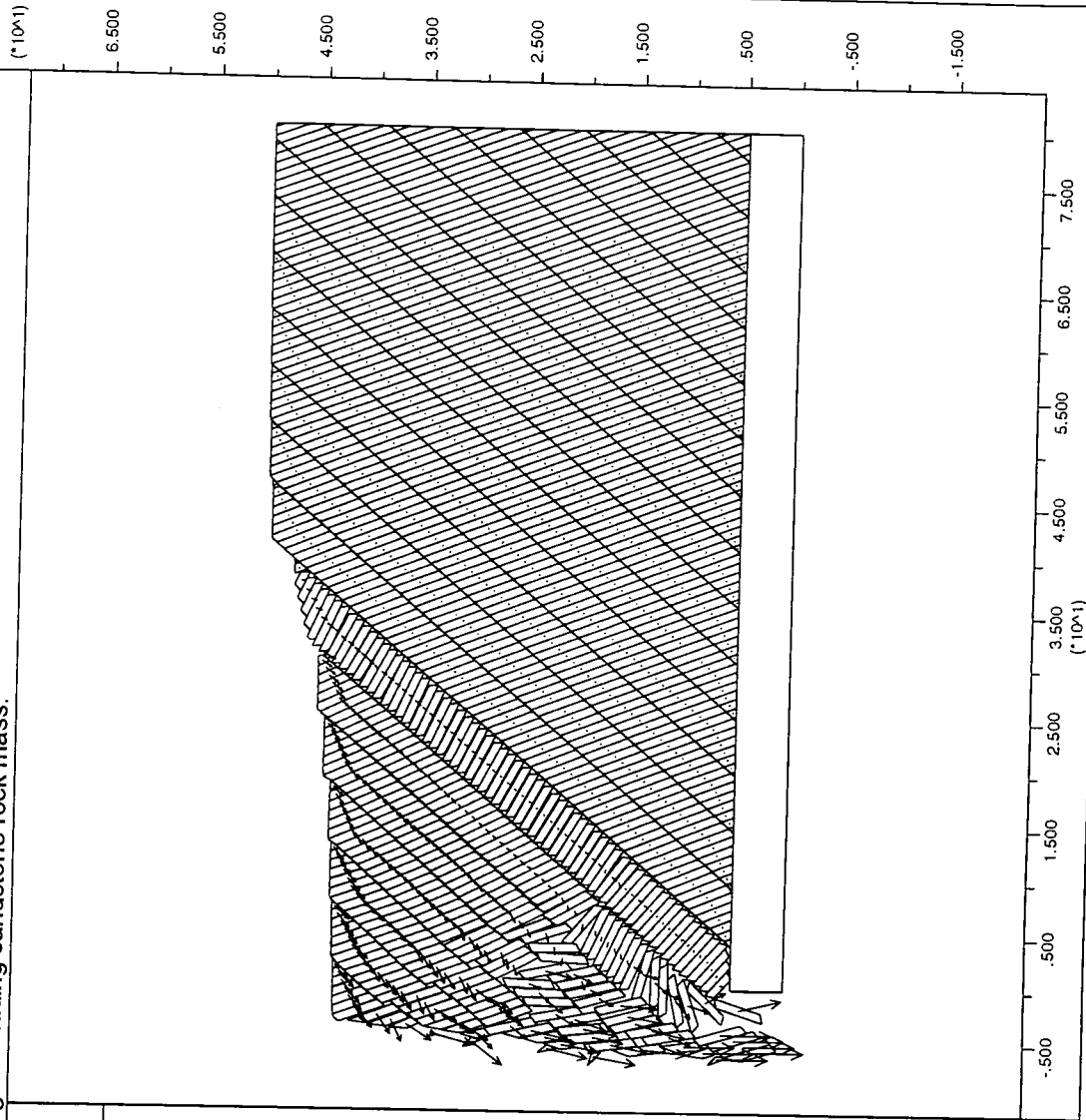
JOB TITLE : Figure 4.24a: Toppling-and-sliding sandstone rock mass.

UDEC (Version 2.00)

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1/04/1980 17:14
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block plot
velocity vectors
maximum = 6.078E+00



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JOB TITLE : Figure 4.24b: Sliding sandstone rock mass.

UDEC (Version 2.00)

LEGEND

1/04/1980 17:16

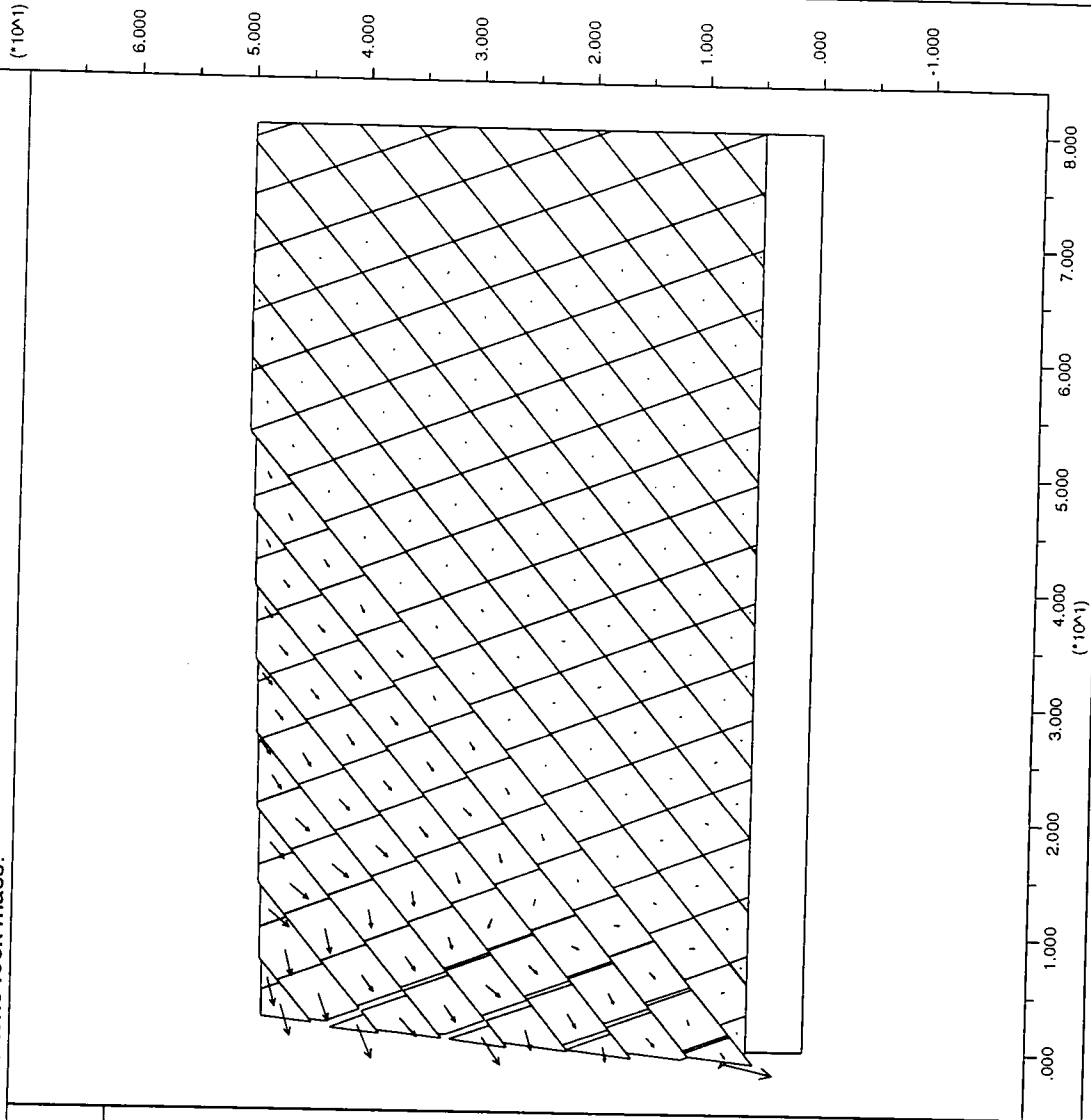
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block plot

velocity vectors

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JOB TITLE : Figure 4.24c: Toppling sandstone rock mass.

UDEC (Version 2.00)

LEGEND

1/04/1980 17:17

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block plot

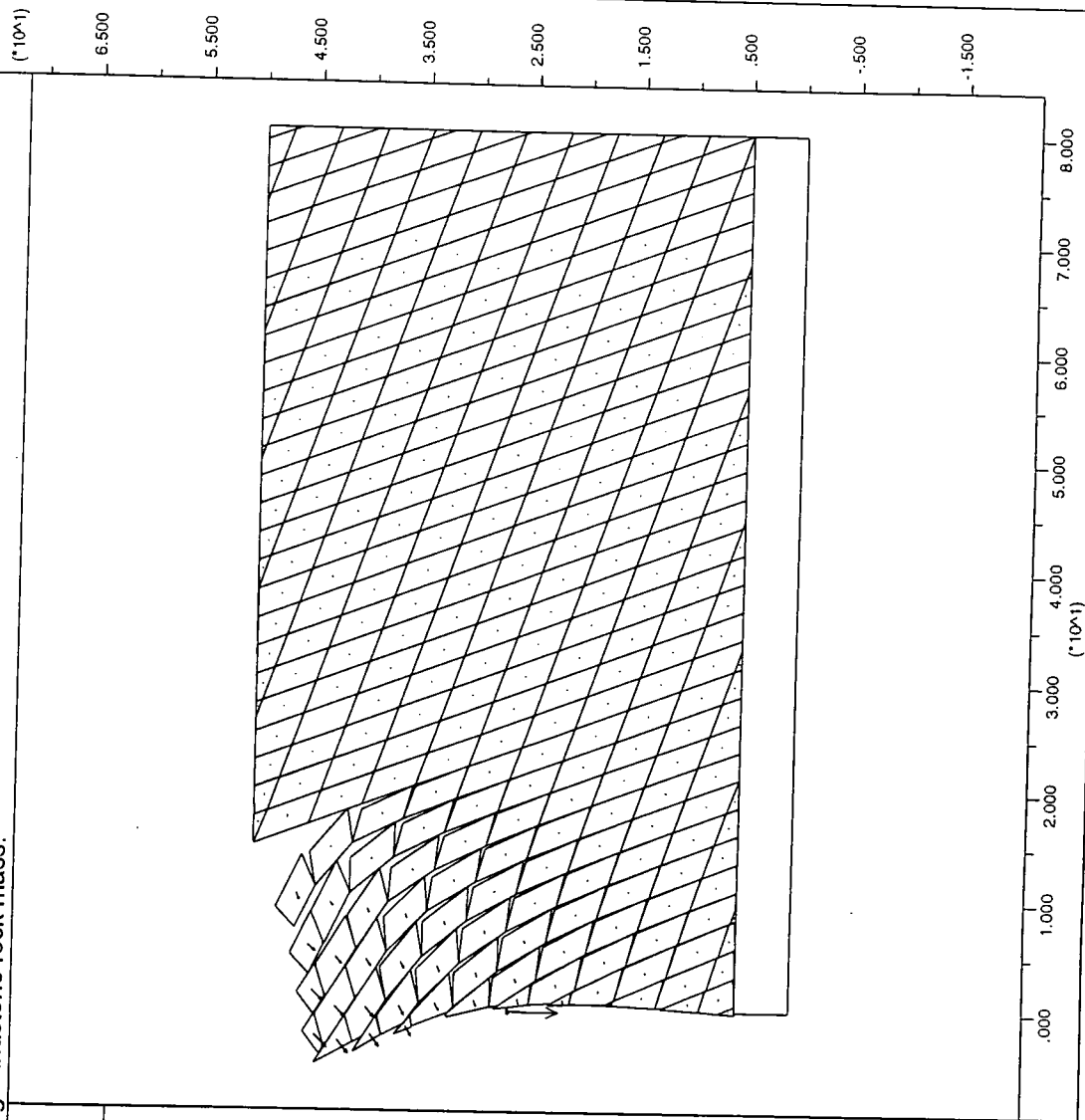
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maximum = 6.439E+00

|||||

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2E 1



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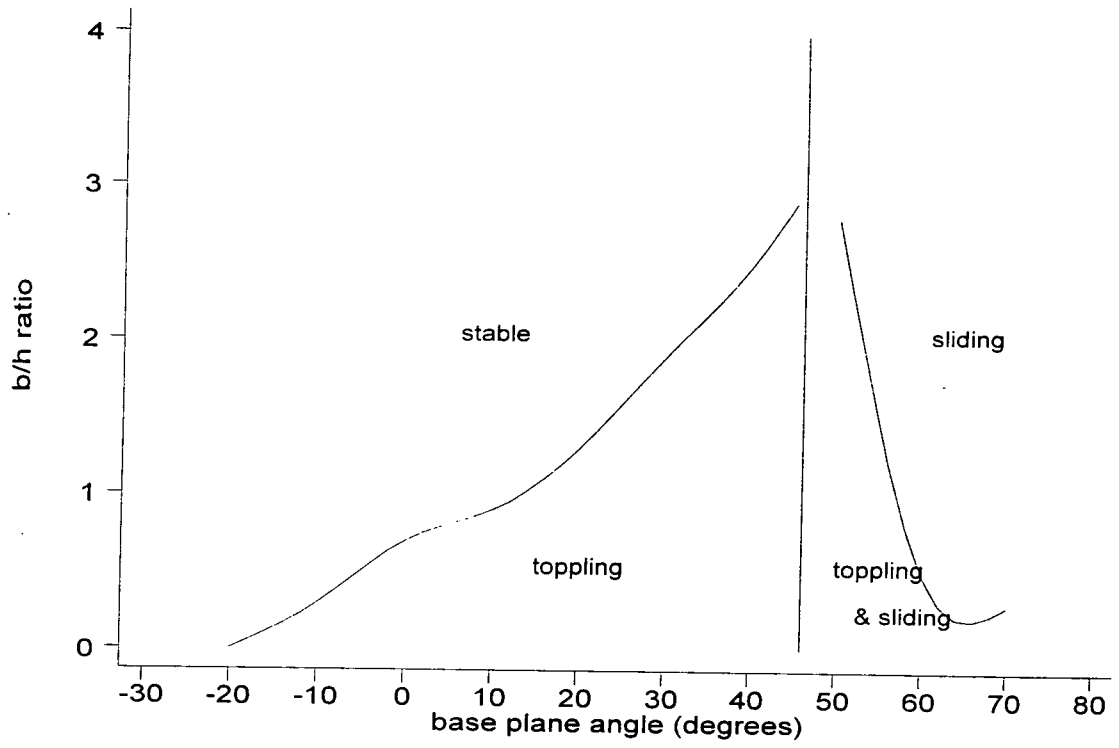


Figure 4.25: Limiting conditions for sliding, toppling and stable granite rock masses.

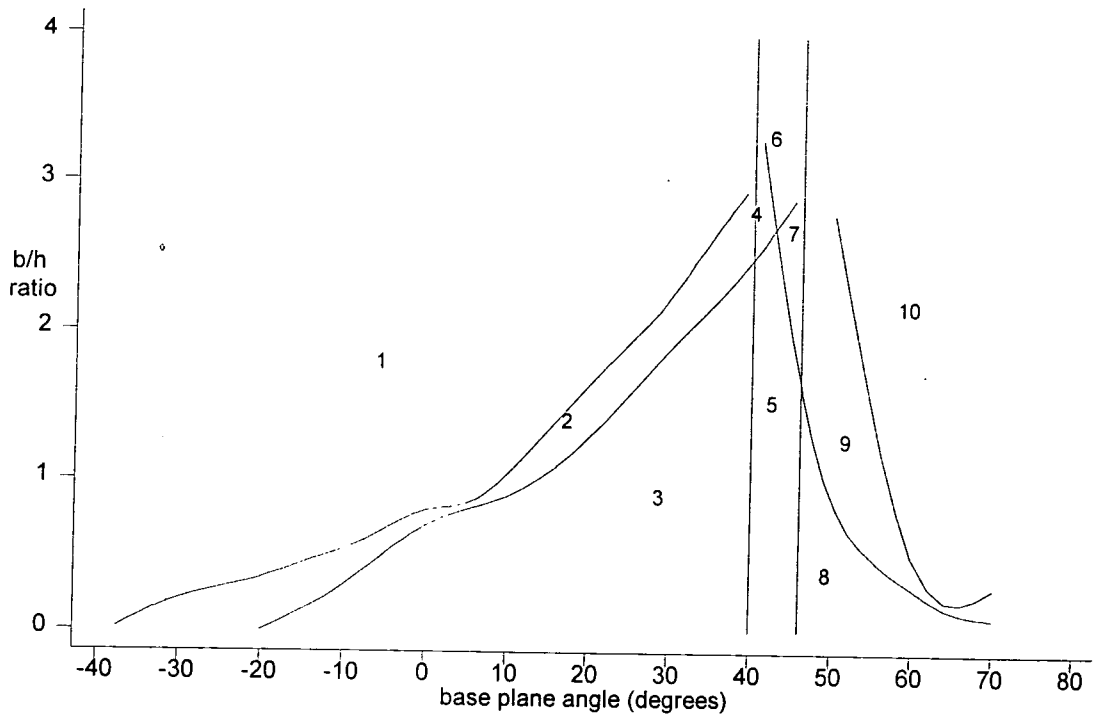


Figure 4.26: Limiting conditions for the failure of granite rock masses compared with the limiting conditions for the failure of the limestone rock masses.

The boundaries between the mechanisms of failure are taken from Figures 4.5 and 4.25.

Zones on the graph are delimited by the boundary lines:

Zone	Limestone	Granite
1	Stable	Stable
2	Toppling	Stable
3	Toppling	Toppling
4	Toppling-and-sliding	Stable
5	Toppling-and-sliding	Toppling
6	Sliding	Stable
7	Sliding	Toppling
8	Toppling-and-sliding	Toppling-and-sliding
9	Sliding	Toppling-and-sliding
10	Sliding	Sliding

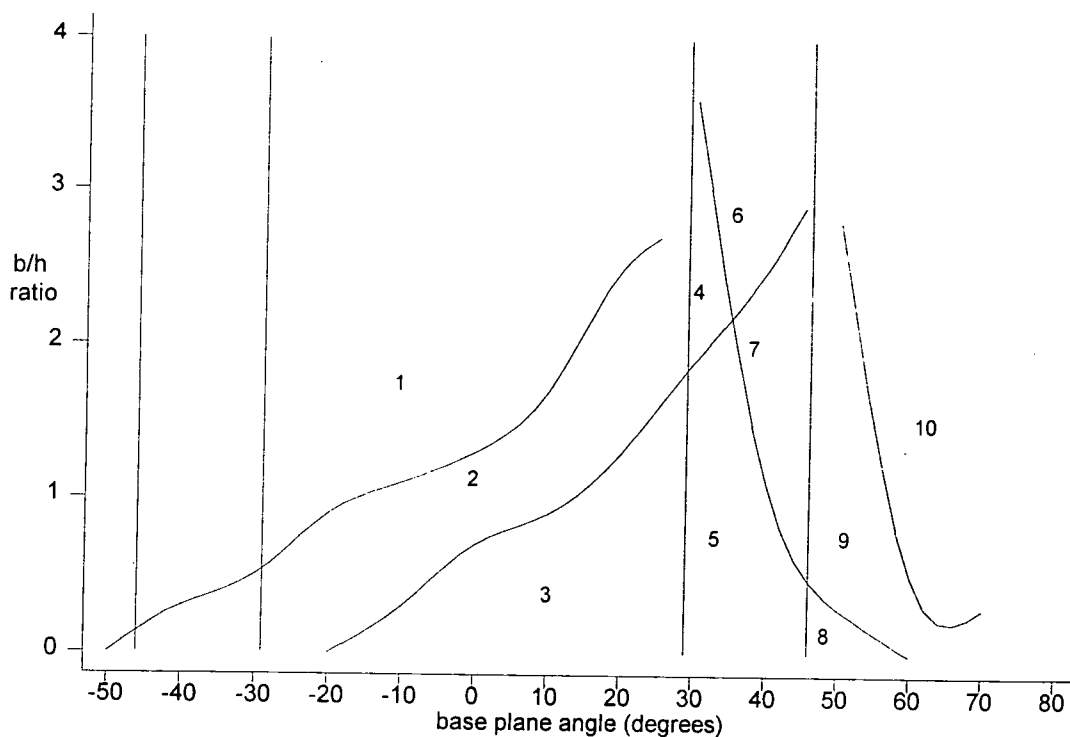


Figure 4.27: Limiting conditions for the failure of granite rock masses compared with the limiting conditions for the failure of sandstone rock masses.

The boundaries between the mechanisms of failure are taken from Figures 4.22 and 4.25. Zones on the graph are delimited by the boundary lines:

Zone	Granite	Sandstone
1	Stable	Stable
2	Stable	Toppling
3	Toppling	Toppling
4	Stable	Toppling-and-sliding
5	Toppling	Toppling-and-sliding
6	Stable	Sliding
7	Toppling	Sliding
8	Toppling-and-sliding	Toppling-and-sliding
9	Toppling-and-sliding	Sliding
10	Sliding	Sliding

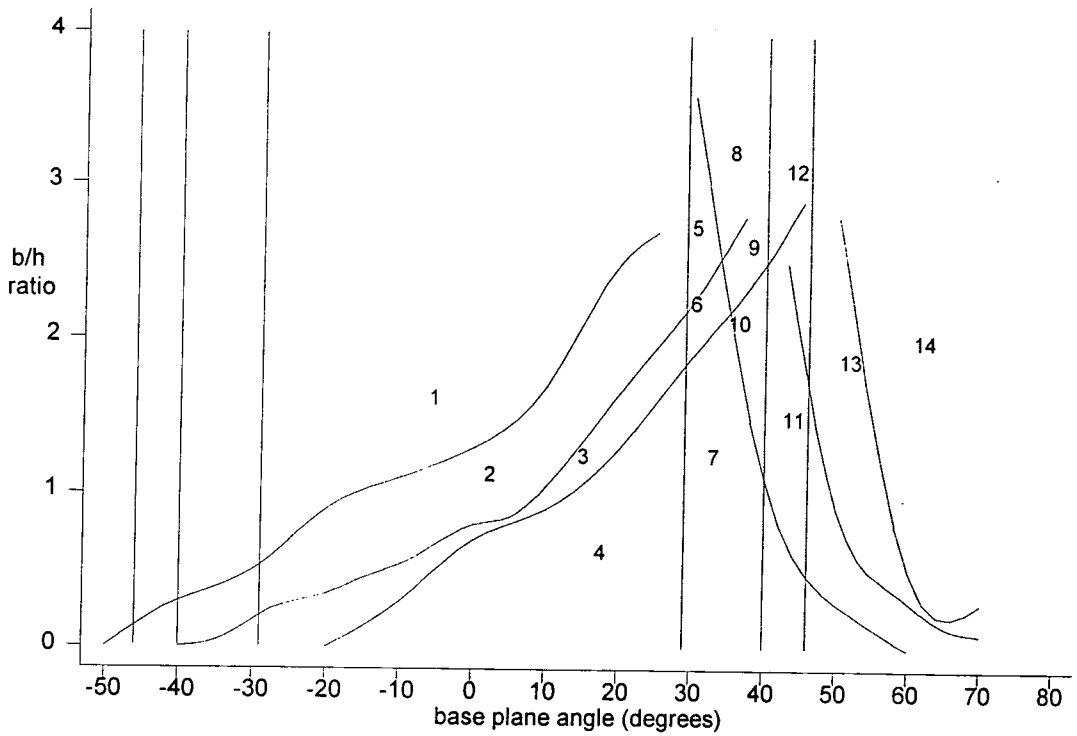


Figure 4.28: Limiting conditions for the failure of granite and sandstone rock masses compared with the limiting conditions for the failure of the limestone rock masses.

The boundaries between the mechanisms of failure are taken from Figures 4.5, 4.22 and 4.25. Zones on the graph are delimited by the boundary lines:

Zone	Sandstone	Limestone	Granite
1	Stable	Stable	Stable
2	Toppling	Stable	Stable
3	Toppling	Toppling	Stable
4	Toppling	Toppling	Toppling
5	Toppling-and-sliding	Stable	Stable
6	Toppling-and-sliding	Toppling	Stable
7	Toppling-and-sliding	Toppling	Toppling
8	Sliding	Stable	Stable
9	Sliding	Toppling	Stable
10	Sliding	Toppling	Toppling
11	Sliding	Toppling-and-sliding	Toppling
12	Sliding	Sliding	Stable
13	Sliding	Sliding	Toppling-and-sliding
14	Sliding	Sliding	Sliding

JOB TITLE : Figure 4.29a: Topping granite rock mass.

UDEC (Version 2.00)

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1/04/1980 17:32

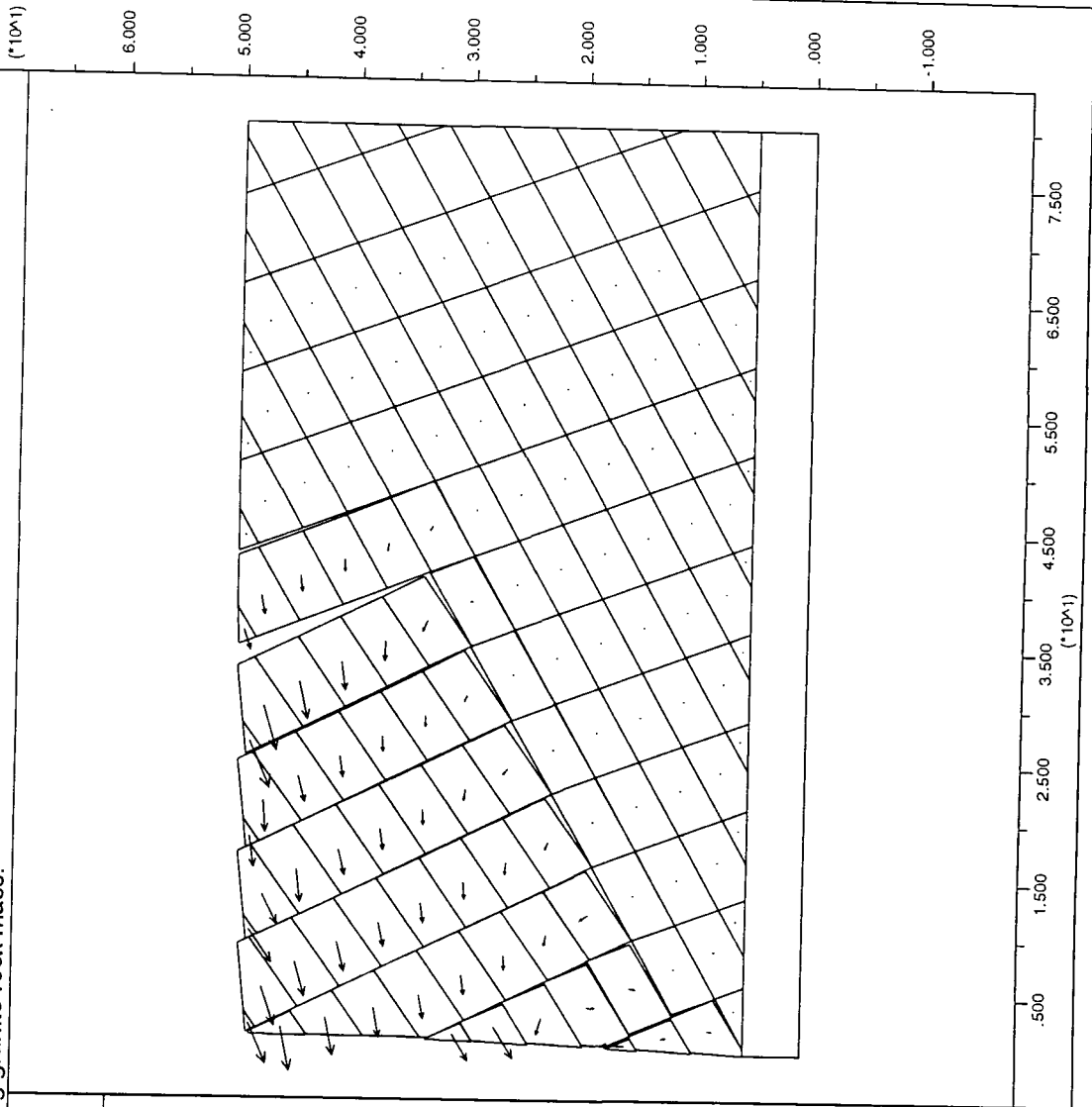
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block plot

velocity vectors

maximum = 3.386E-01



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JOB TITLE : Figure 4.29b: Total unbalanced forces for a toppling granite rock mass.

UDEC (Version 2.00)

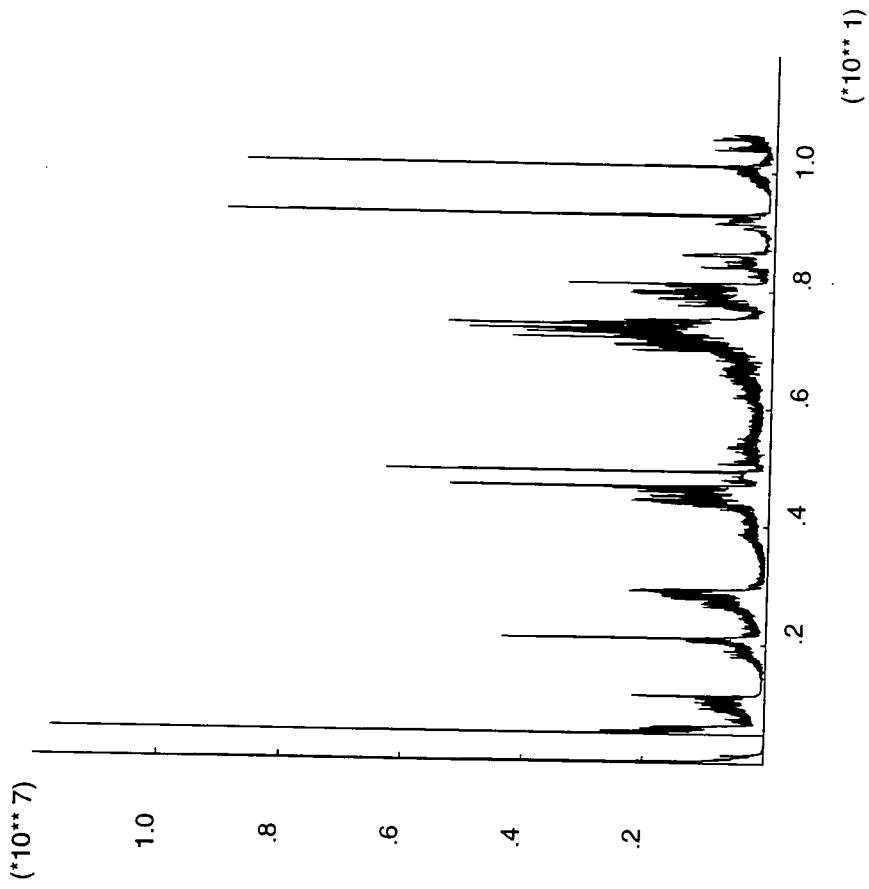
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JOB TITLE : Figure 4.29c: Sliding granite rock mass.

UDEC (Version 2.00)

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9/08/1998 09:11

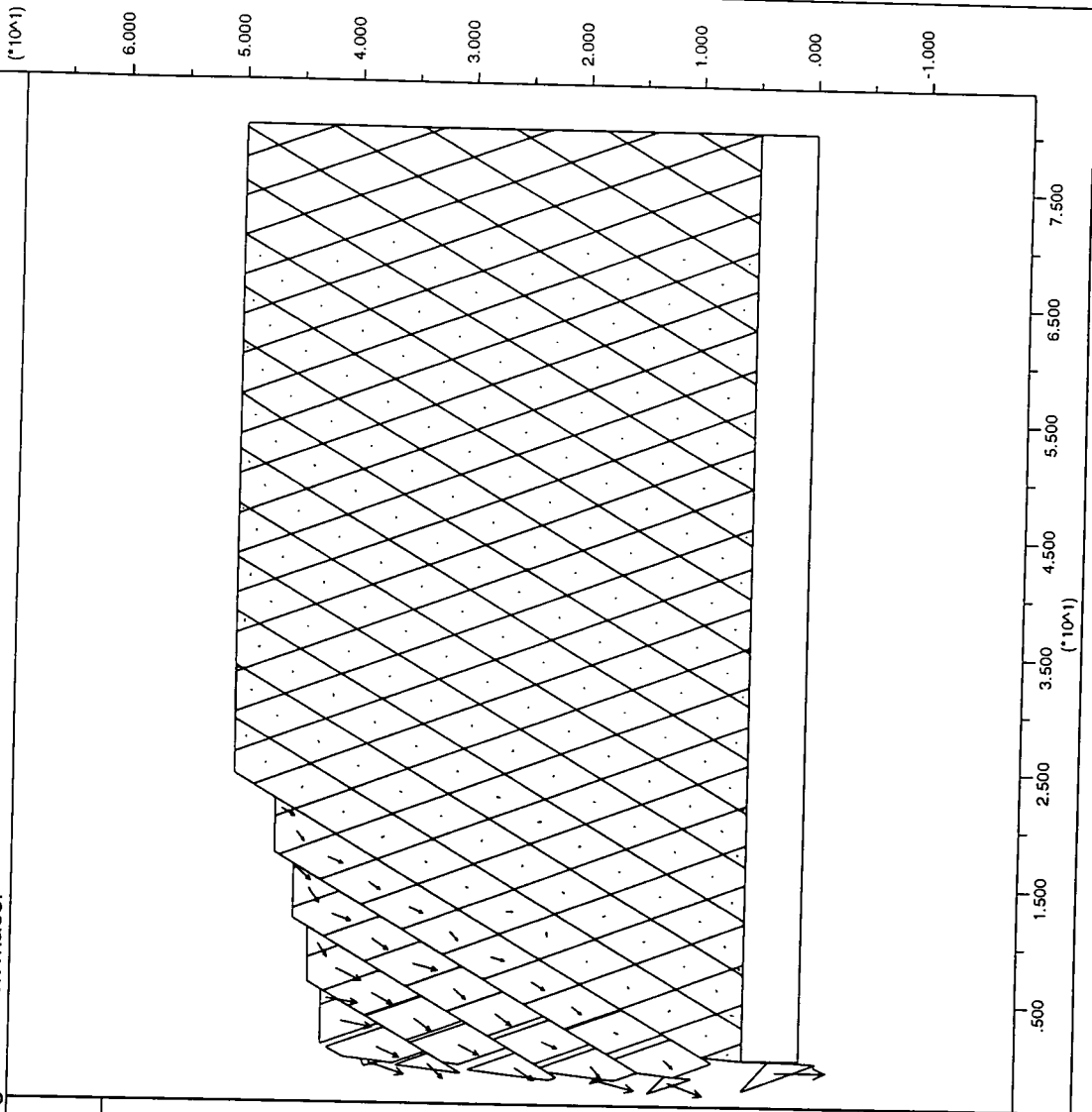
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block plot

velocity vectors

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JOB TITLE : Figure 4.29d: Toppling-and-sliding granite rock mass.

UDEC (Version 2.00)

LEGEND

1/04/1980 17:36

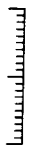
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time 8.855E+00 sec

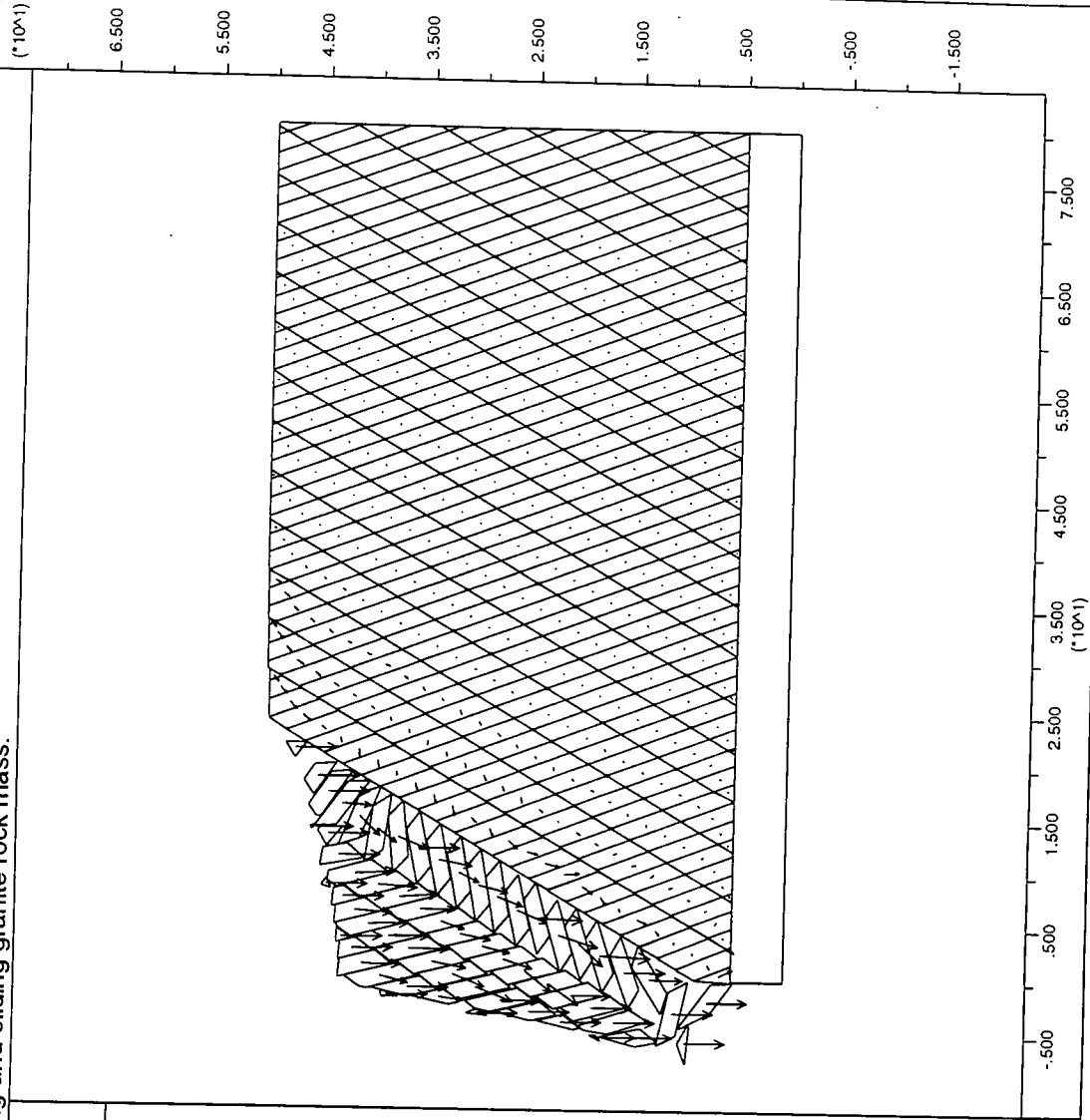
block plot

velocity vectors

maximum = 7.485E-01



0 2E 0



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JOB TITLE : Figure 4.29e: Forces for a toppling-and-sliding granite rock mass.

UDEC (Version 2.00)

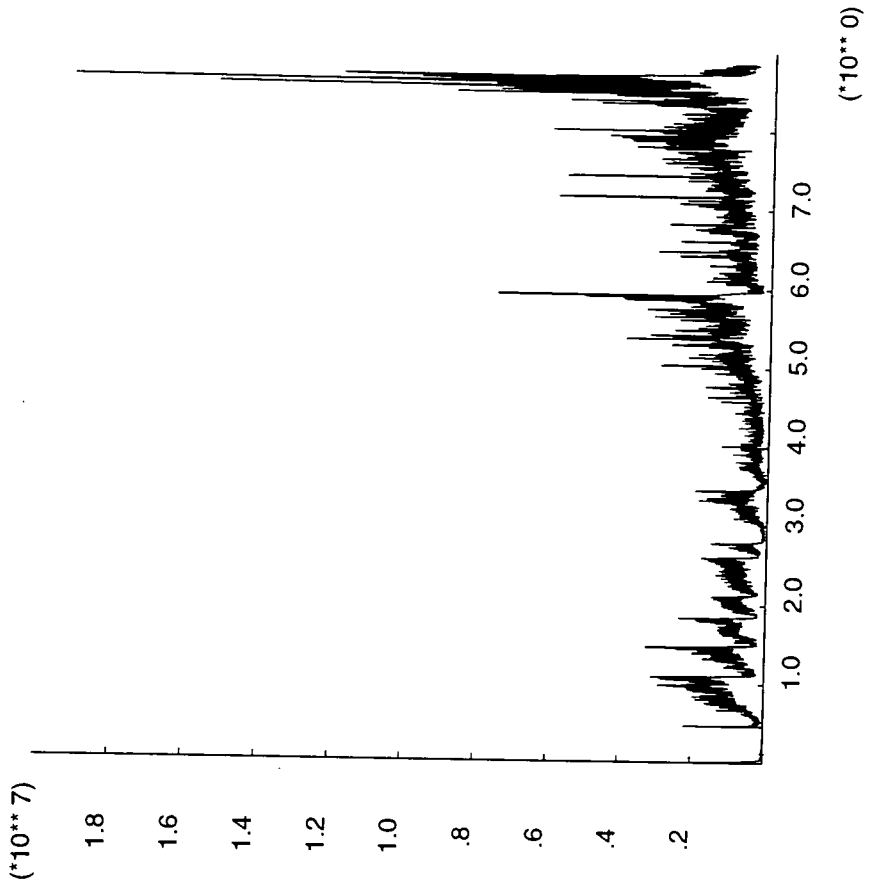
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1/04/1980 17:38

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1.04E+01 <hist 2> 1.91E+07 —



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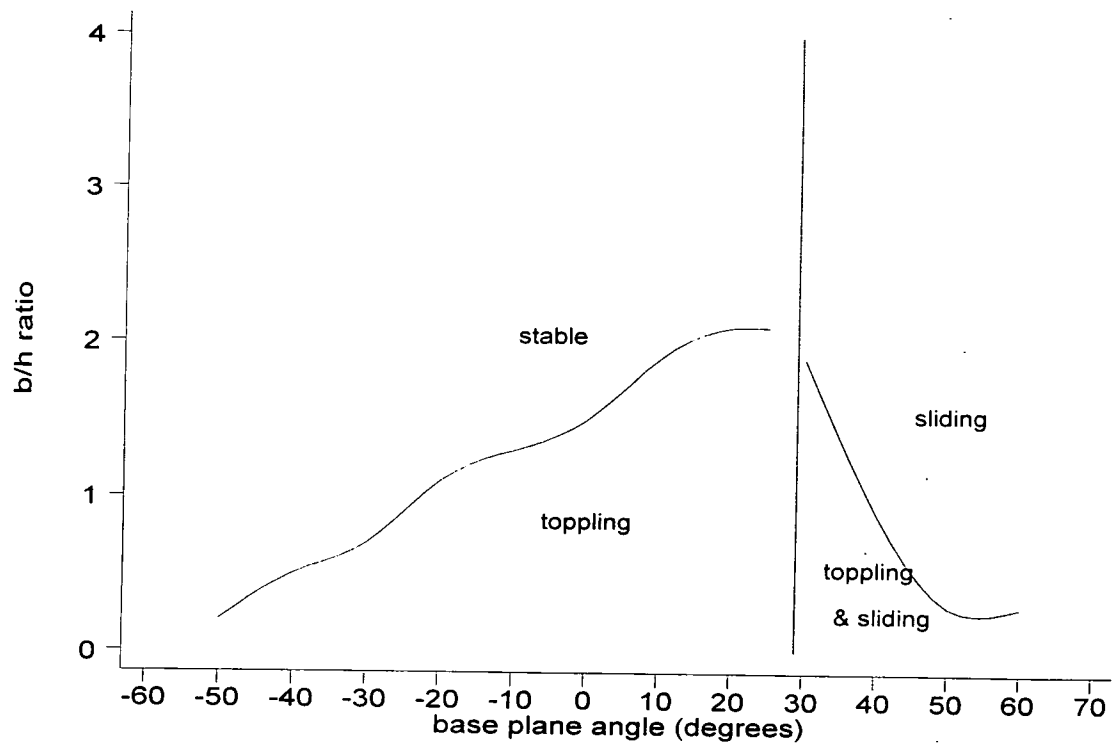


Figure 4.30: Limiting conditions for sliding, toppling and stable sandstone rock masses which contain deformable blocks.

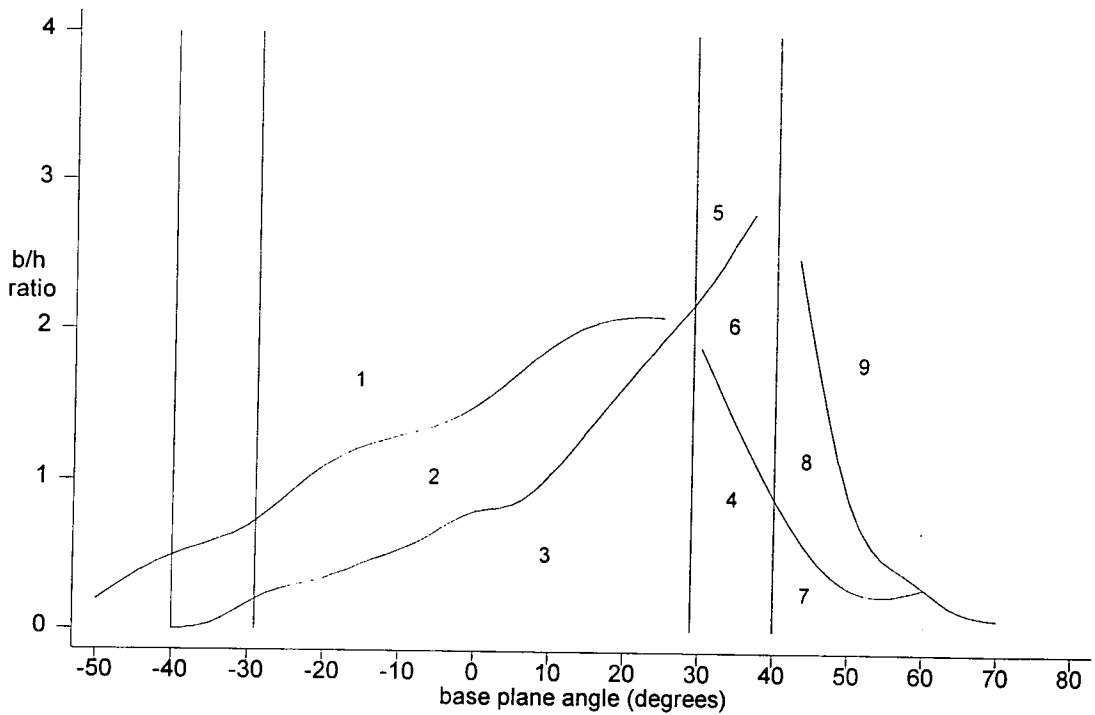


Figure 4.31: Limiting conditions for the failure of sandstone rock masses containing deformable blocks compared with the limiting conditions for the failure of the limestone rock masses.

The boundaries between the mechanisms of failure are taken from Figures 4.5 and 4.30.

Zones on the graph are delimited by the boundary lines:

Zone	Limestone	Deformable sandstone
1	Stable	Stable
2	Stable	Toppling
3	Toppling	Toppling
4	Toppling	Toppling-and-sliding
5	Stable	Sliding
6	Toppling	Sliding
7	Toppling-and-sliding	Toppling-and-sliding
8	Toppling-and-sliding	Sliding
9	Sliding	Sliding

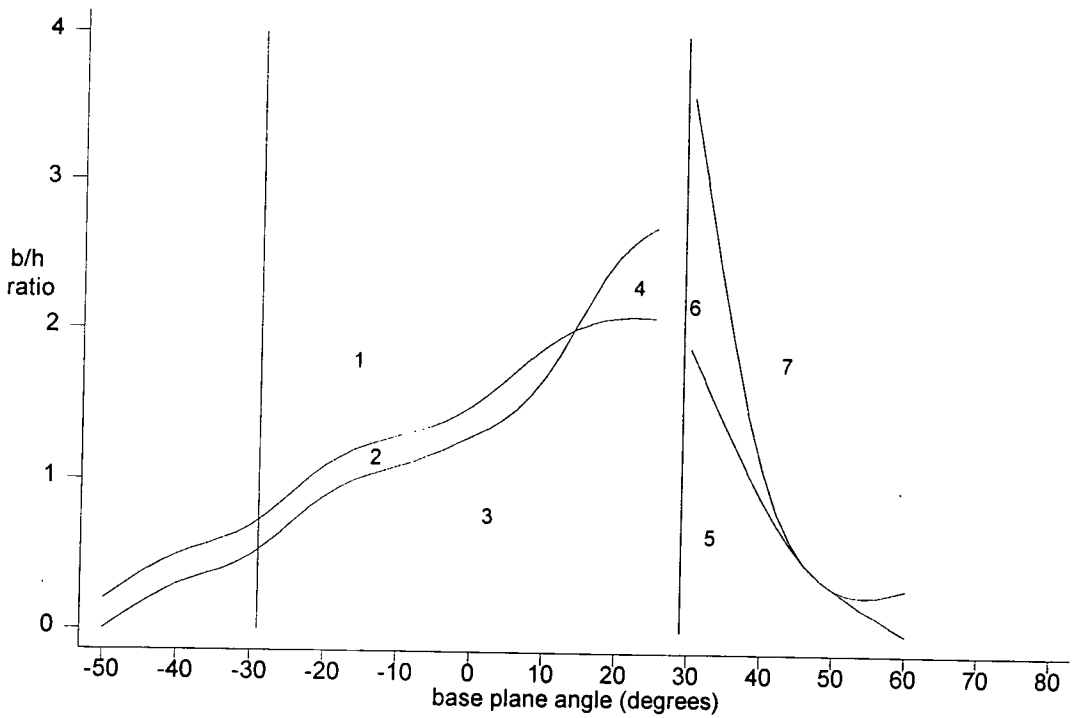


Figure 4.32: Limiting conditions for the failure of sandstone rock masses containing deformable blocks compared with the limiting conditions for the failure of the sandstone rock masses.

The boundaries between the mechanisms of failure are taken from Figures 4.22 and 4.30. Zones on the graph are delimited by the boundary lines:

Zone	Deformable Sandstone	Sandstone
1	Stable	Stable
2	Toppling	Stable
3	Toppling	Toppling
4	Stable	Toppling
5	Toppling-and-sliding	Toppling-and-sliding
6	Sliding	Toppling-and-sliding
7	Sliding	Sliding

JOB TITLE : Figure 4.33a: Toppling sandstone rock mass with deformable blocks.

UDEC (Version 2.00)

LEGEND

1/04/1980 17:54

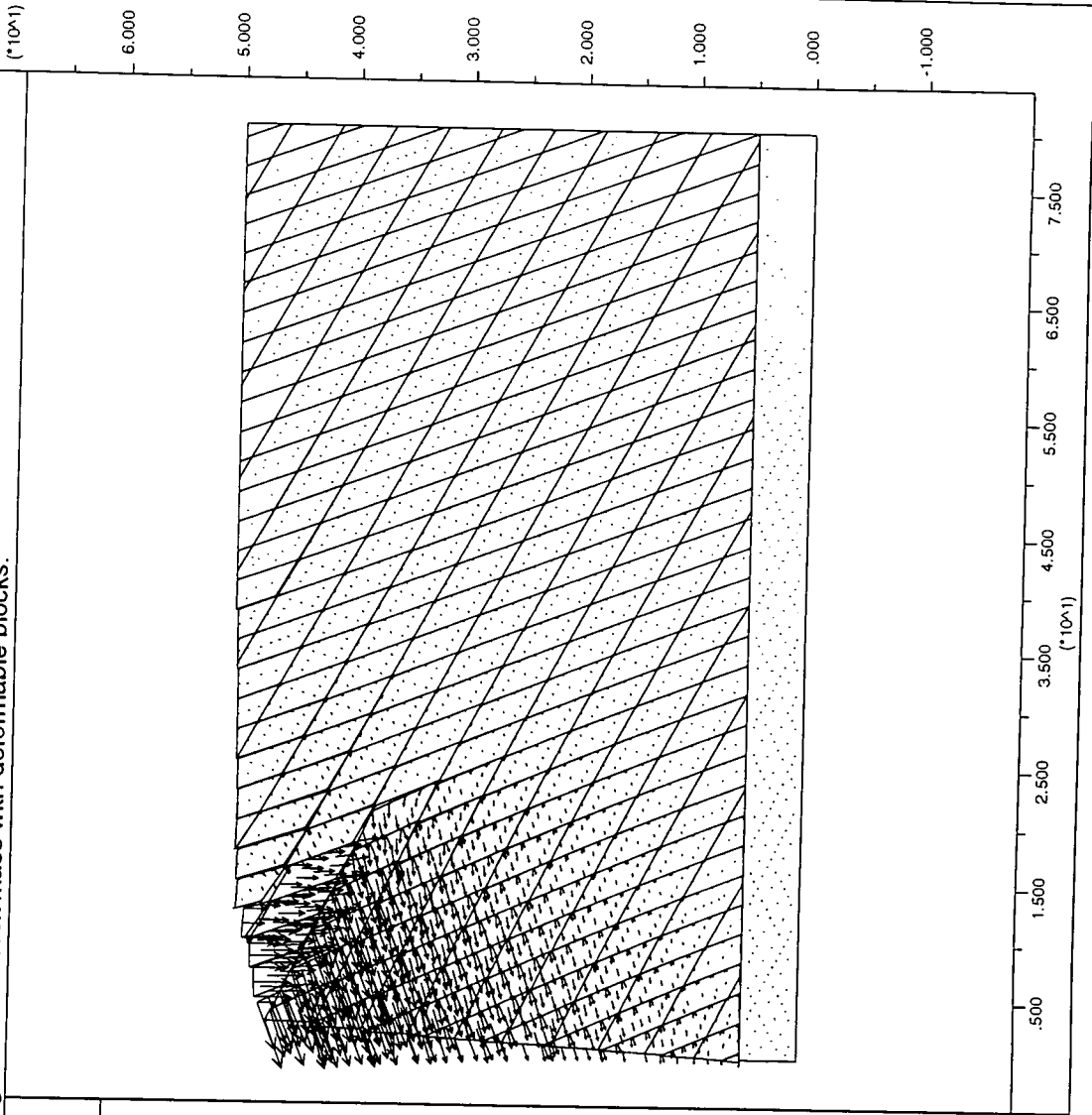
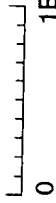
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block plot

velocity vectors

maximum = 2.704E-03



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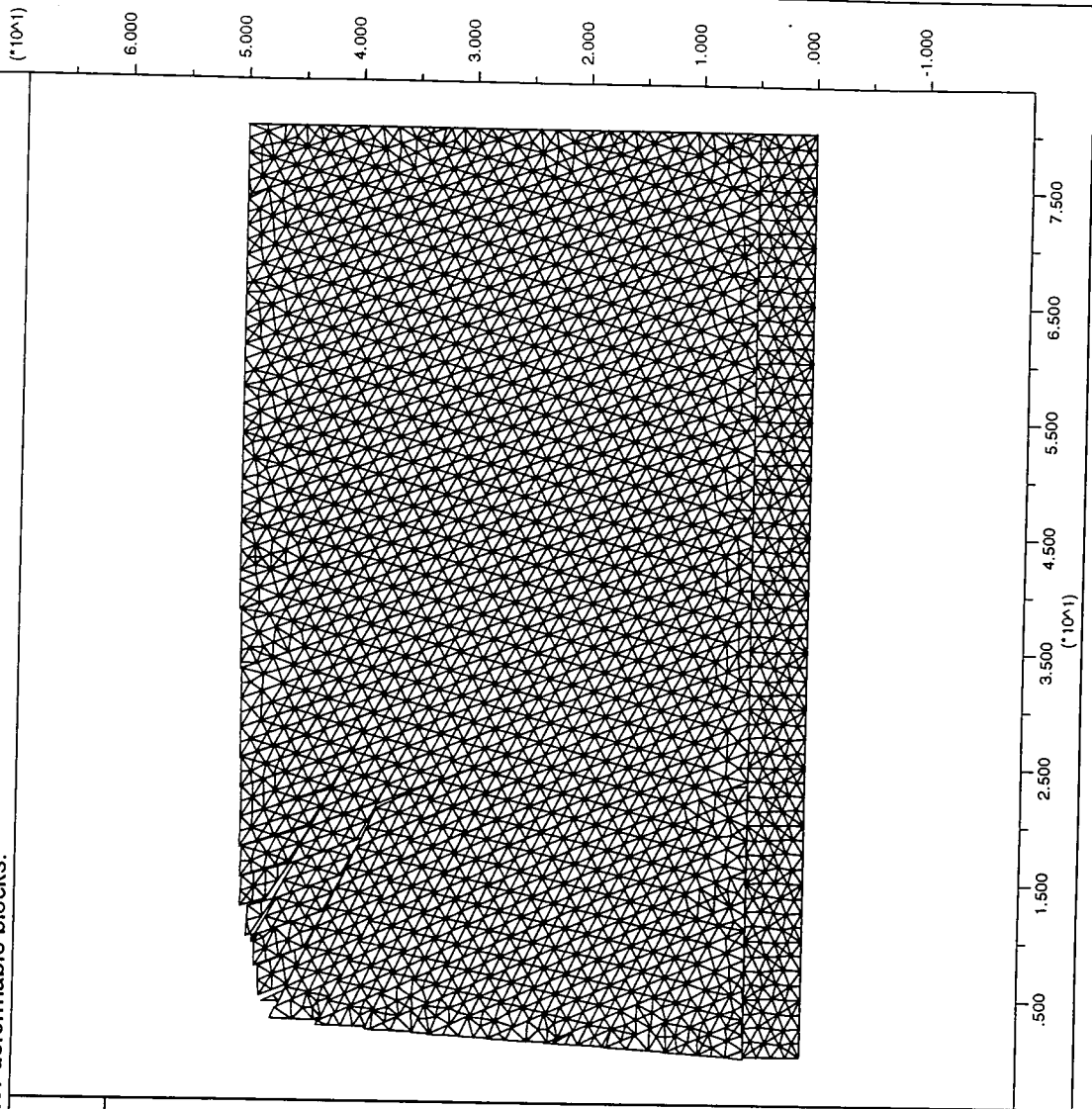
JOB TITLE : Figure 4.33b: Zones for deformable blocks.

UDEC (Version 2.00)

LEGEND

1/04/1980 17:56
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time 4.747E+01 sec

block plot
zones plotted in fdef blocks



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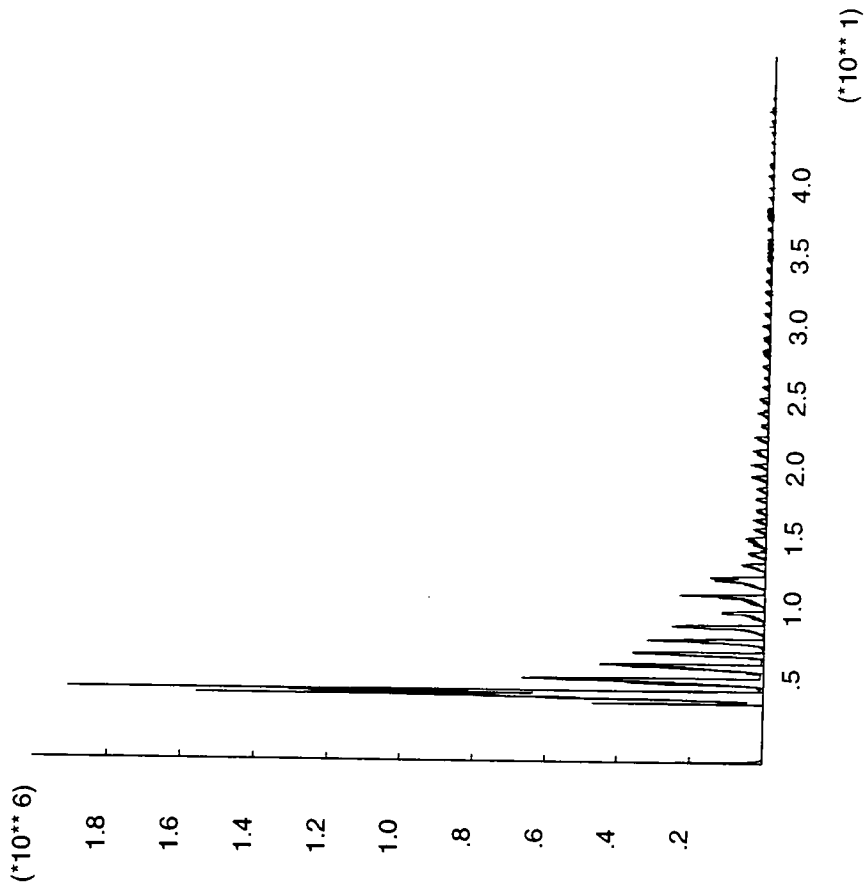
JOB TITLE : Figure 4.33c: Forces for a toppling sandstone rock mass.

UDEC (Version 2.00)

LEGEND

1/04/1980 17:57
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time 4.747E+01 sec

3.17E-01 <hist 2> 1.91E+06 ———



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JOB TITLE : Figure 4.33d: Toppling sandstone rock mass with deformable blocks.

UDEC (Version 2.00)

LEGEND

1/04/1980 17:59

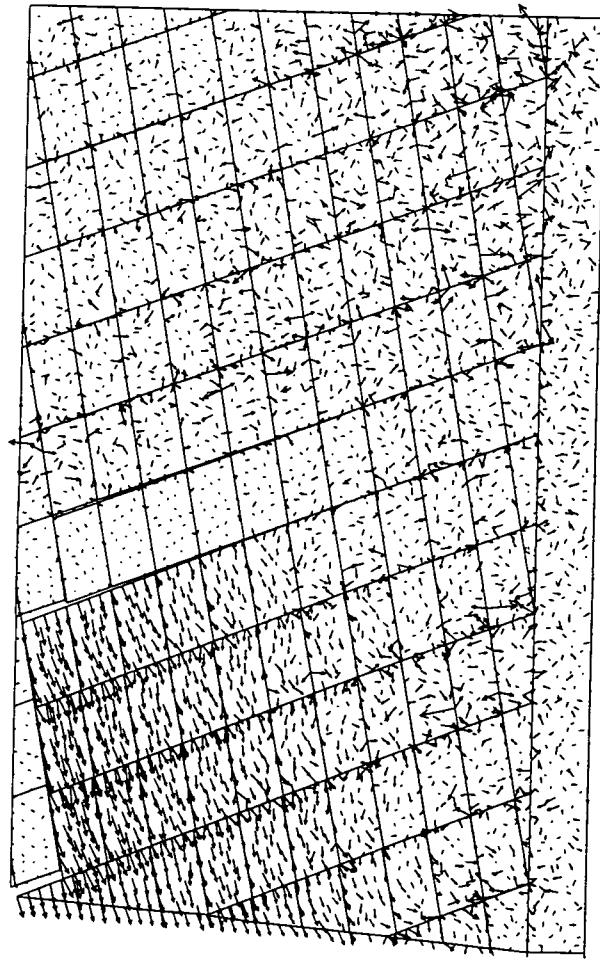
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time 8.328E+01 sec

block plot

velocity vectors

maximum = 8.564E-07



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JOB TITLE : Figure 4.33e: Stable sandstone rock mass with deformable blocks.

UDEC (Version 2.00)

LEGEND

1/04/1980 18:00

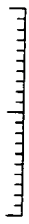
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time 8.963E+01 sec

block plot

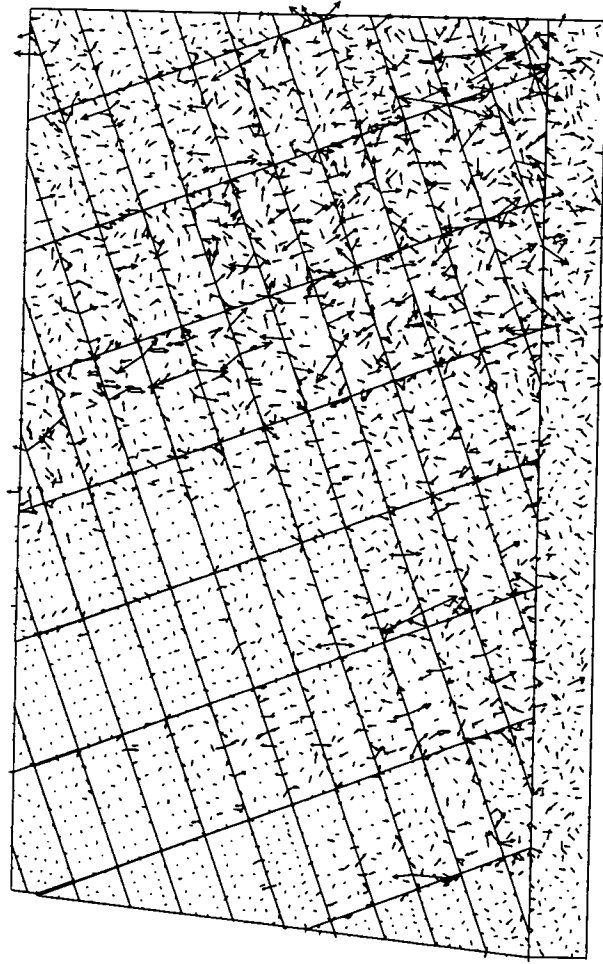
velocity vectors

maximum = 4.920E-07



0

2E -6



(*10^1)

6.000

5.000

4.000

3.000

2.000

1.000

.000

-1.000

7.500

6.500

5.500

4.500

3.500

2.500

1.500

.500

(*10^1)

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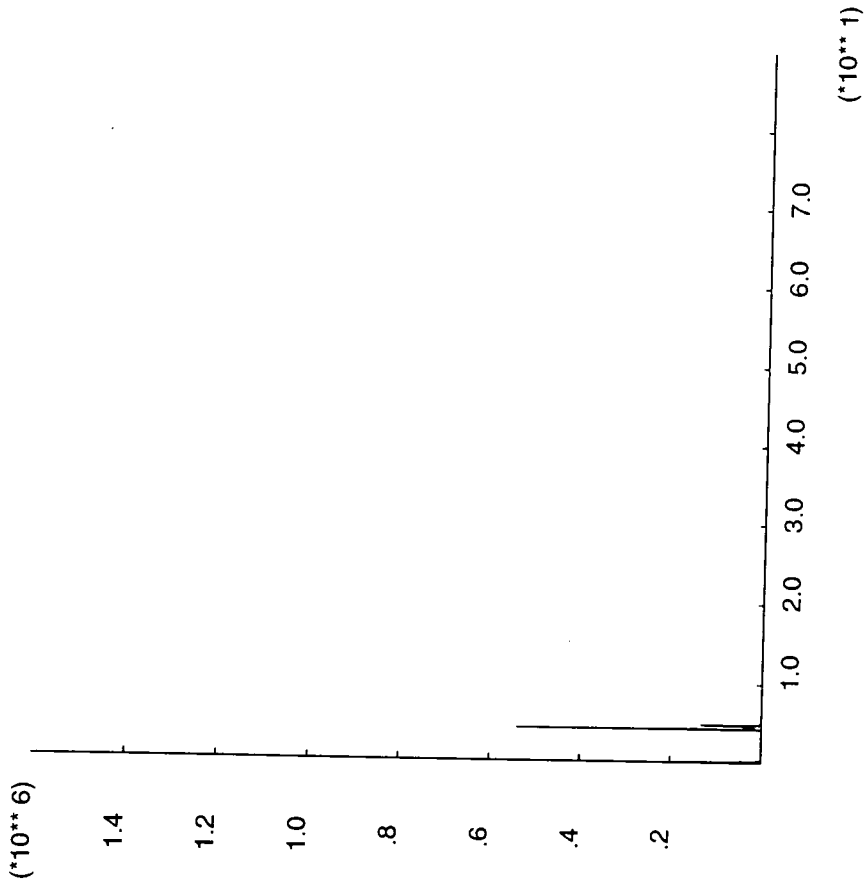
JOB TITLE : Figure 4.33f: Total unbalanced forces for a stable sandstone rock mass.

UDEC (Version 2.00)

LEGEND

1/04/1980 18:01
cycle 210000
time 8.963E+01 sec

4.96E-01 <hist 2> 1.47E+06 ———



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JOB TITLE : Figure 4.33g: Sliding sandstone rock mass with deformable blocks.

UDEC (Version 2.00)

LEGEND

1/04/1980 18:03

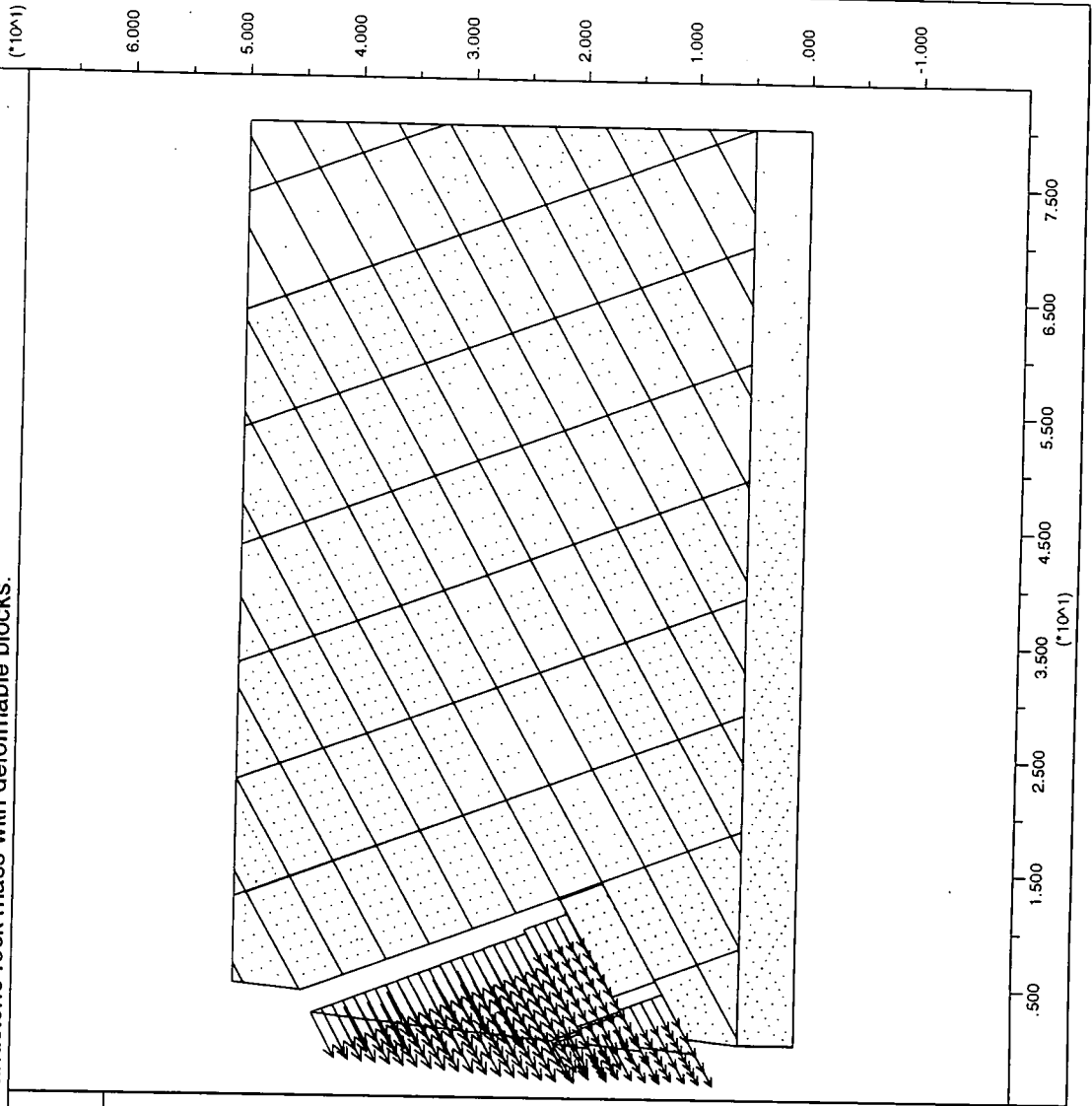
cycle 210000

time 8.376E+01 sec

block plot

velocity vectors

maximum = 2.330E-02



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JOB TITLE: Figure 4.33h: Sliding sandstone rock mass with deformable blocks.

UDEC (Version 2.00)

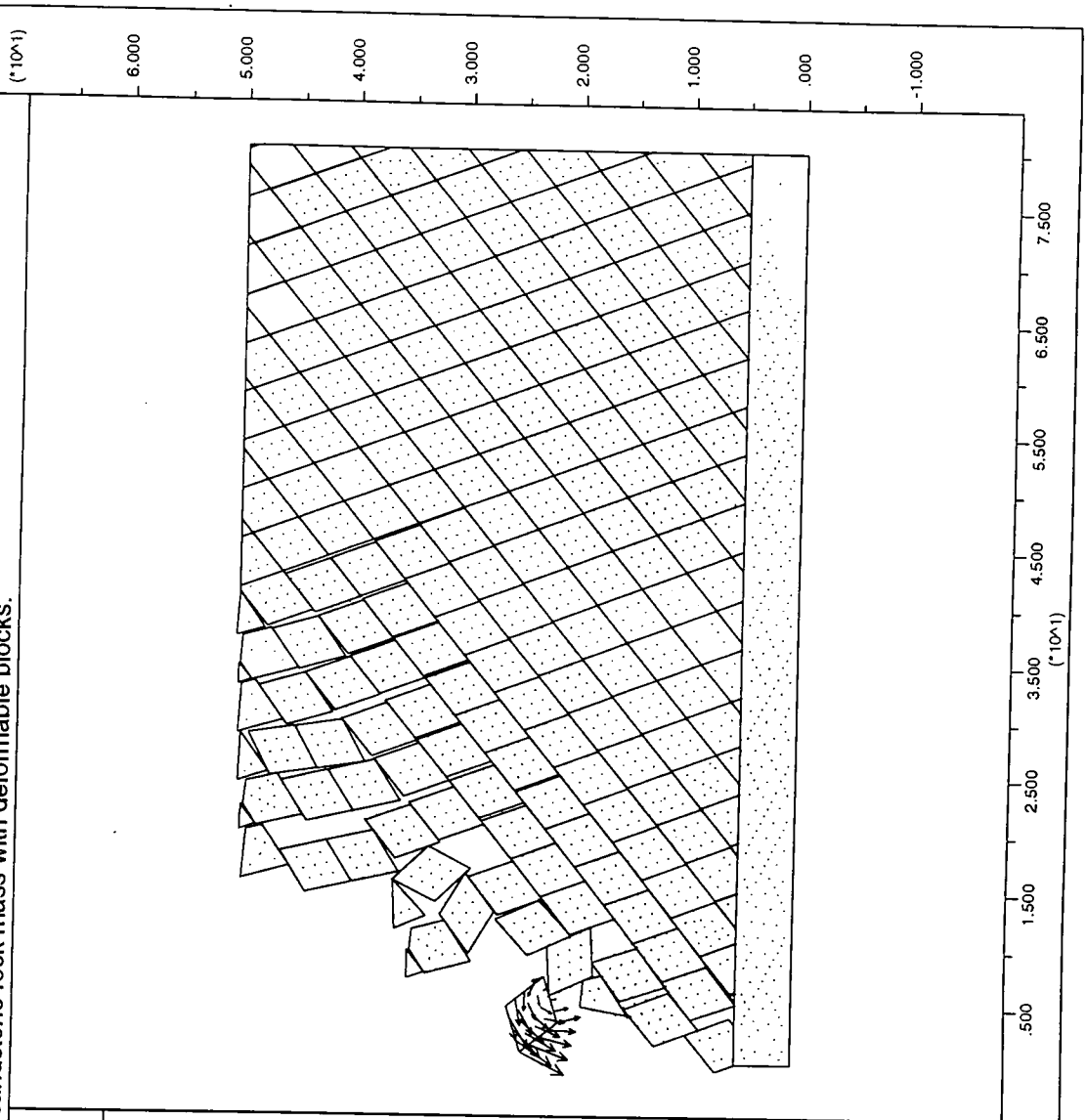
LEGEND

9/06/1998 17:15
cycle 110000
time 4.141E+01 sec

block plot
velocity vectors
maximum = 6.266E+00

|||||
0 2E 1

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JOB TITLE : Figure 4.33i: Total unbalanced forces for a sliding sandstone rock mass.

UDEC (Version 2.00)

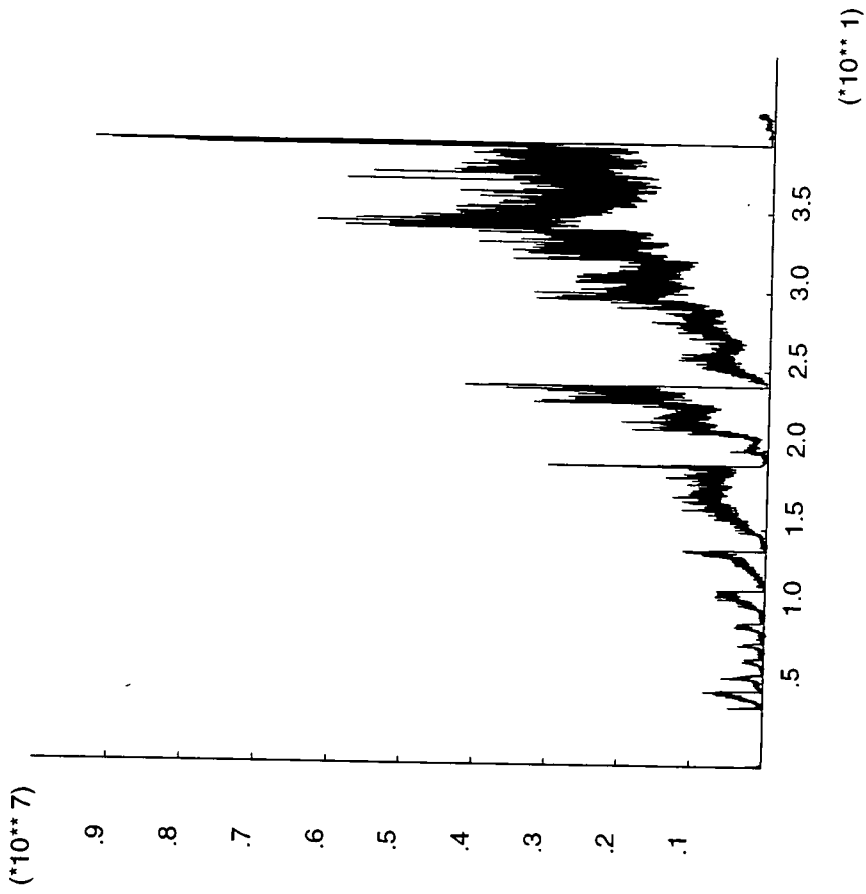
LEGEND

1/04/1980 18:07

cycle 110000

time 4.141E+01 sec

4.15E-01 <hist 2> 9.30E+06 —



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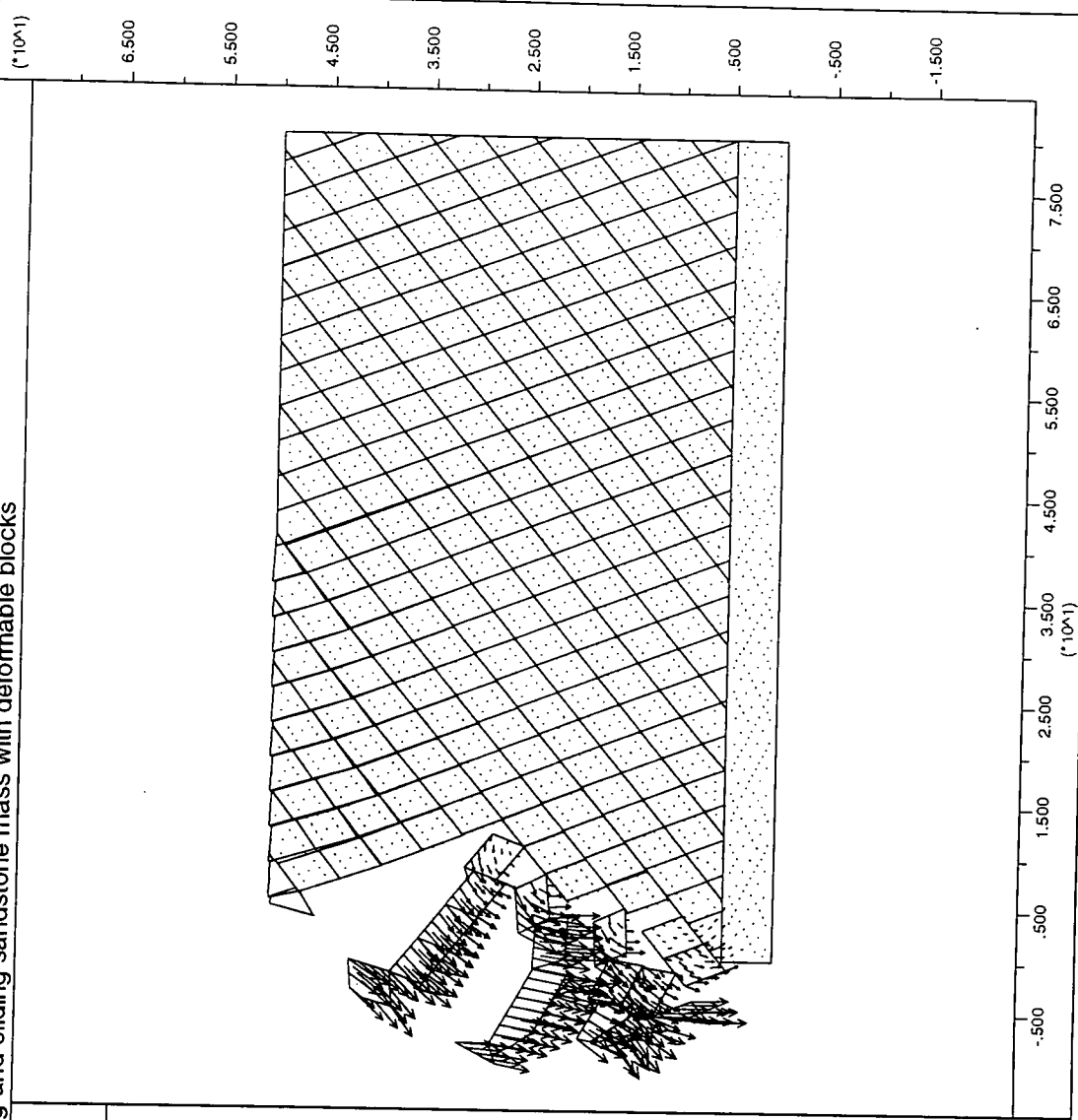
JOB TITLE : Figure 4.33j: Toppling-and-sliding sandstone mass with deformable blocks

UDEC (Version 2.00)

LEGEND

1/04/1980 18:09
cycle 53251
time 2.079E+01 sec
block plot
velocity vectors
maximum = 6.081E+00

|||||||
0 2E 1



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JOB TITLE : Figure 4.33k: Forces for a toppling-and-sliding sandstone rock mass.

UDEC (Version 2.00)

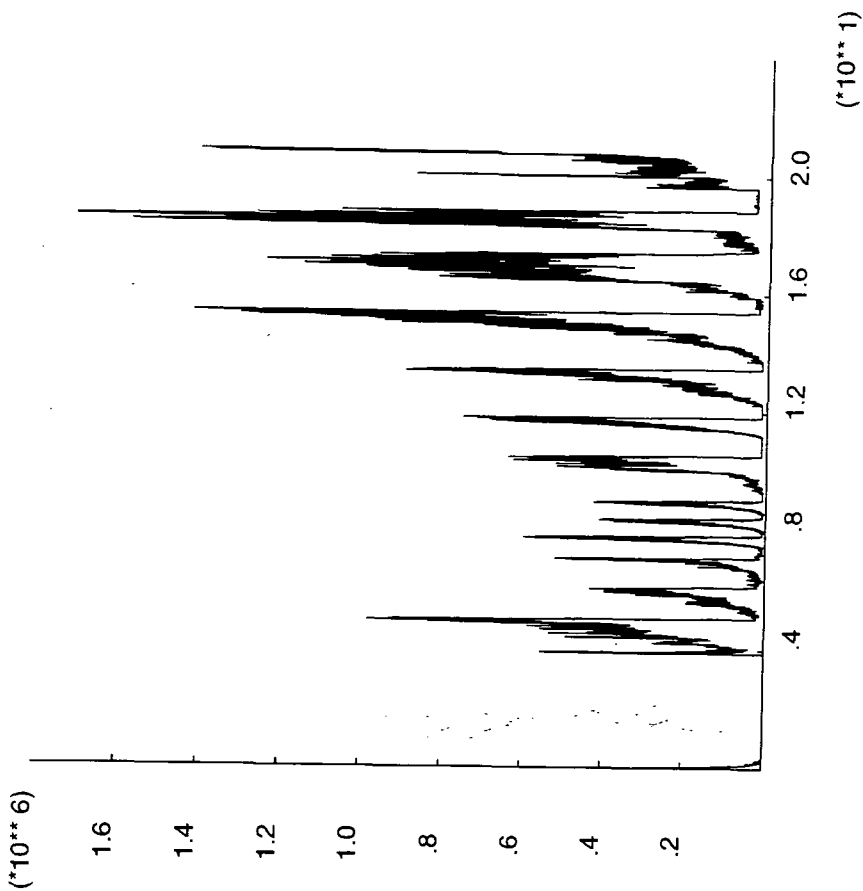
LEGEND

1/04/1980 18:10

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5.71E-01 <hist 2> 1.71E+06 ———



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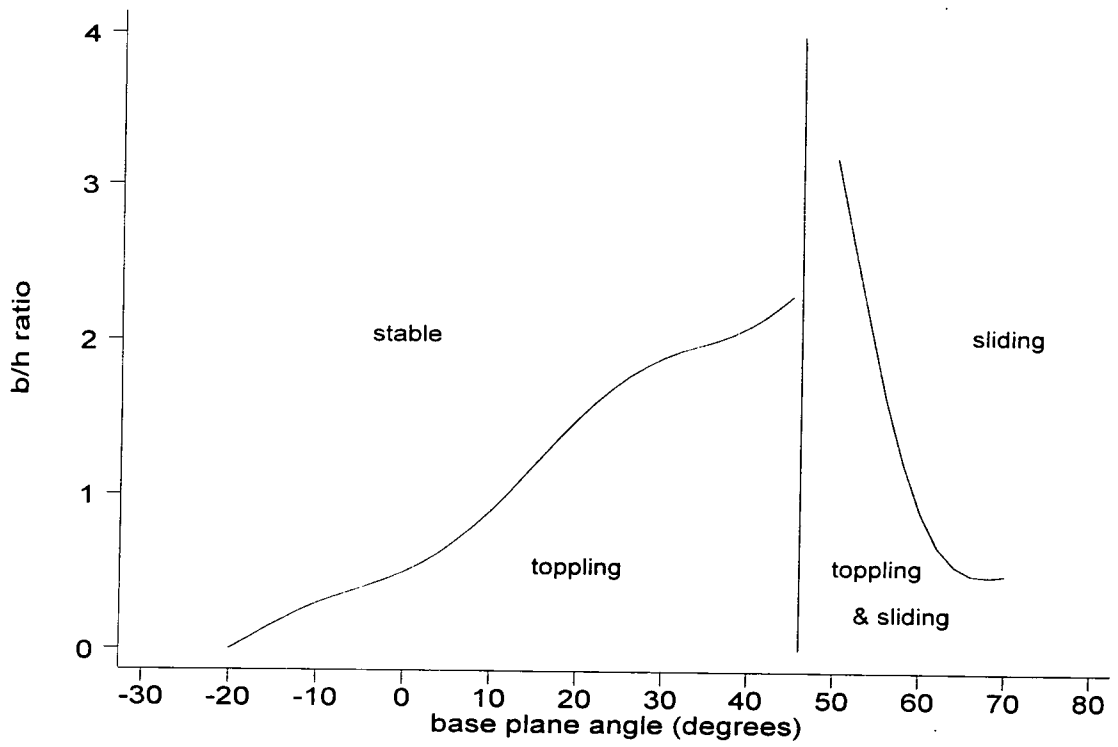


Figure 4.34: Limiting conditions for sliding, toppling and stable granite rock masses which contain deformable blocks.

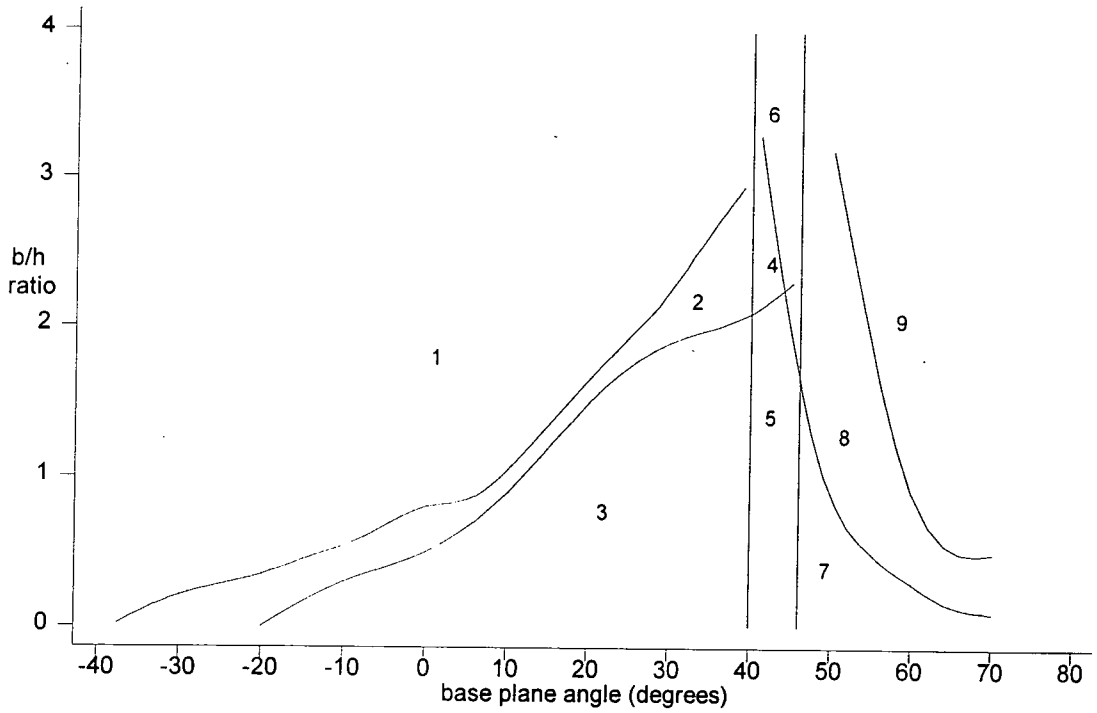


Figure 4.35: Limiting conditions for the failure of granite rock masses containing deformable blocks compared with the limiting conditions for the failure of the limestone rock masses.

The boundaries between the mechanisms of failure are taken from Figures 4.5 and 4.34. Zones on the graph are delimited by the boundary lines:

Zone	Limestone	Deformable granite
1	Stable	Stable
2	Toppling	Stable
3	Toppling	Toppling
4	Toppling-and-sliding	Stable
5	Toppling-and-sliding	Toppling
6	Sliding	Stable
7	Toppling-and-sliding	Toppling-and-sliding
8	Sliding	Toppling-and-sliding
9	Sliding	Sliding

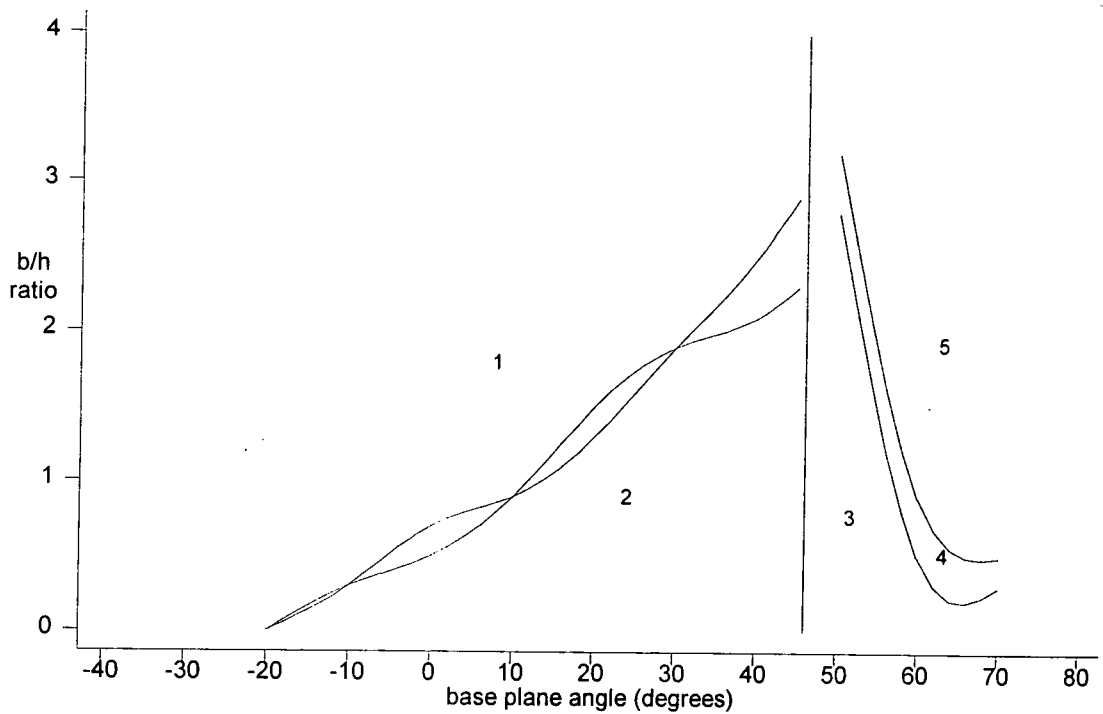


Figure 4.36: Limiting conditions for the failure of granite rock masses containing deformable blocks compared with the limiting conditions for the failure of the granite rock masses.

The boundaries between the mechanisms of failure are taken from Figures 4.25 and 4.34. Zones on the graph are delimited by the boundary lines:

Zone	Granite	Deformable granite
1	Stable	Stable
2	Toppling	Toppling
3	Toppling-and-sliding	Toppling-and-sliding
4	Sliding	Toppling-and-sliding
5	Sliding	Sliding

JOB TITLE : Figure 4.37a: Toppling granite rock mass with deformable blocks.

UDEC (Version 2.00)

LEGEND

1/04/1980 20:18

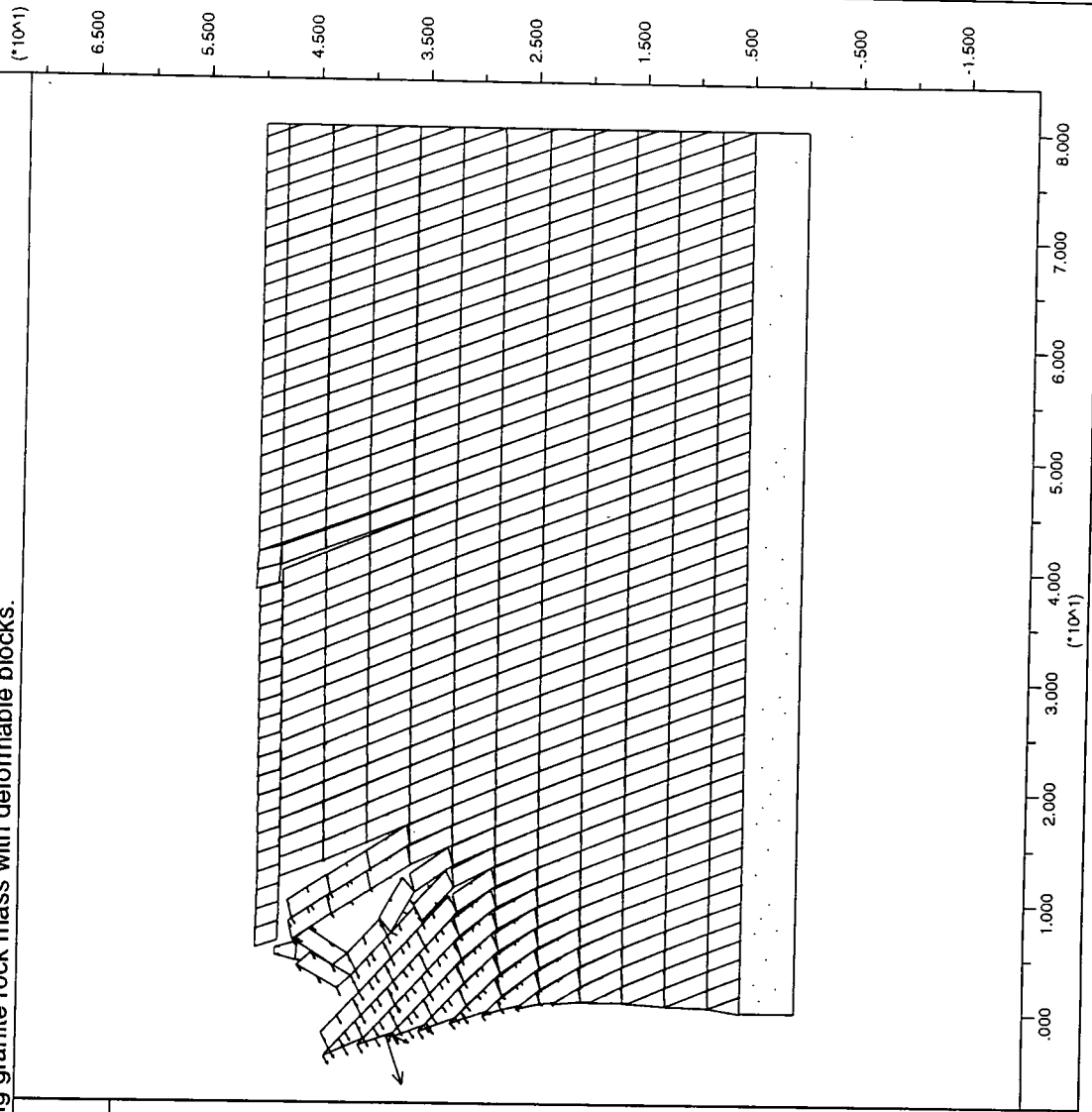
cycle 210000

time 1.467E+02 sec

block plot

velocity vectors

maximum = 1.852E-03



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JOB TITLE : Figure 4.37b: Toppling granite rock mass showing deformable zones.

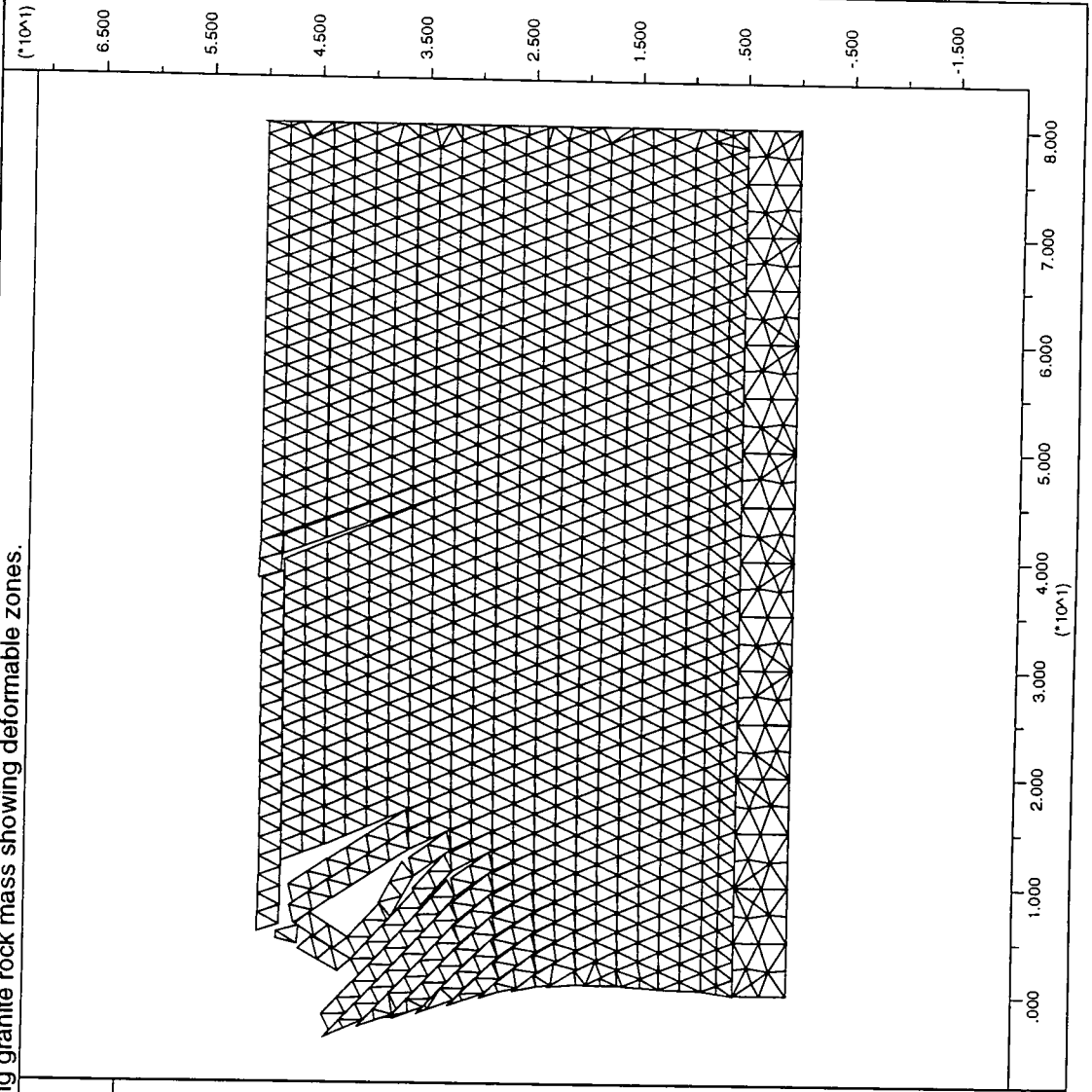
UDEC (Version 2.00)

LEGEND

1/04/1980 20:19
cycle 210000
time 1.467E+02 sec

block plot
zones plotted in fdef blocks

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JOB TITLE : Figure 4.37c: Toppling-and-sliding granite mass with deformable blocks.

UDEC (Version 2.00)

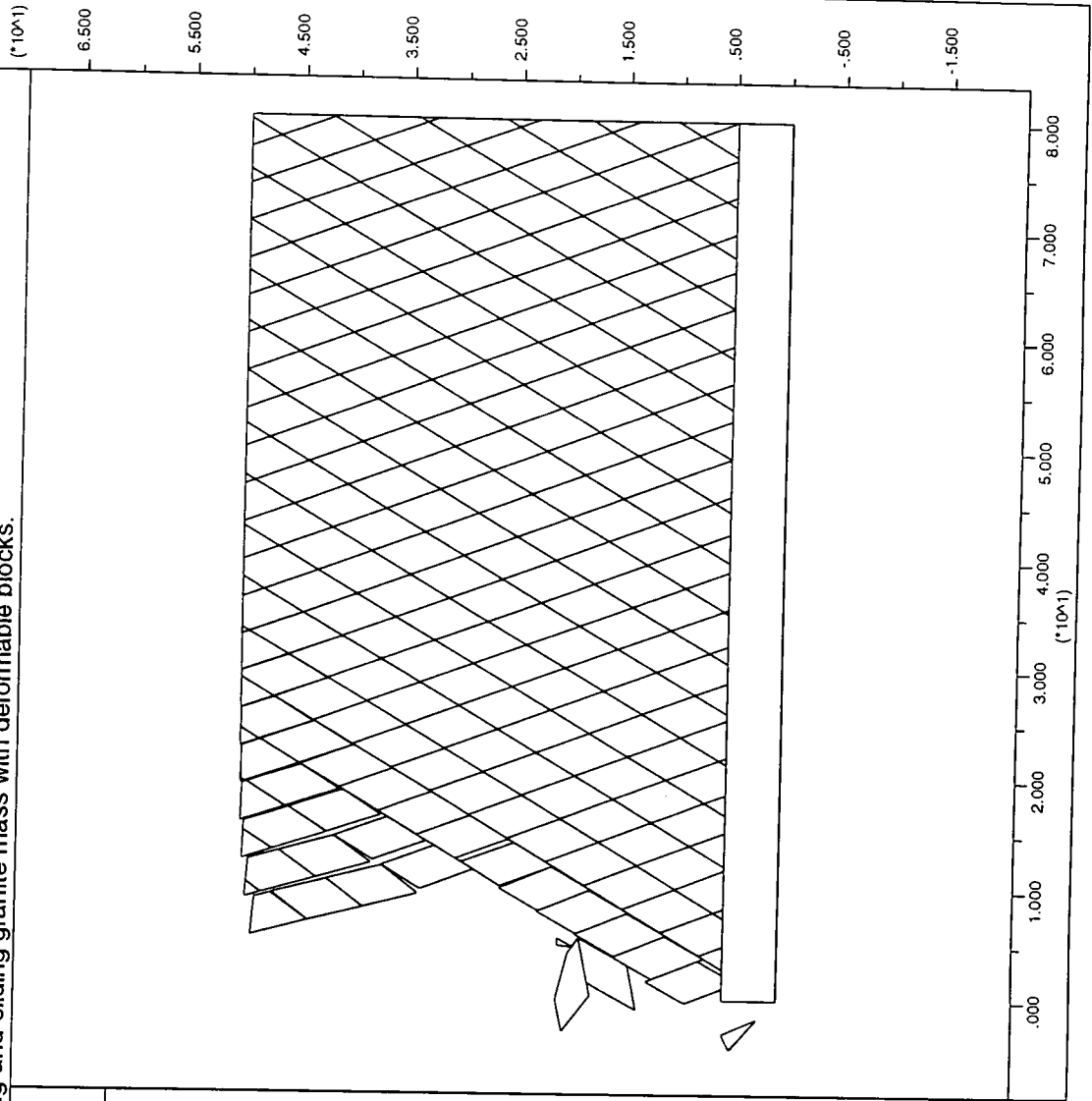
LEGEND

1/04/1980 20:21

cycle 210000

time 1.272E+02 sec

block plot



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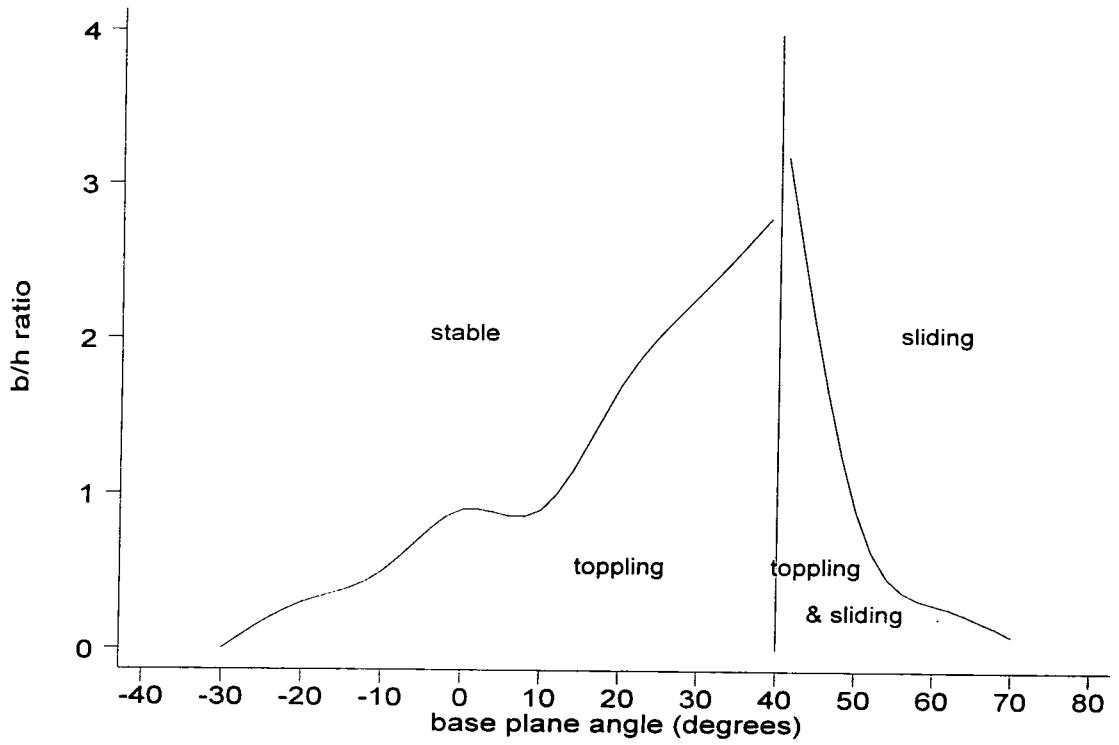


Figure 4.38: Limiting conditions for sliding, toppling and stable rock masses which contain variable discontinuity spacings.

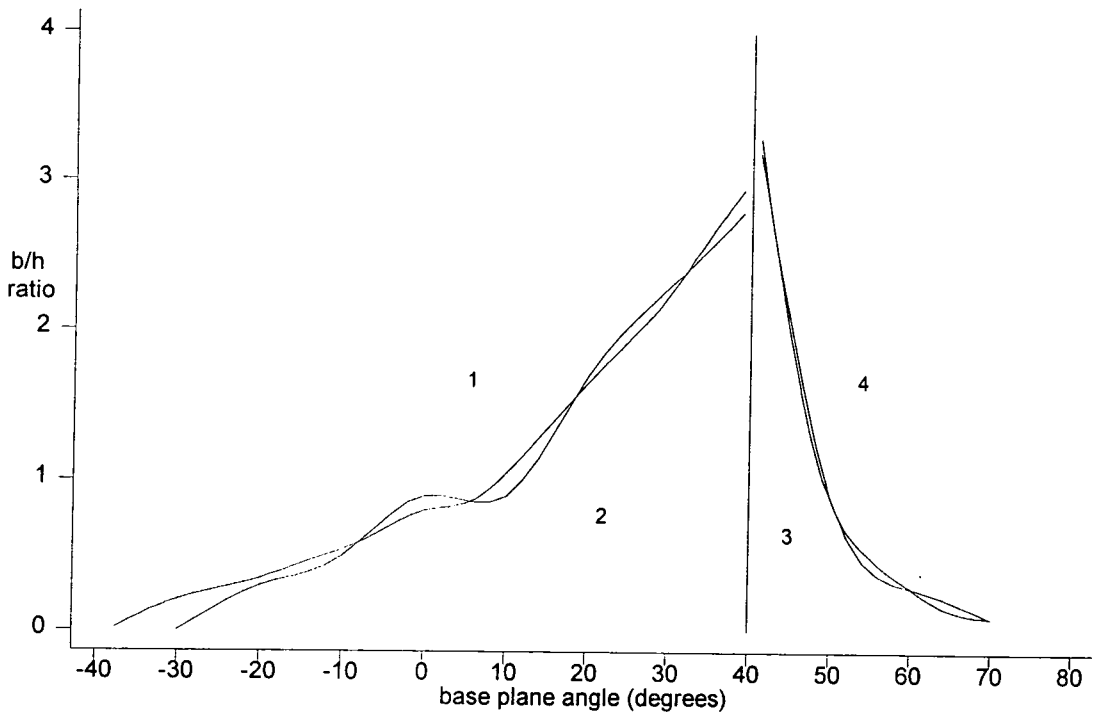


Figure 4.39: Limiting conditions for the failure of rock masses containing variable discontinuity spacings compared with the limiting conditions for the failure of the limestone rock masses.

The boundaries between the mechanisms of failure are taken from Figures 4.5 and 4.38.

Zones on the graph are delimited by the boundary lines:

Zone	Limestone	Variable spacings
1	Stable	Stable
2	Toppling	Toppling
3	Sliding	Sliding
4	Toppling-and-sliding	Toppling-and-sliding

JOB TITLE : Figure 4.40a: Toppling mass which contains variable joint spacings.

UDEC (Version 2.00)

LEGEND

1/04/1980 20:33

cycle 210000

time 1.610E+01 sec

block plot

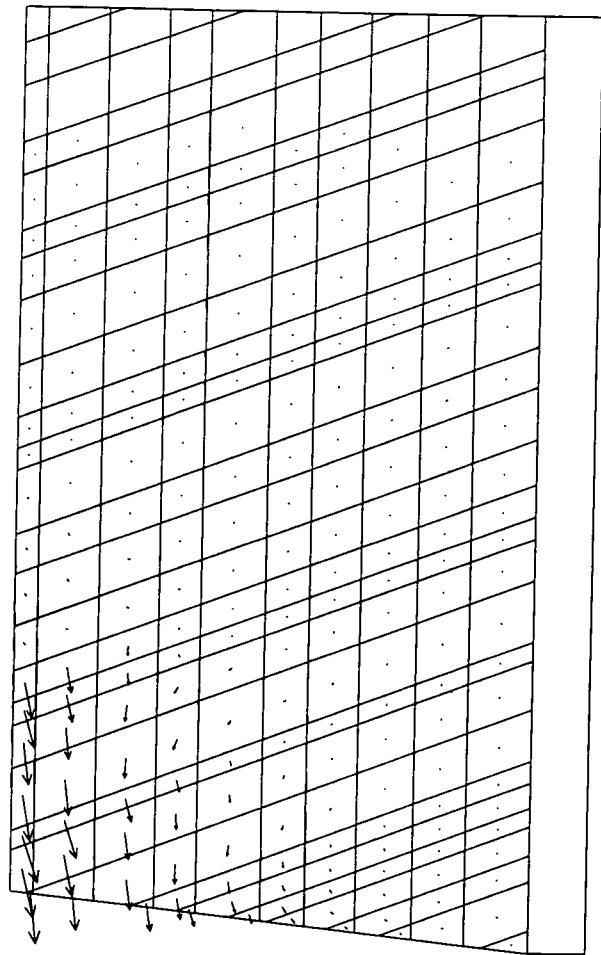
velocity vectors

maximum = 5.507E-05

┌────────────────┐

0

2E-4



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JOB TITLE : Figure 4.40b: Stable mass which contains variable joint spacings.

UDEC (Version 2.00)

LEGEND

1/04/1980 20:34

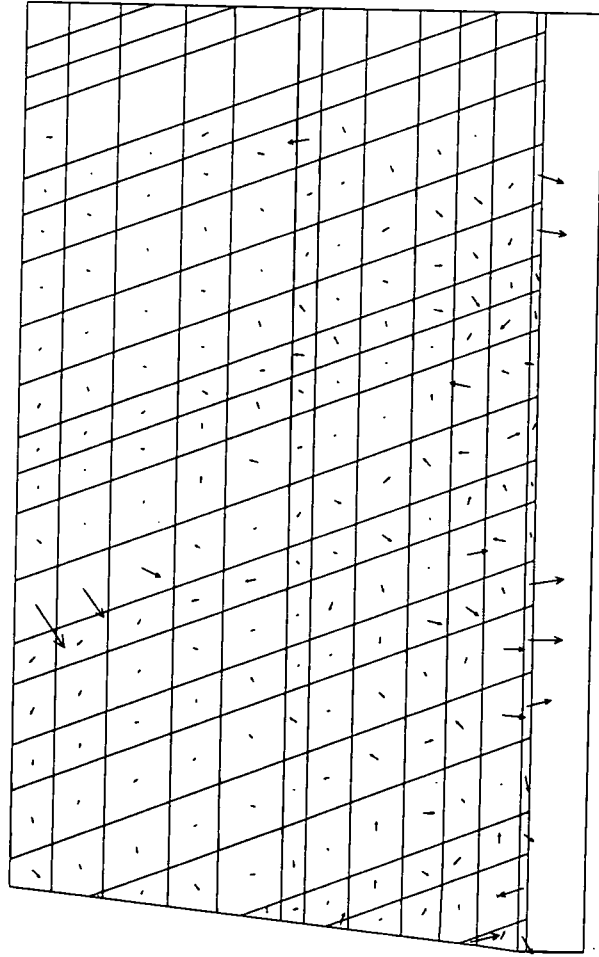
cycle 210000

time 3.029E+01 sec

block plot

velocity vectors

maximum = 3.495E-07



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JOB TITLE : Figure 4.40c: Sliding mass which contains variable joint spacings.

UDEC (Version 2.00)

LEGEND

1/04/1980 20:36

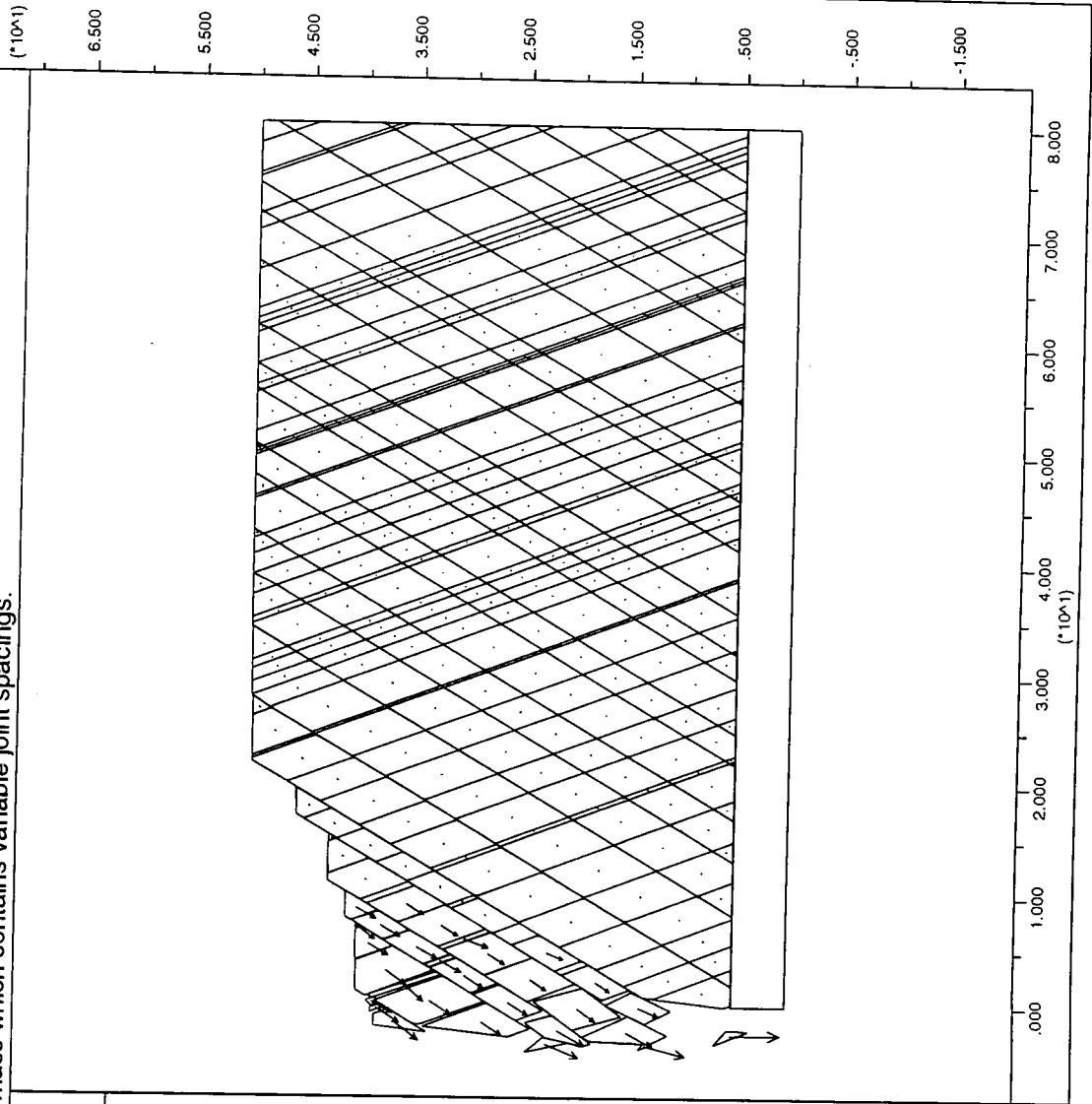
cycle 210000

time 1.265E+01 sec

block plot

velocity vectors

maximum = 1.958E+00



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JOB TITLE : Figure 4.40d: Toppling-and-sliding rock mass with variable joint spacing

UDEC (Version 2.00)

LEGEND

1/04/1980 20:37

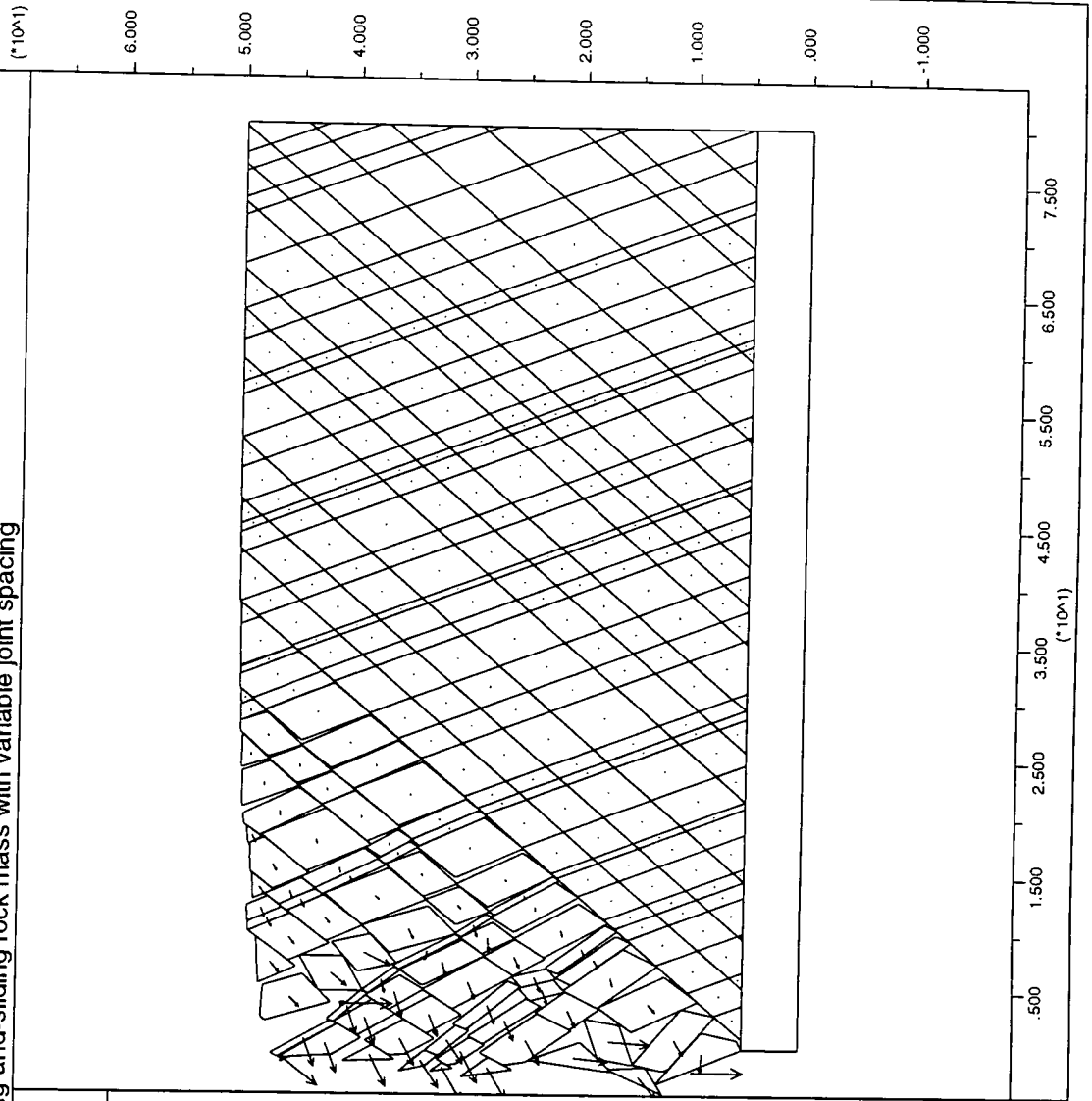
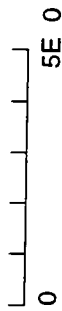
cycle 210000

time 9.313E+00 sec

block plot

velocity vectors

maximum = 1.001E+00



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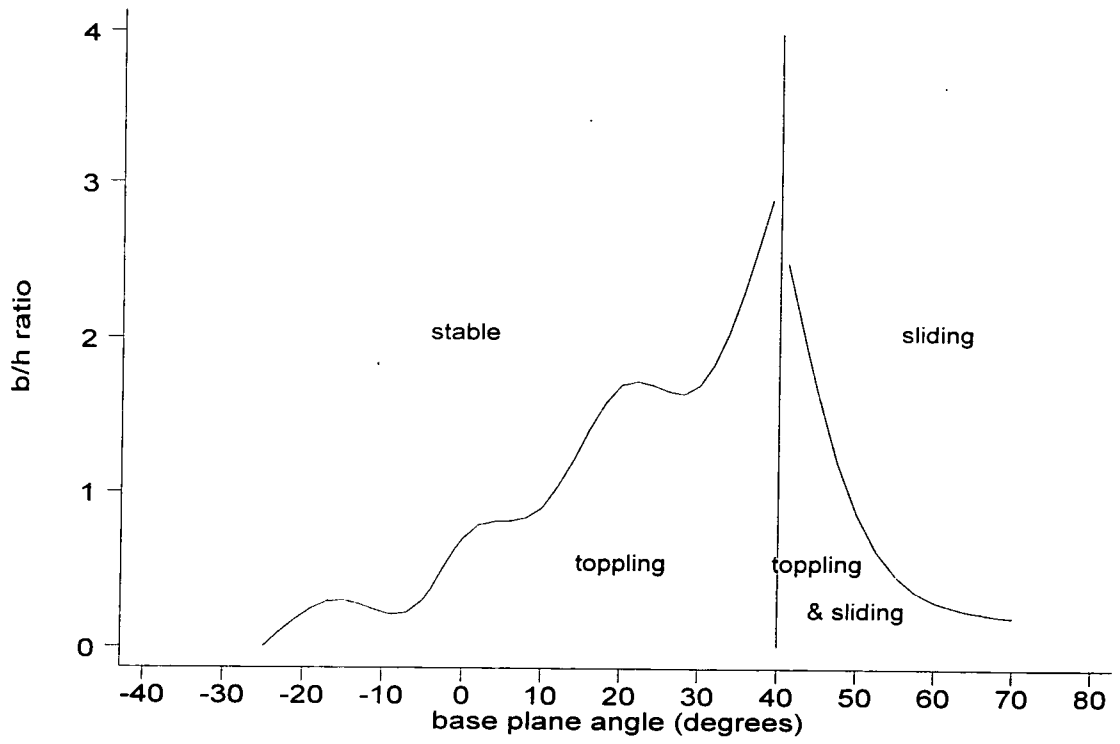


Figure 4.41: Limiting conditions for sliding, toppling and stable rock masses which contain variable discontinuity dip values.

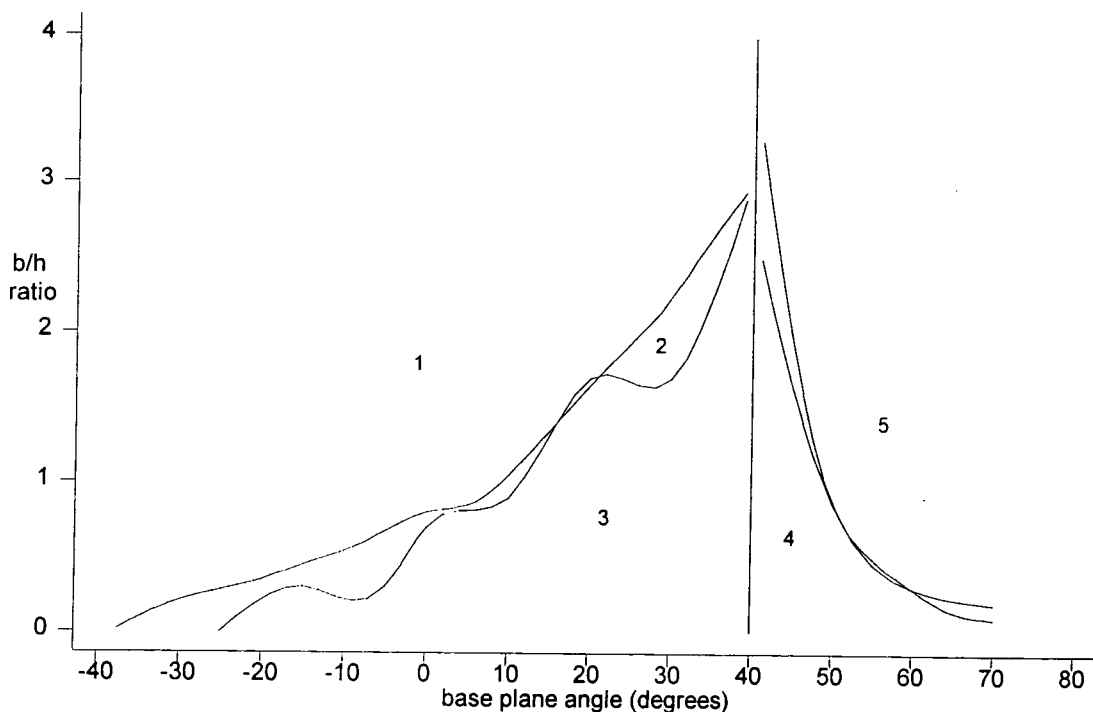


Figure 4.42: Limiting conditions for the failure of rock masses containing variable discontinuity dip values compared with the limiting conditions for the failure of the limestone rock masses.

The boundaries between the mechanisms of failure are taken from Figures 4.5 and 4.41.

Zones on the graph are delimited by the boundary lines:

Zone	Limestone	Variable dip
1	Stable	Stable
2	Toppling	Stable
3	Toppling	Toppling
4	Toppling-and-sliding	Toppling-and-sliding
5	Sliding	Sliding

JOB TITLE : Figure 4.43a: Toppling rock mass with variable joint dip values.

UDEC (Version 2.00)

LEGEND

1/04/1980 20:52

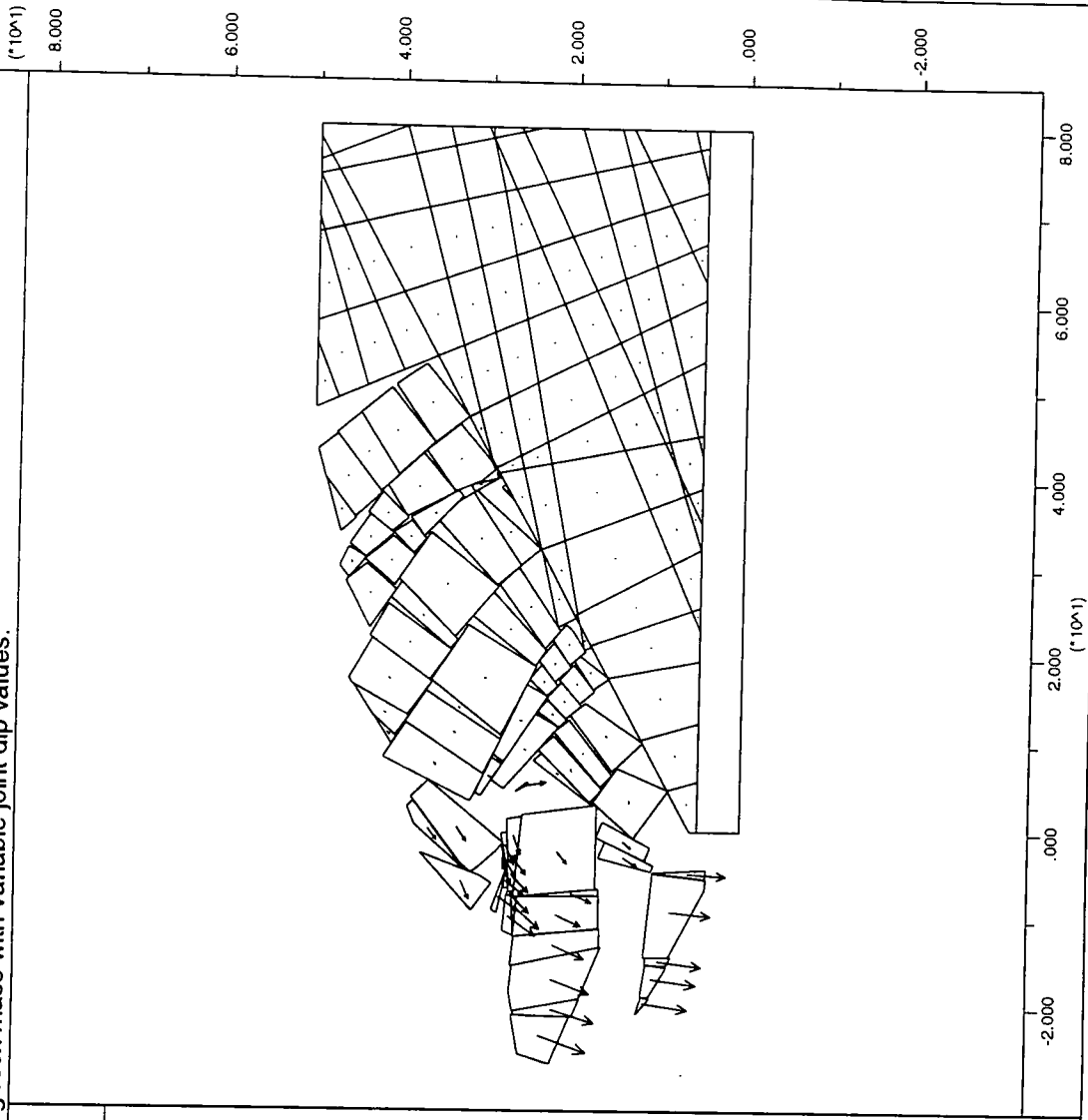
cycle 210000

time 2.026E+01 sec

block plot

velocity vectors

maximum = 1.026E+01



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JOB TITLE : Figure 4.43b: Forces for a toppling mass with variable joint dip values.

UDEC (Version 2.00)

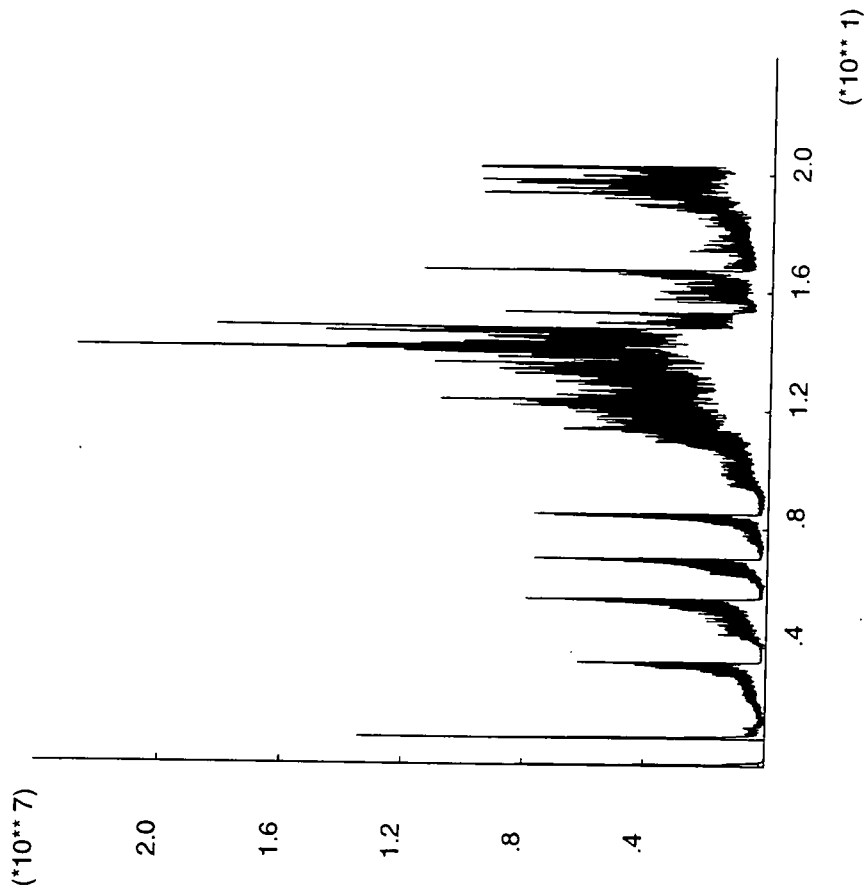
LEGEND

1/04/1980 20:54

cycle 210000

time 2.026E+01 sec

1.26E+01 <hist 2> 2.28E+07



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JOB TITLE : Figure 4.43c: Toppling-and-sliding mass with variable joint dip values.

UDEEC (Version 2.00)

LEGEND

1/04/1980 20:55

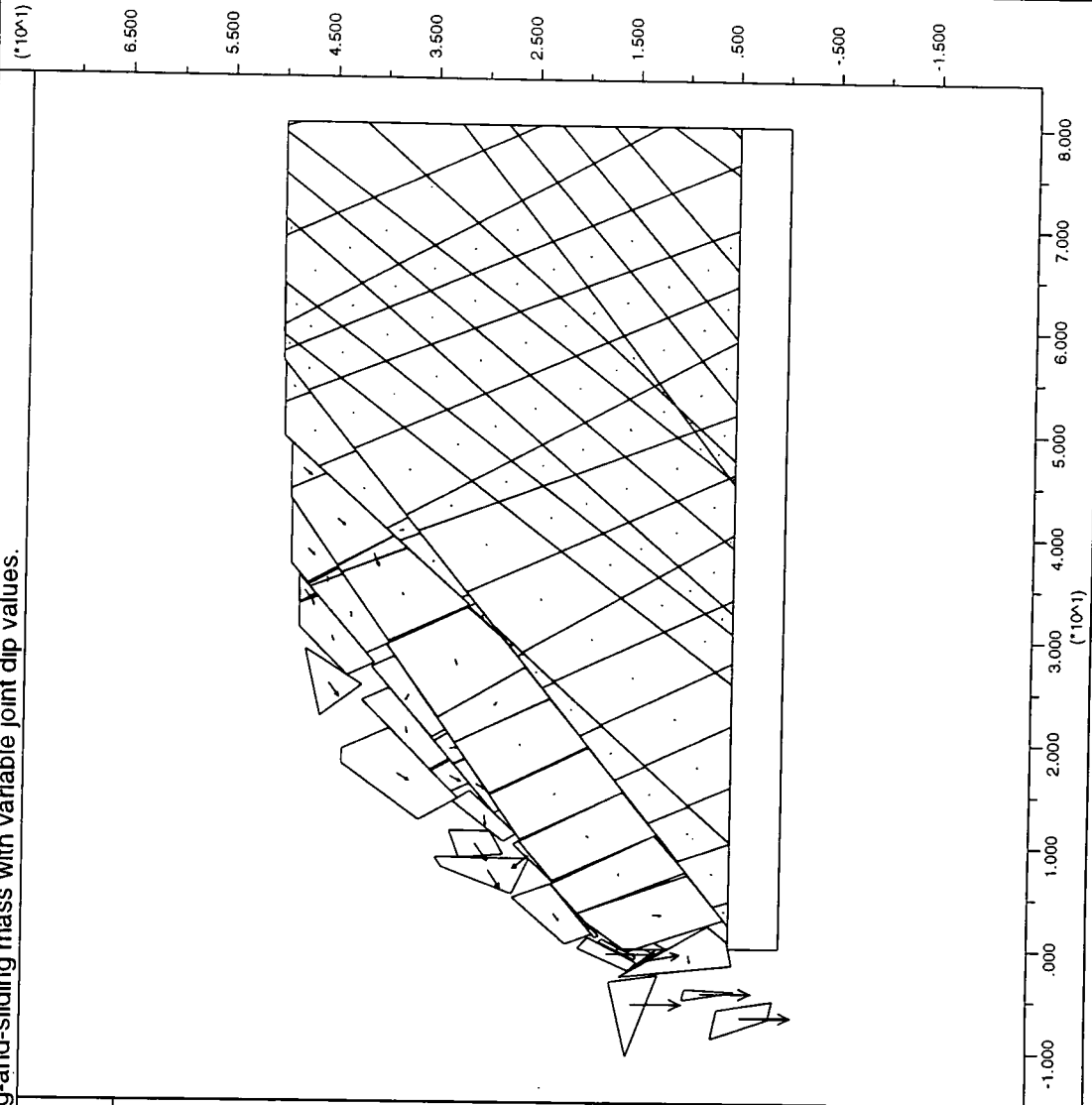
cycle 410000

time 3.137E+01 sec

block plot

velocity vectors

maximum = 1.557E+00



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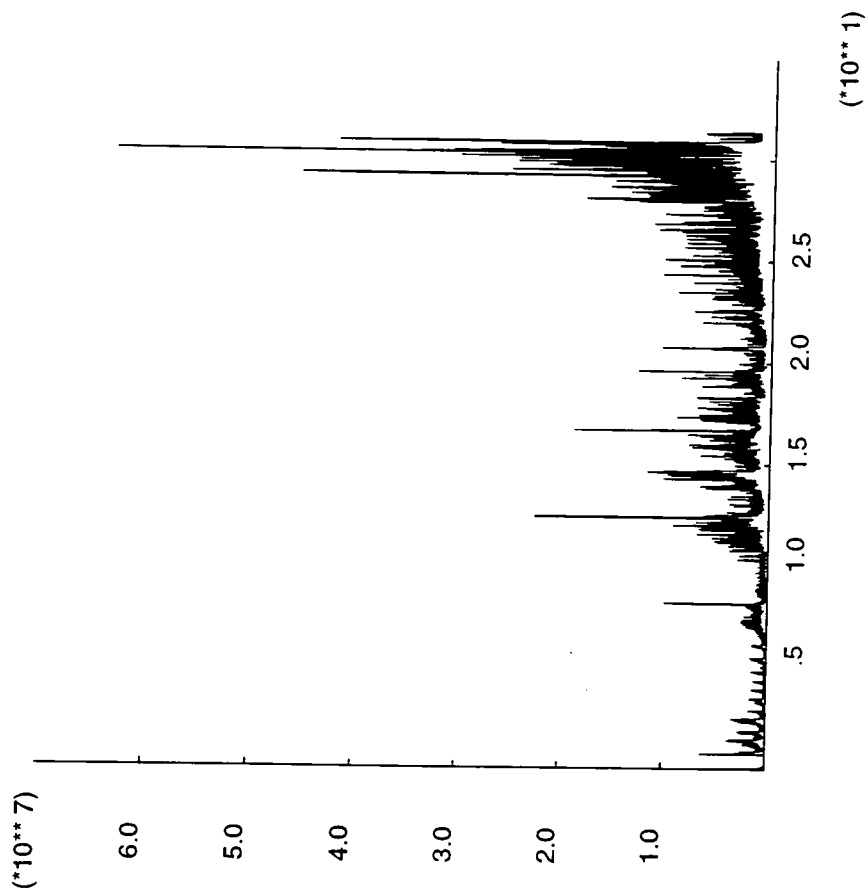
JOB TITLE : Figure 4.43d: Forces for a toppling-and-sliding mass with variable dip.

UDEC (Version 2.00)

LEGEND

1/04/1980 20:56
cycle 410000
time 3.137E+01 sec

2.95E+00 <hist 2> 6.30E+07



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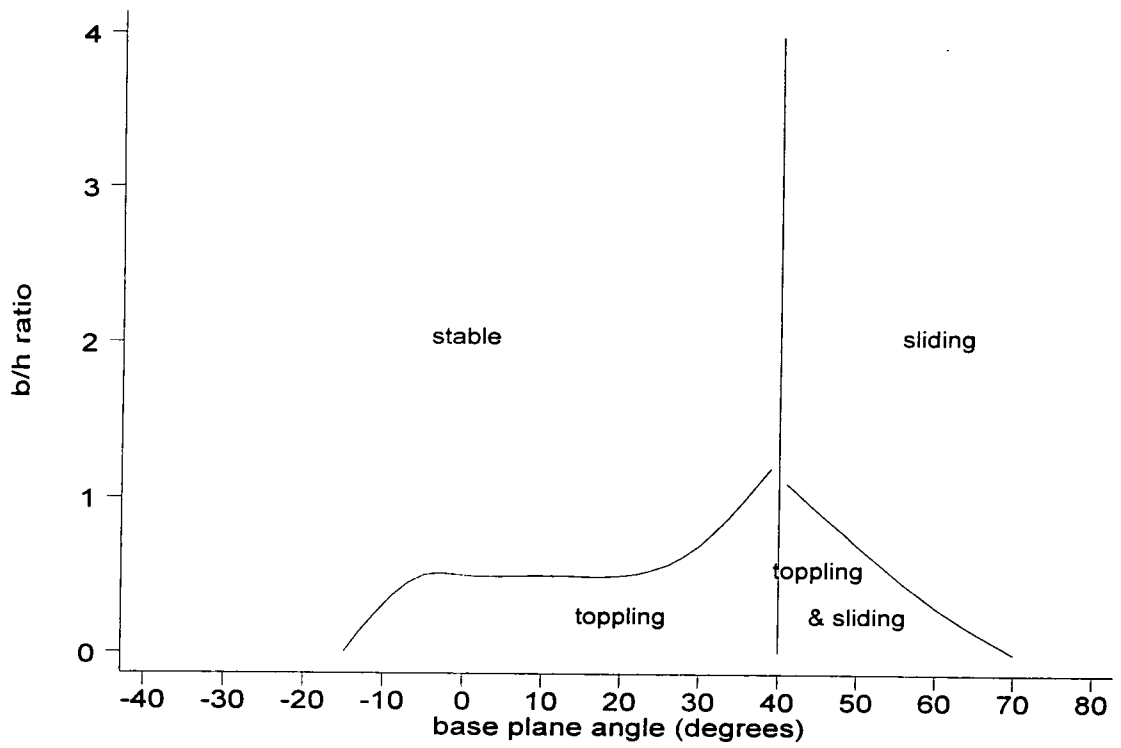


Figure 4.44: Limiting conditions for sliding, toppling and stable rock masses which contain impersistent discontinuities.

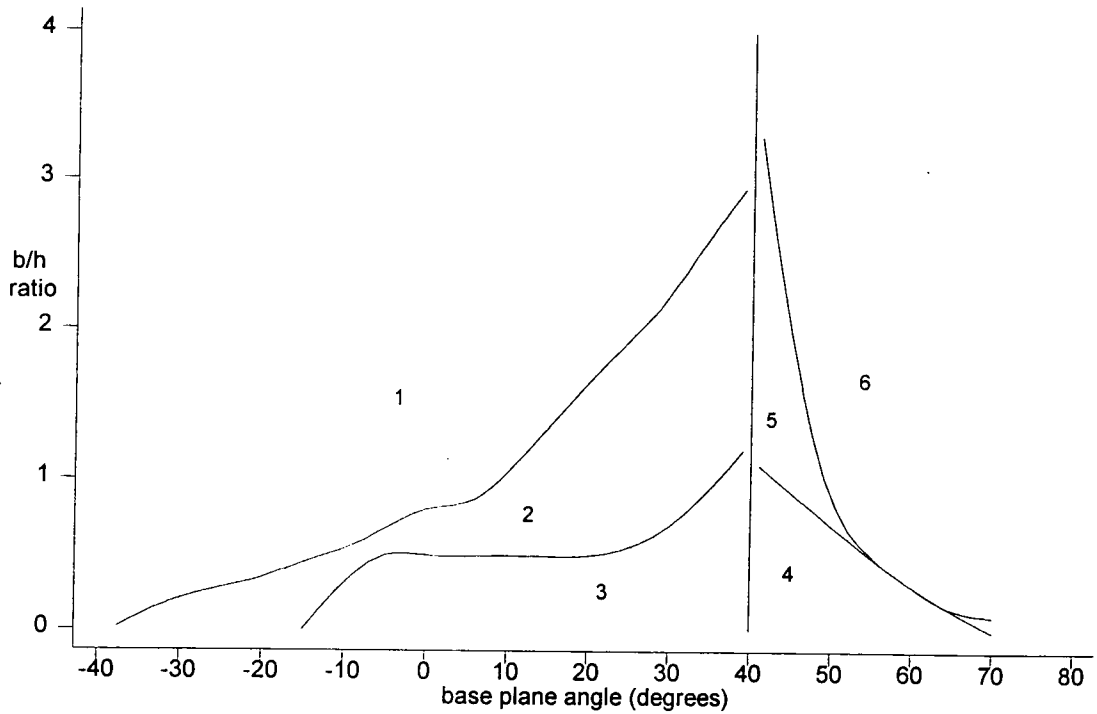


Figure 4.45: Limiting conditions for the failure of rock masses containing impersistent discontinuities compared with the limiting conditions for the failure of the limestone rock masses.

The boundaries between the mechanisms of failure are taken from Figures 4.5 and 4.44.

Zones on the graph are delimited by the boundary lines:

Zone	Limestone	Impersistent rock masses
1	Stable	Stable
2	Toppling	Stable
3	Toppling	Toppling
4	Toppling-and-sliding	Toppling-and-sliding
5	Toppling-and-sliding	Sliding
6	Sliding	Sliding

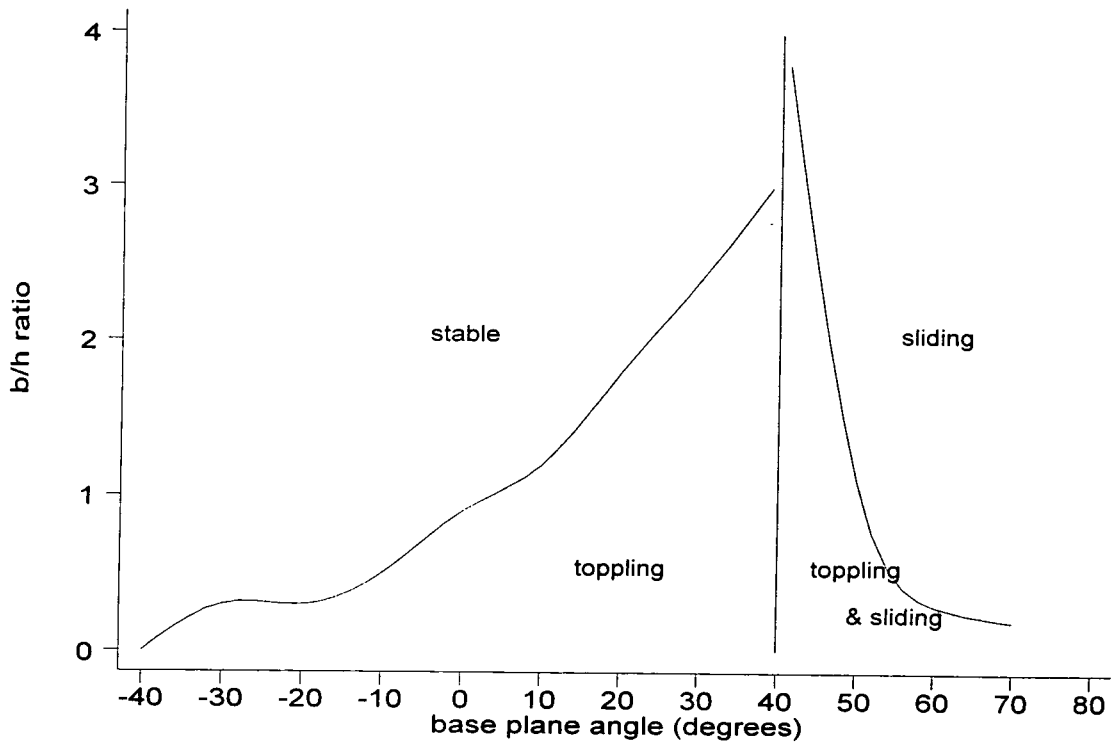


Figure 4.46: Limiting conditions for sliding, toppling and stable rock masses which contain a water table set to 35 metres.

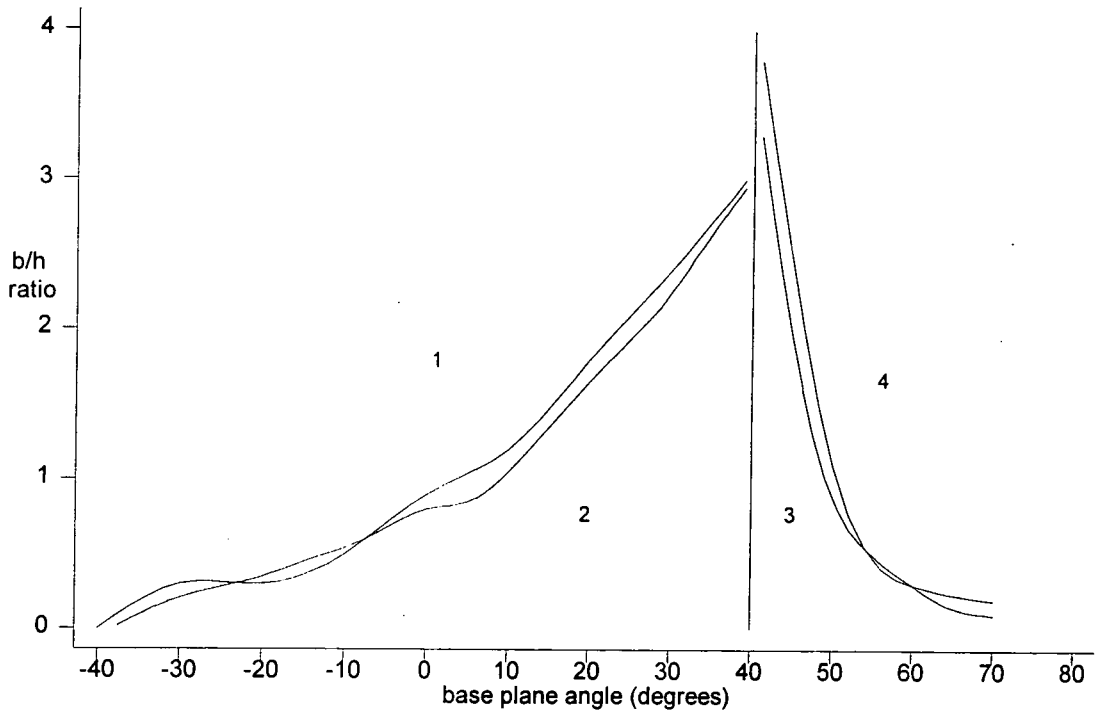


Figure 4.47: Limiting conditions for the failure of rock masses containing a water table set to 35 metres compared with the limiting conditions for the failure of the limestone rock masses.

The boundaries between the mechanisms of failure are taken from Figures 4.5 and 4.46.

Zones on the graph are delimited by the boundary lines:

Zone	Limestone	Rock masses with water table
1	Stable	Stable
2	Toppling	Toppling
3	Toppling-and-sliding	Toppling-and-sliding
4	Sliding	Sliding

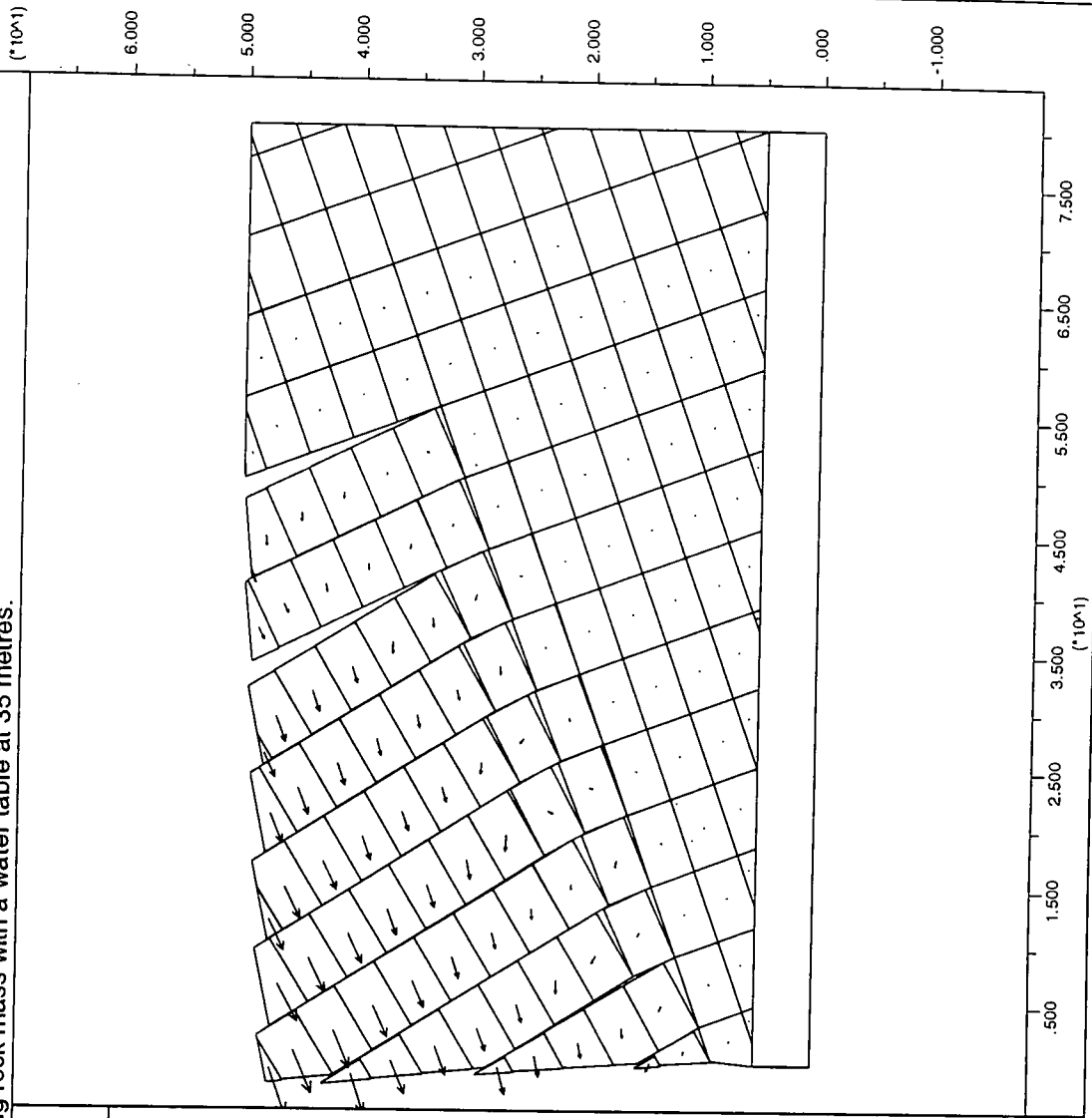
JOB TITLE : Figure 4.48a: Toppling rock mass with a water table at 35 metres.

UDEC (Version 2.00)

LEGEND

1/04/1980 21:31
cycle 210000
time 1.438E+01 sec
flow time = 1.438E+01 sec

block plot
velocity vectors
maximum = 3.299E+00



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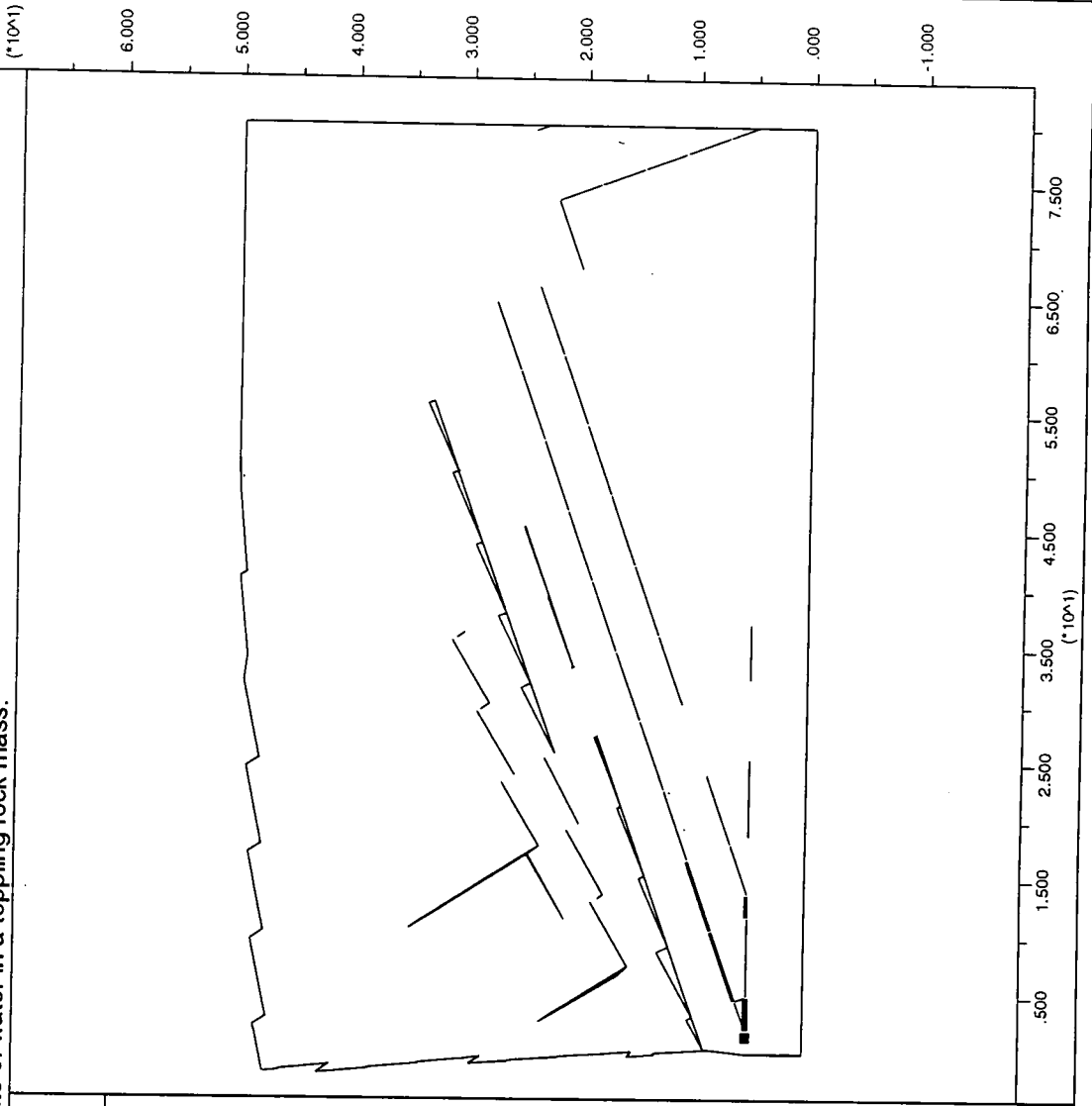
JOB TITLE : Figure 4.48b: Flow rate of water in a toppling rock mass.

UDEC (Version 2.00)

LEGEND

1/04/1980 21:33
cycle 210000
time 1.438E+01 sec
flow time = 1.438E+01 sec

boundary plot
flow rates
max flow rate = 1.850E+01
each line thick = 3.699E+00



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JOB TITLE : Figure 4.48c: Pore water pressure in a topping rock mass.

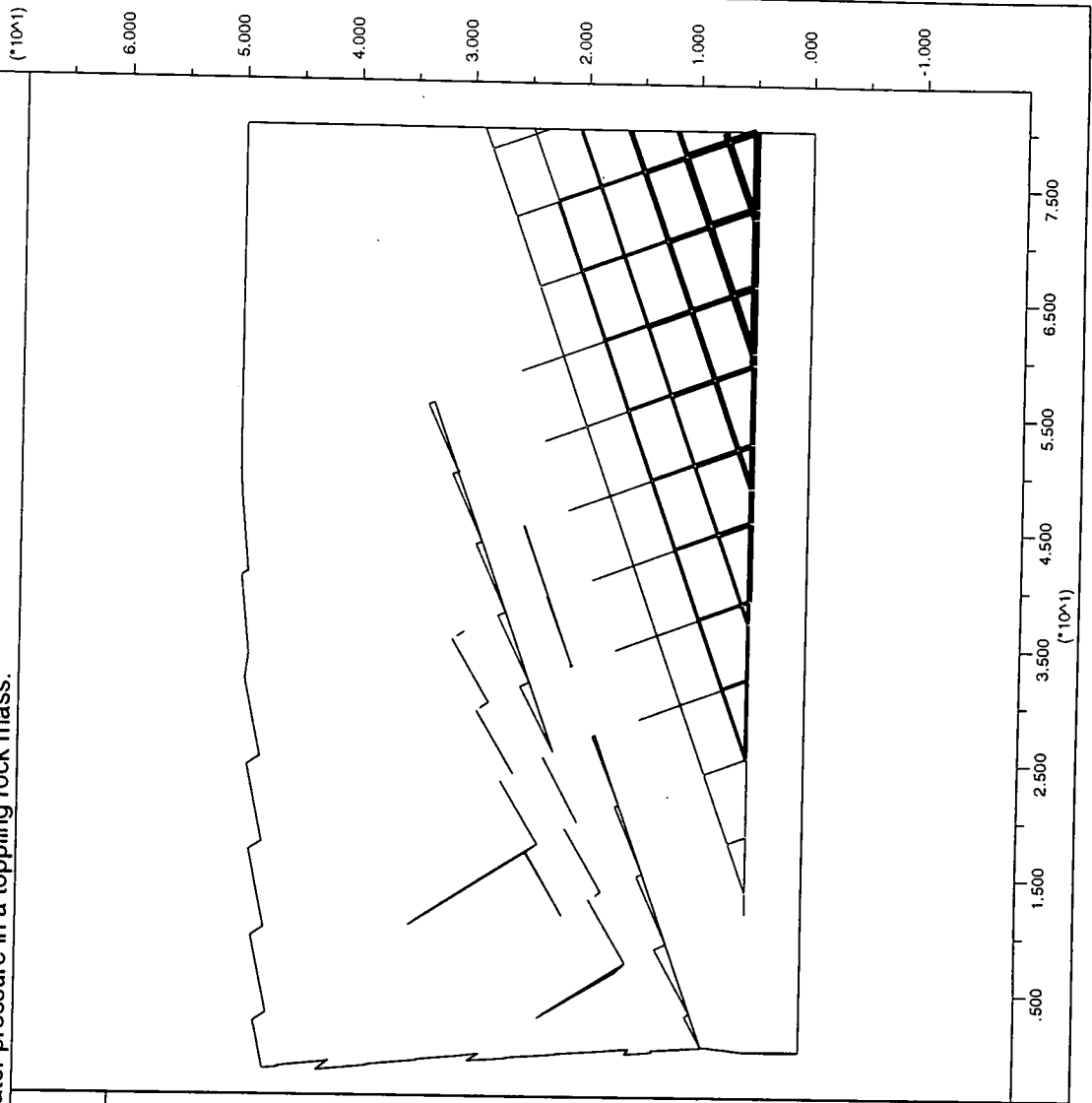
UDEC (Version 2.00)

LEGEND

1/04/1980 21:33
cycle 210000
time 1.438E+01 sec
flow time = 1.438E+01 sec

boundary plot
domain pore pressures
maximum pressure = 2.890E+05
each line thick = 5.780E+04

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JOB TITLE : Figure 4.48d: Flow rate in a stable rock mass.

UDEC (Version 2.00)

LEGEND

1/04/1980 21:35

cycle 210000

time 2.522E+01 sec

flow time = 2.522E+01 sec

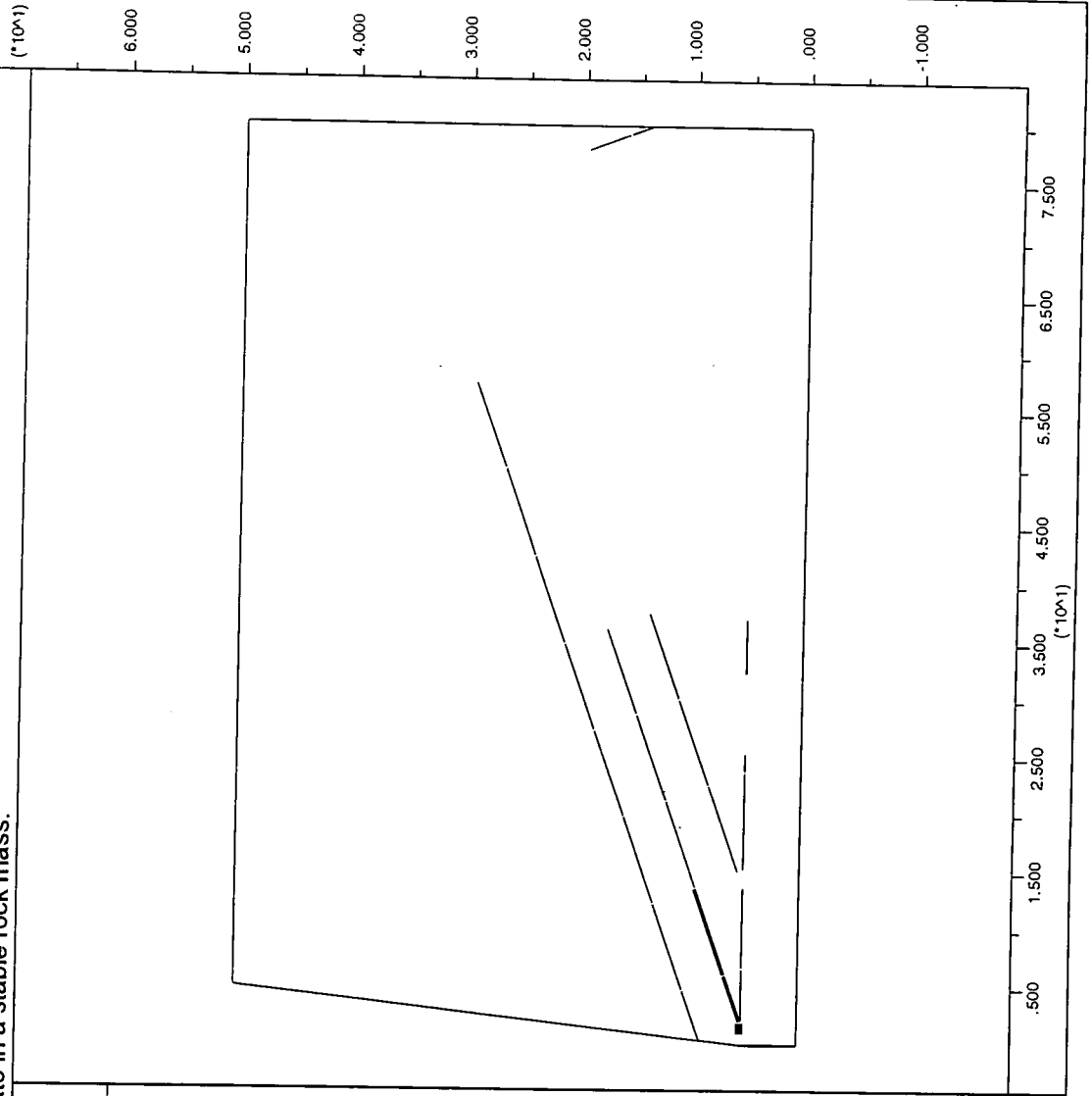
boundary plot

flow rates

max flow rate = 1.508E+01

each line thick = 3.016E+00

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JOB TITLE : Figure 4.48e: Pore water pressure in a stable rock mass.

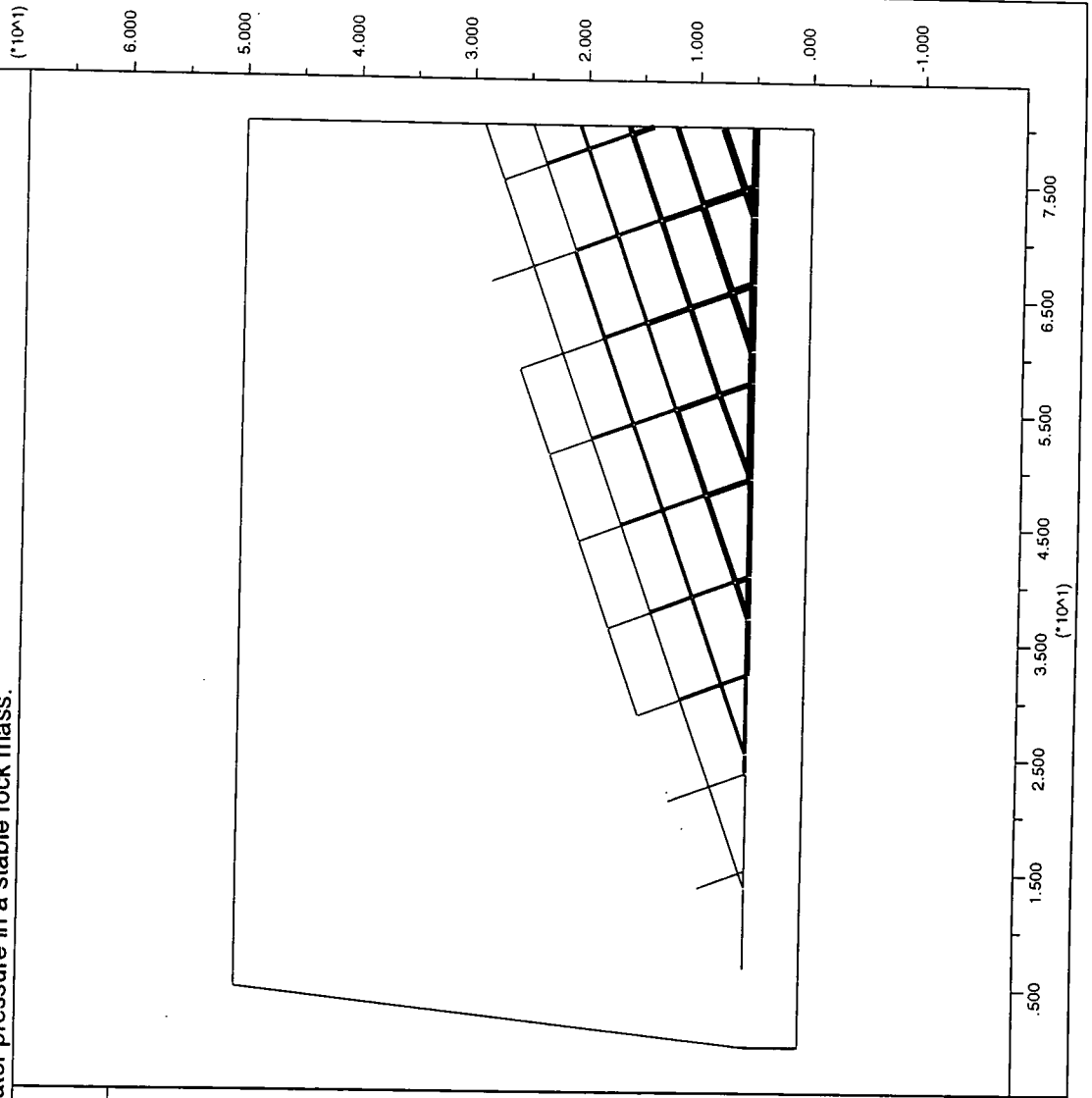
UDEC (Version 2.00)

LEGEND

1/04/1980 21:36
cycle 210000
time 2.522E+01 sec
flow time = 2.522E+01 sec

boundary plot
domain pore pressures
maximum pressure = 2.923E+05
each line thick = 5.846E+04

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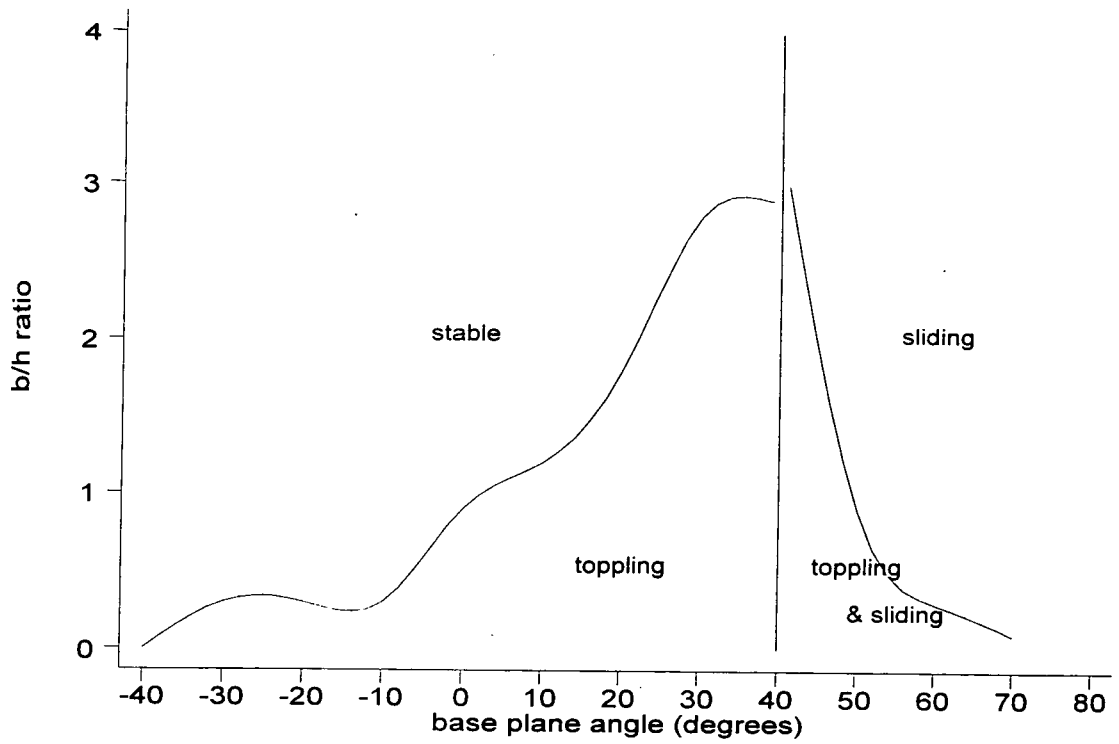


Figure 4.49: Limiting conditions for sliding, toppling and stable rock masses which contain a water table set to 50 metres.

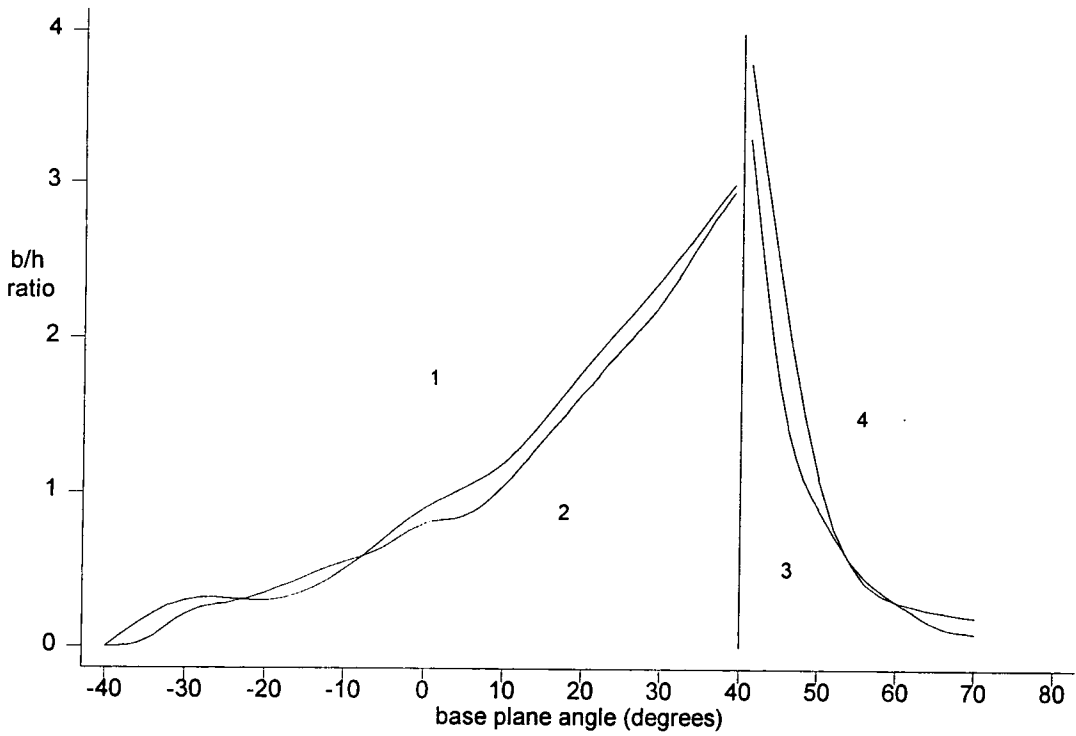


Figure 4.50: Limiting conditions for the failure of rock masses containing a water table set to 50 metres compared with the limiting conditions for the failure of the limestone rock masses.

The boundaries between the mechanisms of failure are taken from Figures 4.5 and 4.49. Zones on the graph are delimited by the boundary lines:

Zone	Limestone	Rock masses with water table
1	Stable	Stable
2	Toppling	Toppling
3	Toppling-and-sliding	Toppling-and-sliding
4	Sliding	Sliding

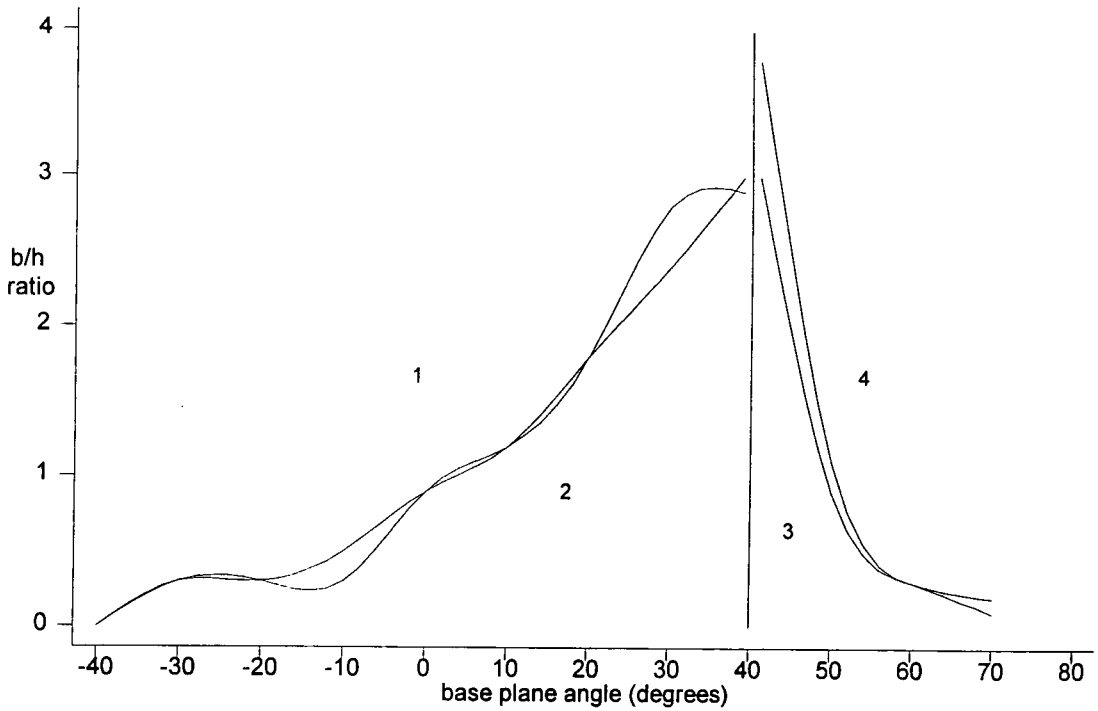


Figure 4.51: Limiting conditions for the failure of rock masses containing a water table set to 50 metres compared with the limiting conditions for the failure of rock masses containing a water table set to 35 metres.

The boundaries between the mechanisms of failure are taken from Figures 4.46 and 4.49. Zones on the graph are delimited by the boundary lines:

Zone	Water table = 50 m	Water table = 35 m
1	Stable	Stable
2	Toppling	Toppling
3	Toppling-and-sliding	Toppling-and-sliding
4	Sliding	Sliding

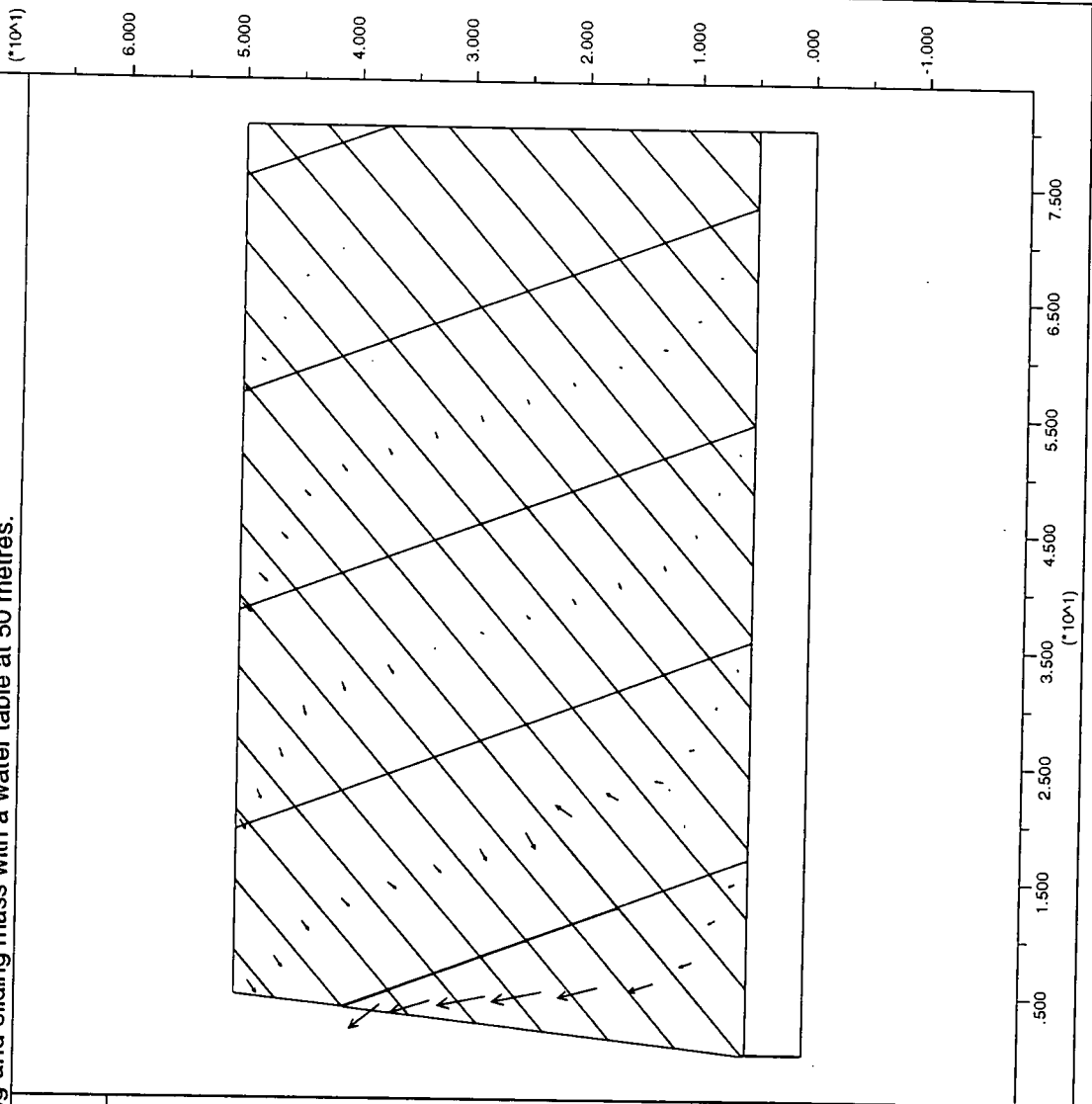
JOB TITLE : Figure 4.52a: Toppling-and-sliding mass with a water table at 50 metres.

UDEC (Version 2.00)

LEGEND

1/04/1980 21:53
cycle 210000
time 7.250E+00 sec
flow time = 7.250E+00 sec

block plot
velocity vectors
maximum = 2.765E-03



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JOB TITLE : Figure 4.52b: Flow rate of a toppling-and-sliding rock mass.

UDEC (Version 2.00)

LEGEND

1/04/1980 21:53

cycle 210000

time 7.250E+00 sec

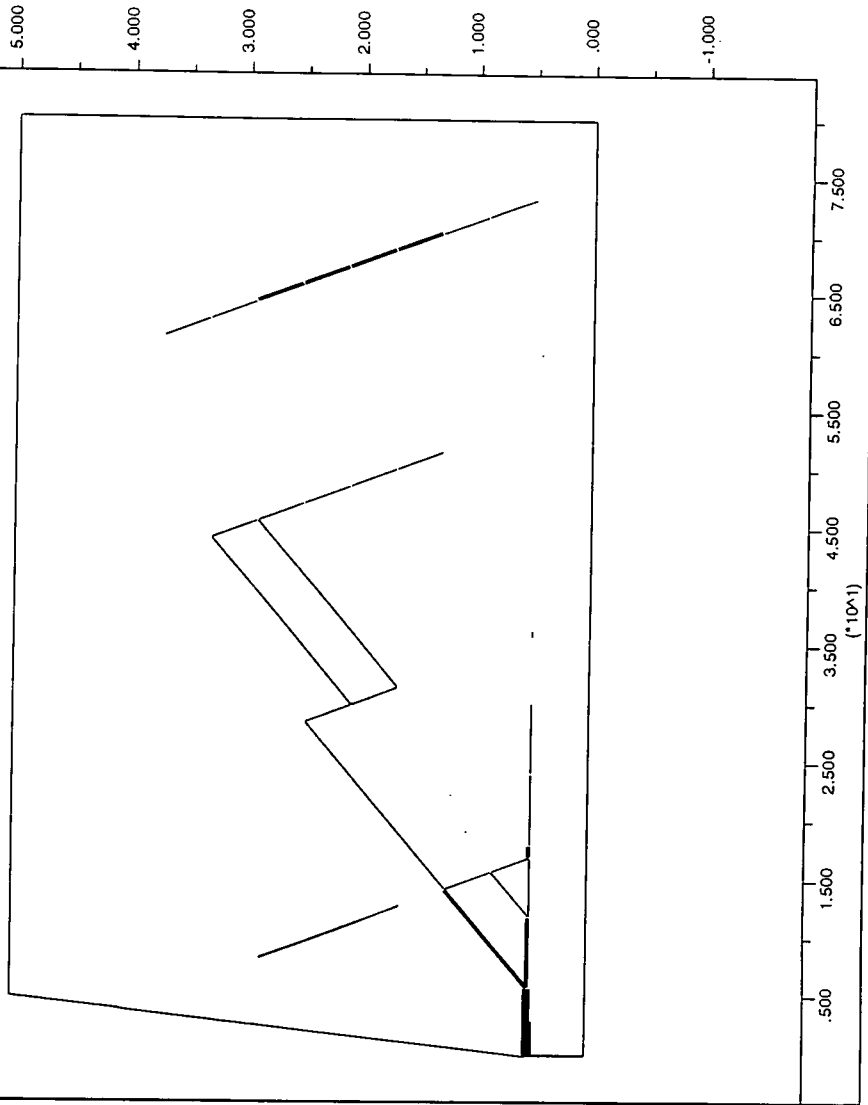
flow time = 7.250E+00 sec

boundary plot

flow rates

max flow rate = 2.076E+01

each line thick = 4.152E+00



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JOB TITLE : Figure 4.52c: Pore water pressure in a toppling-and-sliding mass.

UDEC (Version 2.00)

LEGEND

1/04/1980 21:56

cycle 210000

time 7.250E+00 sec

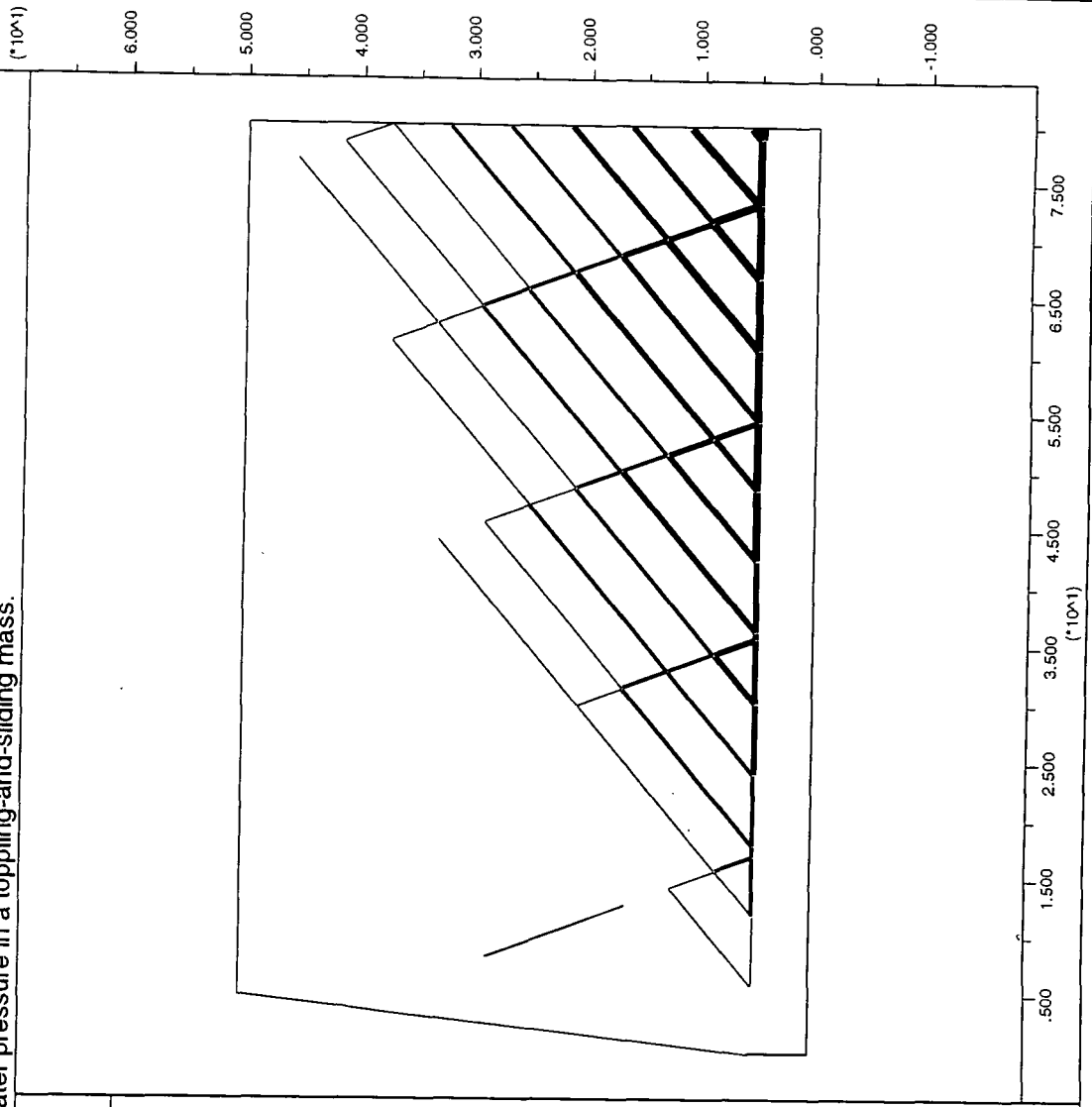
flow time = 7.250E+00 sec

boundary plot

domain pore pressures

maximum pressure = 4.486E+05

each line thick = 8.971E+04



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JOB TITLE : Figure 4.52d: Forces for a toppling-and-sliding mass with a water table.

UDEC (Version 2.00)

LEGEND

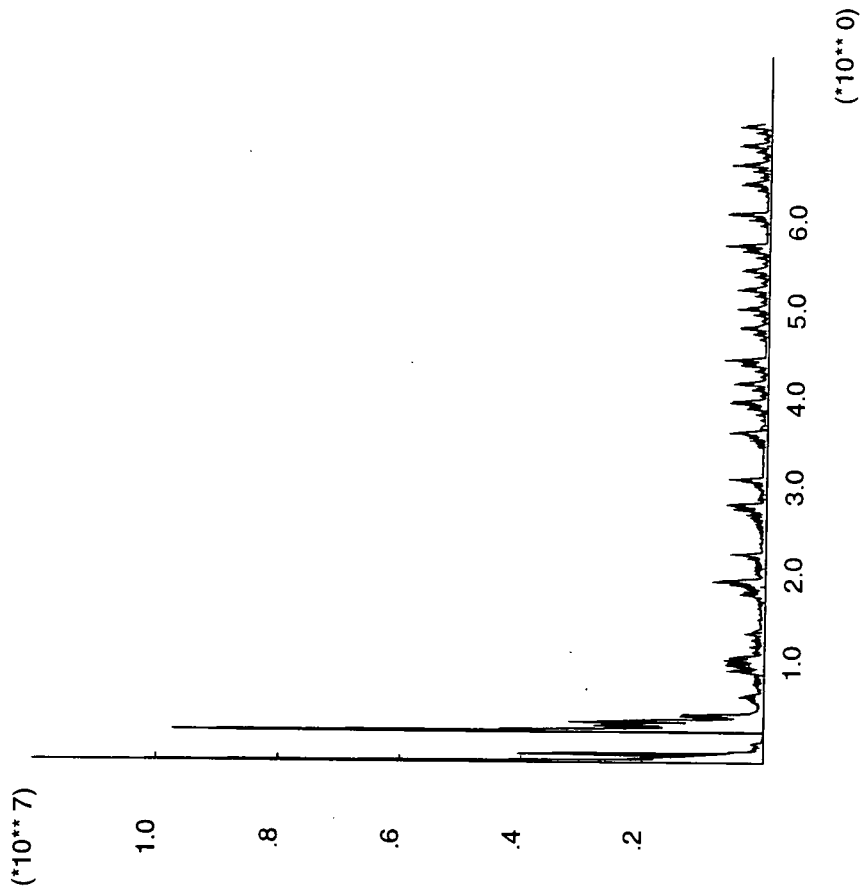
1/04/1980 21:57

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flow time = 7.250E+00 sec

1.36E+03 <hist 2> 1.19E+07 ———



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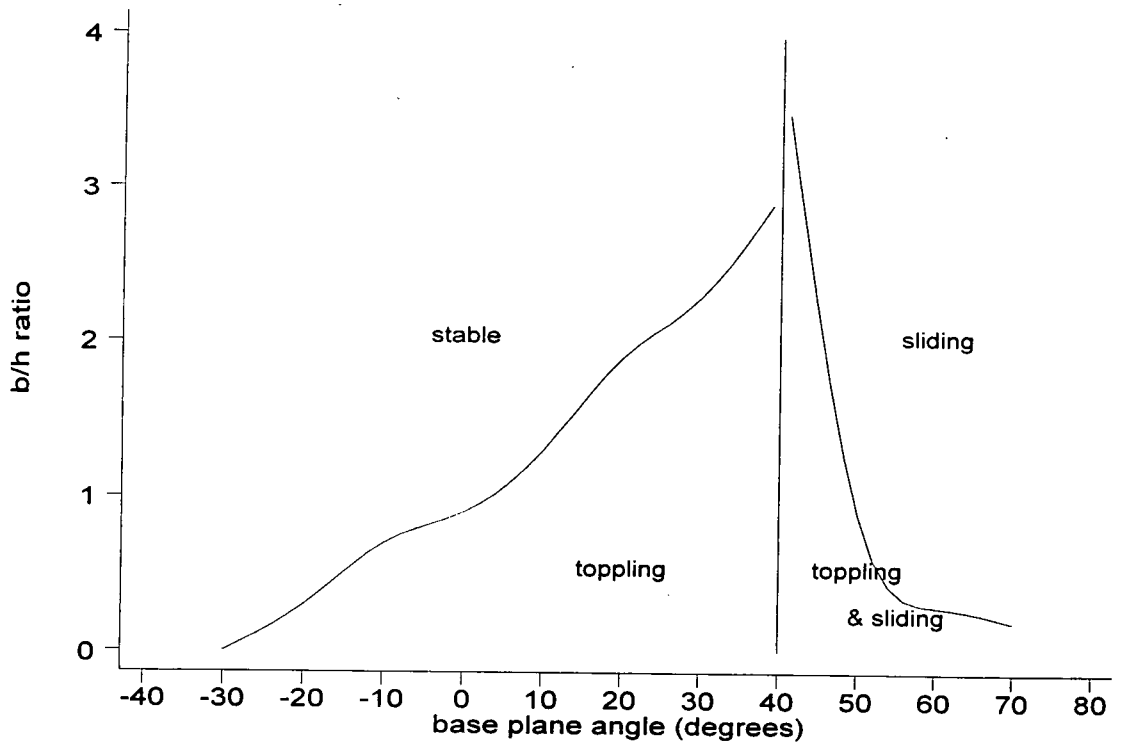


Figure 4.53: Limiting conditions for sliding, toppling and stable rock masses which have joint stiffness values set to 5 GPa.

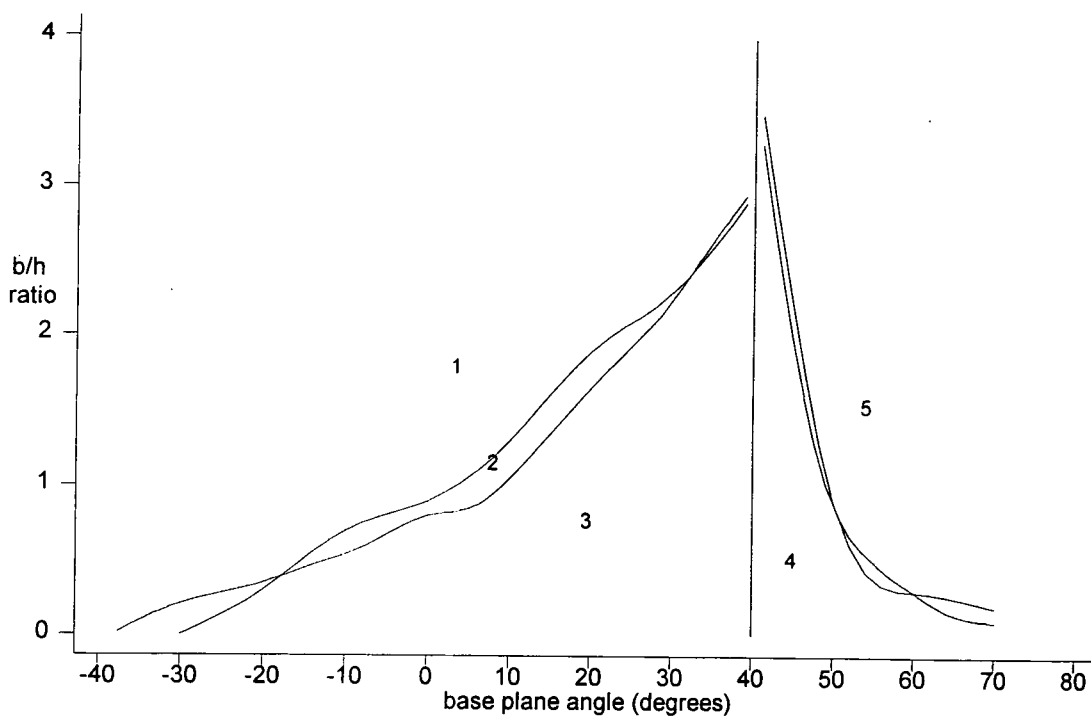


Figure 4.54: Limiting conditions for the failure of rock masses which have joint stiffness values set to 5 GPa compared with the limiting conditions for the failure of the limestone rock masses.

The boundaries between the mechanisms of failure are taken from Figures 4.5 and 4.53.

Zones on the graph are delimited by the boundary lines:

Zone	Limestone	Joint stiffness = 5 GPa
1	Stable	Stable
2	Stable	Toppling
3	Toppling	Toppling
4	Toppling-and-sliding	Toppling-and-sliding
5	Sliding	Sliding

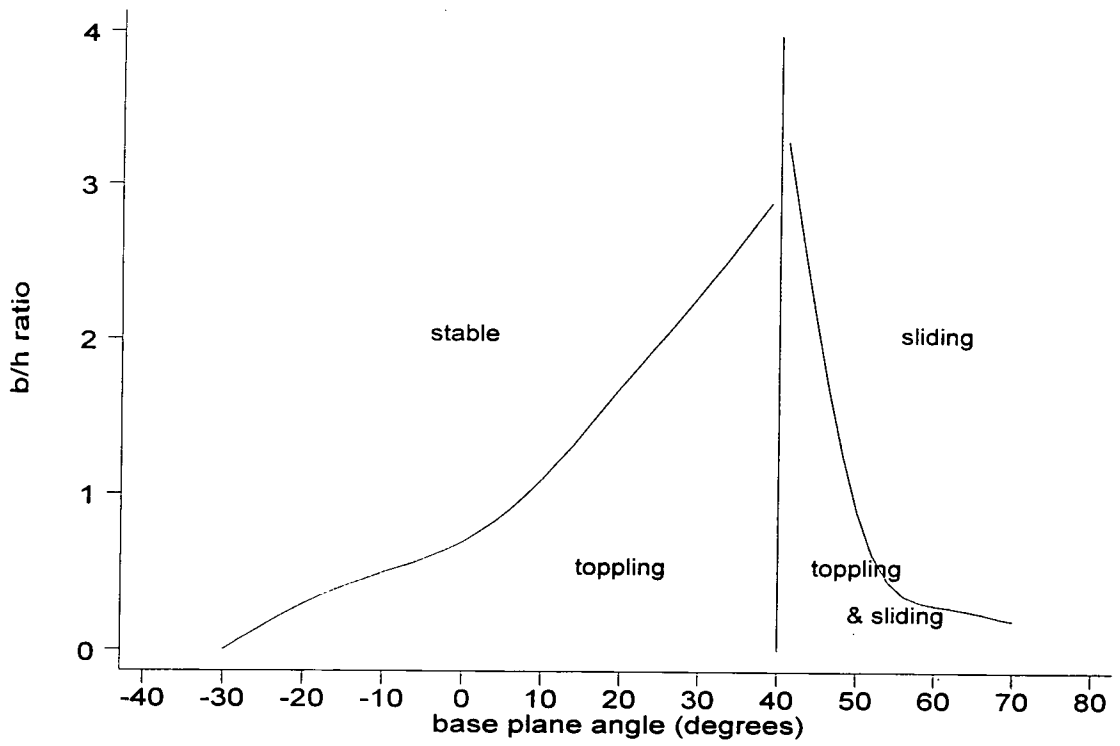


Figure 4.55: Limiting conditions for sliding, toppling and stable rock masses bounded by a wave cut platform.

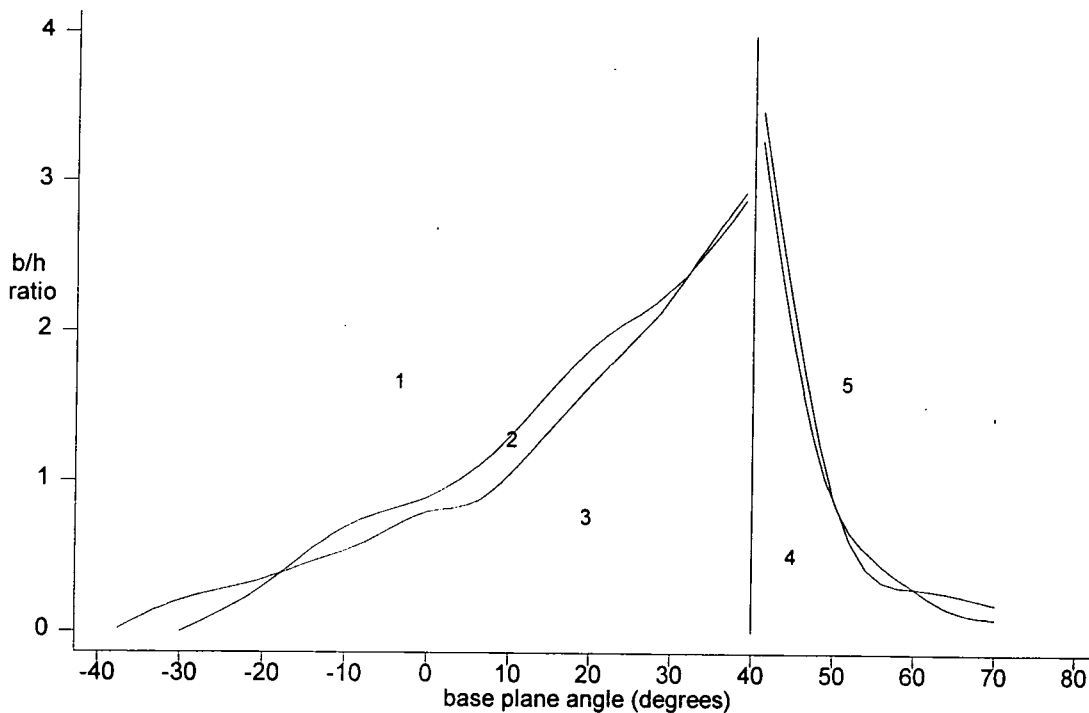


Figure 4.56: Limiting conditions for the failure of rock masses bounded by a wave cut platform compared with the limiting conditions for the failure of the limestone rock masses.

The boundaries between the mechanisms of failure are taken from Figures 4.5 and 4.55.

Zones on the graph are delimited by the boundary lines:

Zone	Limestone	Wave cut platform
1	Stable	Stable
2	Stable	Toppling
3	Toppling	Toppling
4	Toppling-and-sliding	Toppling-and-sliding
5	Sliding	Sliding

JOB TITLE : Figure 4.57a: Toppling rock mass bounded by a wave-cut platform.

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LEGEND

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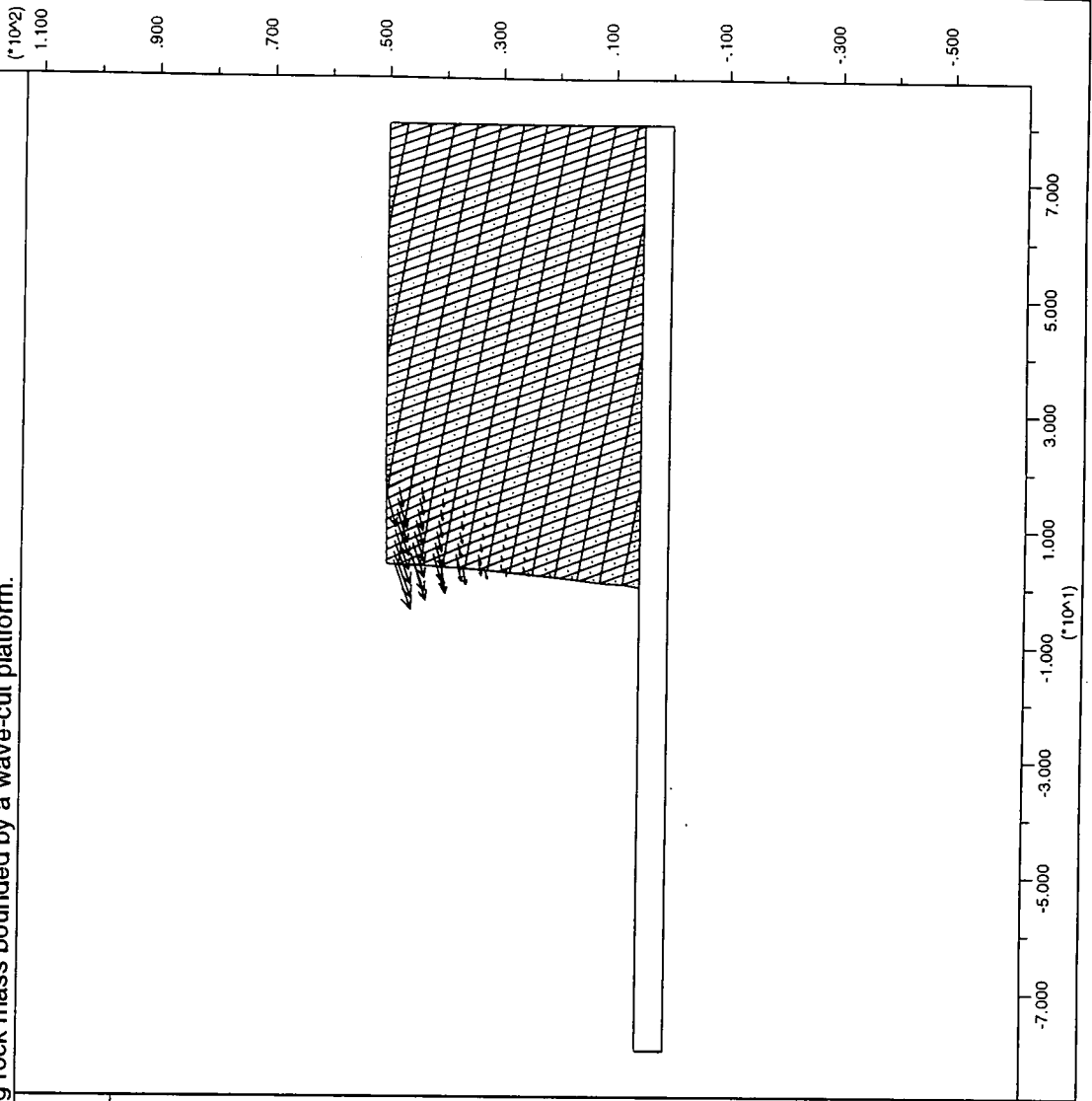
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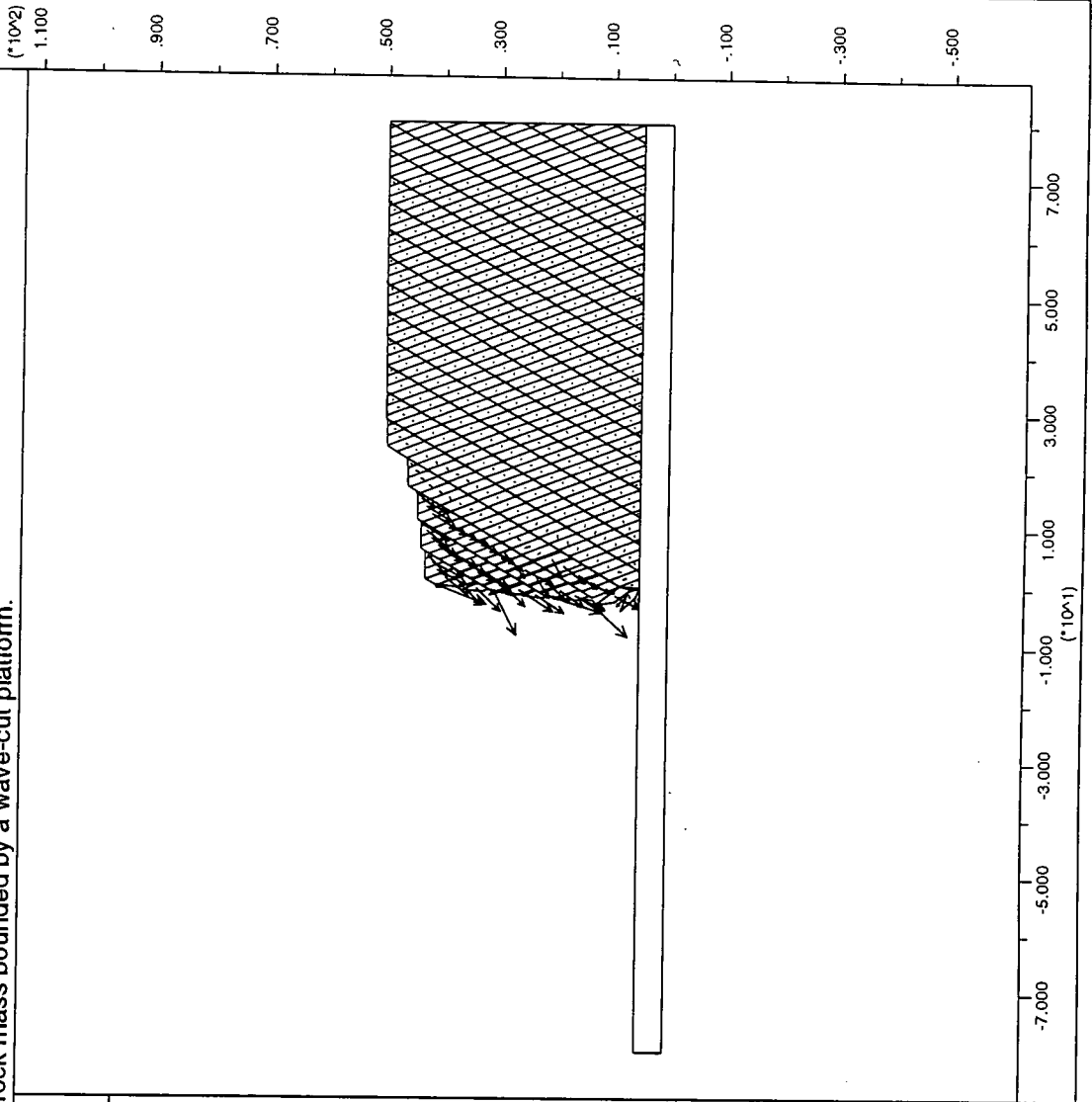
JOB TITLE : Figure 4.57b: Sliding rock mass bounded by a wave-cut platform.

UDEC (Version 2.00)

LEGEND

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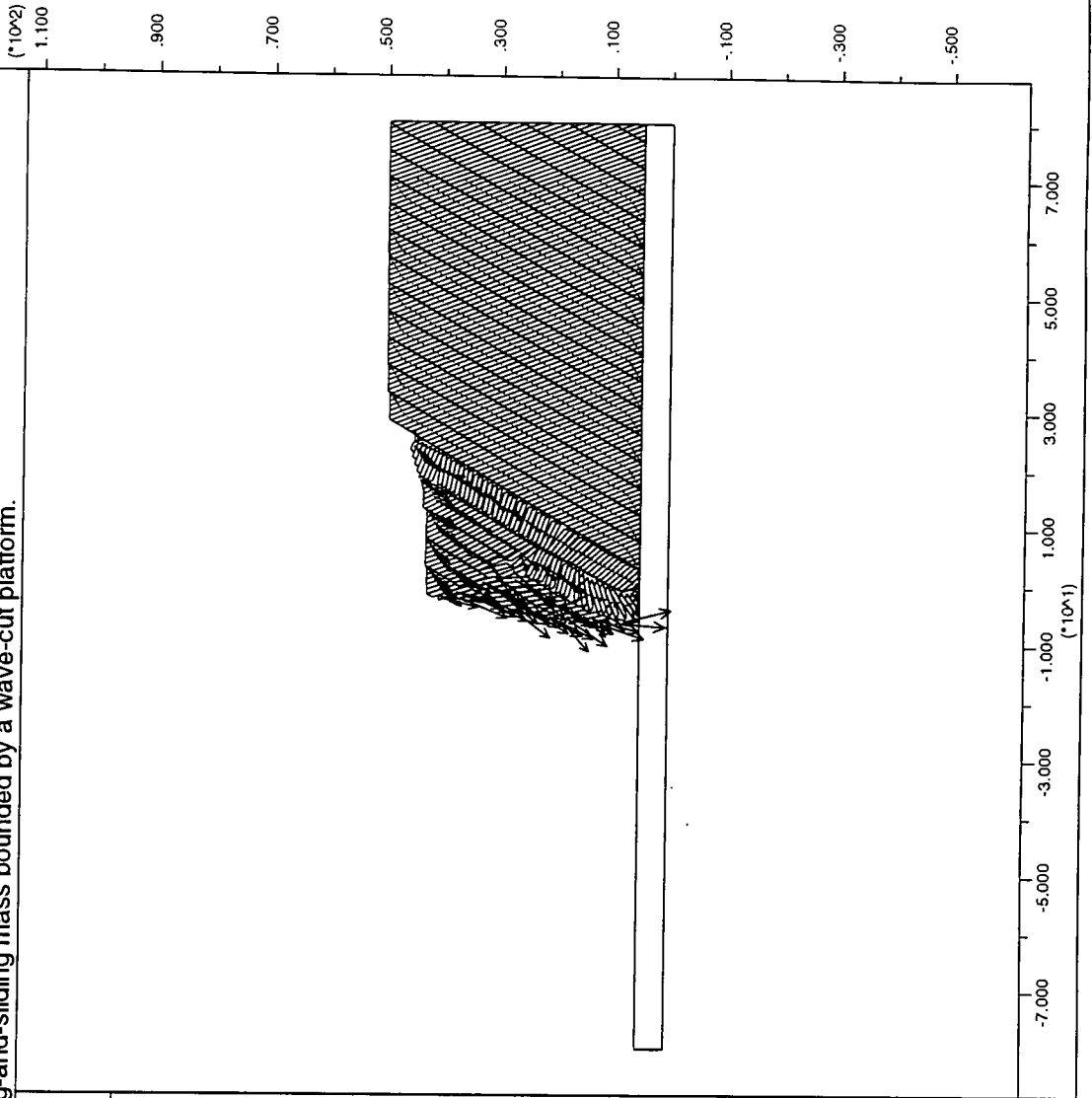
JOB TITLE : Figure 4.57c: Toppling-and-sliding mass bounded by a wave-cut platform.

UDEC (Version 2.00)

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block plot
velocity vectors
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JOB TITLE : Figure 4.58: Limestone rock mass above a clay base with deformable zones

UDEC (Version 2.00)

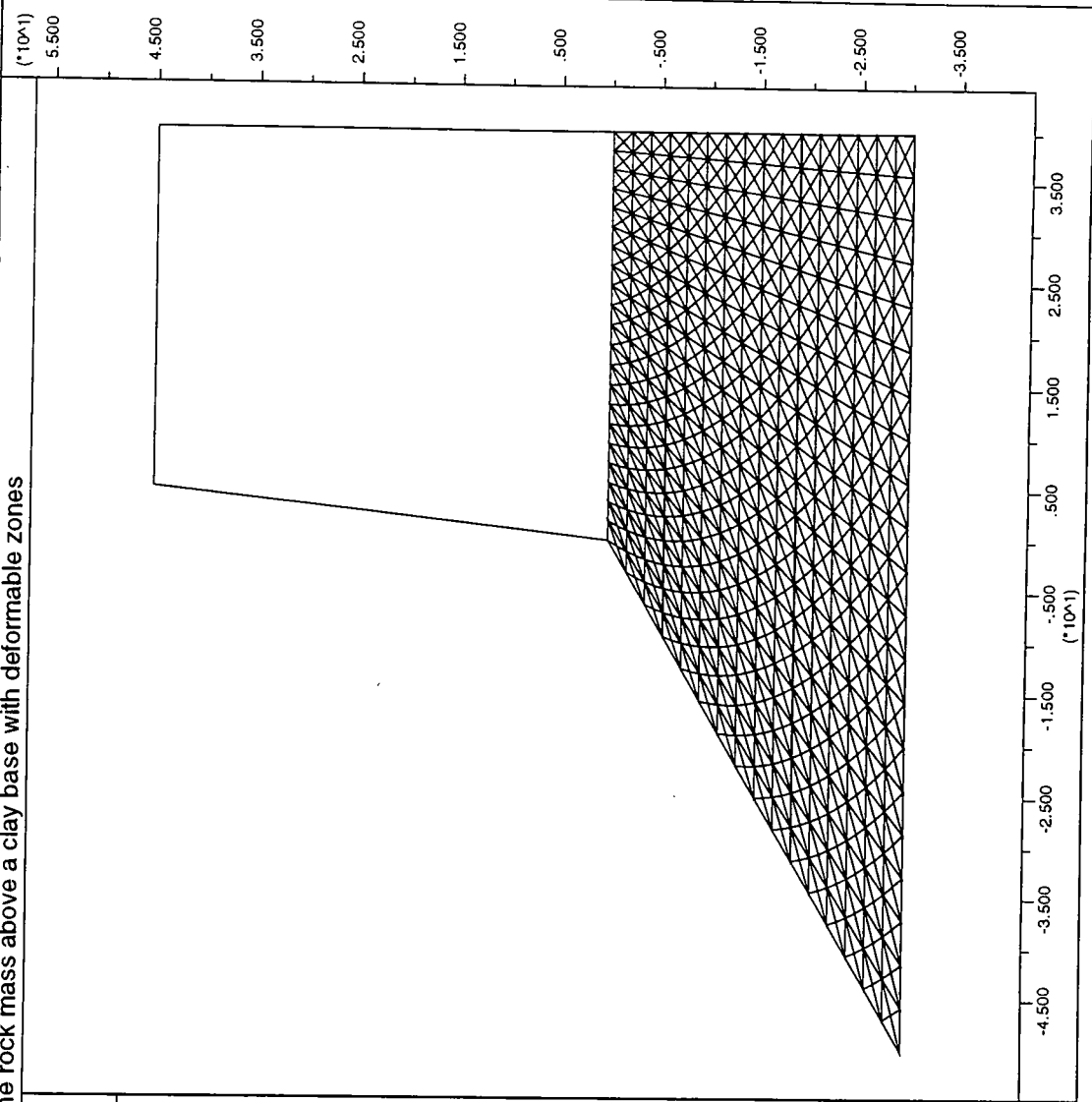
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boundary plot
zones plotted in fdef blocks



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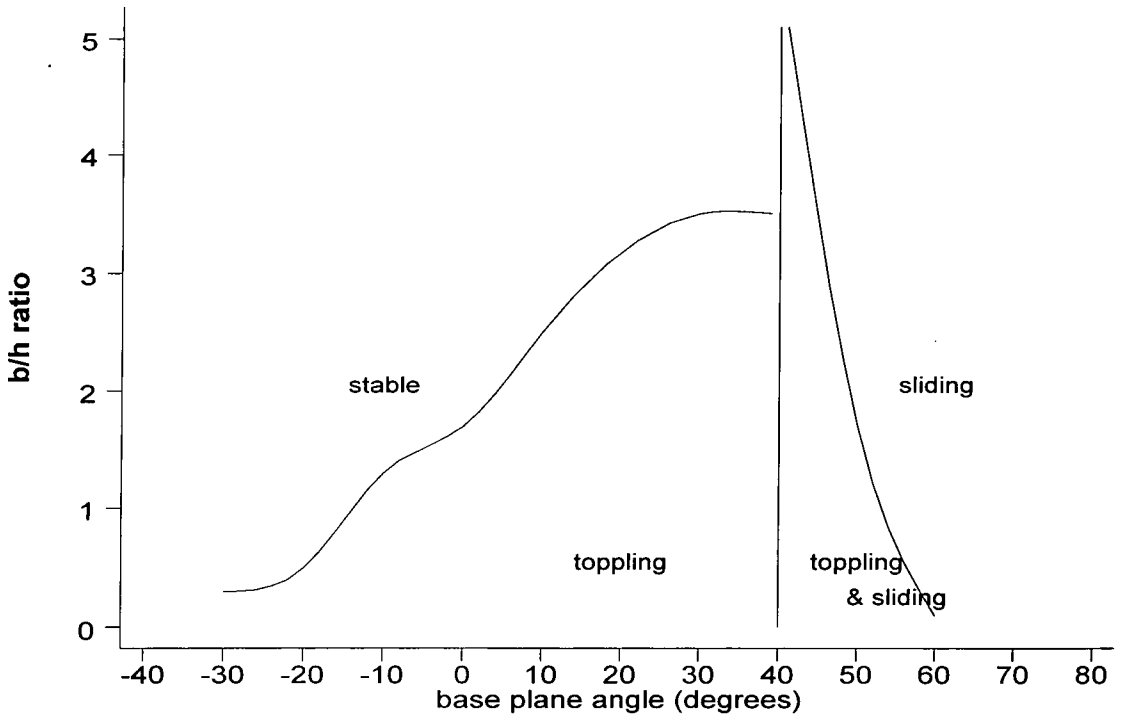


Figure 4.59: Limiting conditions for sliding, toppling and stable rock masses above a clay base.

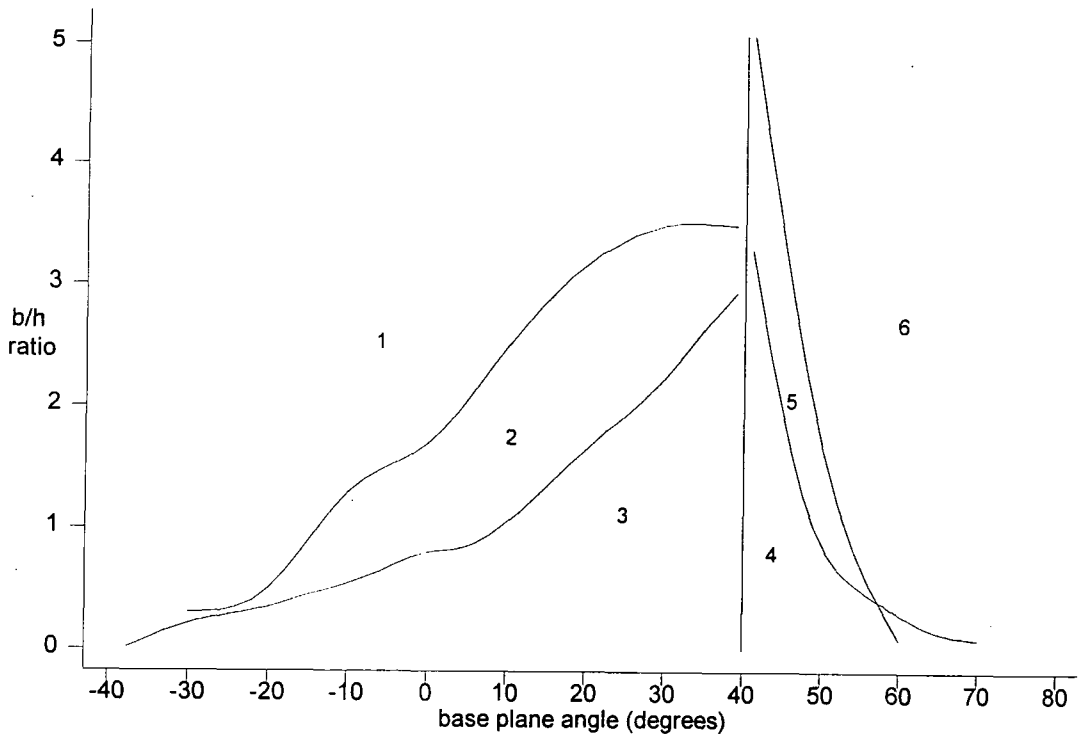


Figure 4.60: Limiting conditions for the failure of rock masses above a clay base compared with the limiting conditions for the failure of the limestone rock masses.

The boundaries between the mechanisms of failure are taken from Figures 4.5 and 4.59. Zones on the graph are delimited by the boundary lines:

Zone	Limestone	Clay base
1	Stable	Stable
2	Stable	Toppling
3	Toppling	Toppling
4	Toppling-and-sliding	Toppling-and-sliding
5	Sliding	Toppling-and-sliding
10	Sliding	Sliding

JOB TITLE : Figure 4.61a: Toppling rock mass above a clay base.

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LEGEND

1/04/1980 14:14

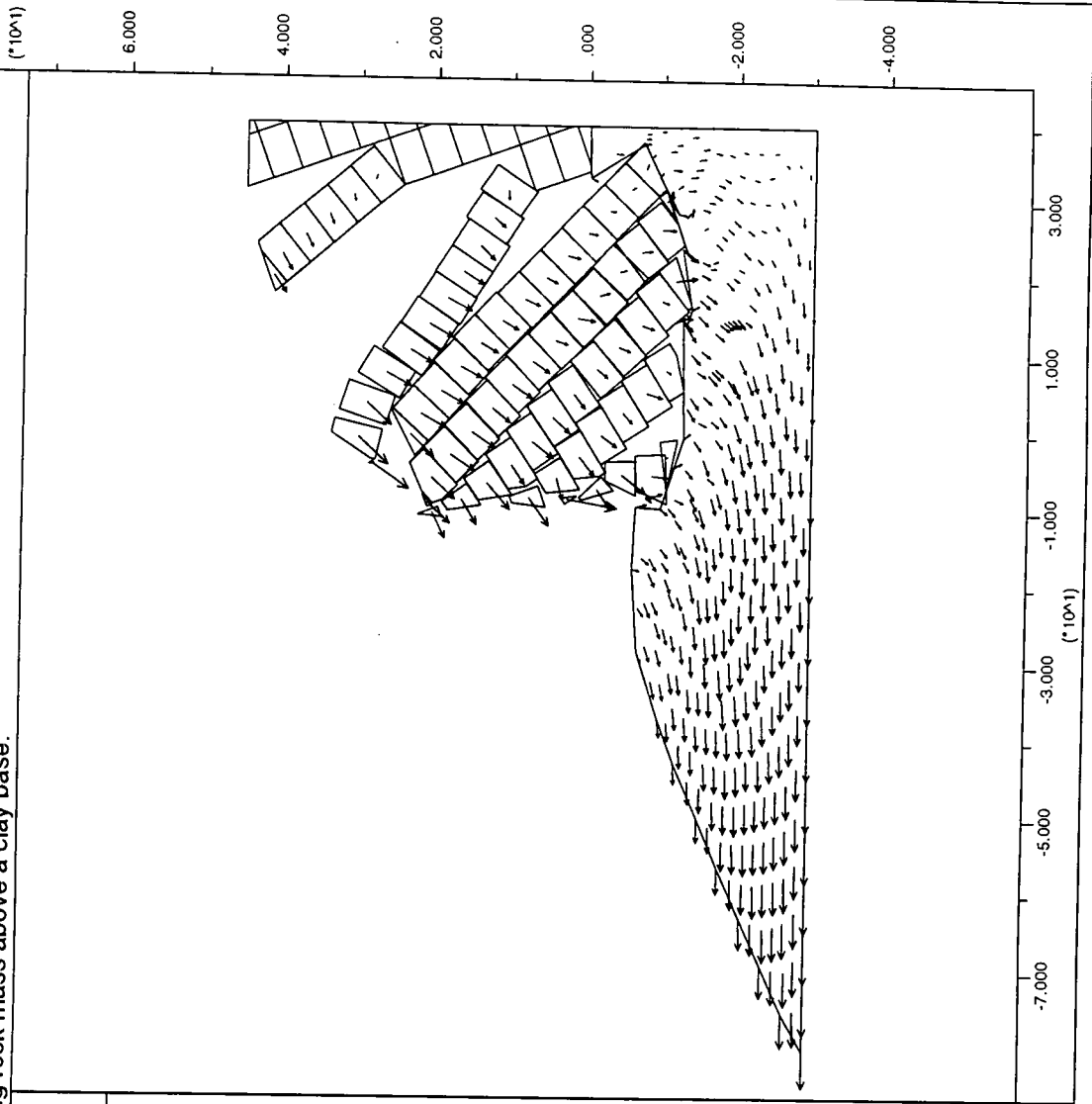
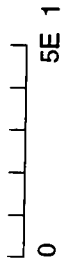
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block plot

velocity vectors

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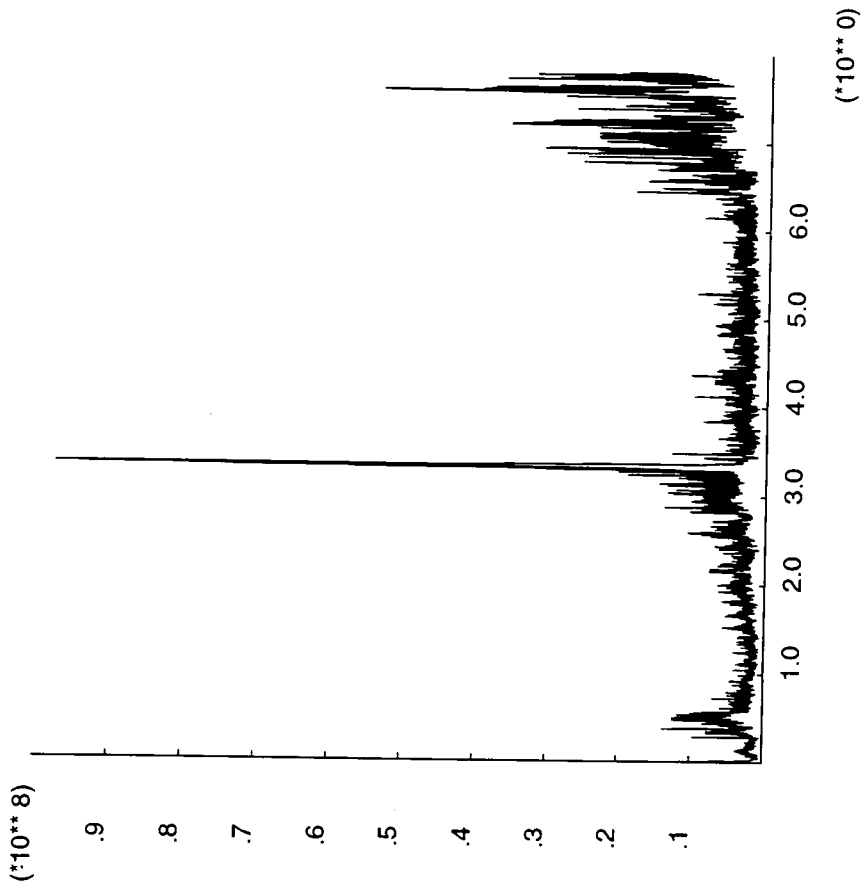
JOB TITLE : Figure 4.61b: Forces for a toppling rock mass above a clay base.

UDEC (Version 2.00)

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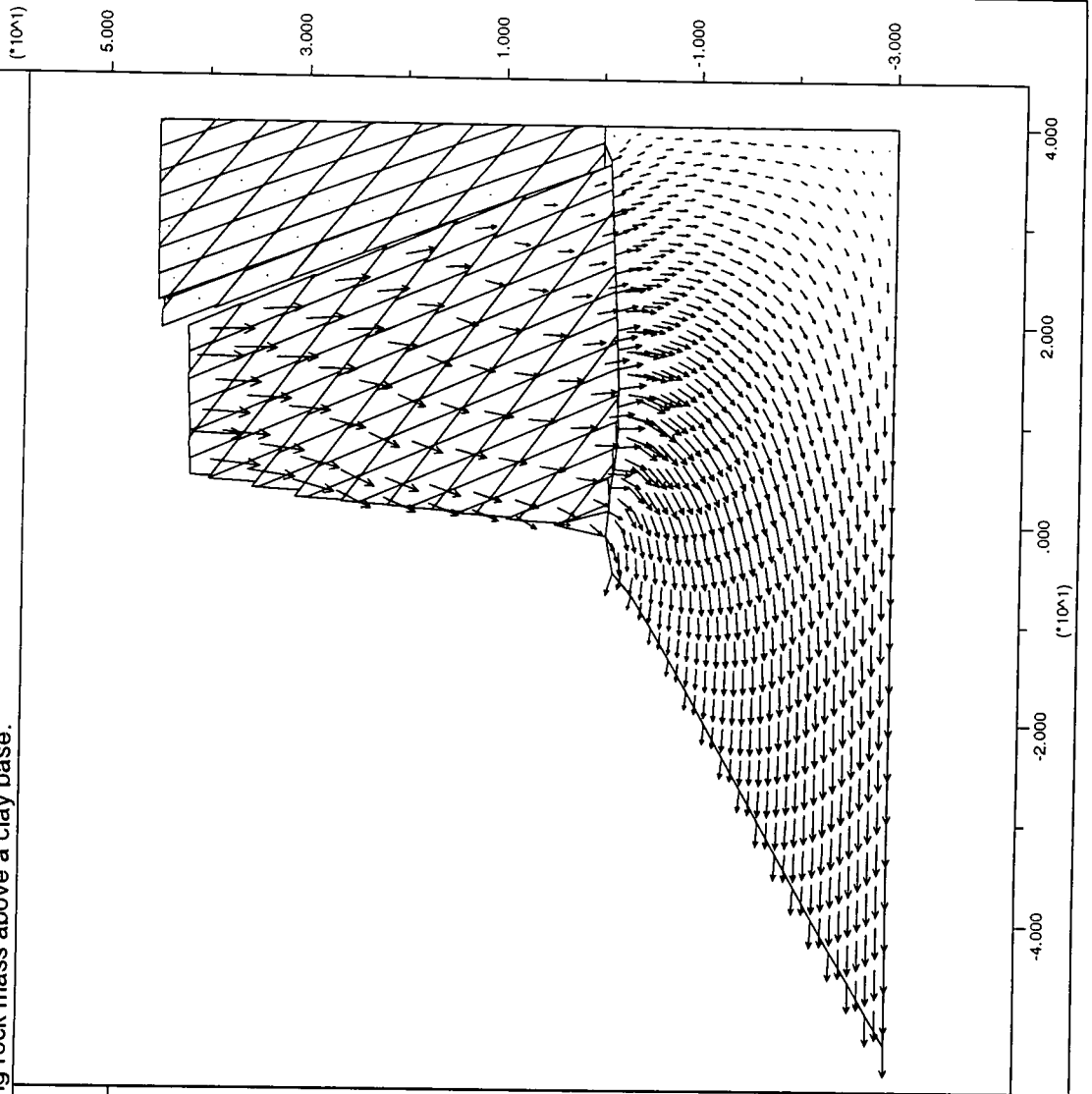
JOB TITLE : Figure 4.61c: Slumping rock mass above a clay base.

UDEC (Version 2.00)

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velocity vectors
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JOB TITLE : Figure 4.61d: Toppling rock mass above a clay base.

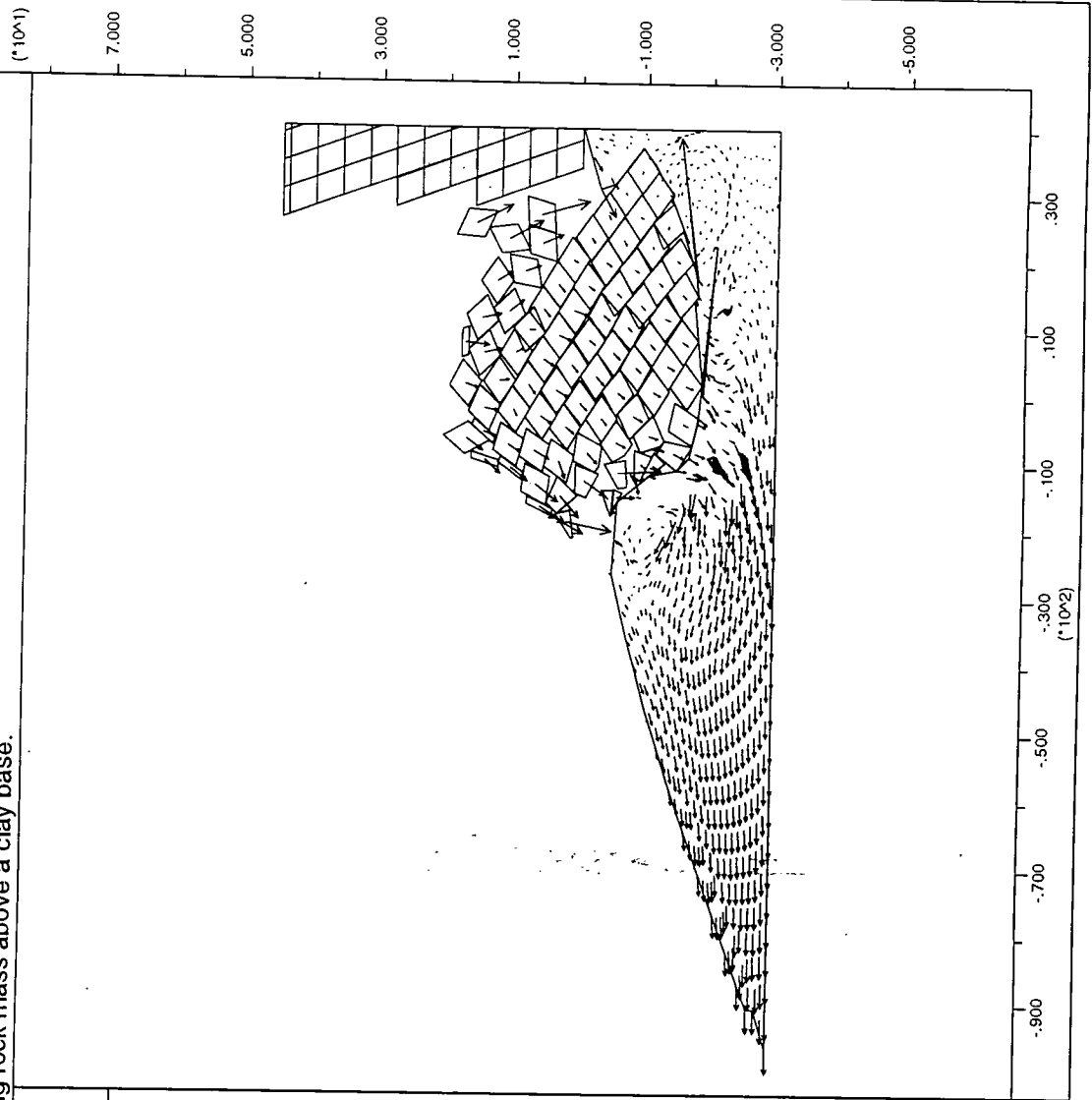
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velocity vectors
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JOB TITLE : Figure 4.61e: Toppling rock mass above a clay base.

UDEC (Version 2.00)

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1/04/1980 14:19

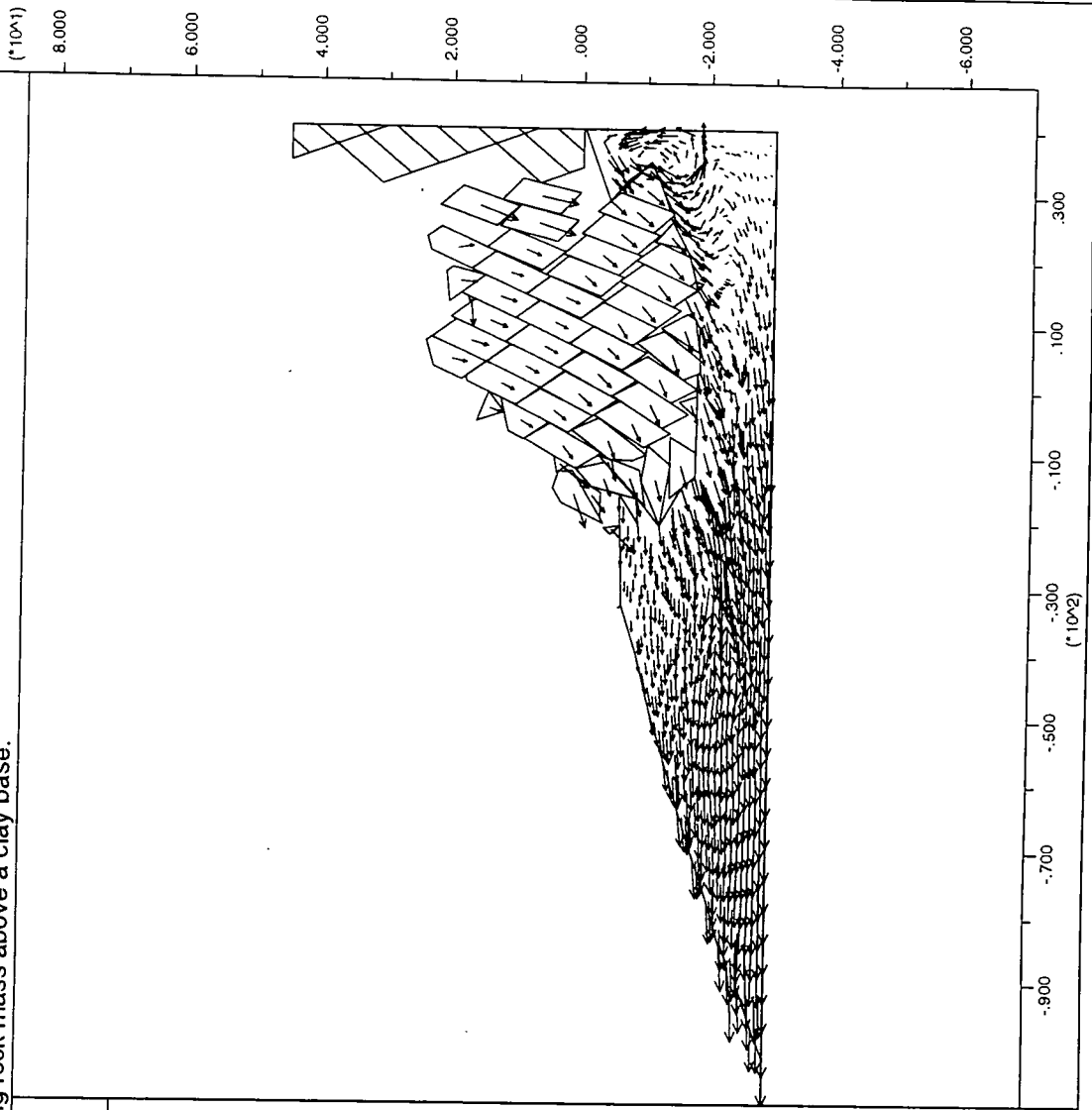
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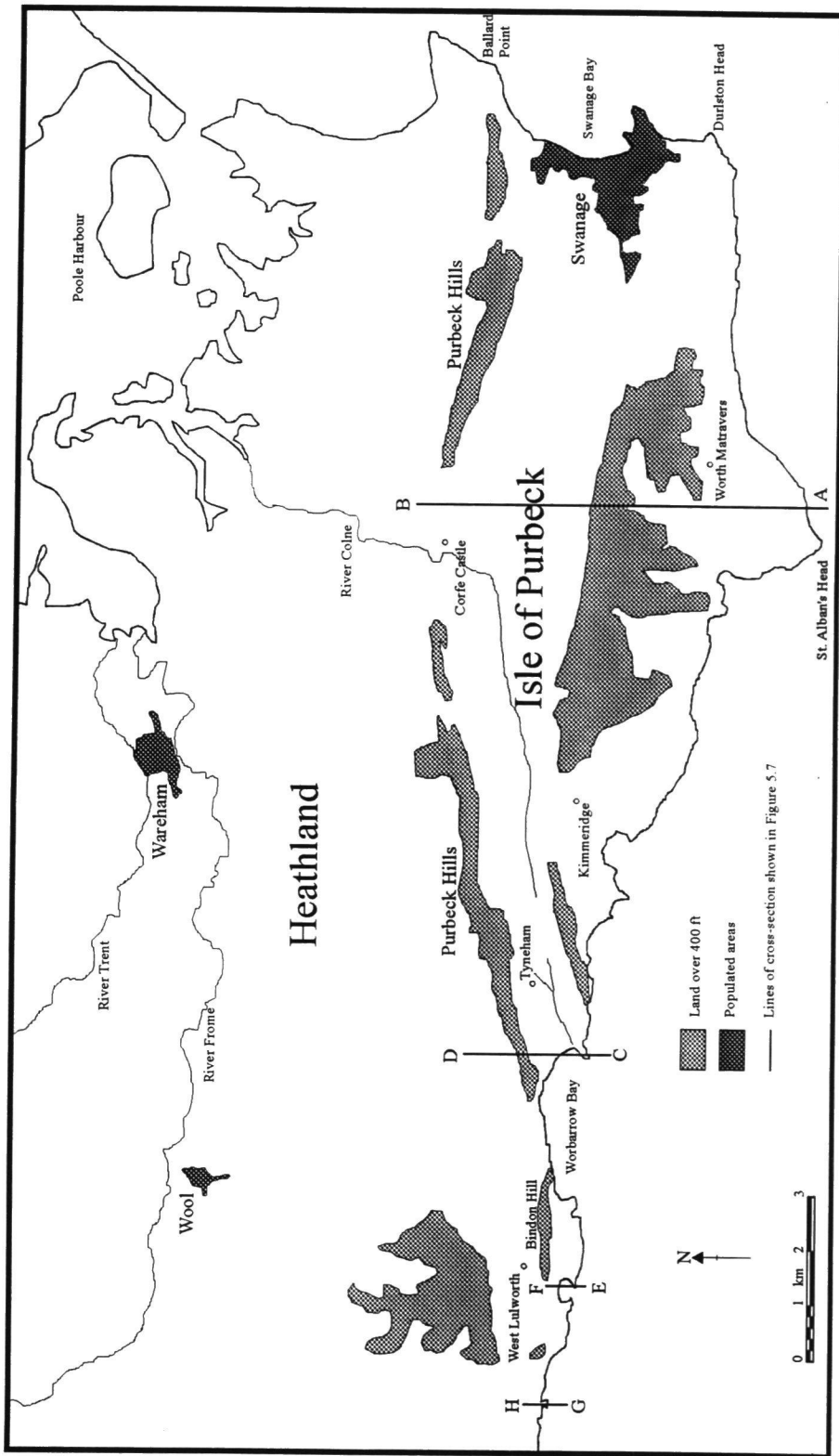


Figure 5.1: Location map of the Isle of Purbeck.

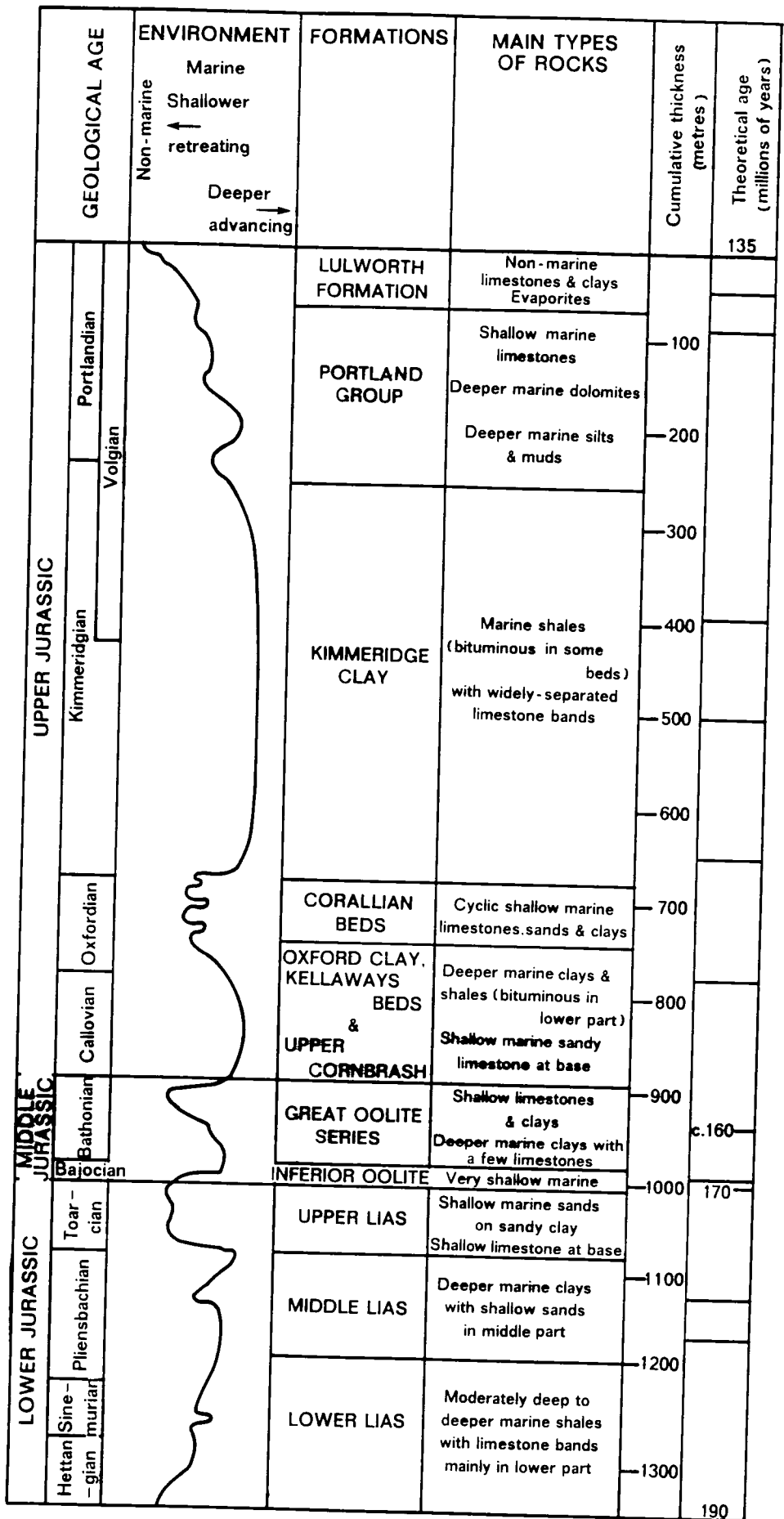


Figure 5.2a: The Jurassic stratigraphic column in Dorset.

From Allison, 1986, after Melville and Freshney, 1982.

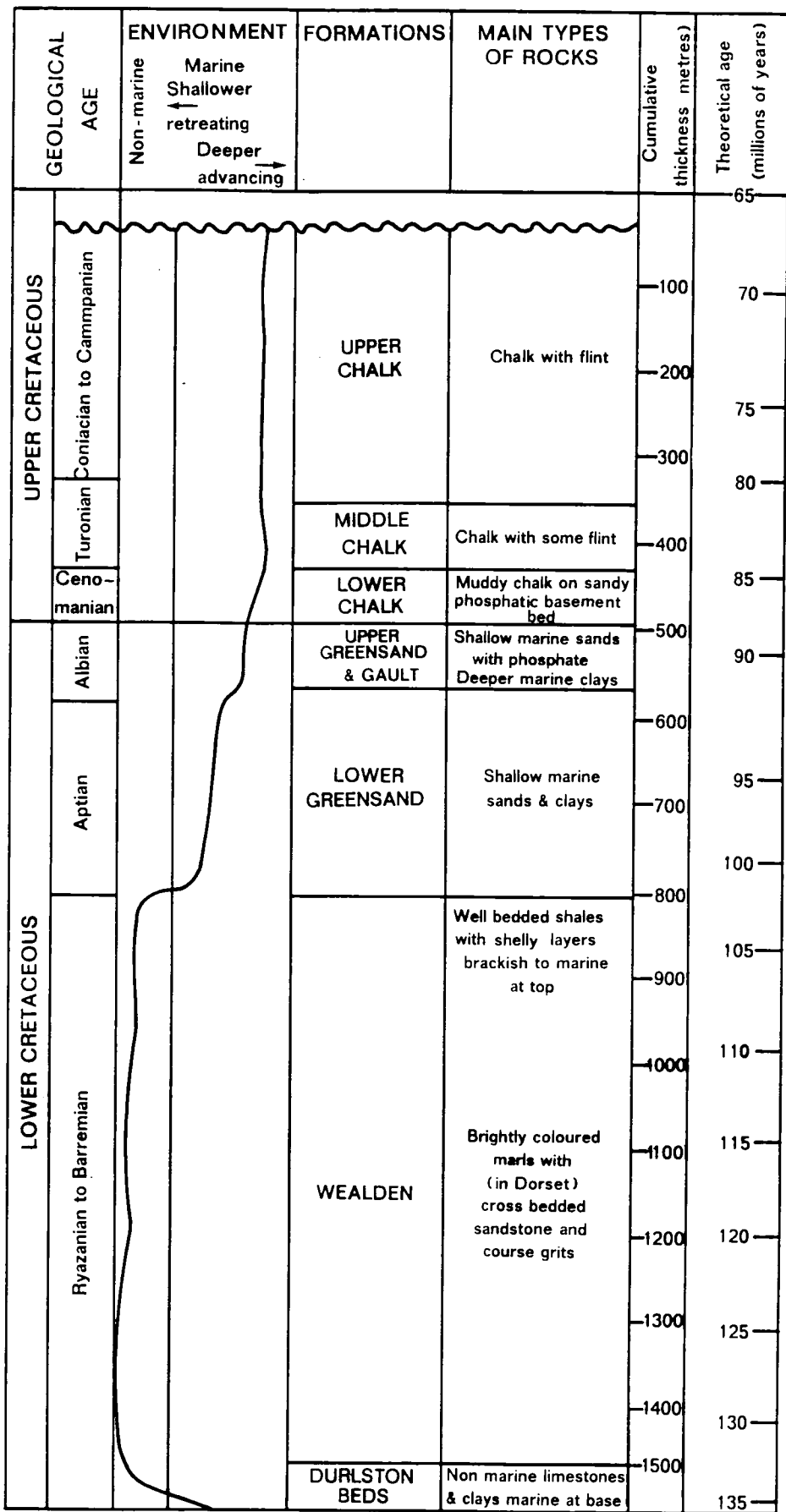


Figure 5.2b: The Cretaceous stratigraphic column in Dorset.

From Allison, 1986, after Melville and Freshney, 1982.

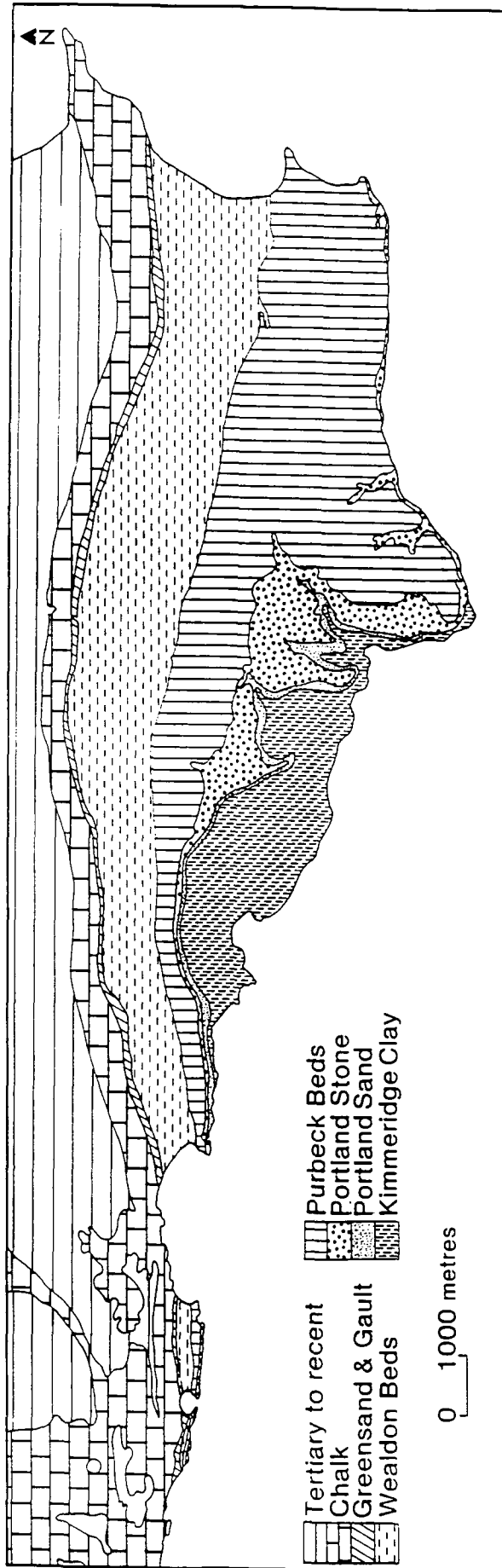


Figure 5.3: Geology of the Isle of Purbeck. From Allison, 1986.

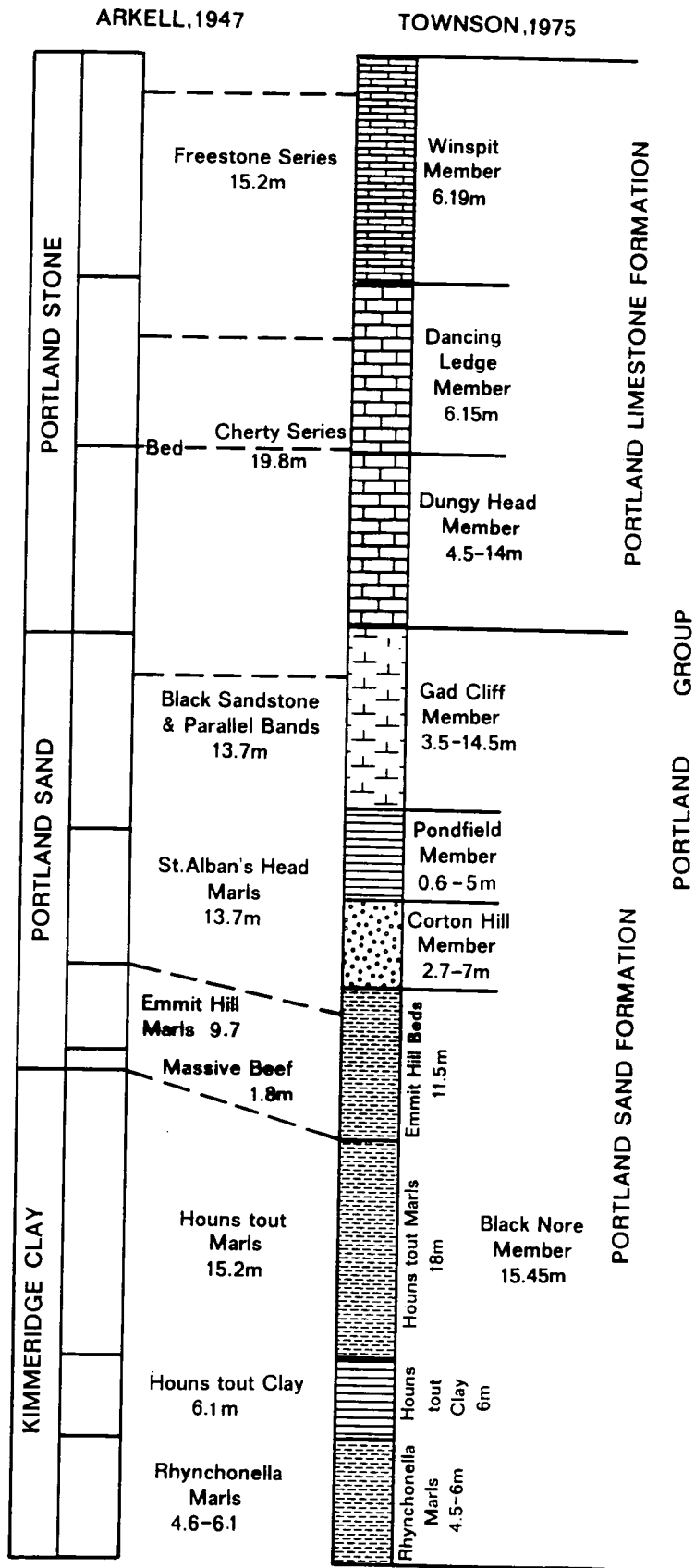


Figure 5.4: Classification of the Portland Beds. From Allison, 1986.

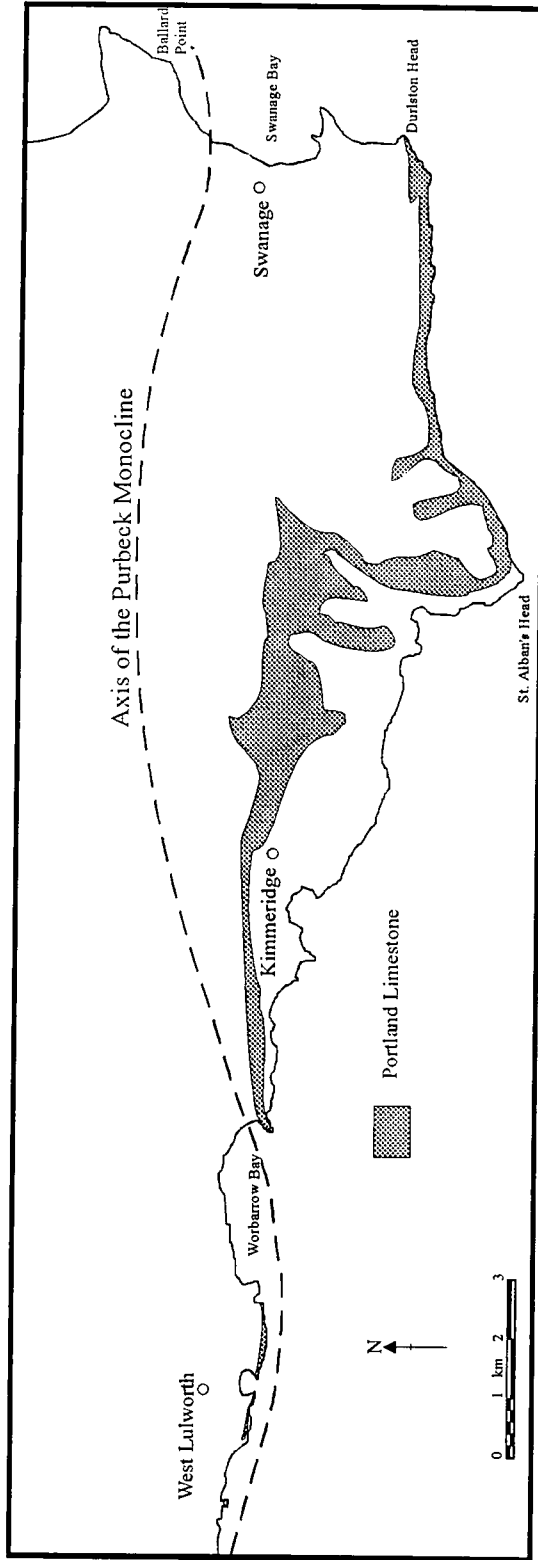


Figure 5.5: Map of the Isle of Purbeck showing the axis of the Purbeck Monocline and the distribution of the Portland Limestone. Allison, 1989.

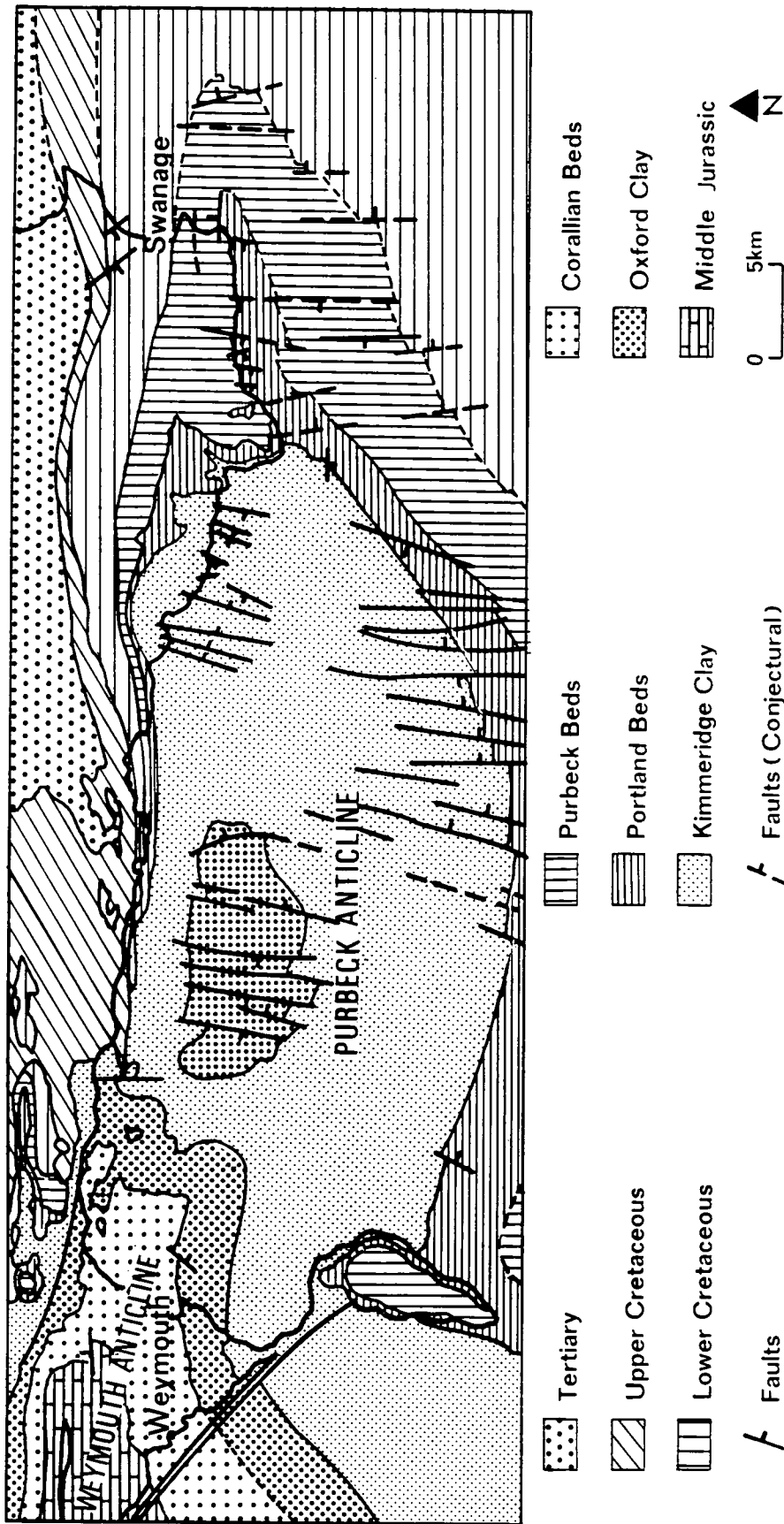


Figure 5.6: The structural setting of the east Dorset coastline. From Allison, 1986.

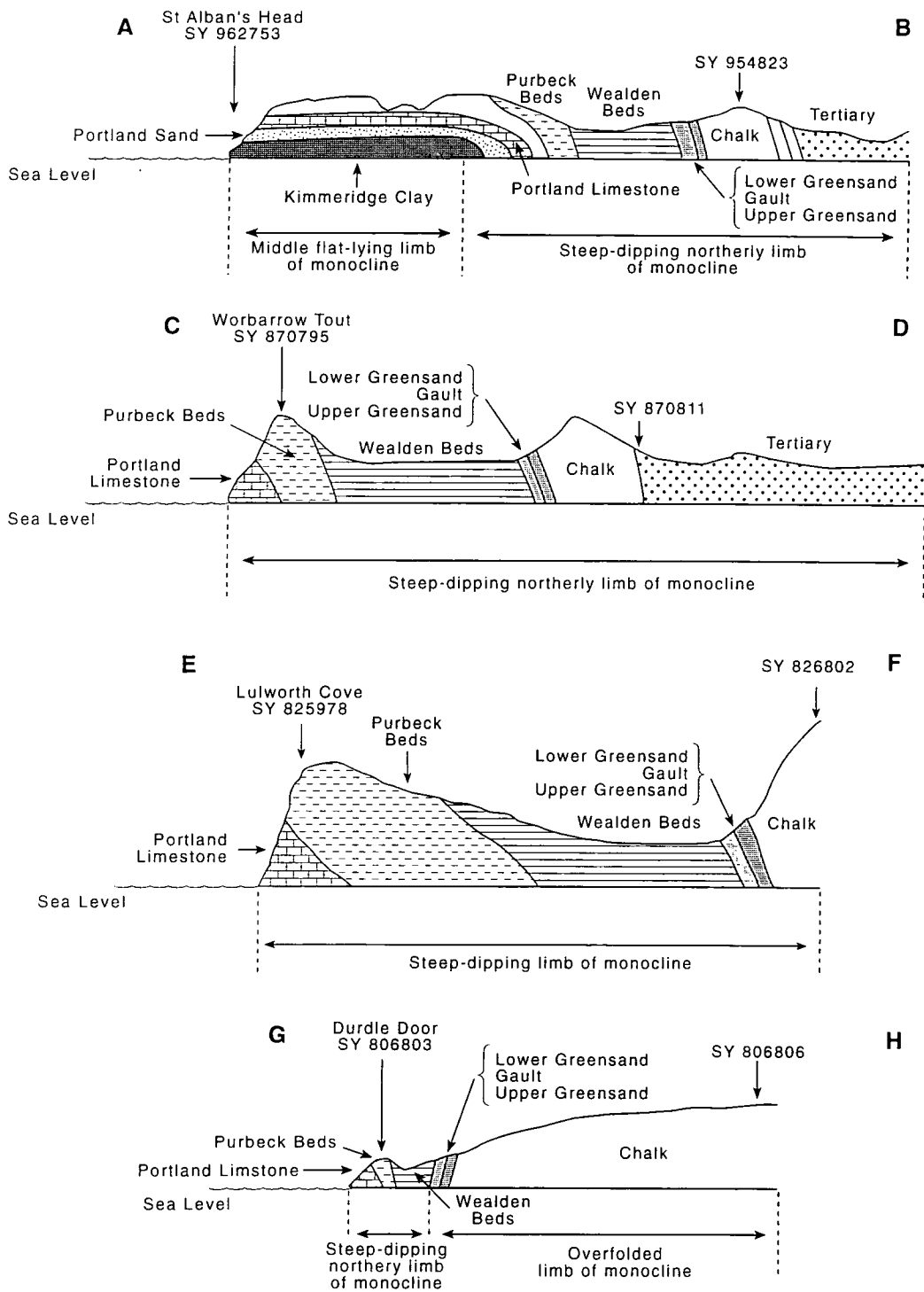


Figure 5.7: Geological cross-sections along the Purbeck coast.

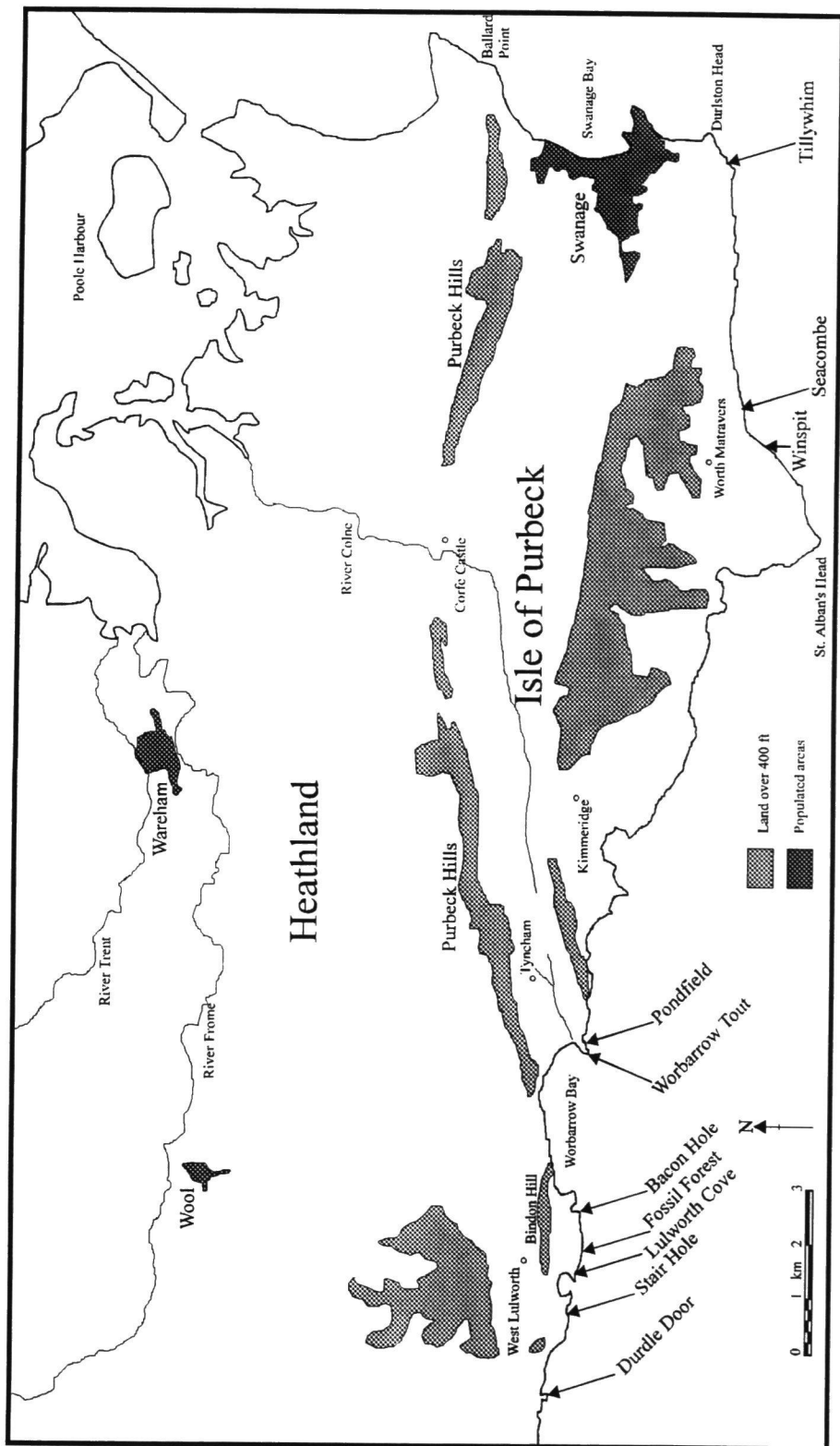


Figure 5.8: Map of the Isle of Purbeck showing the location of field sites.

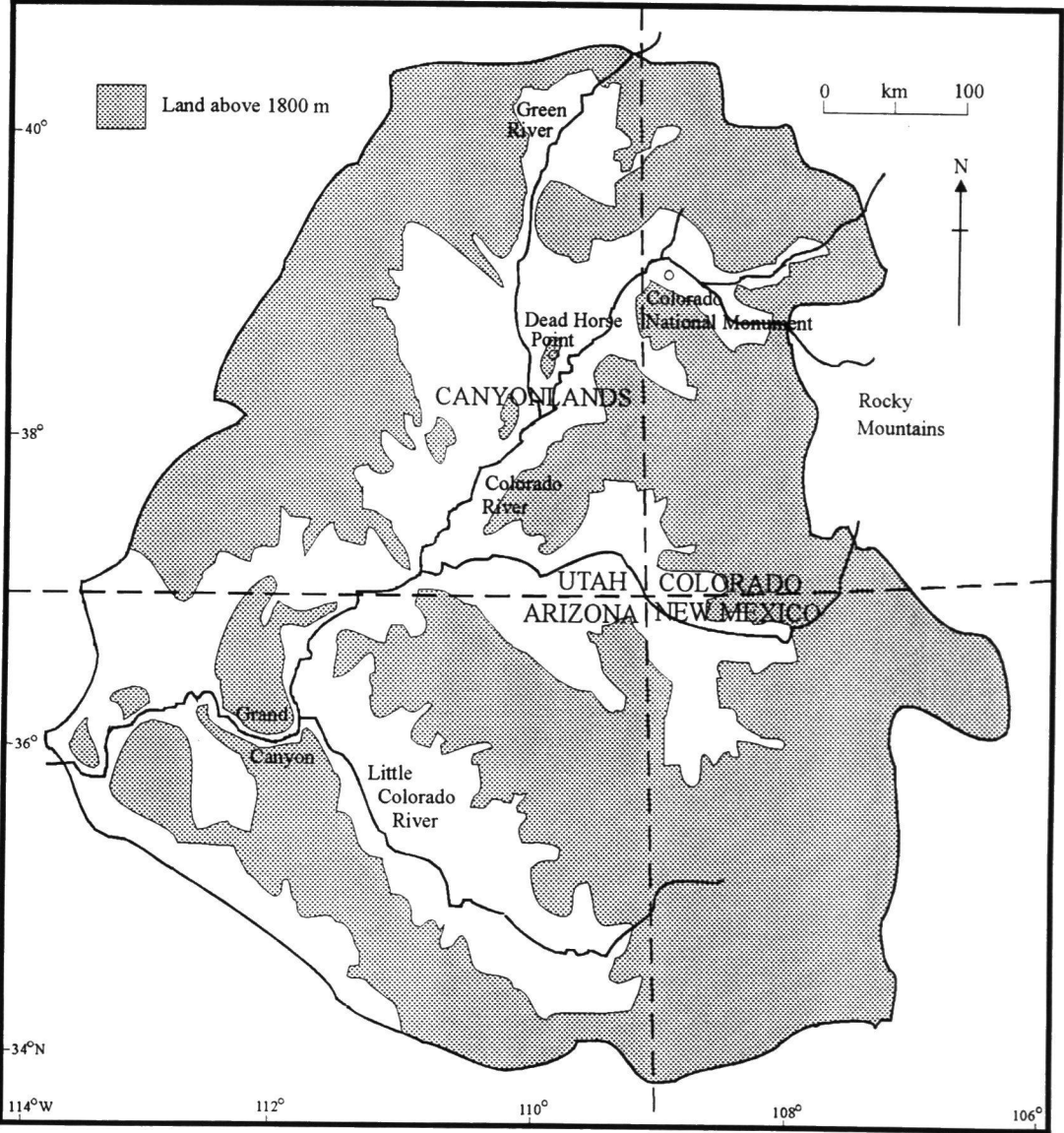


Figure 5.9: Location map of the Colorado Plateau.

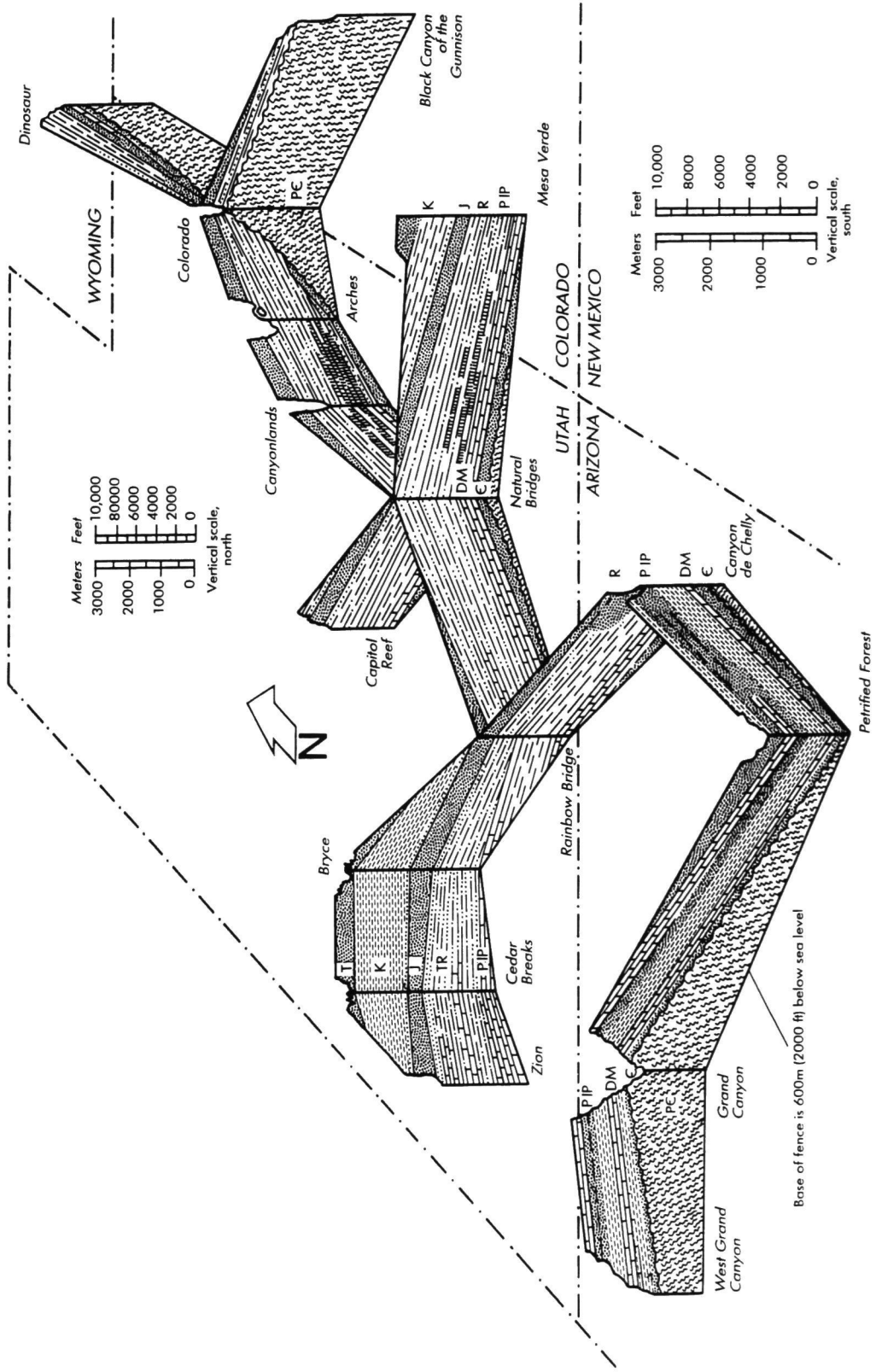


Figure 5.10: The Colorado Plateau stratigraphic column.

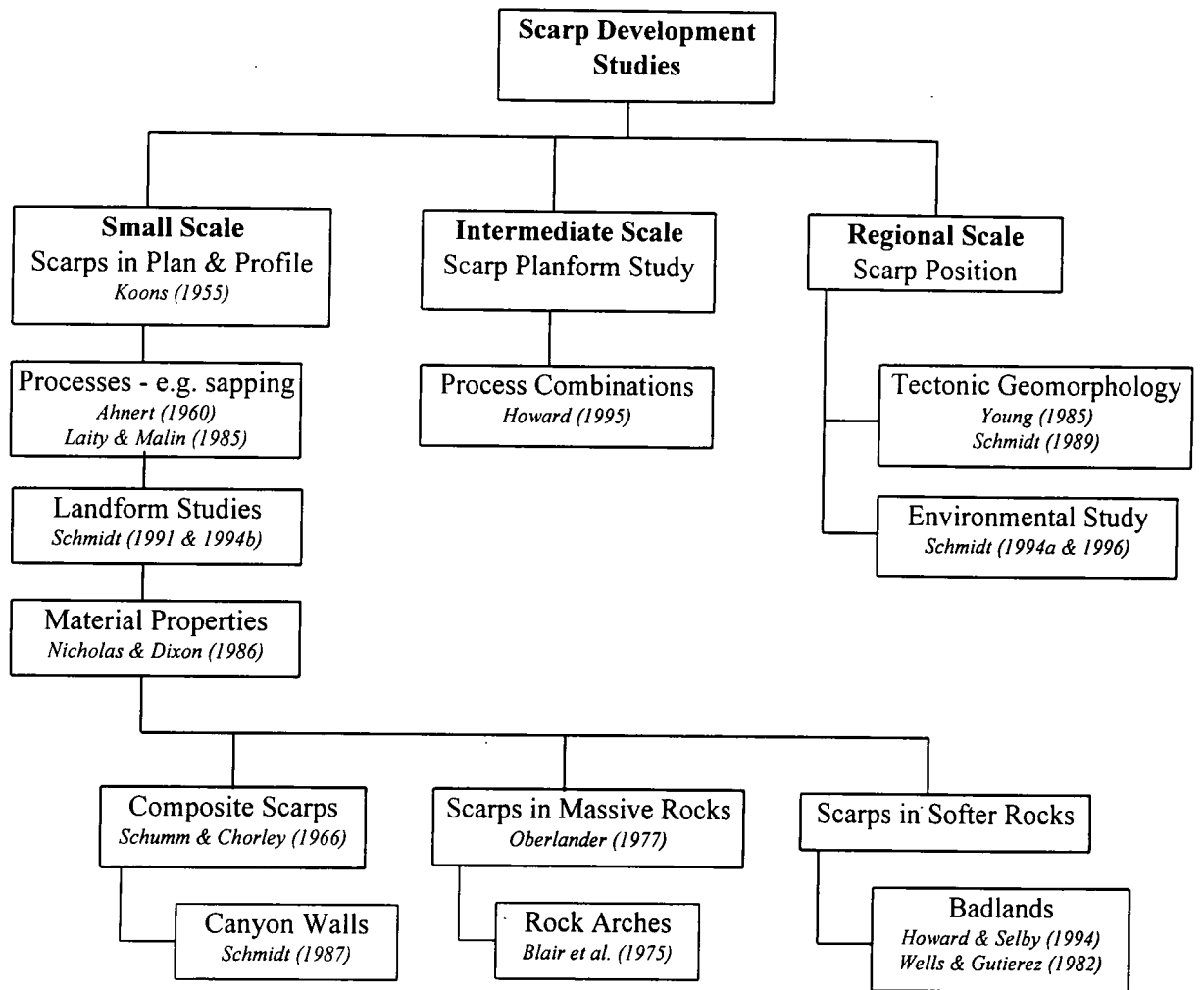


Figure 5.11: A summary of slope development studies on the Colorado Plateau.

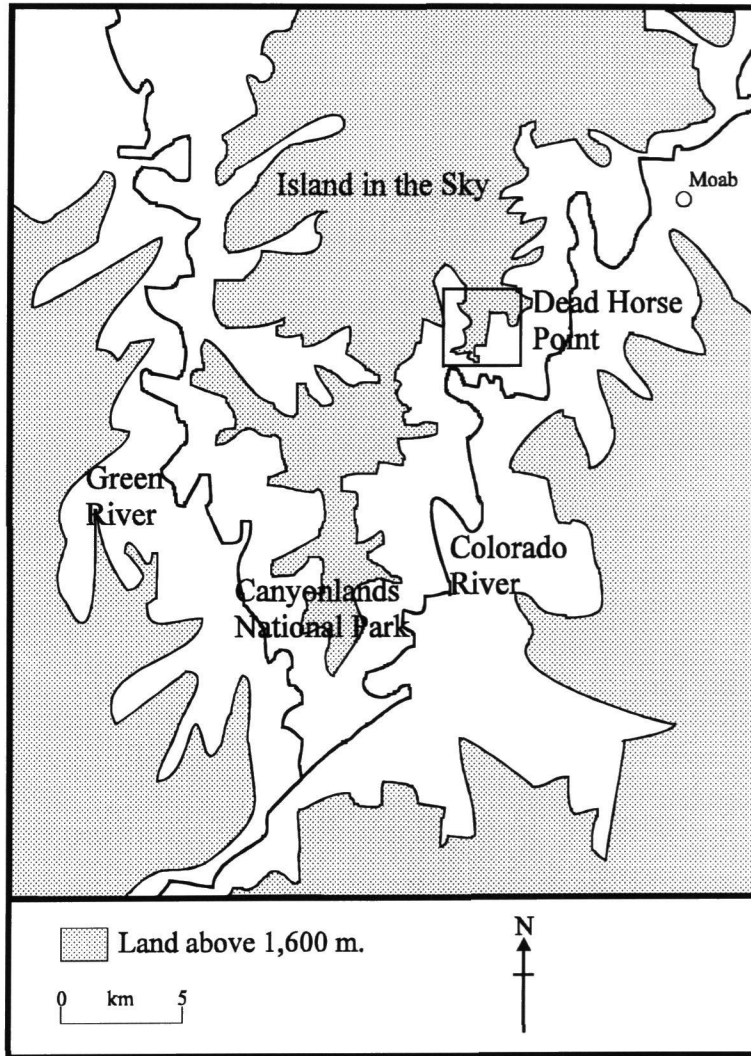


Figure 5.12: Location map of Dead Horse Point State Park and the Island in the Sky Mesa.

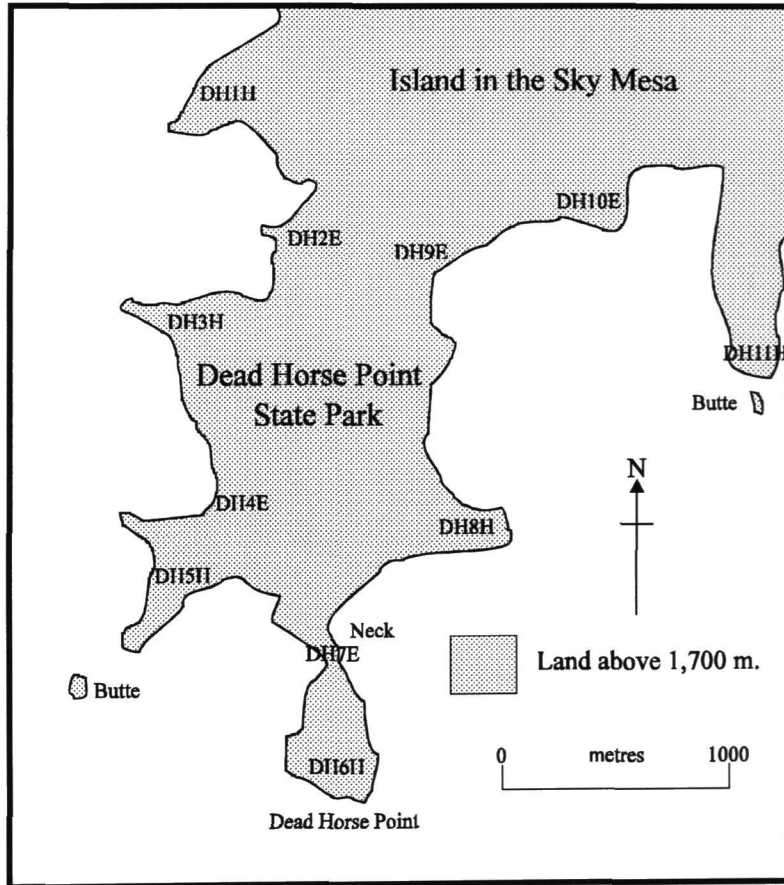


Figure 5.13: Scarp plan at Dead Horse Point State Park.

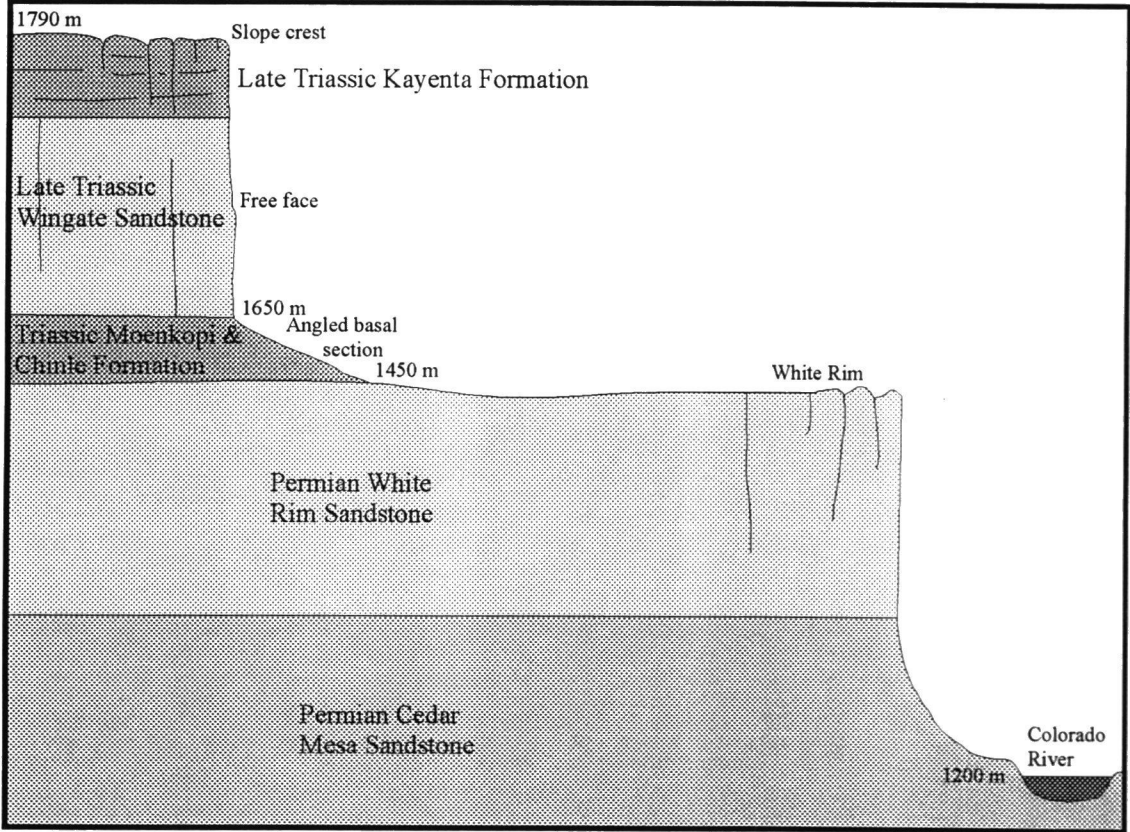


Figure 5.14: A profile of the cliffs at Dead Horse Point State Park.

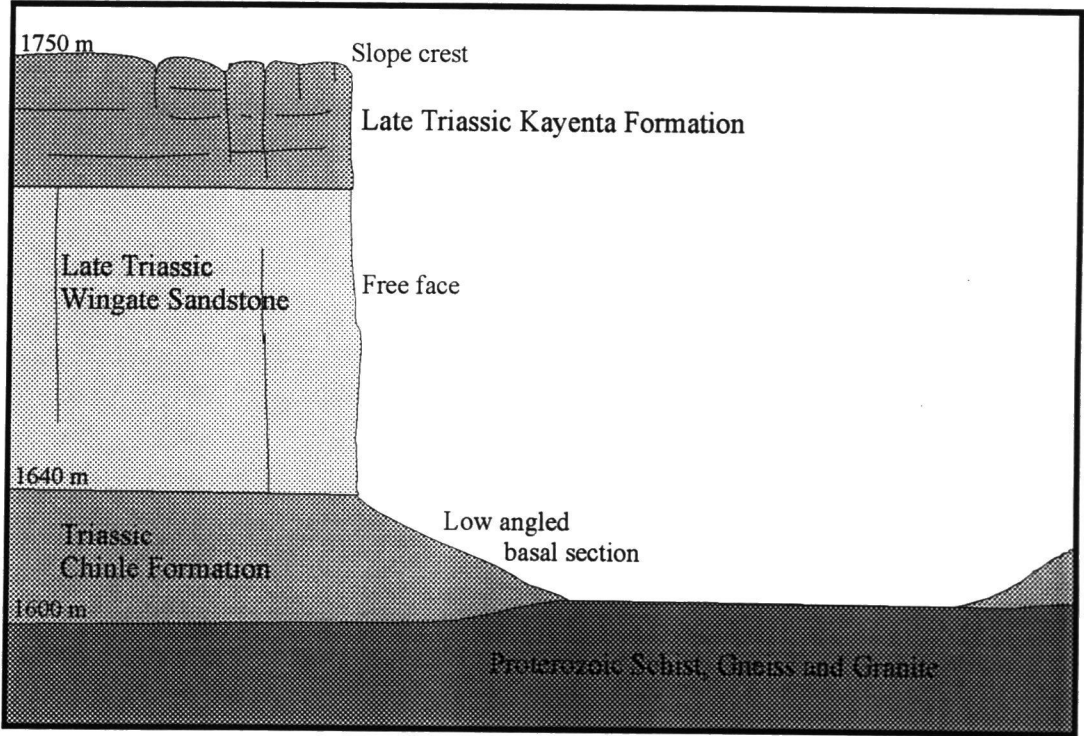


Figure 5.15: A profile of the cliffs at the Colorado National Monument.

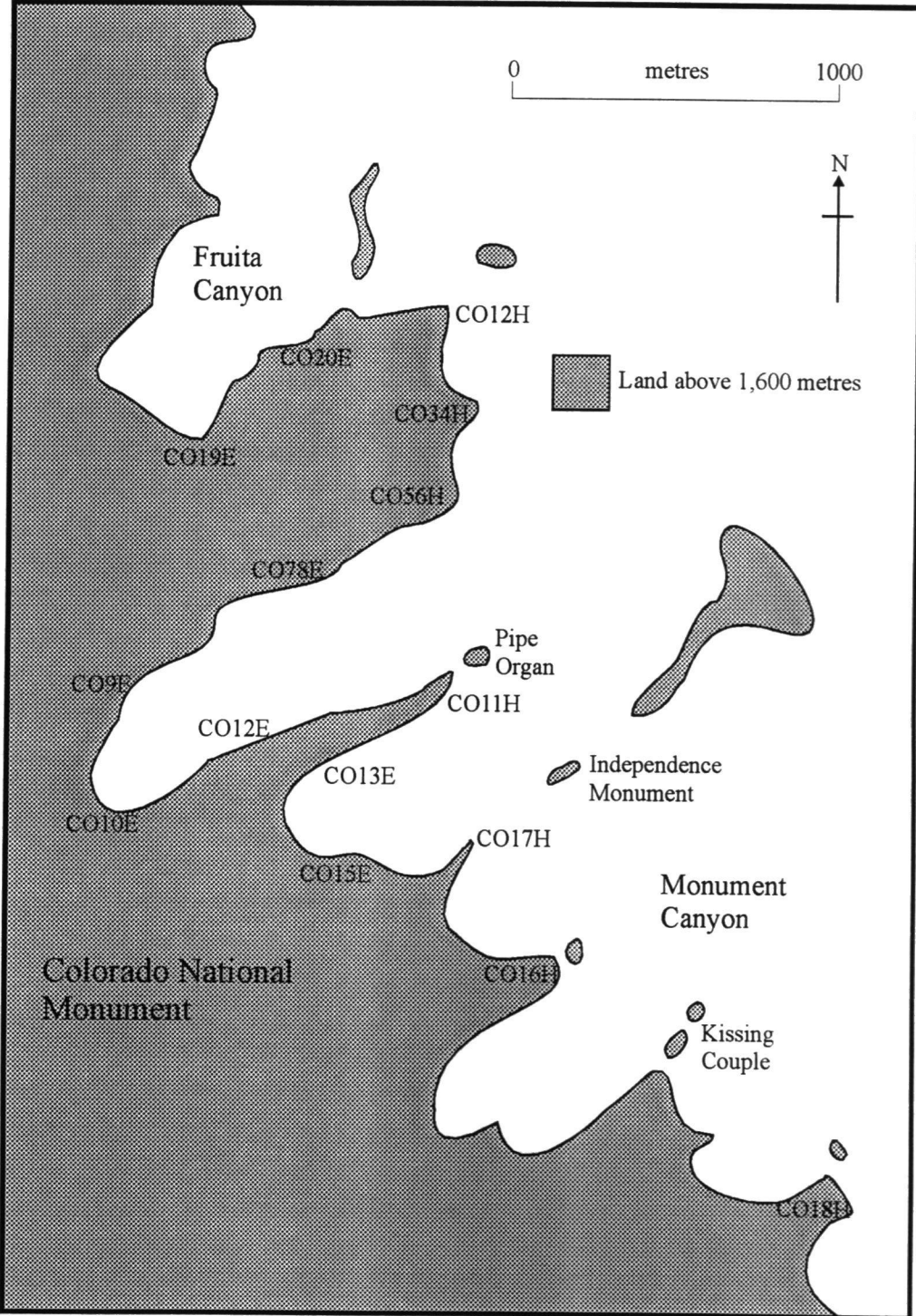


Figure 5.16: Scarp plan at the Colorado National Monument.

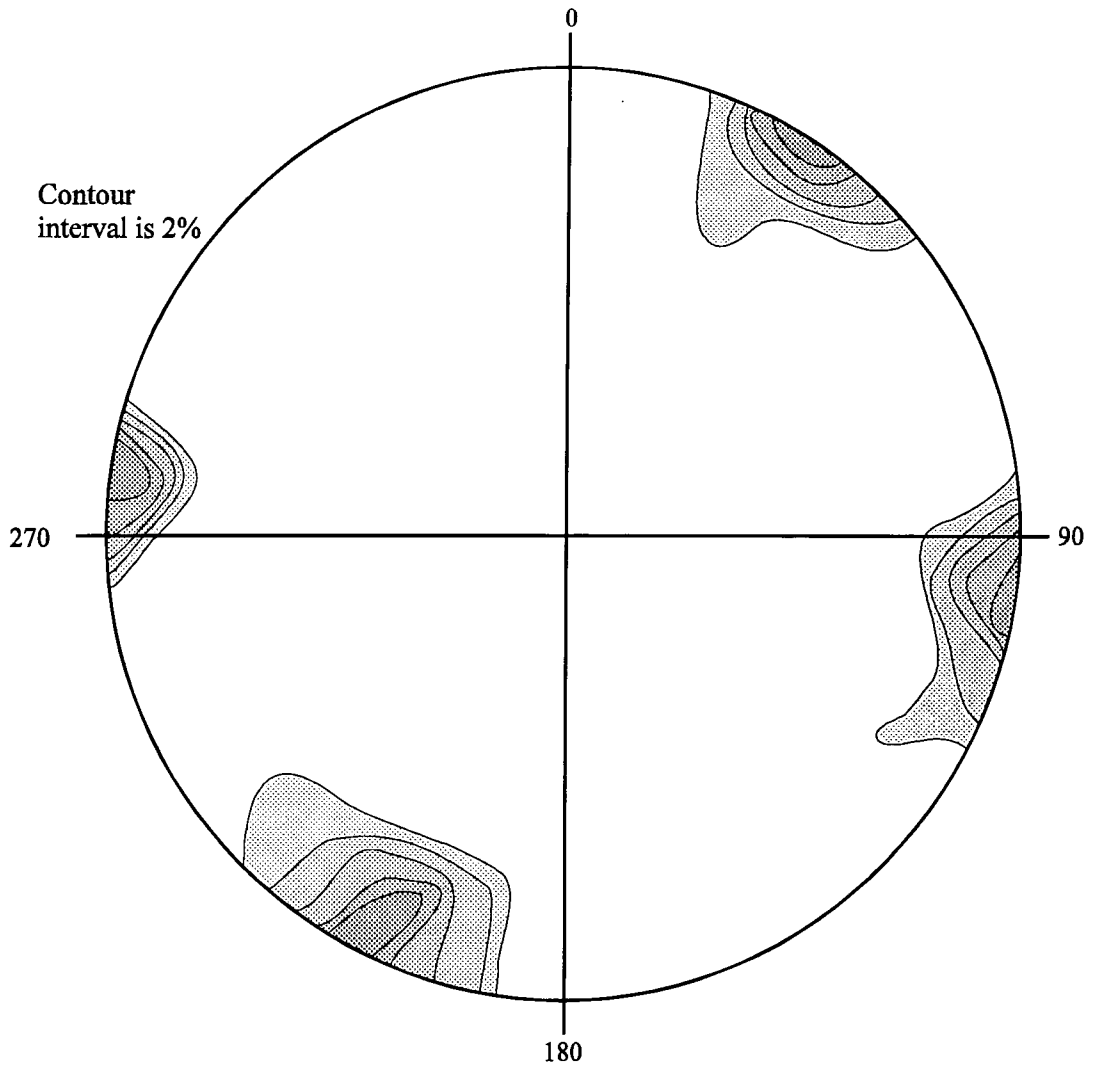


Figure 6.1: Polar projection for the discontinuities in the Portland Limestone at Winspit. From Allison, 1989.

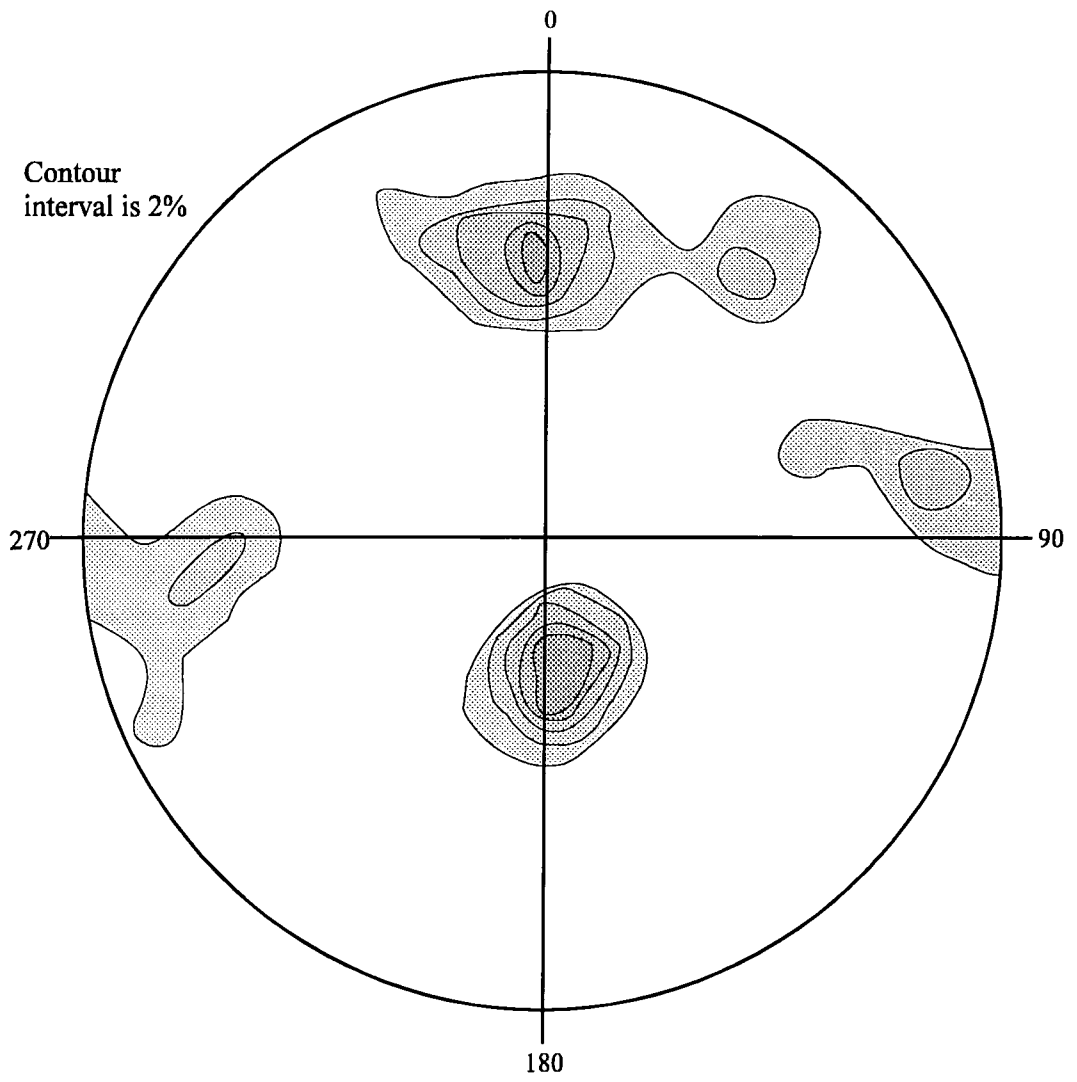


Figure 6.2: Polar projection for the discontinuities in the Portland Limestone at Fossil Forest. From Allison, 1989.

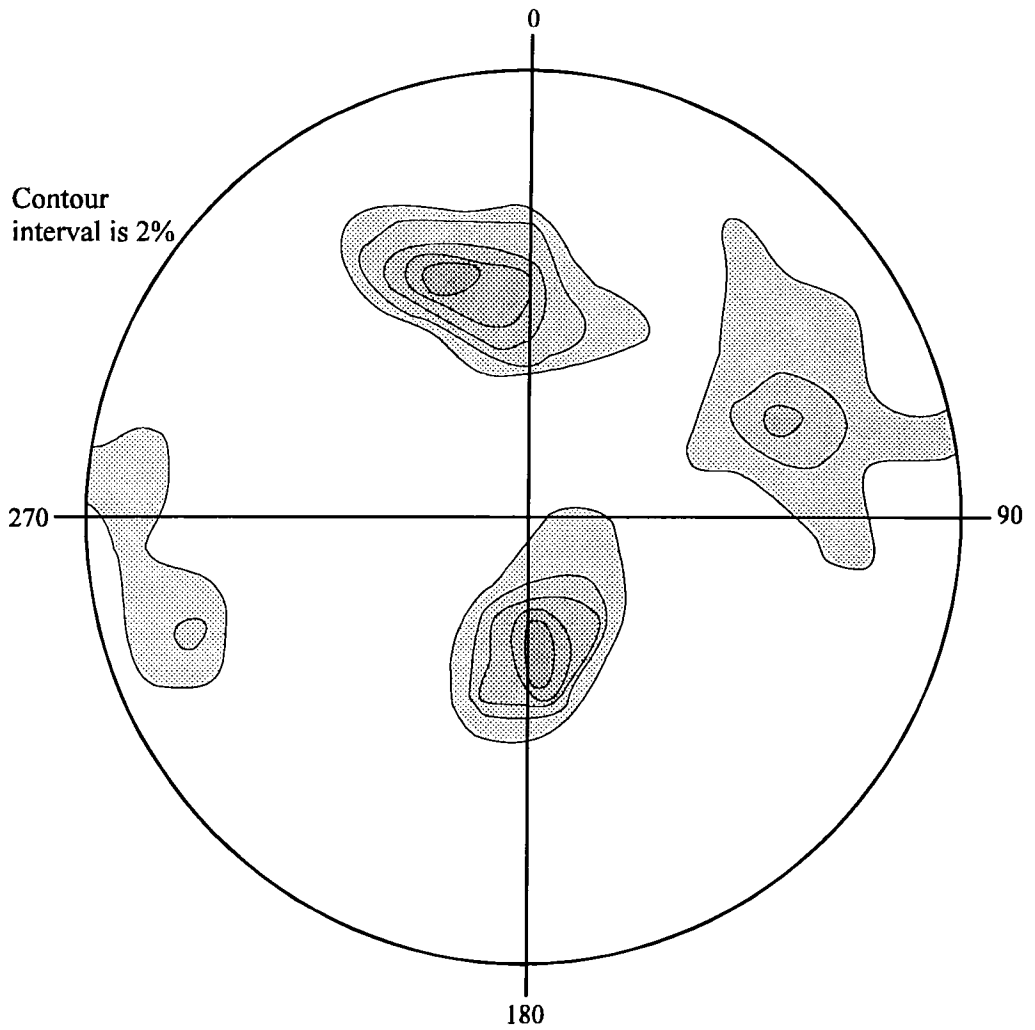


Figure 6.3: Polar projection for the discontinuities in the Portland Limestone at Lulworth Cove. From Allison, 1989.

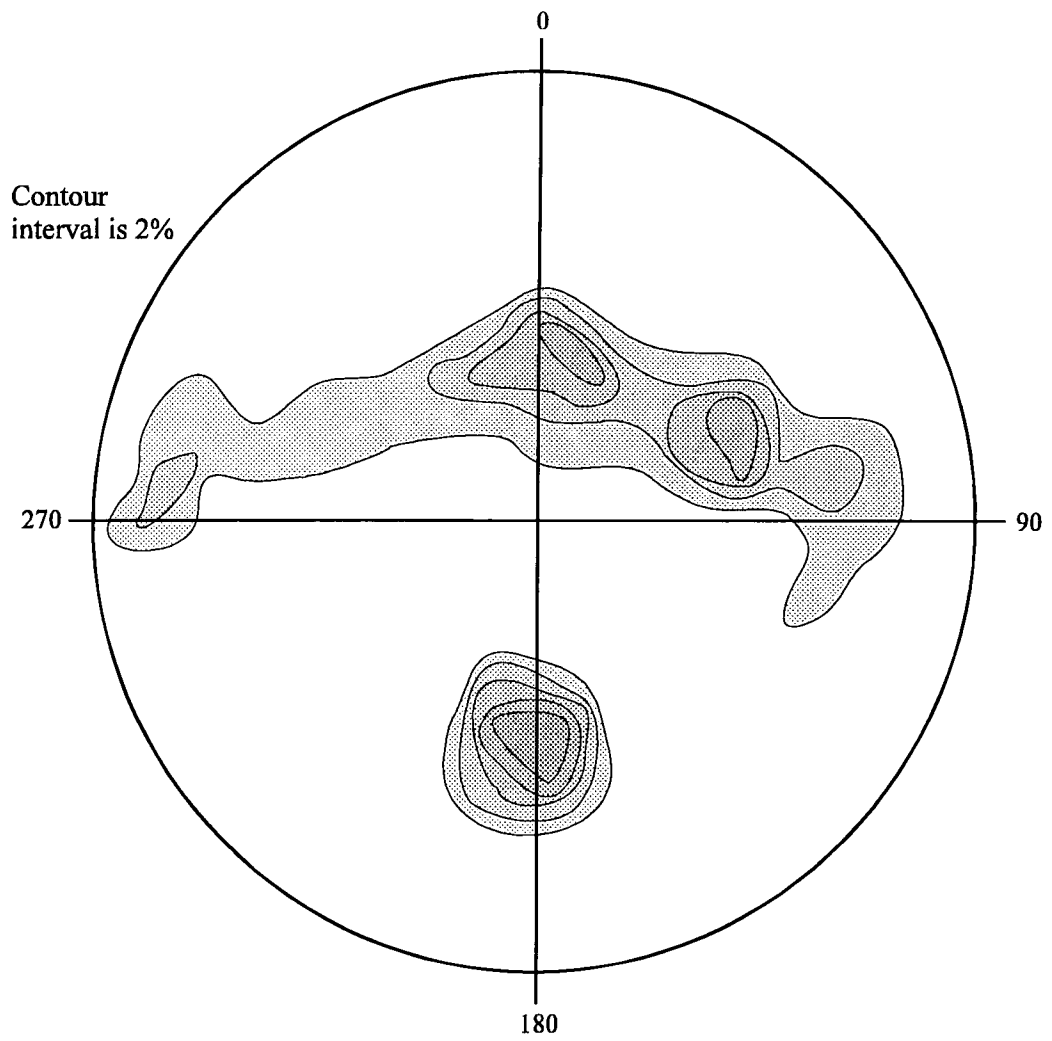


Figure 6.4: Polar projection for the discontinuities in the Portland Limestone at Durdle Door. From Allison, 1989.

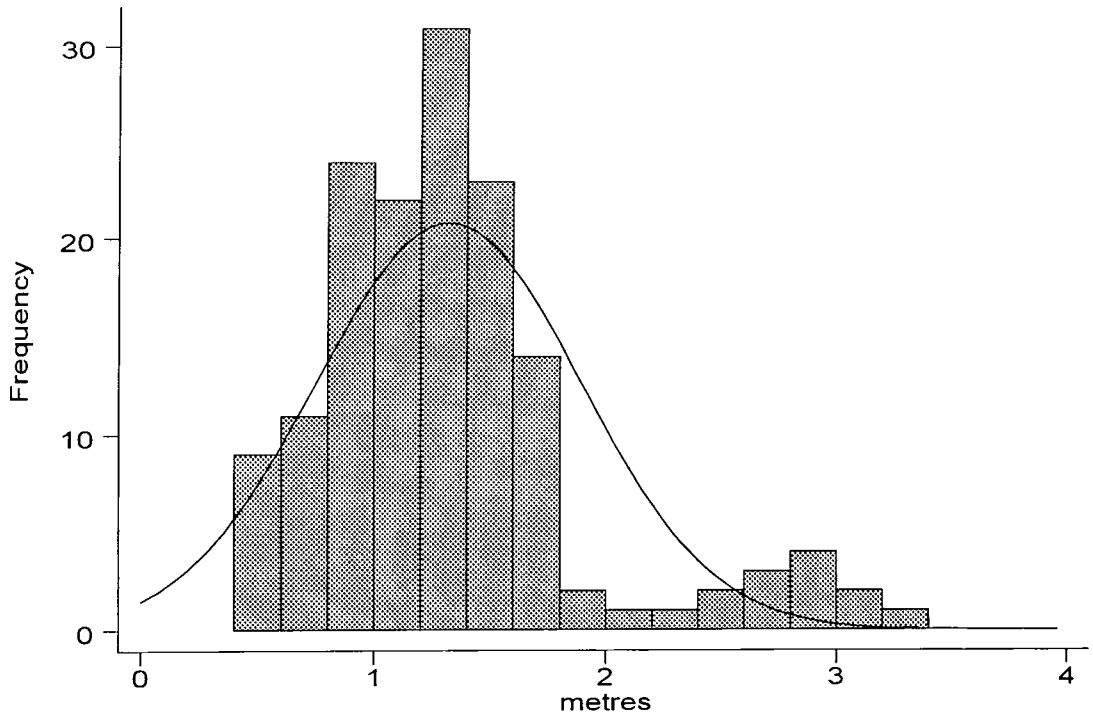


Figure 6.5: Frequency distribution of Winspit joint spacing readings.

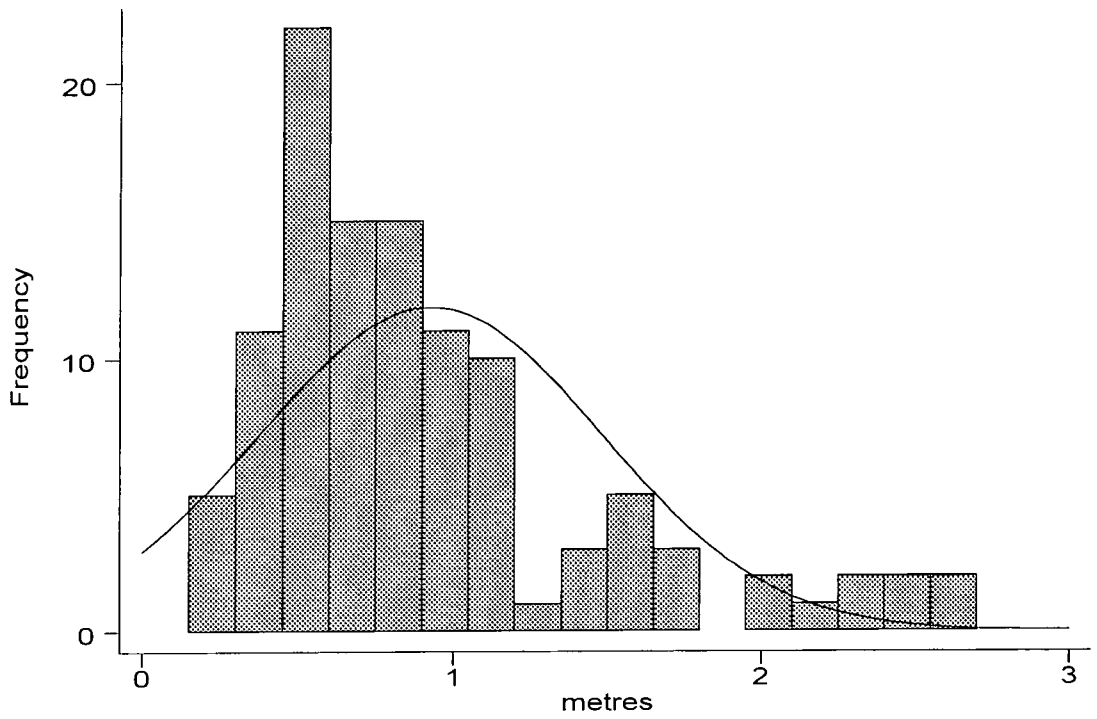


Figure 6.6: Frequency distribution of Fossil Forest joint spacing readings.

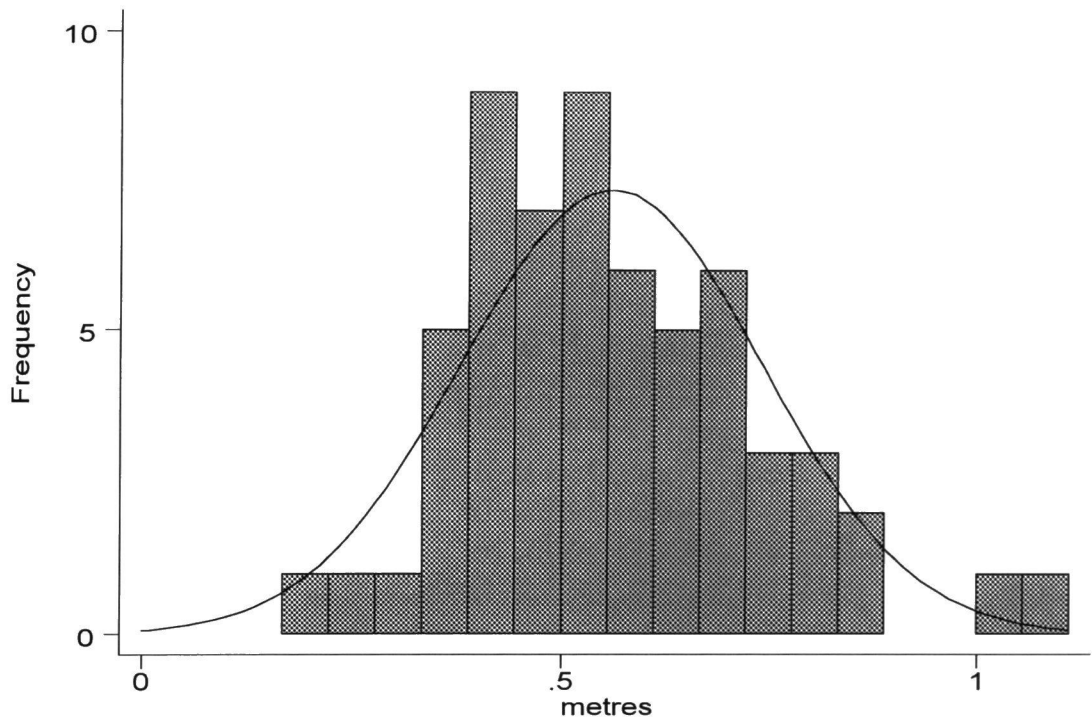


Figure 6.7: Frequency distribution of Lulworth Cove joint spacing readings.

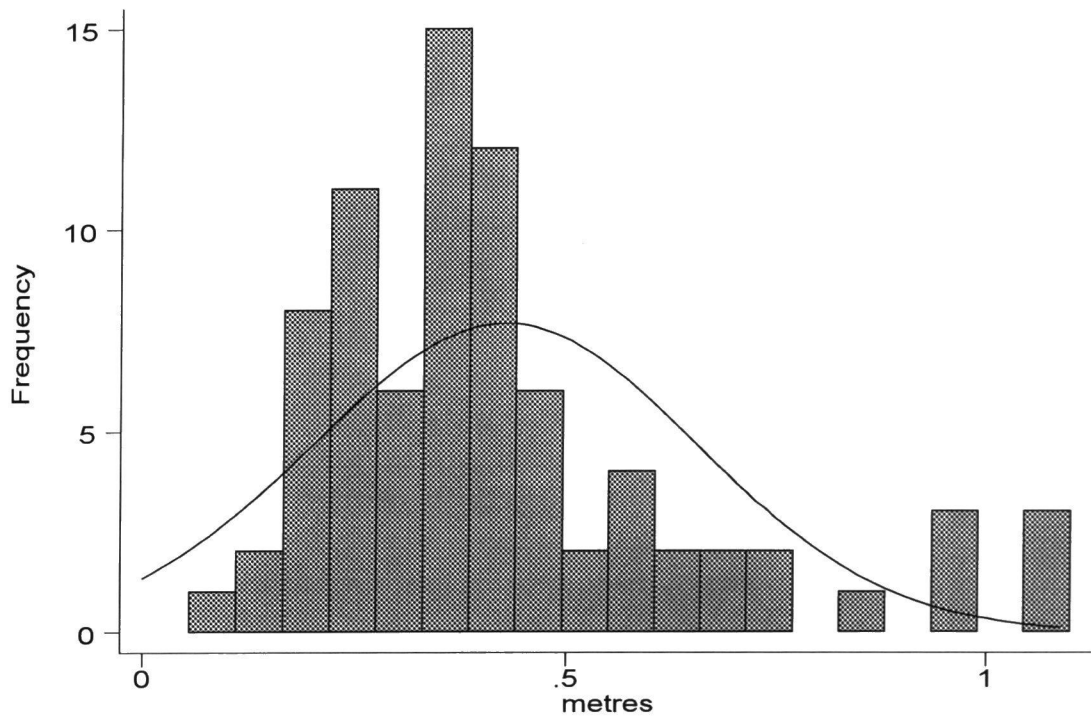


Figure 6.8: Frequency distribution of Durdle Door joint spacing readings.

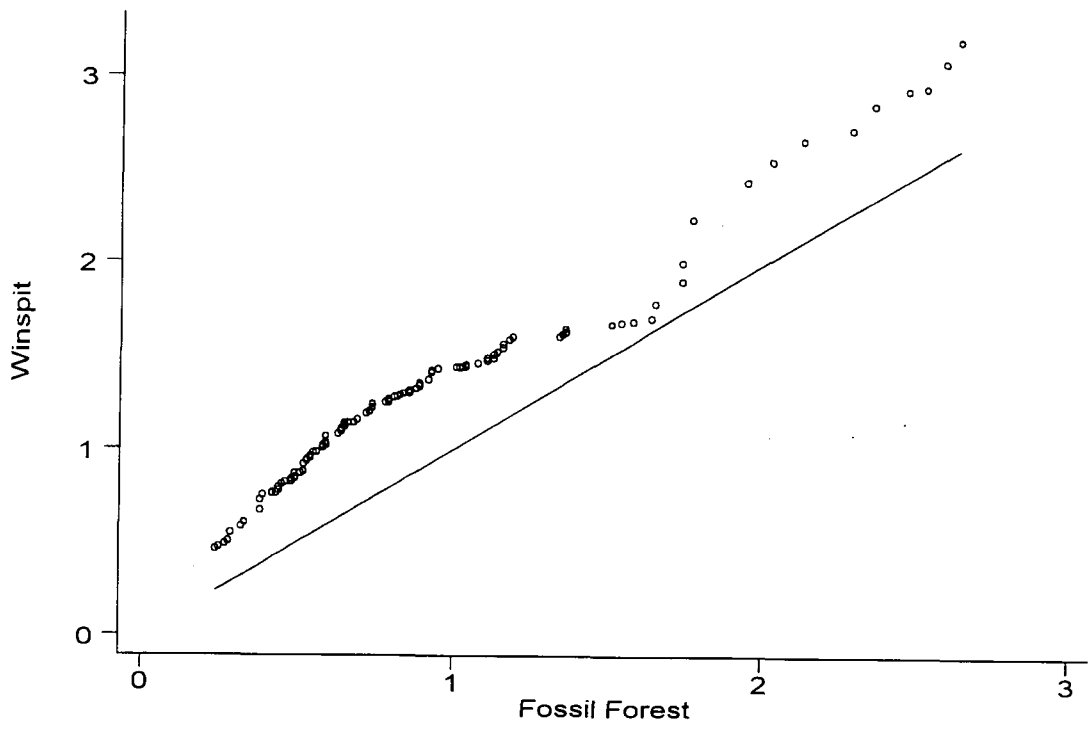


Figure 6.9: A quantile-quantile plot for joint spacing readings from Winspit and Fossil Forest.

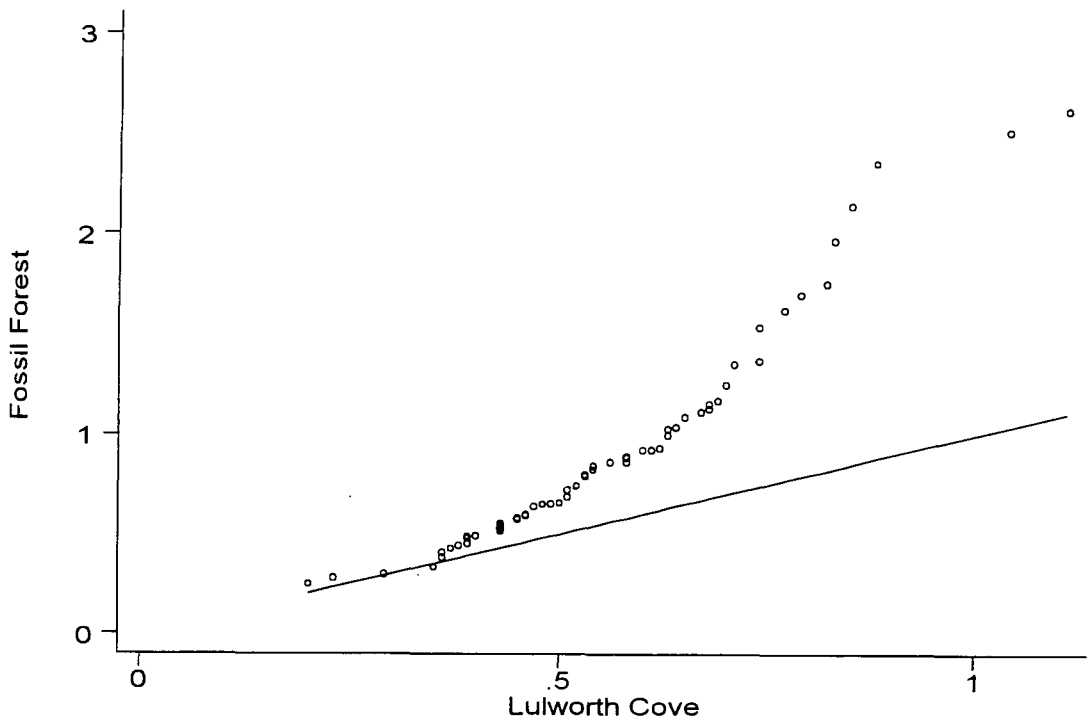


Figure 6.10: A quantile-quantile plot for joint spacing readings from Fossil Forest and Lulworth Cove.

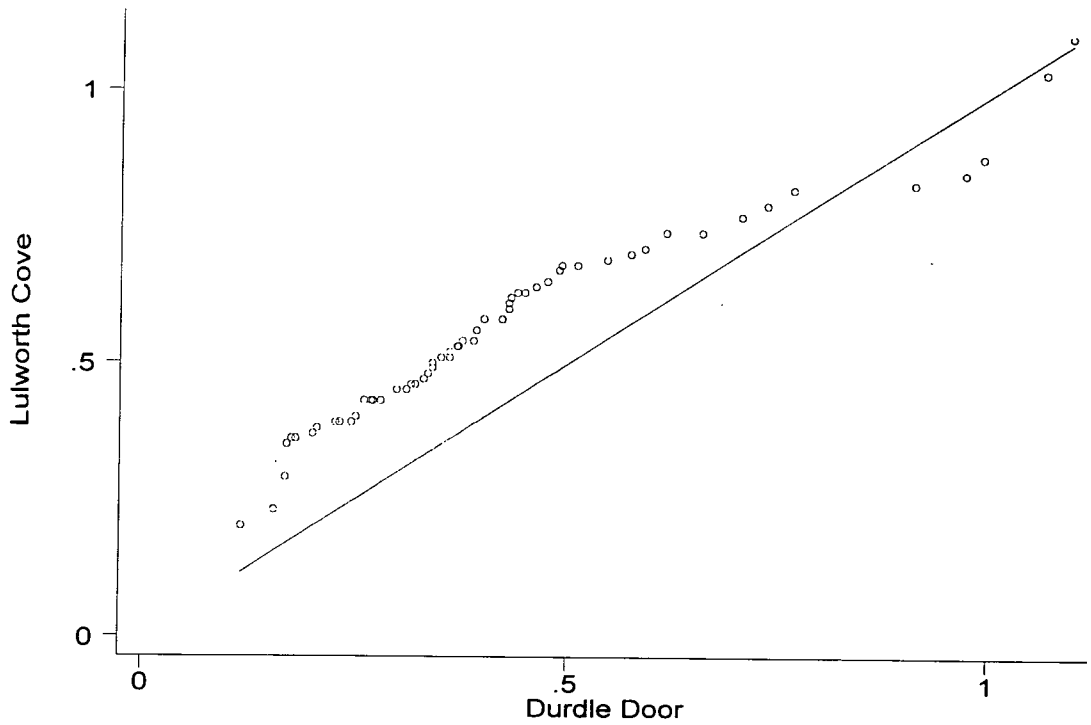


Figure 6.11: A quantile-quantile plot for joint spacing readings from Lulworth Cove and Durdle Door.

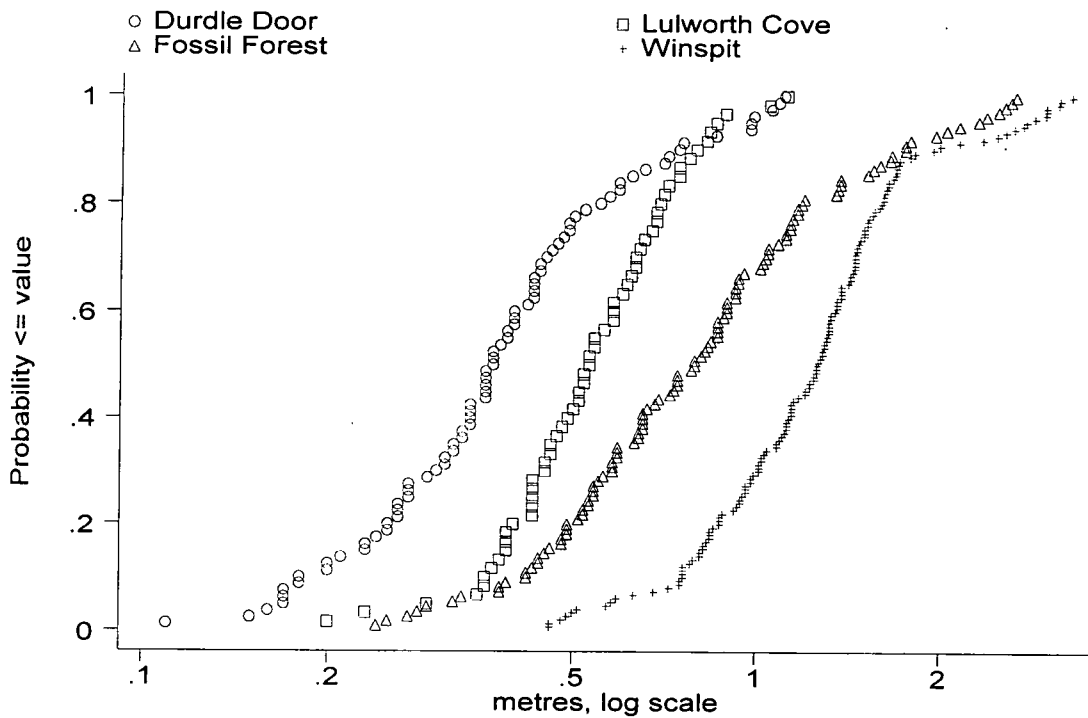


Figure 6.12: A cumulative distribution function of joint spacing readings for Winspit, Fossil Forest, Lulworth Cove and Durdle Door.

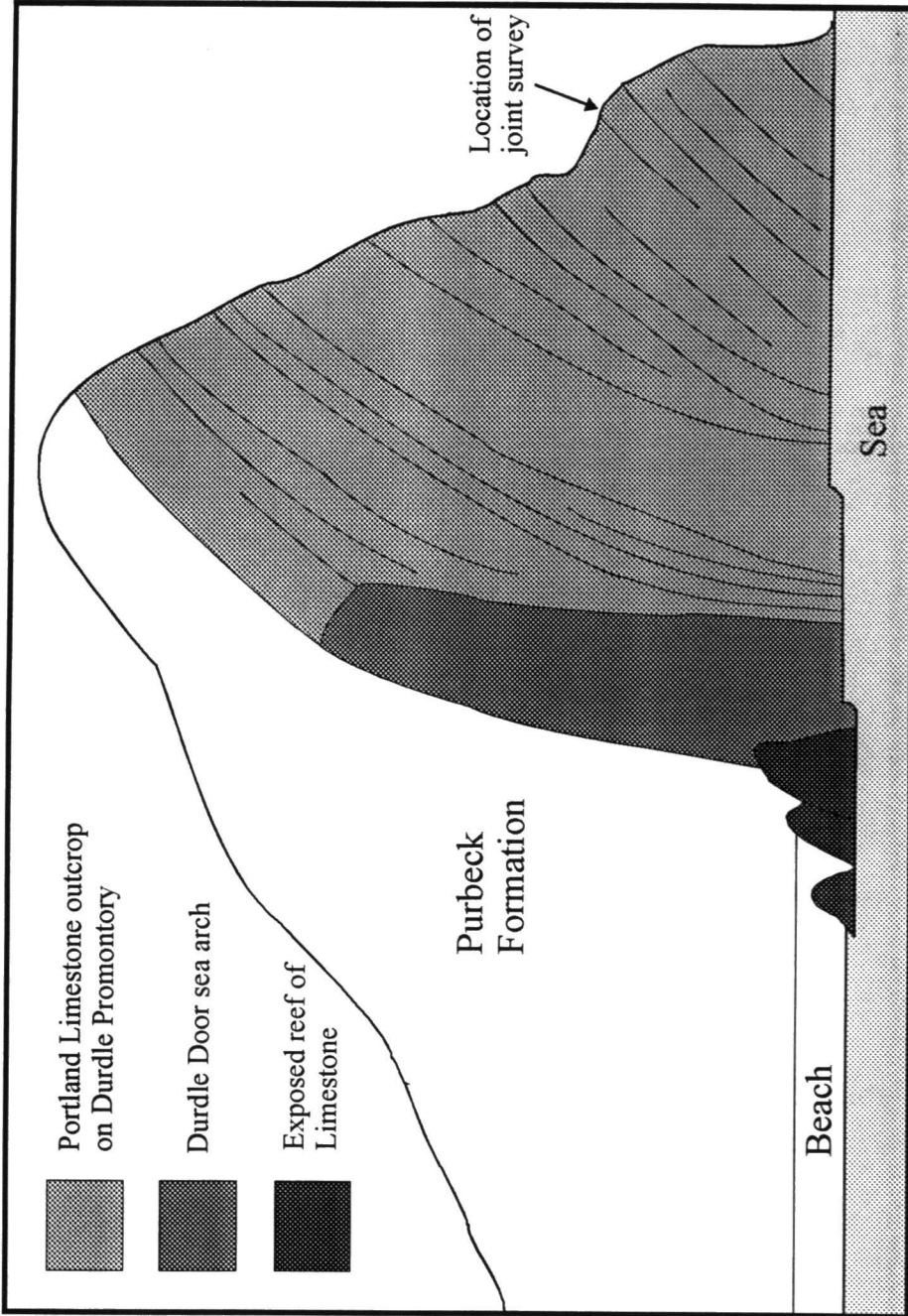


Figure 6.13: A sketch of the Durdle Promontory from the south-west, seaward side showing visible discontinuities.

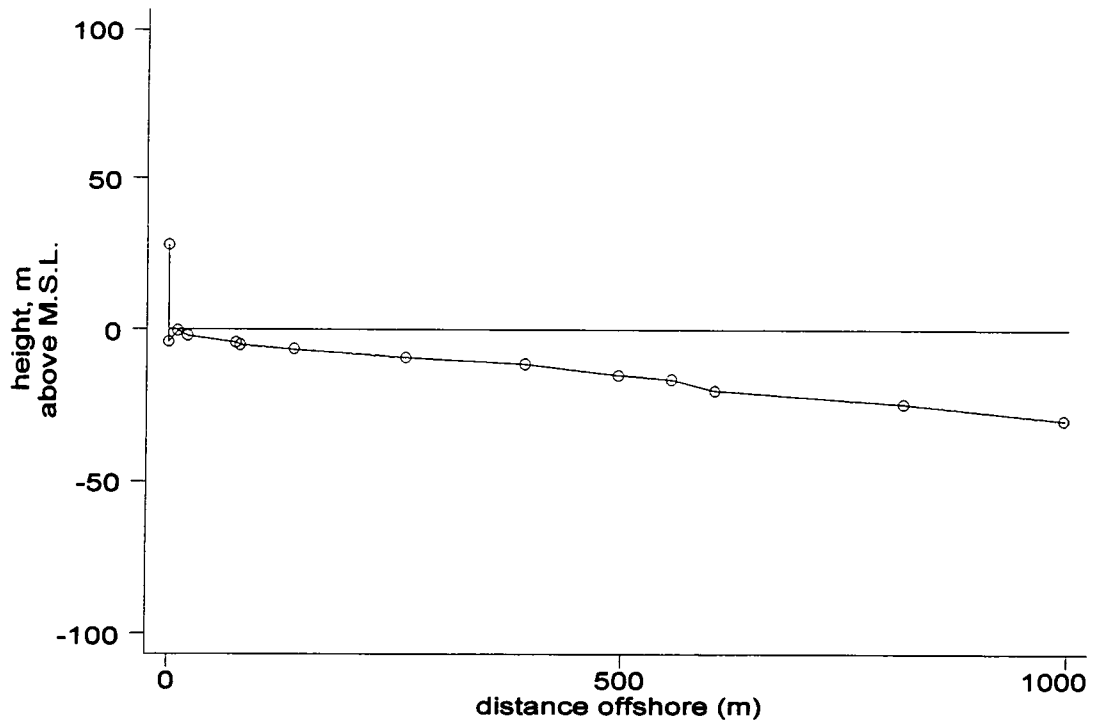


Figure 6.14: Profile of the sea floor offshore from Tillywhim.

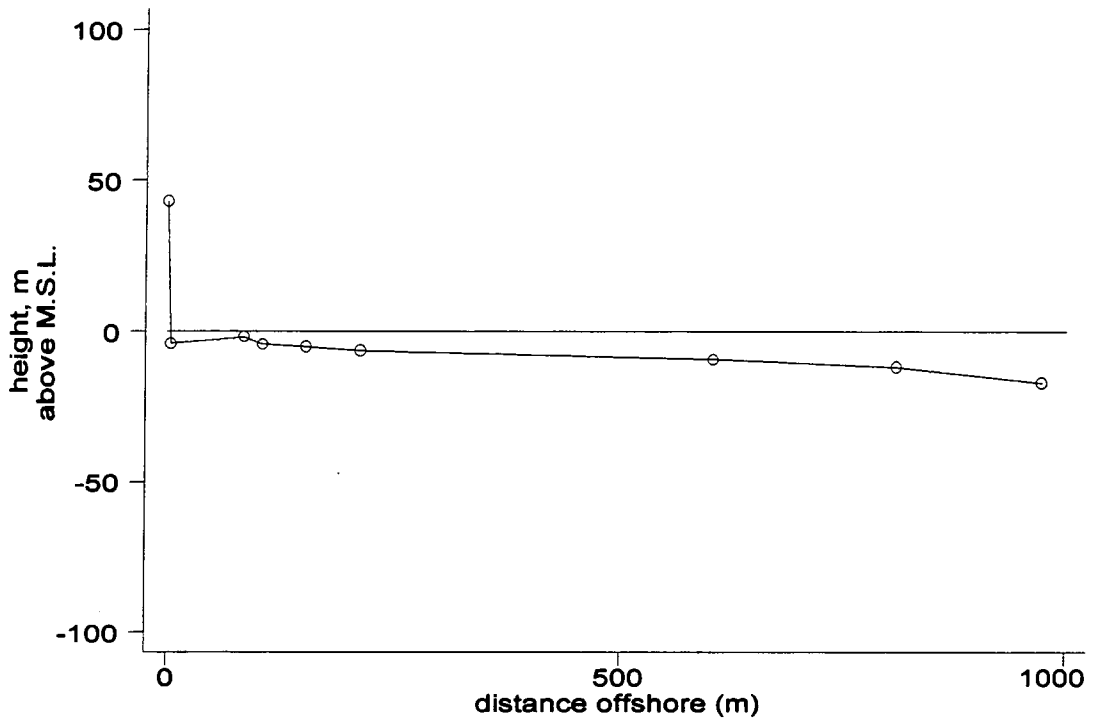


Figure 6.15: Profile of the sea floor offshore from Winspit.

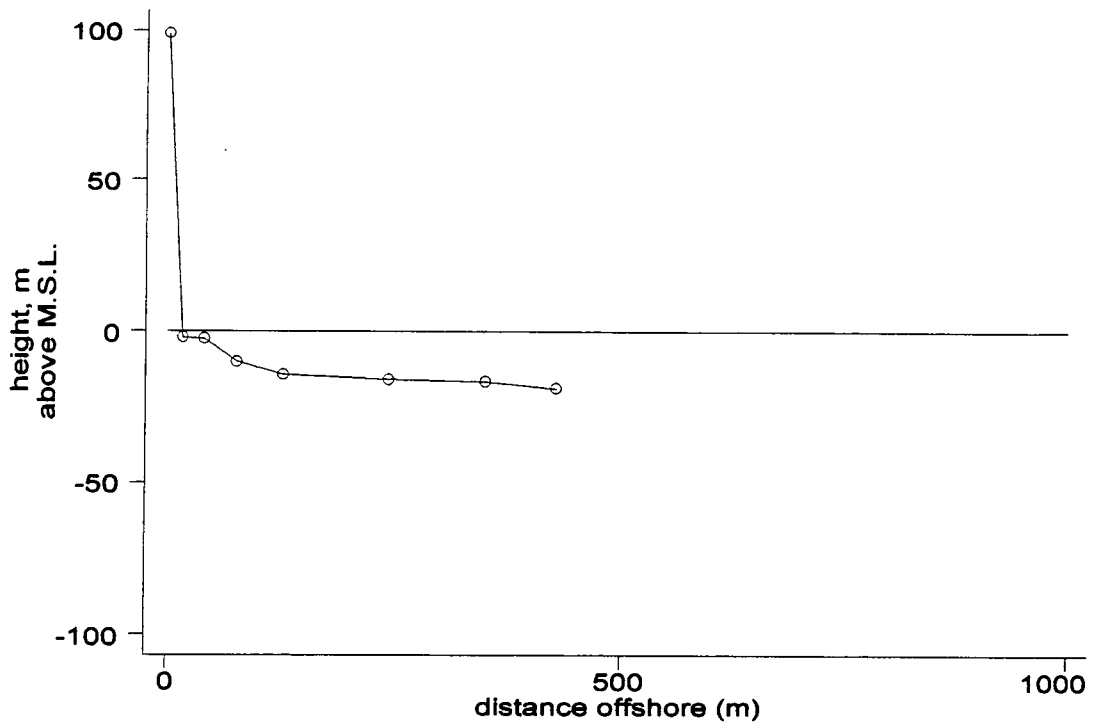


Figure 6.16: Profile of the sea floor offshore from Pondfield.

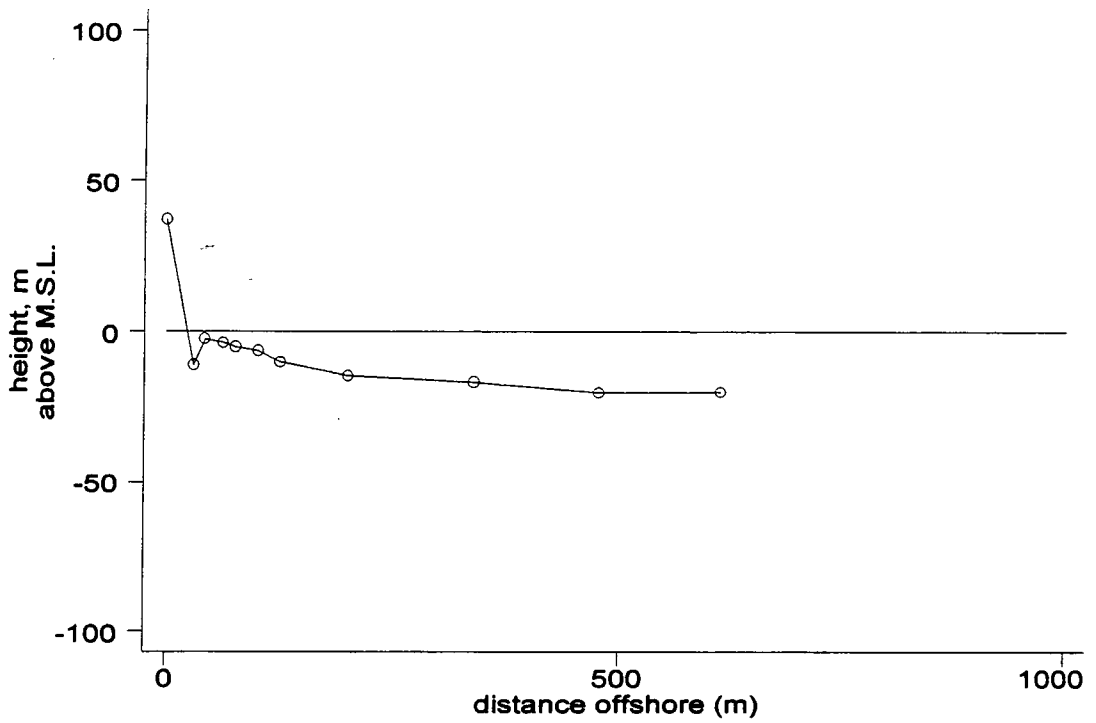


Figure 6.17: Profile of the sea floor offshore from Bacon Hole.

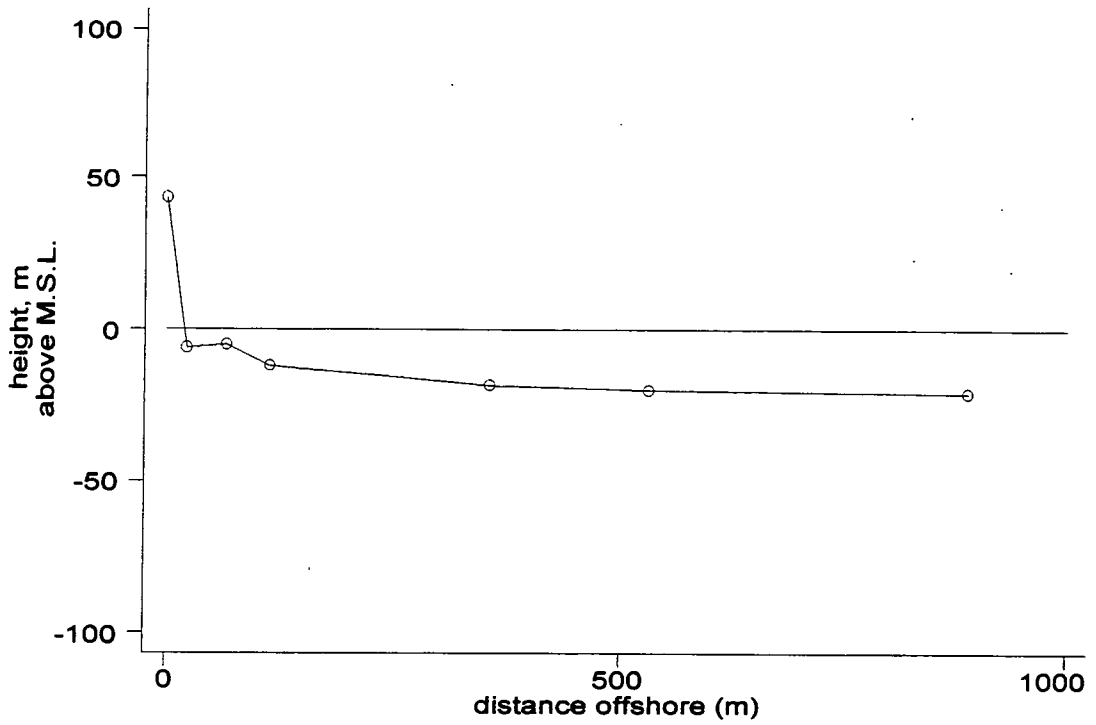


Figure 6.18: Profile of the sea floor offshore from Fossil Forest.

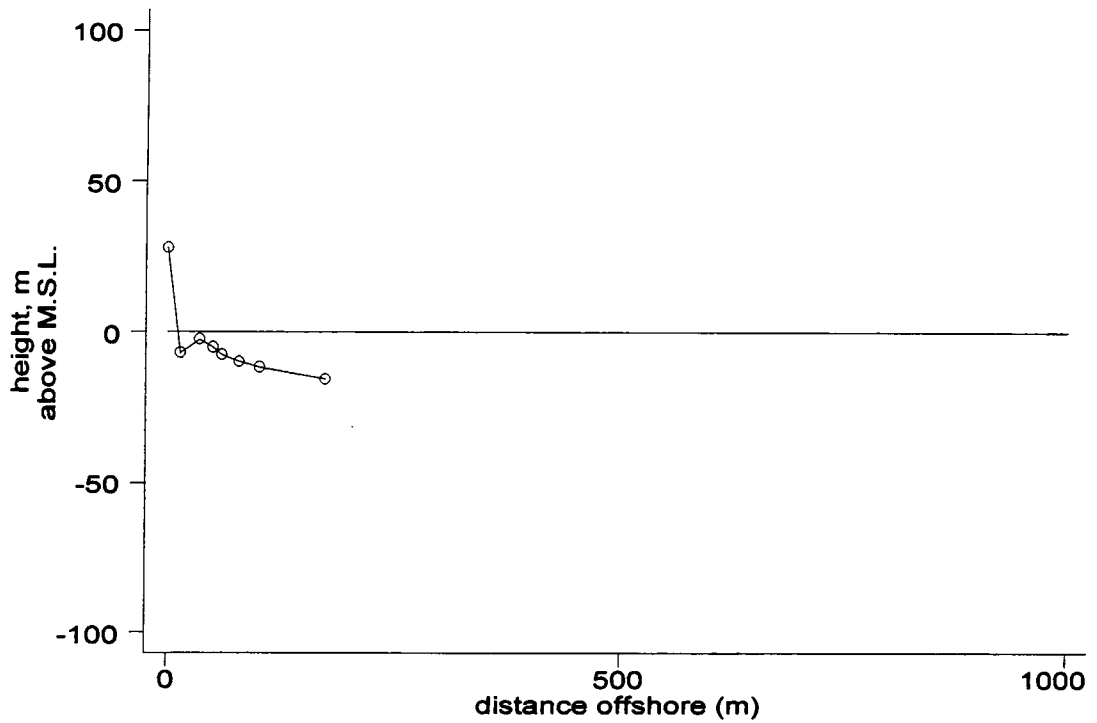


Figure 6.19: Profile of the sea floor offshore from Potter's Hole.

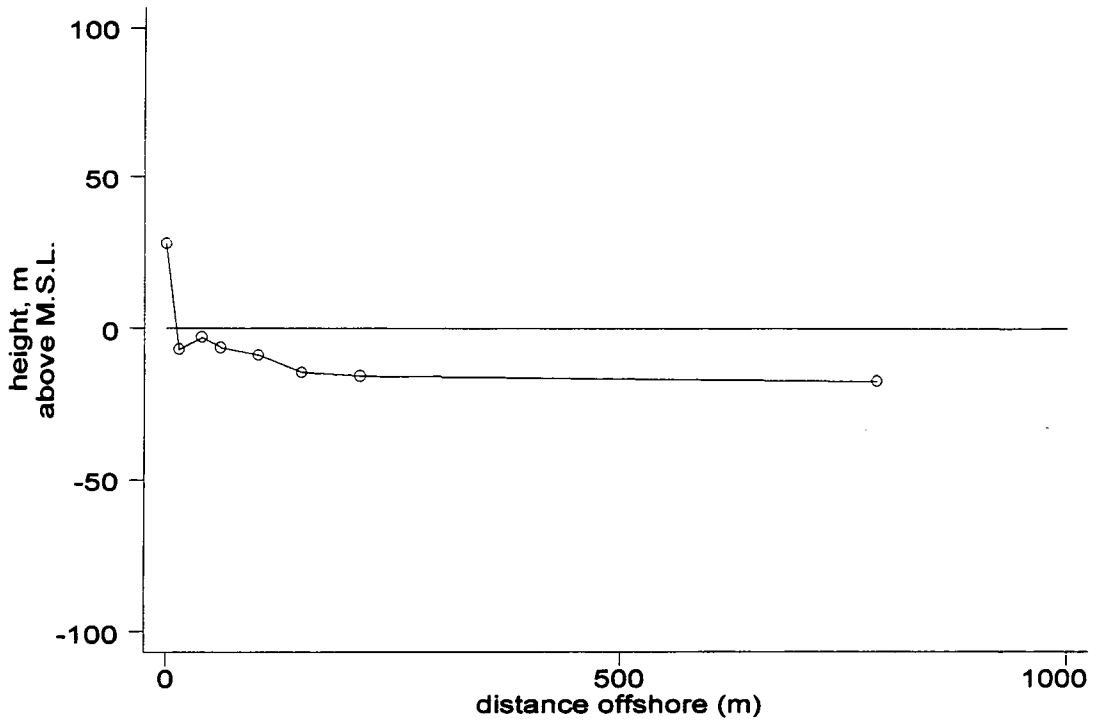


Figure 6.20: Profile of the sea floor offshore from Lulworth Cove.

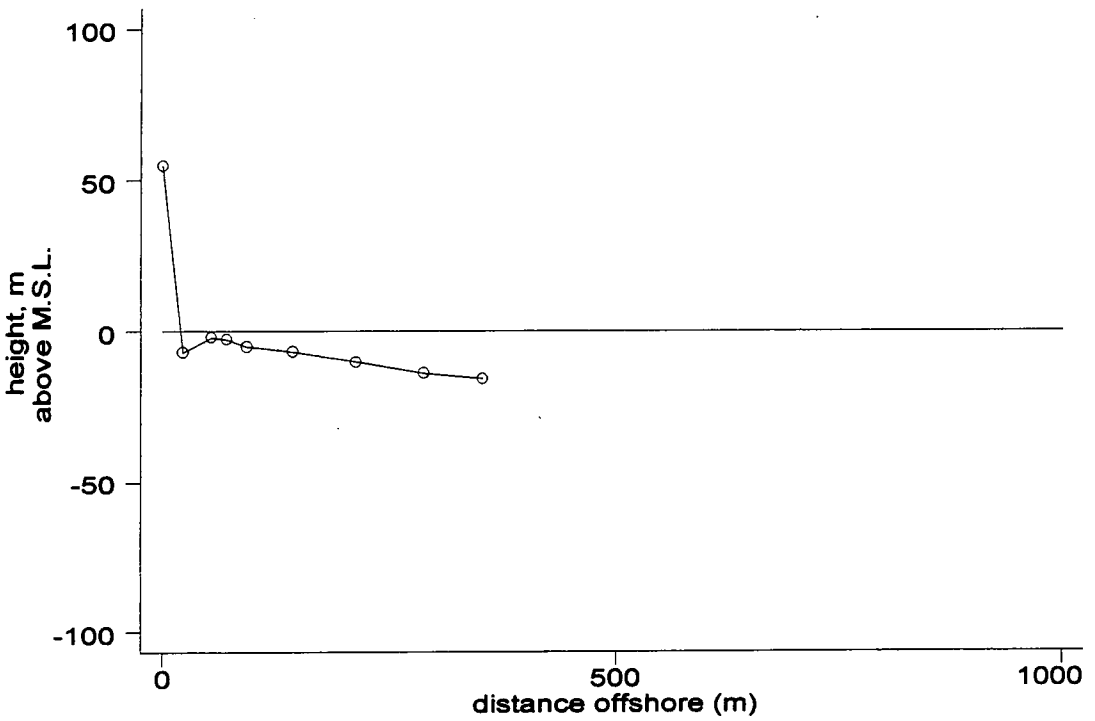


Figure 6.21: Profile of the sea floor offshore from Stair Hole.

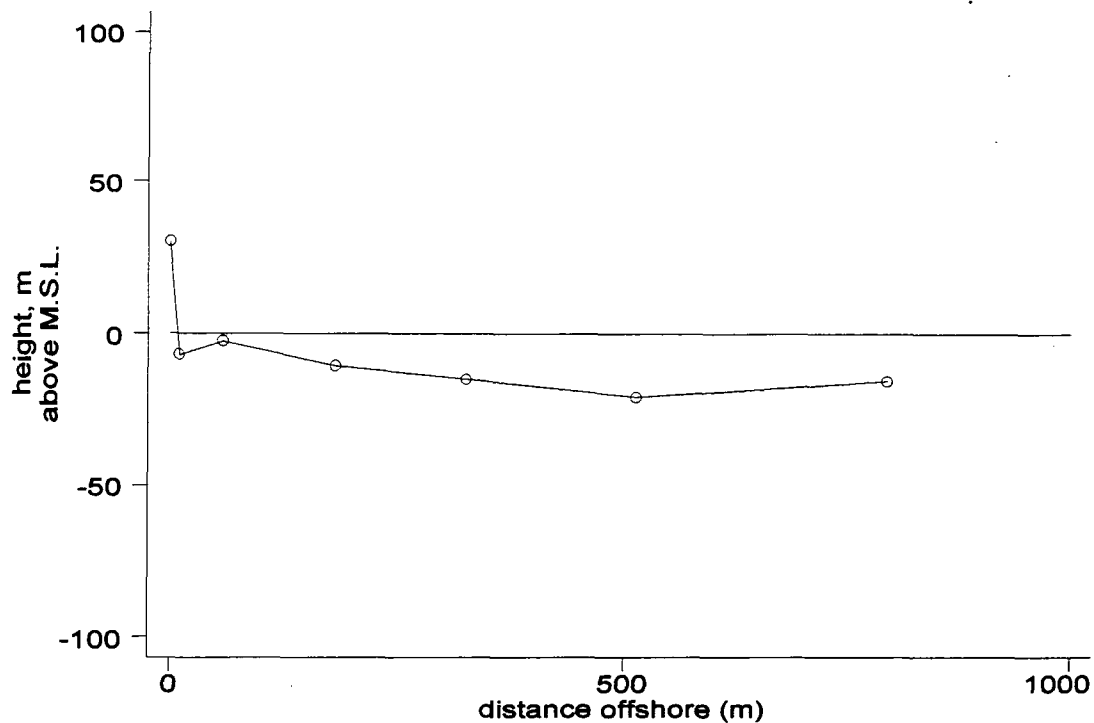


Figure 6.22: Profile of the sea floor offshore from Durdle Door.

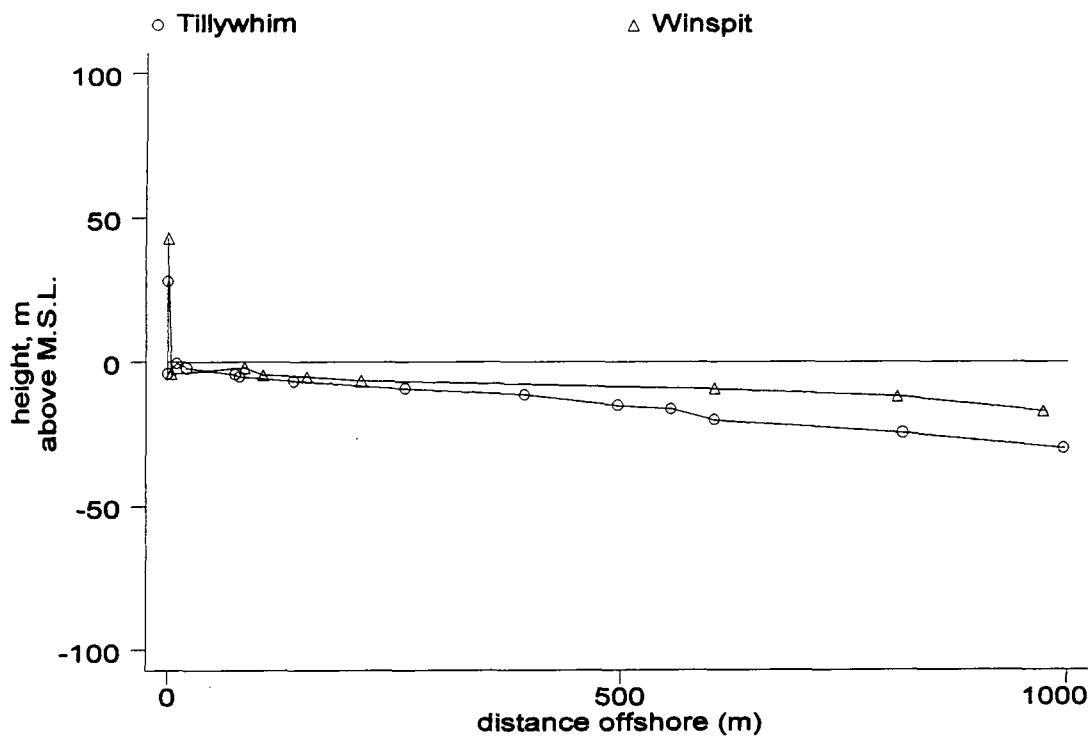


Figure 6.23: Offshore profiles for the sites at the eastern end of the Isle of Purbeck.

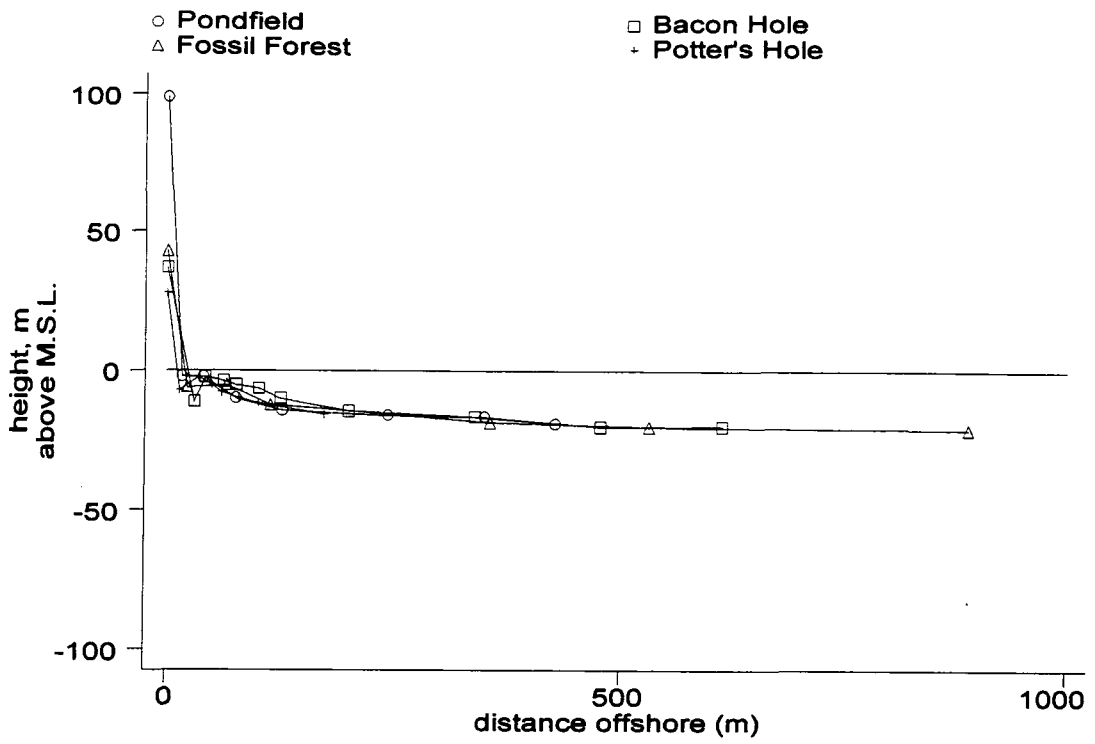


Figure 6.24: Offshore profiles for the sites in the central part of the Isle of Purbeck.

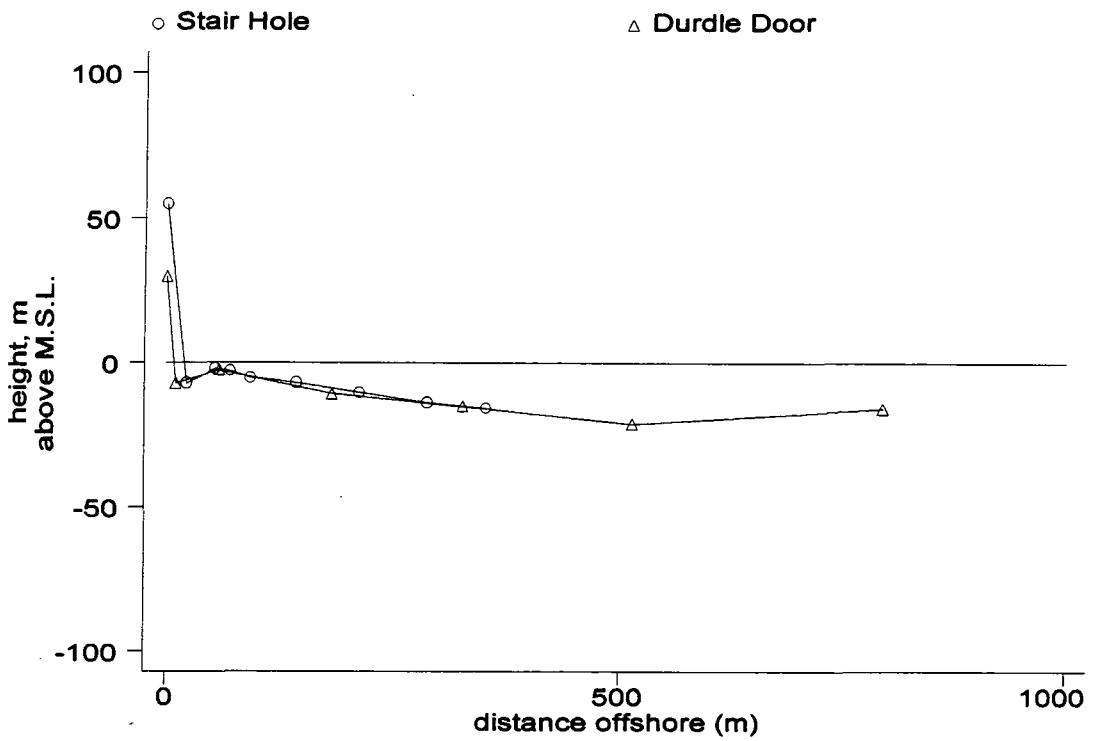


Figure 6.25: Offshore profiles for the sites at the western end of the Isle of Purbeck.

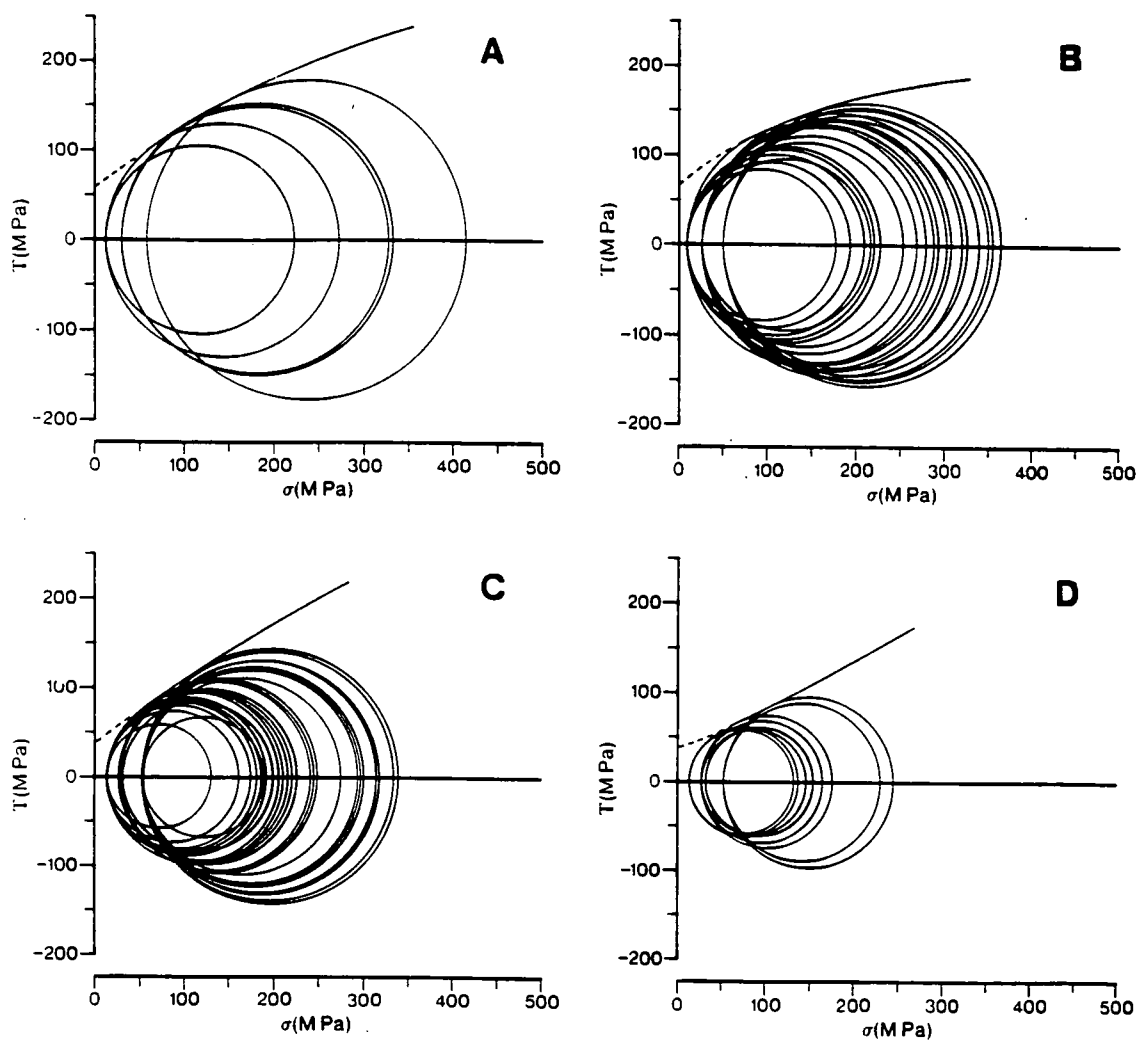


Figure 6.26: Mohr's circles of stress from tests conducted at confining pressures (σ_3) of 15 MPa, 30 MPa and 60 MPa. A: Durdle Door, B: Stair Hole, Lulworth Cove and Worbarrow Tout, C: Fossil Forest, Bacon Hole, Pondfield, Seacombe and Tillywhim, D: Winspit. From Allison, 1989.

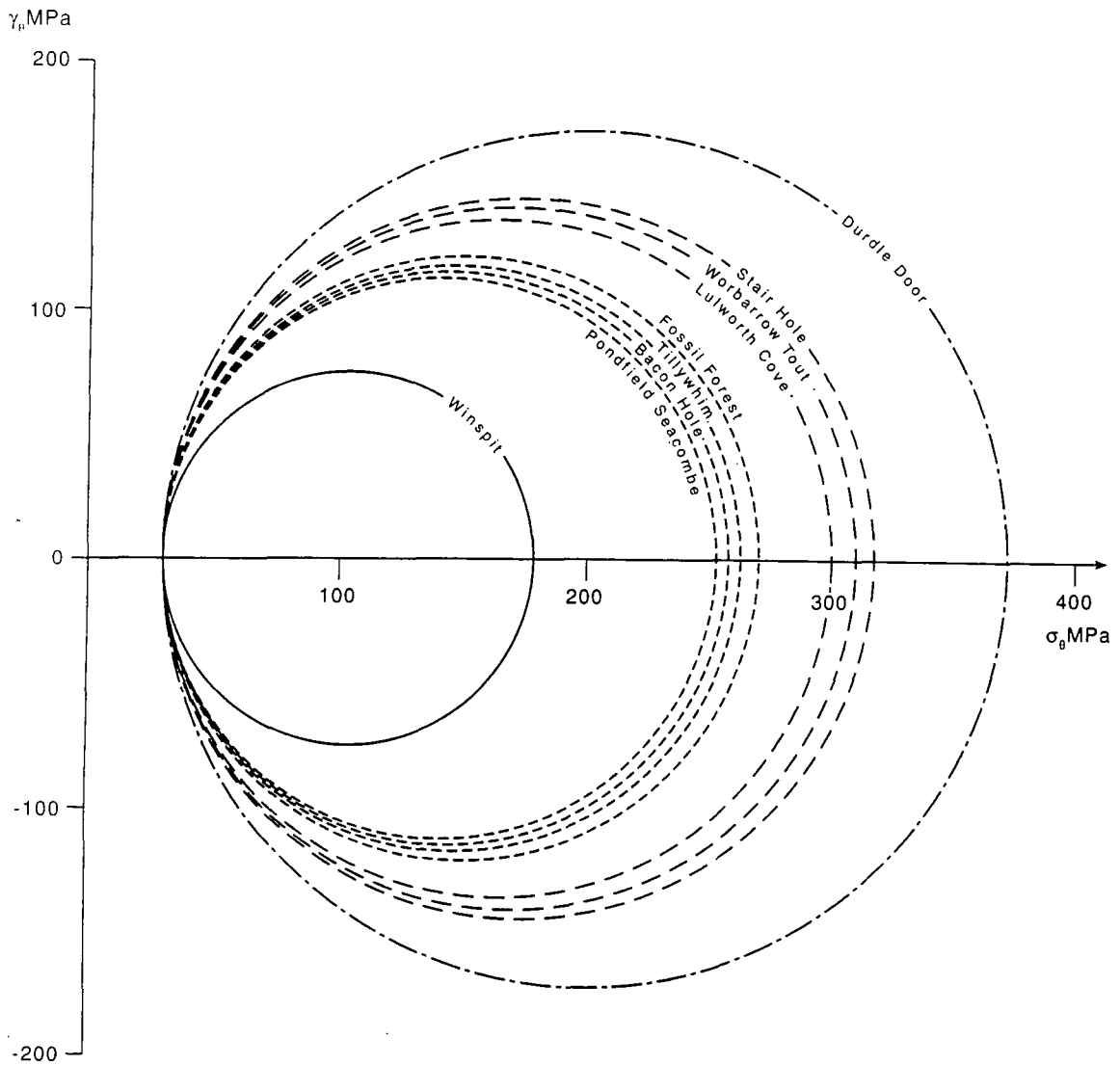


Figure 6.27: Changes in rock strength for the Portland Limestone along the Isle of Purbeck coast.

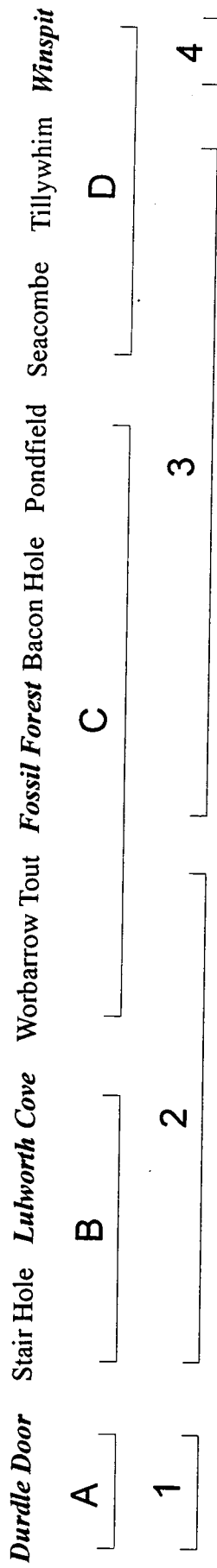


Figure 6.27: Groups of sites with similar geotechnical characteristics. The sites chosen for modelling are indicated by a bold / italic font. Depending upon the dip of the bedding, sites are split into the groups of A, B, C and D: Group A has bedding that dips at 50 degrees, group B at 30 degrees, Group C at 20 degrees and Group D has horizontal bedding. Based upon an intact rock strength control, sites are split into the groups of 1, 2, 3, and 4: Group 1 has a yield stress of 373 MPa, group 2 between 299 and 317 MPa, group 3 between 255 and 271 MPa and group 4 of 188 MPa.

JOB TITLE : Figure 6.29: Durdle Door sea arch at equilibrium

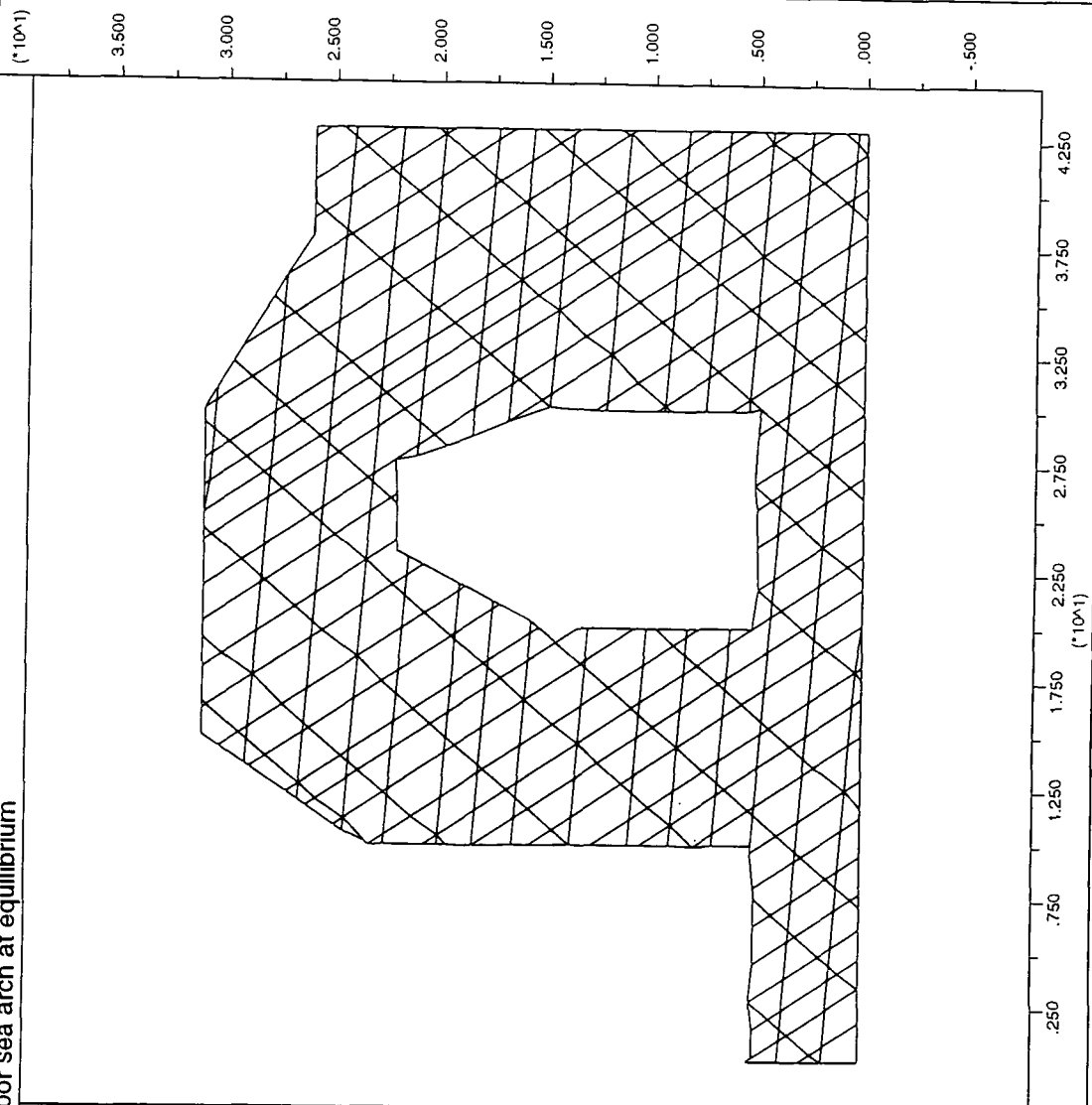
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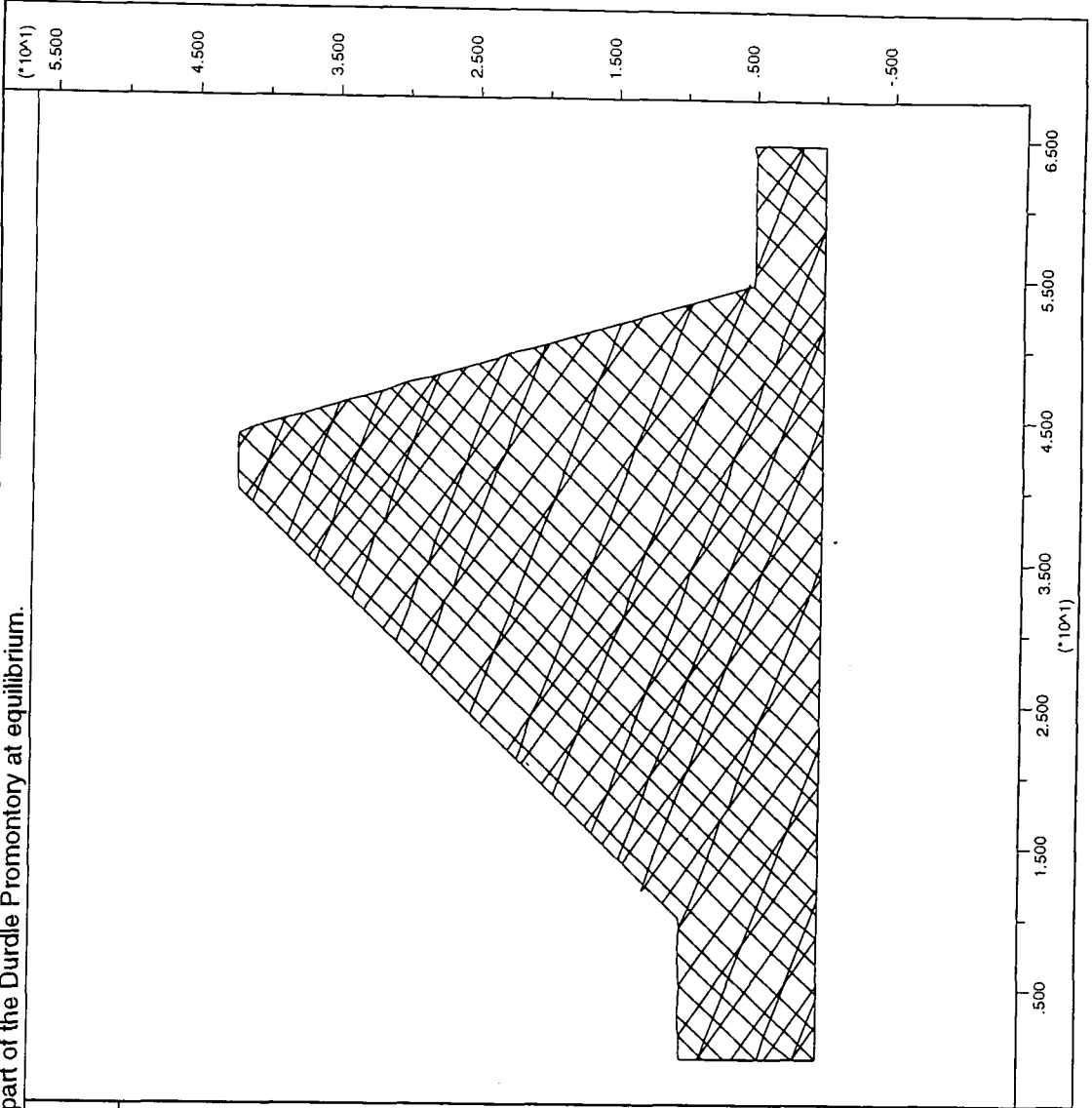
JOB TITLE : Figure 6.30: Eastern part of the Durdle Promontory at equilibrium.

UDEC (Version 2.00)

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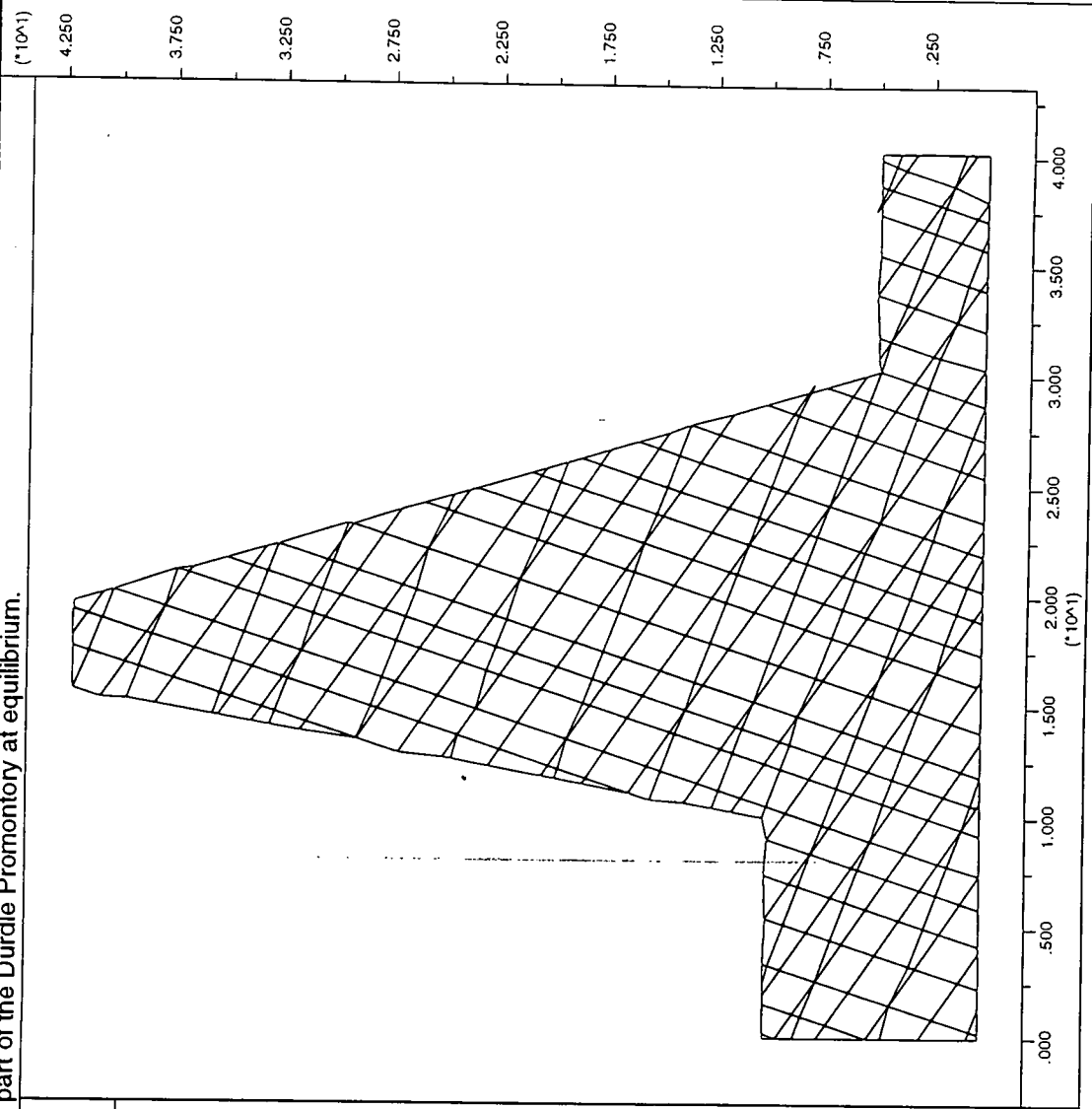
JOB TITLE : Figure 6.31: Western part of the Durdle Promontory at equilibrium.

UDEC (Version 2.00)

LEGEND

1/04/1980 11:05
cycle 6000
time 1.462E+00 sec
block plot

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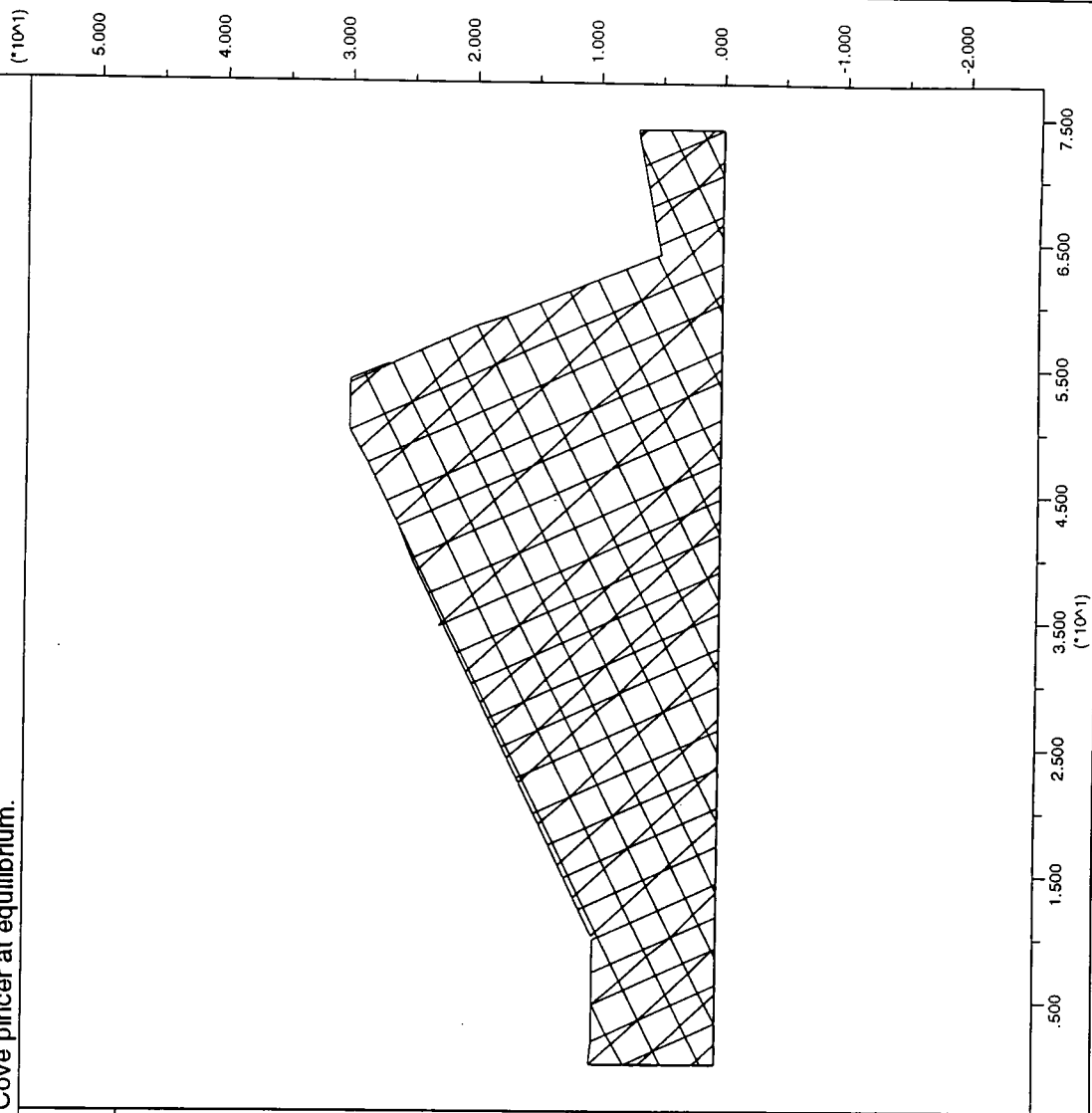
JOB TITLE: Figure 6.32: Lulworth Cove pincer at equilibrium.

UDEC (Version 2.00)

LEGEND

1/04/1980 11:40
cycle 6000
time 1.174E+00 sec
block plot

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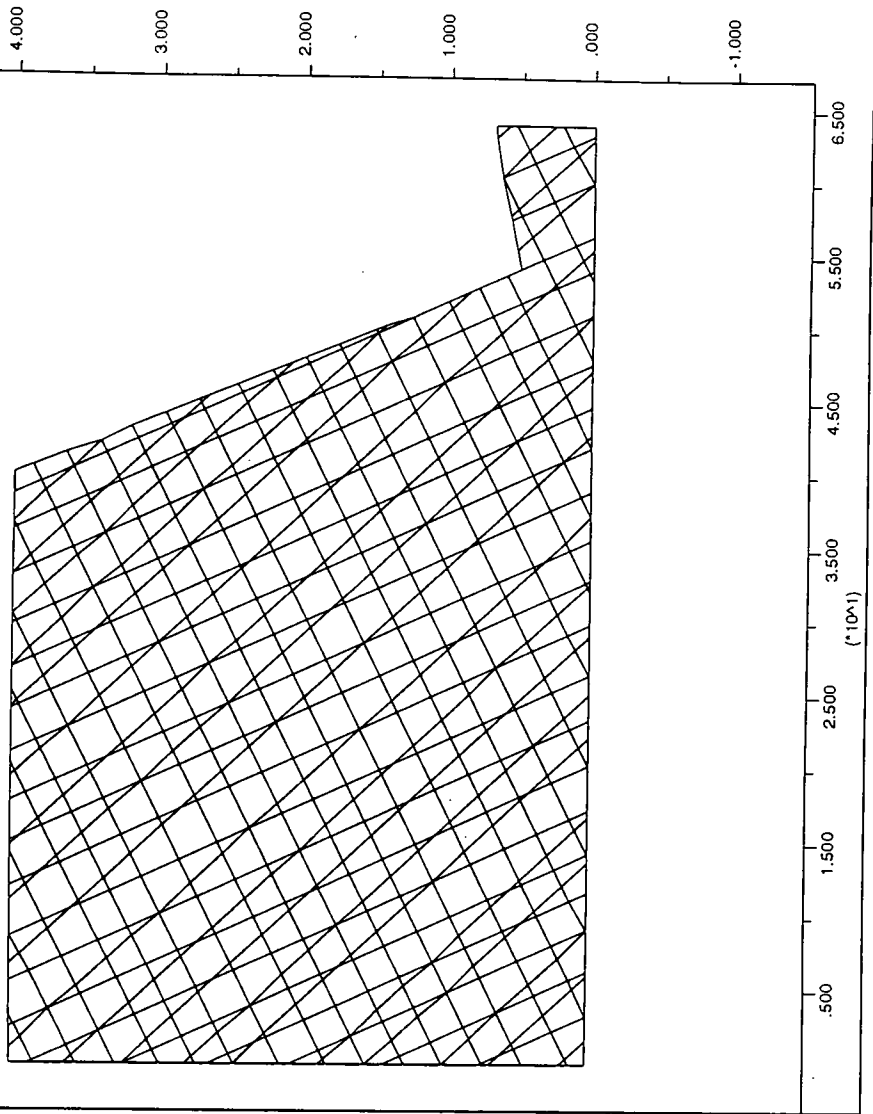


JOB TITLE : Figure 6.33: Lulworth Cove cliff at equilibrium.

UDEC (Version 2.00)

LEGEND

1/04/1980 12:14
cycle 6000
time 9.318E-01 sec
block plot



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JOB TITLE : Figure 6.34: Fossil Forest at equilibrium.

UDEC (Version 2.00)

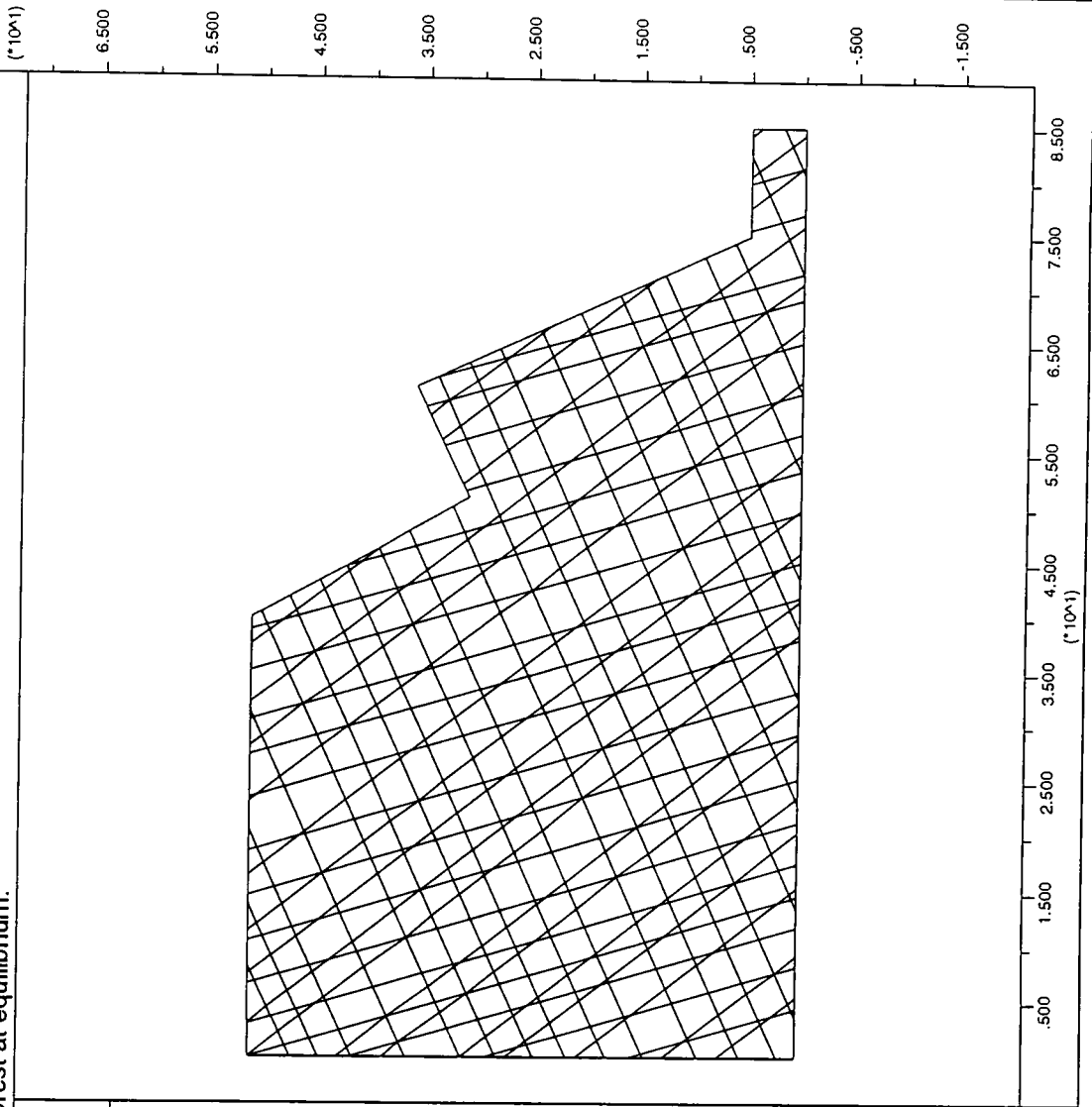
LEGEND

1/04/1980 12:18

cycle 6000

time 8.584E-01 sec

block plot



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JOB TITLE : Figure 6.35: Quarried Winspit section at equilibrium.

UDEC (Version 2.00)

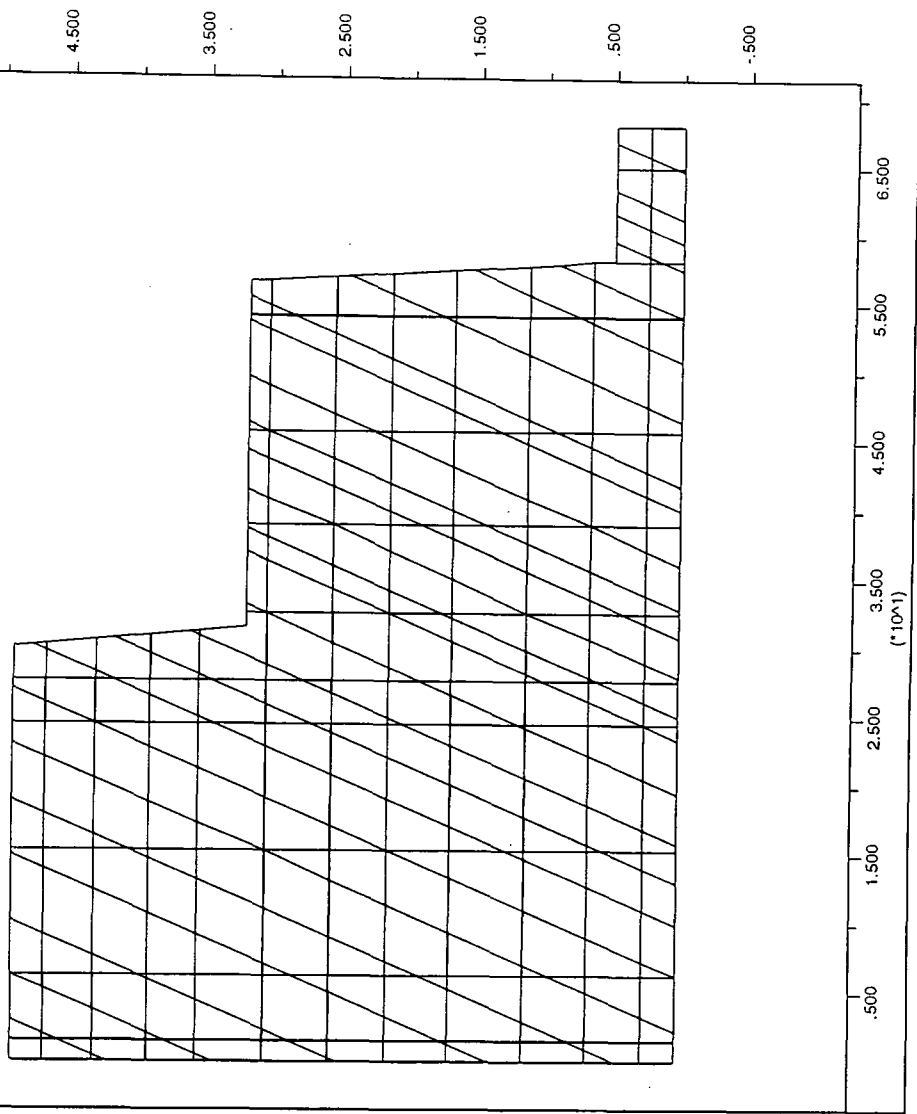
LEGEND

1/04/1980 12:20

cycle 6000

time 8.891E-01 sec

block plot



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JOB TITLE : Figure 6.36: Winspit cliff at equilibrium.

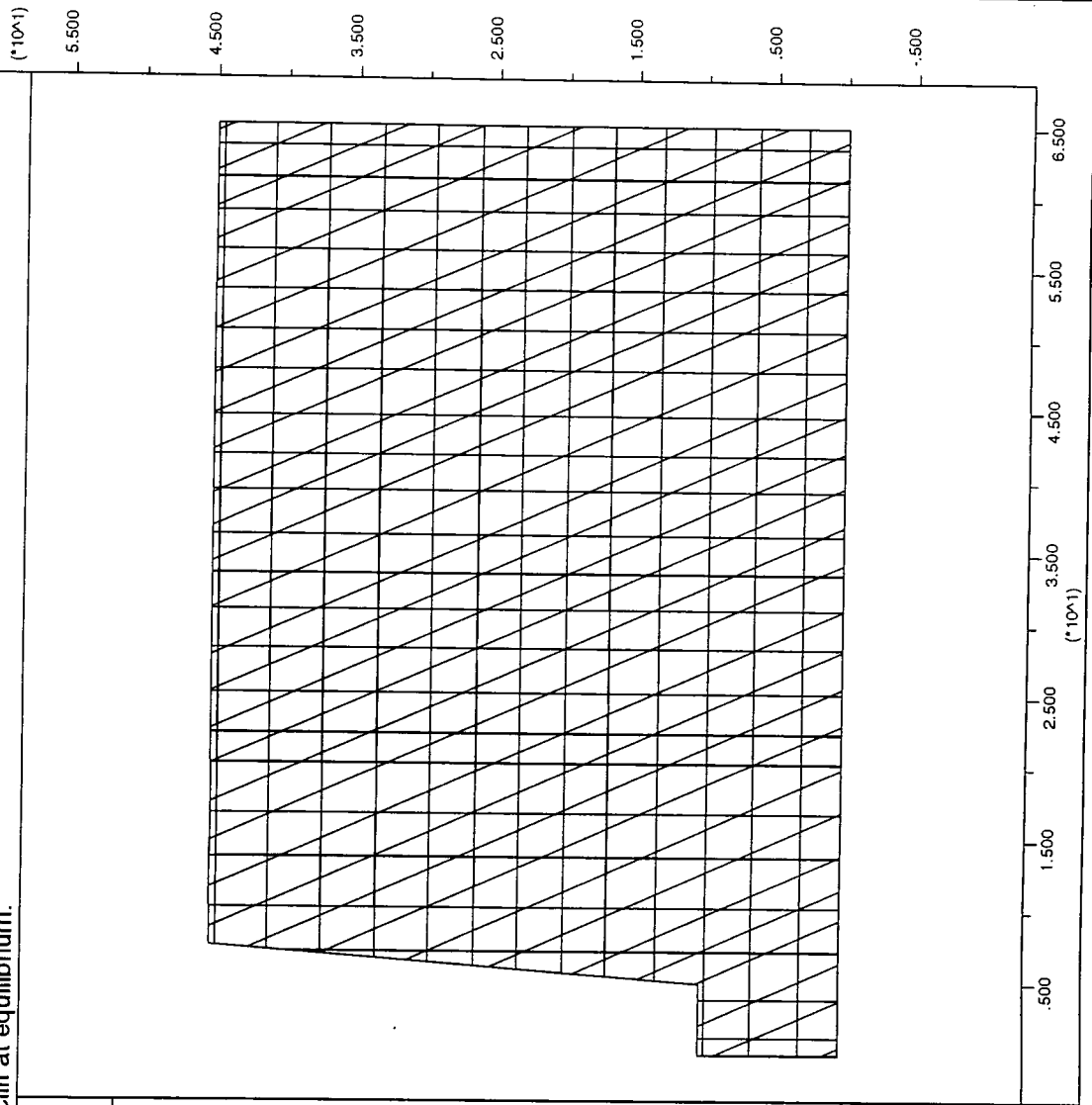
UDEC (Version 2.00)

LEGEND

1/04/1980 13:01
cycle 6000
time 9.537E-02 sec

block plot

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JOB TITLE : Figure 6.37: Forces for the quarried Winspit section at equilibrium.

UDEC (Version 2.00)

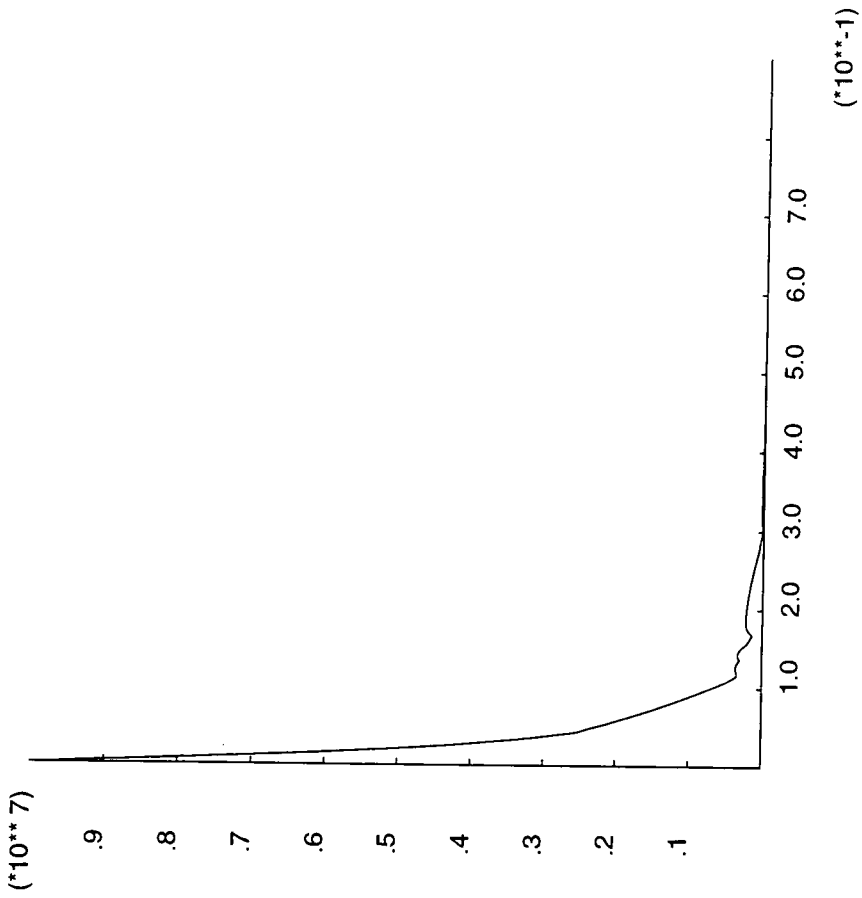
LEGEND

1/04/1980 14:44

cycle 6000

time 8.891E-01 sec

5.37E+00 <hist 3> 9.60E+06



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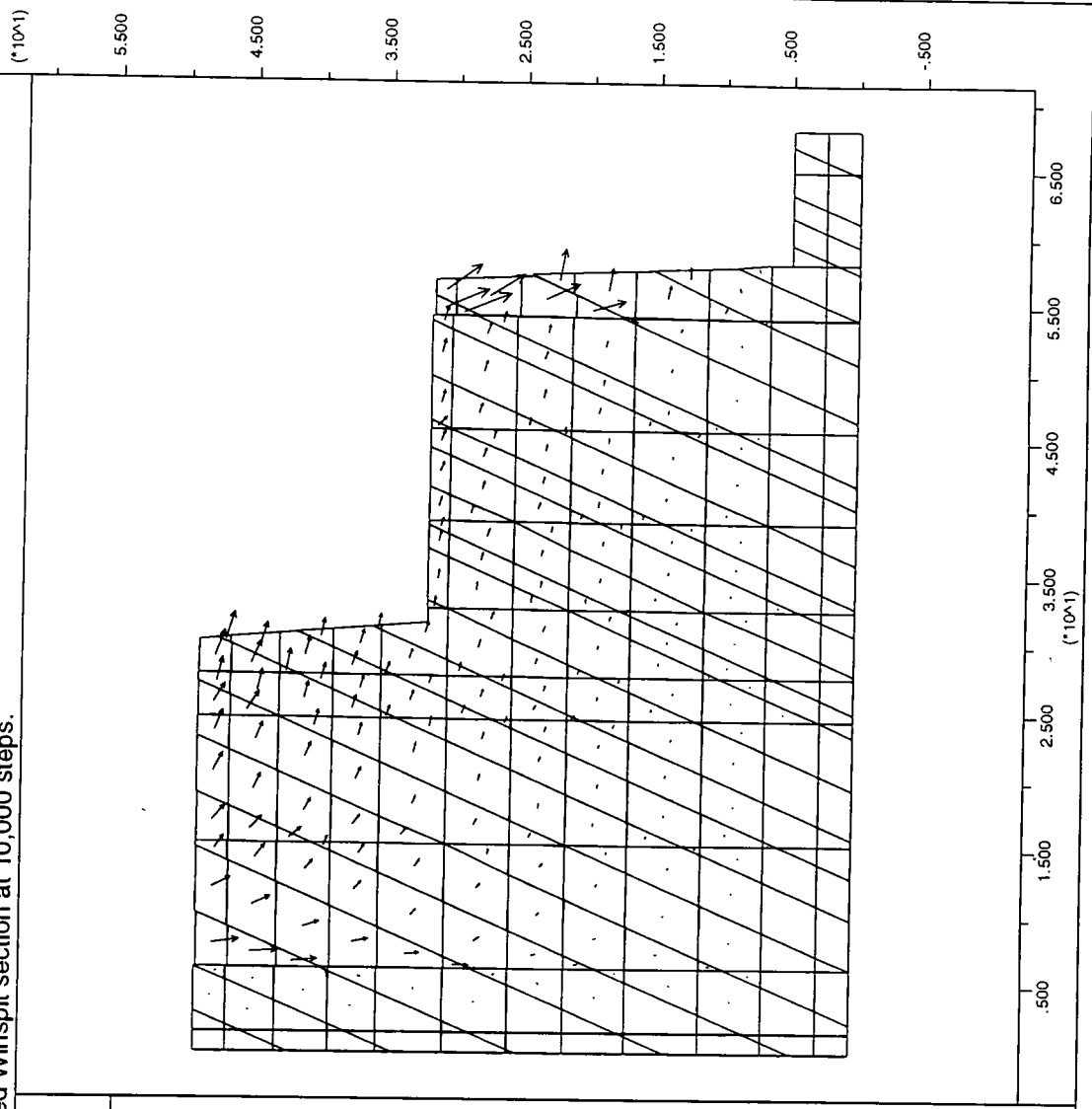
JOB TITLE : Figure 6.38a: Quarried Winspit section at 10,000 steps.

UDEC (Version 2.00)

LEGEND

1/04/1980 14:45
cycle 10000
time 1.482E+00 sec

block plot
velocity vectors
maximum = 1.262E+00



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JOB TITLE : Figure 6.38b: Quarried Winspit section at 30,000 steps.

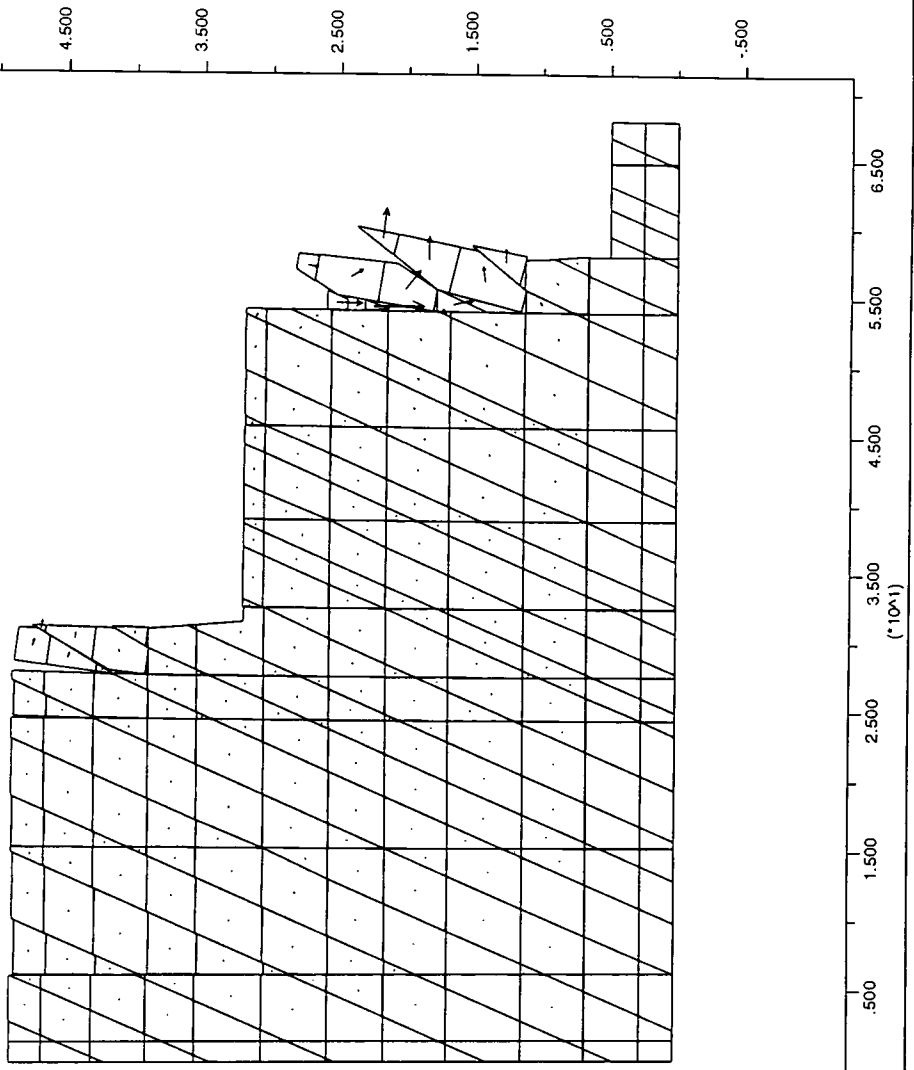
UDEC (Version 2.00)

LEGEND

1/04/1980 14:46
cycle 30000
time 4.550E+00 sec

block plot
velocity vectors
maximum = 5.795E-01

0 2E 0



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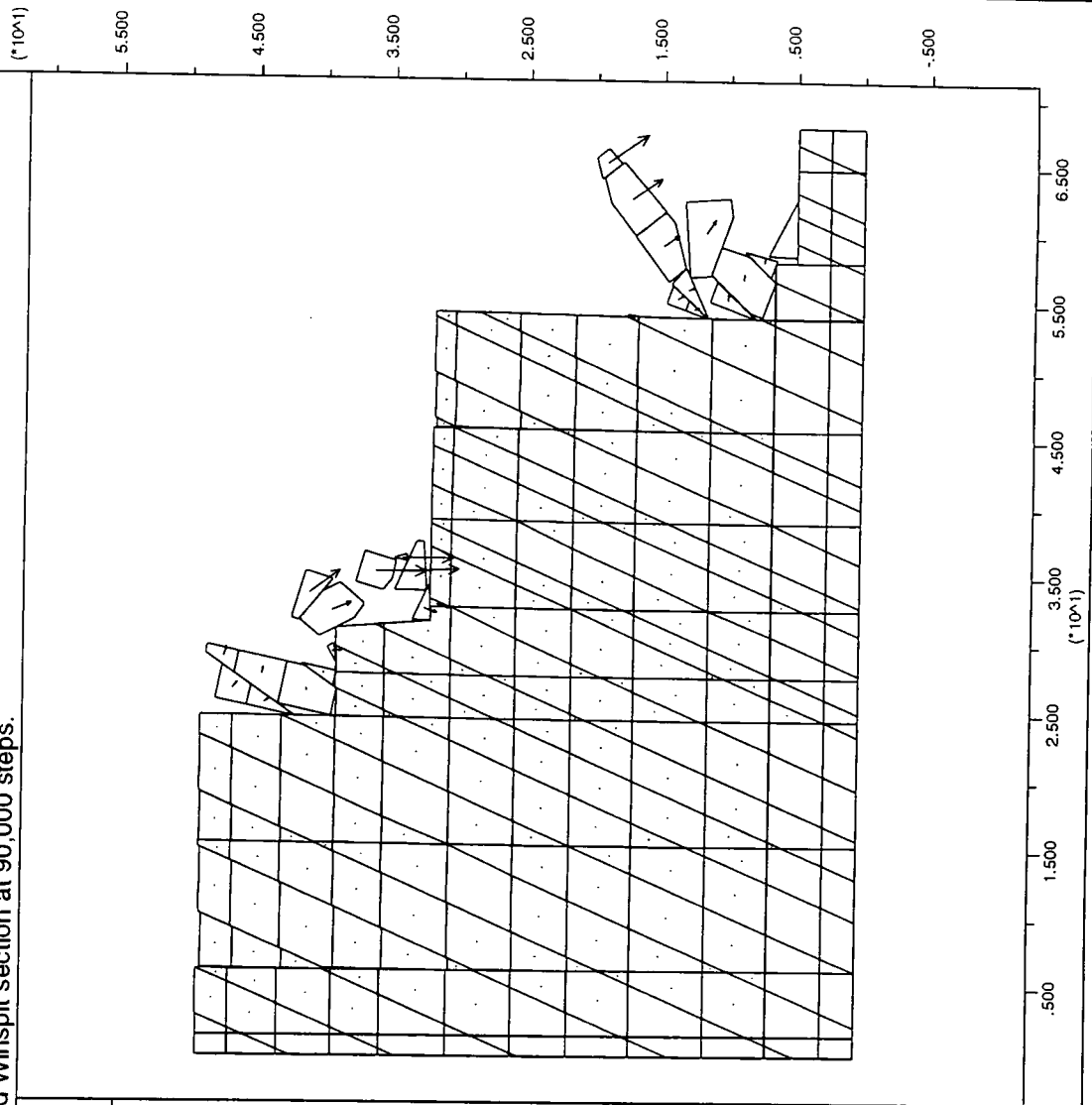
JOB TITLE : Figure 6.38c: Quarried Winspit section at 90,000 steps.

UDEEC (Version 2.00)

LEGEND

1/04/1980 14:47
cycle 90000
time 1.378E+01 sec

block plot
velocity vectors
maximum = 3.827E+00



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JOB TITLE : Figure 6.38d: Quarried Winspit section at 150,000 steps.

UDEC (Version 2.00)

LEGEND

1/04/1980 14:48

cycle 150000

time 2.310E+01 sec

block plot

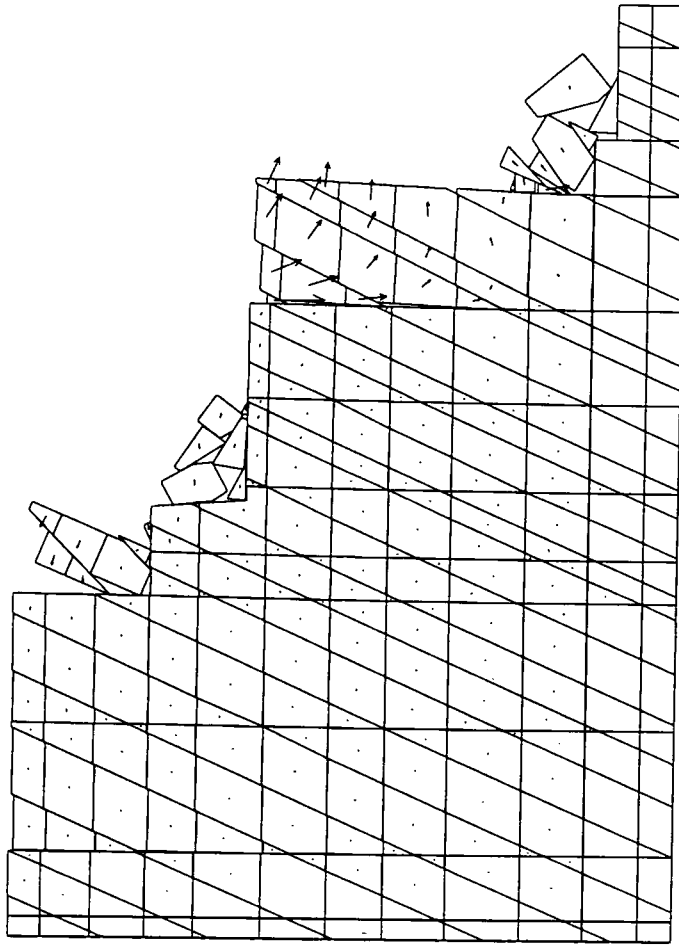
velocity vectors

maximum = 6.867E-03

|||||

0

2E-2



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JOB TITLE : Figure 6.38e: Quarried Winspit section at 190,000 steps.

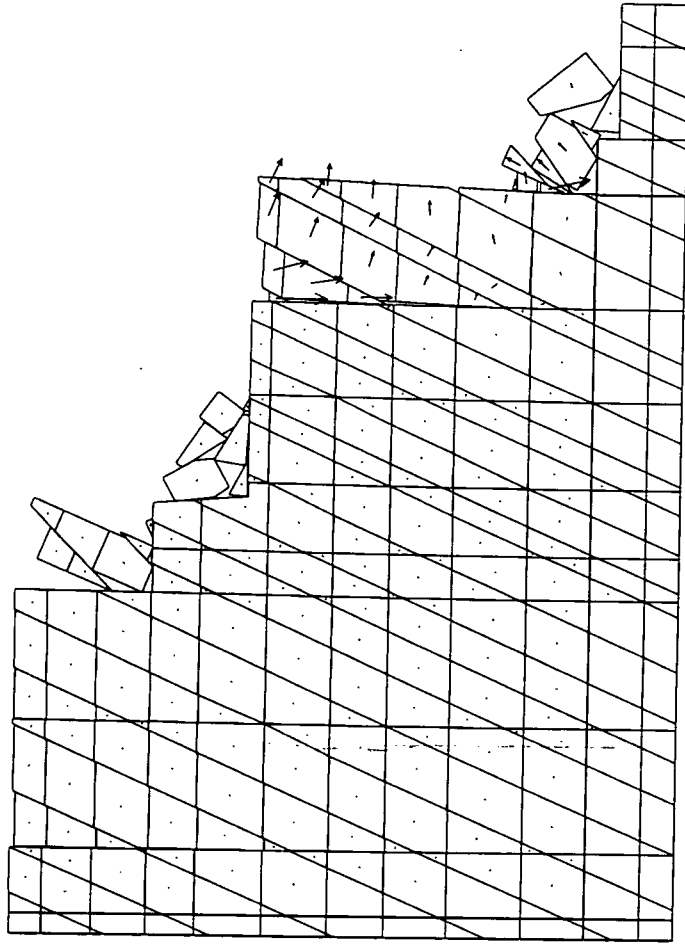
UDEEC (Version 2.00)

LEGEND

1/04/1980 14:50
 cycle 190000
 time 2.934E+01 sec

block plot
 velocity vectors
 maximum = 5.802E-05

0  2E-4



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JOB TITLE : Figure 6.38f: Quarried Winspit section at 390,000 steps.

UDEC (Version 2.00)

LEGEND

1/04/1980 14:51

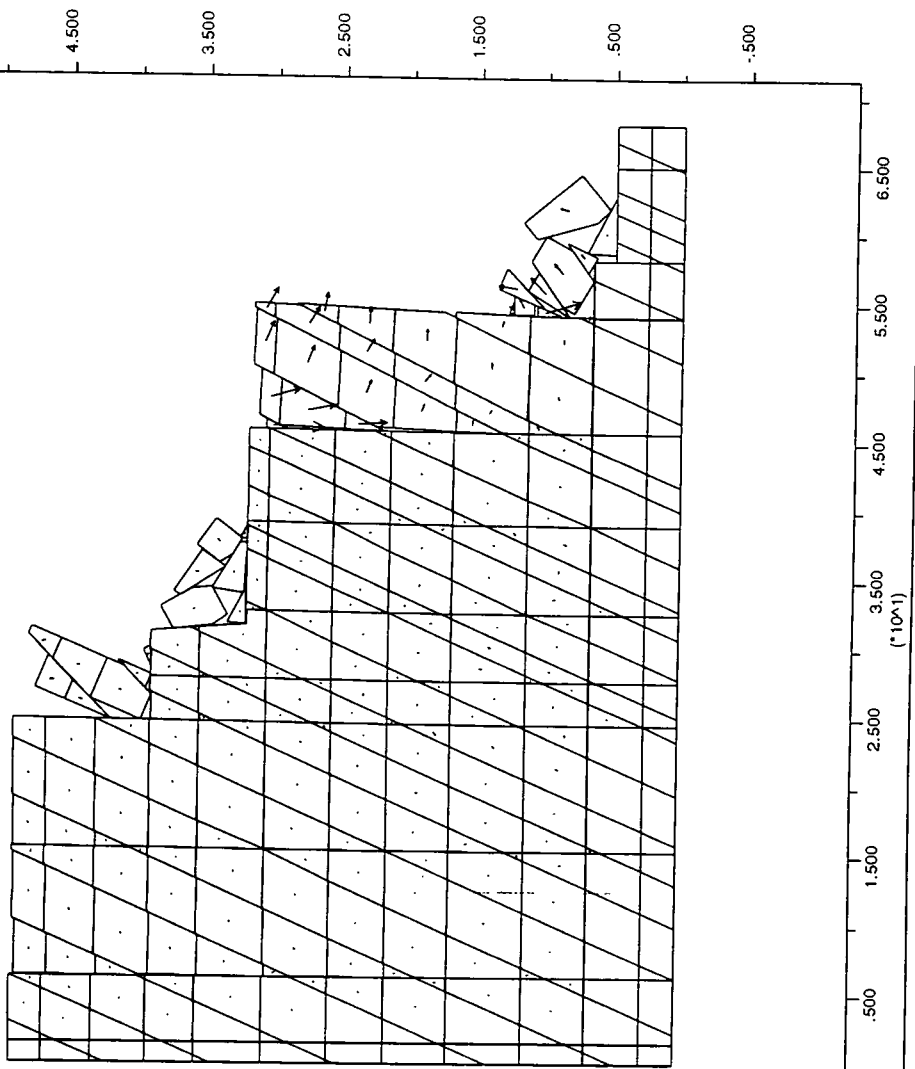
cycle 390000

time 6.053E+01 sec

block plot

velocity vectors

maximum = 1.749E-05



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JOB TITLE : Figure 6.39: Forces for the quarried Winspit section at 390,000 steps.

UDEC (Version 2.00)

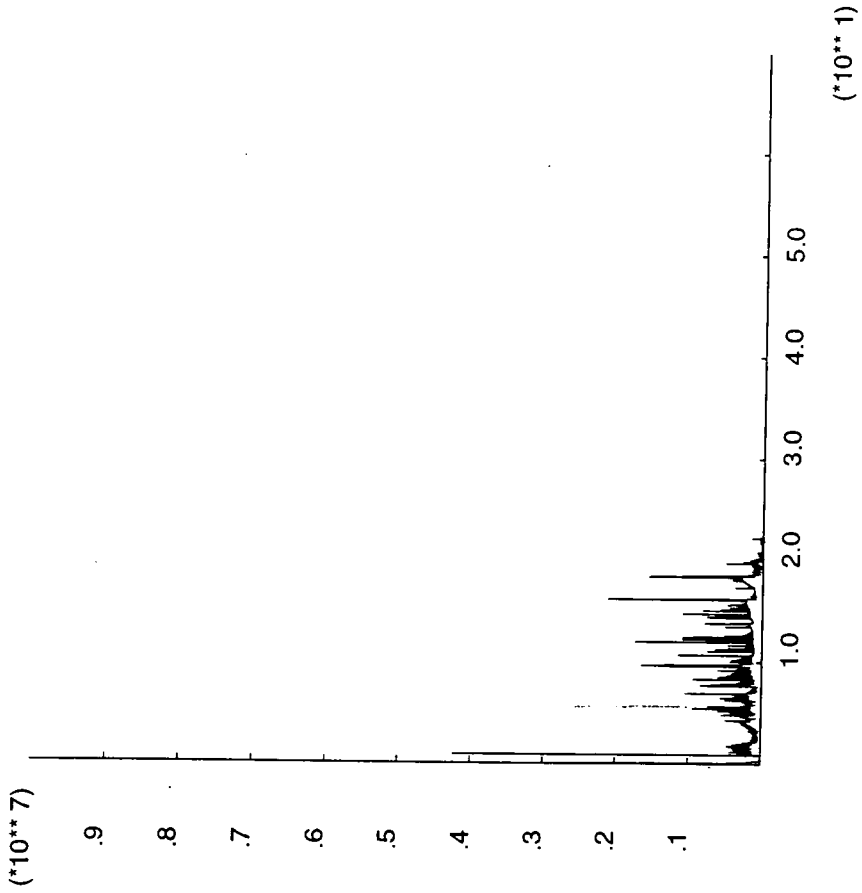
LEGEND

1/04/1980 14:52

cycle 390000

time 6.053E+01 sec

4.69E-01 <hist 3> 9.60E+06 ———



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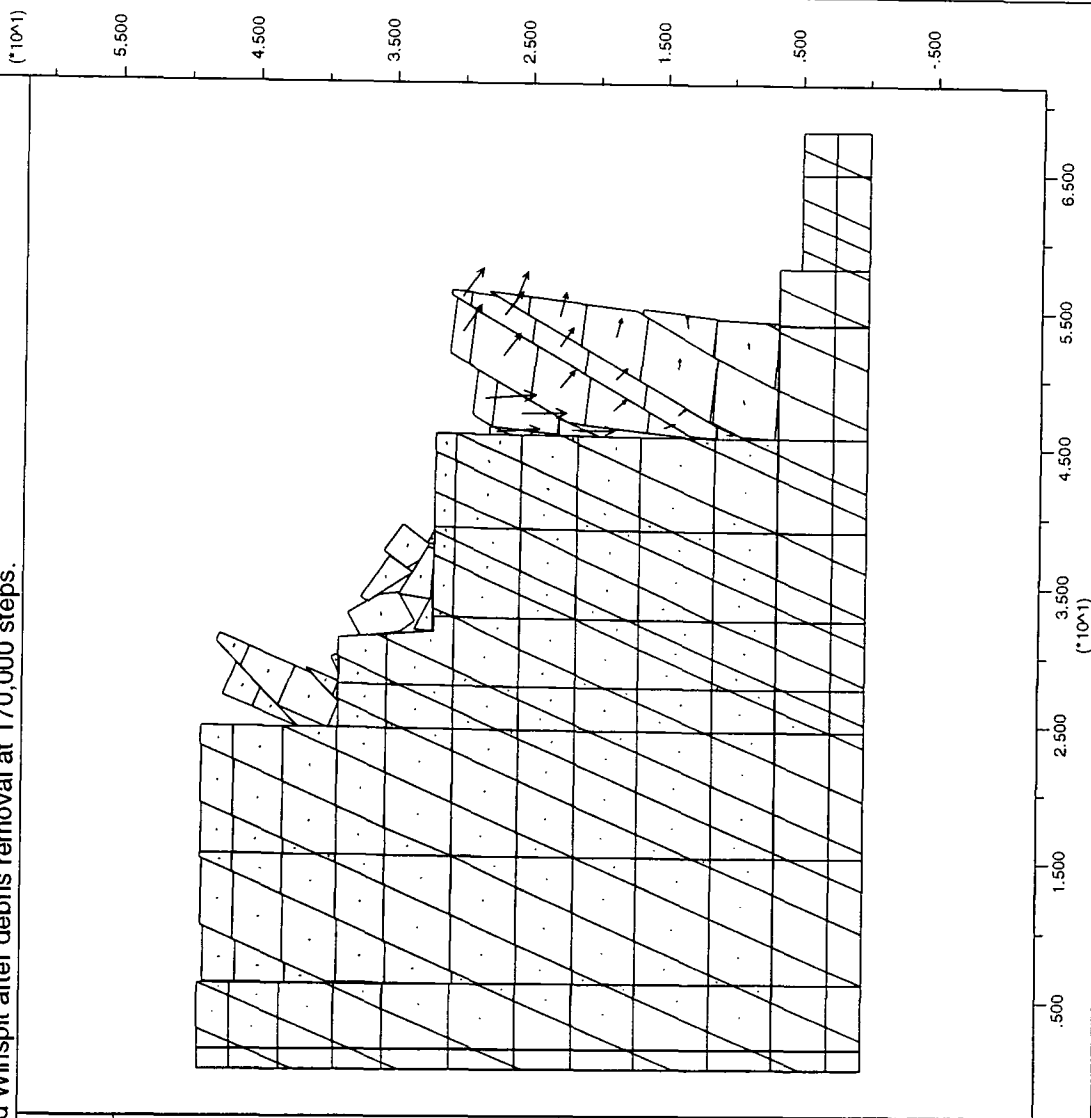
JOB TITLE : Figure 6.40a: Quarried Winspit after debris removal at 170,000 steps.

UDEC (Version 2.00)

LEGEND

1/04/1980 15:05
cycle 170000
time 2.621E+01 sec

block plot
velocity vectors
maximum = 2.374E-01



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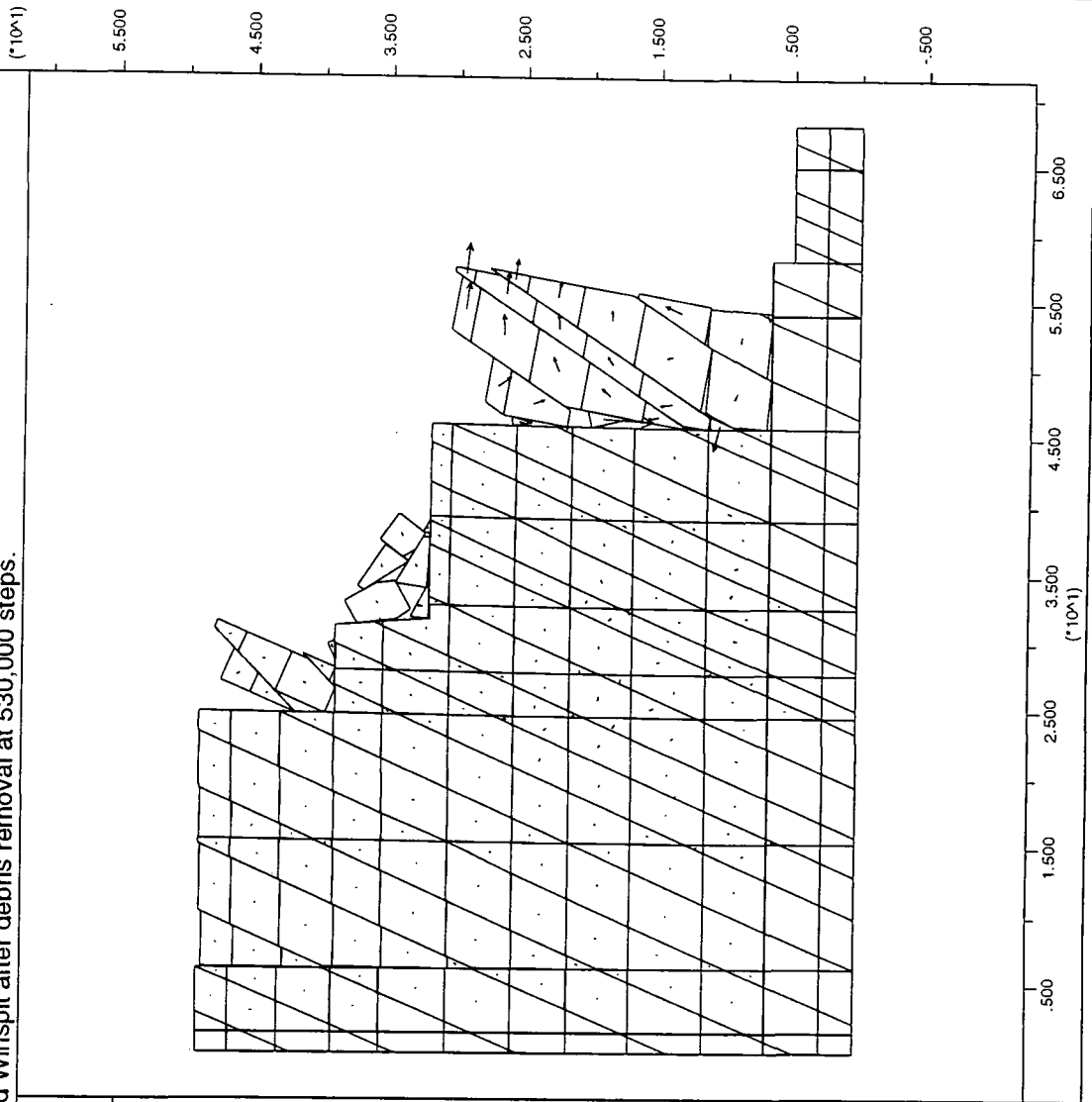
JOB TITLE : Figure 6.40b: Quarried Winspit after debris removal at 530,000 steps.

UDEC (Version 2.00)

LEGEND

1/04/1980 15:07
cycle 530000
time 8.225E+01 sec

block plot
velocity vectors
maximum = 1.691E-05



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JOB TITLE : Figure 6.41a: Winspit cliff at 100,000 steps.

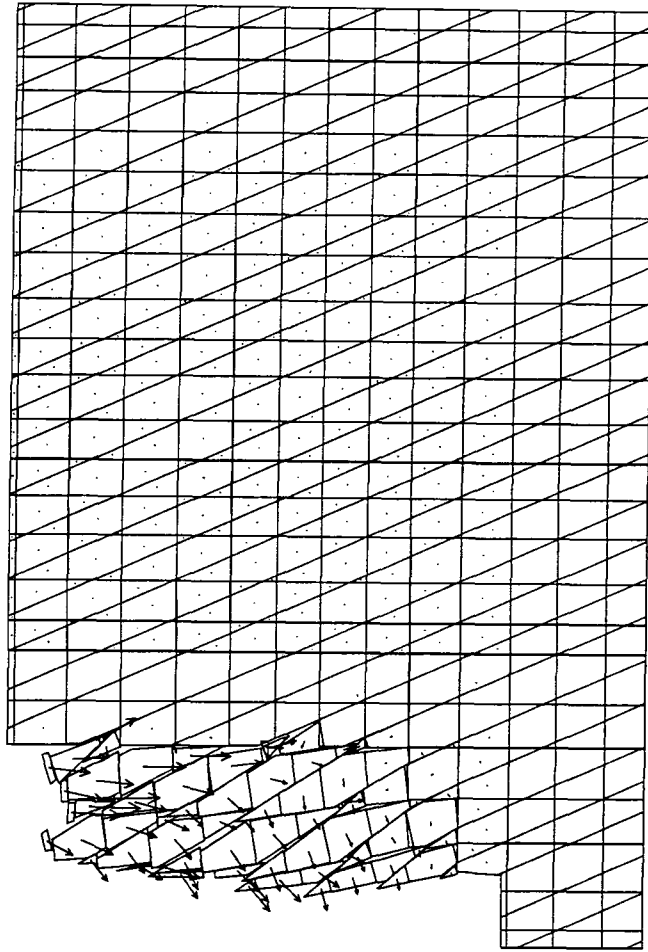
UDEC (Version 2.00)

LEGEND

1/04/1980 15:09
cycle 100000
time 1.634E+00 sec

block plot
velocity vectors
maximum = 5.477E+00

0 2E 1



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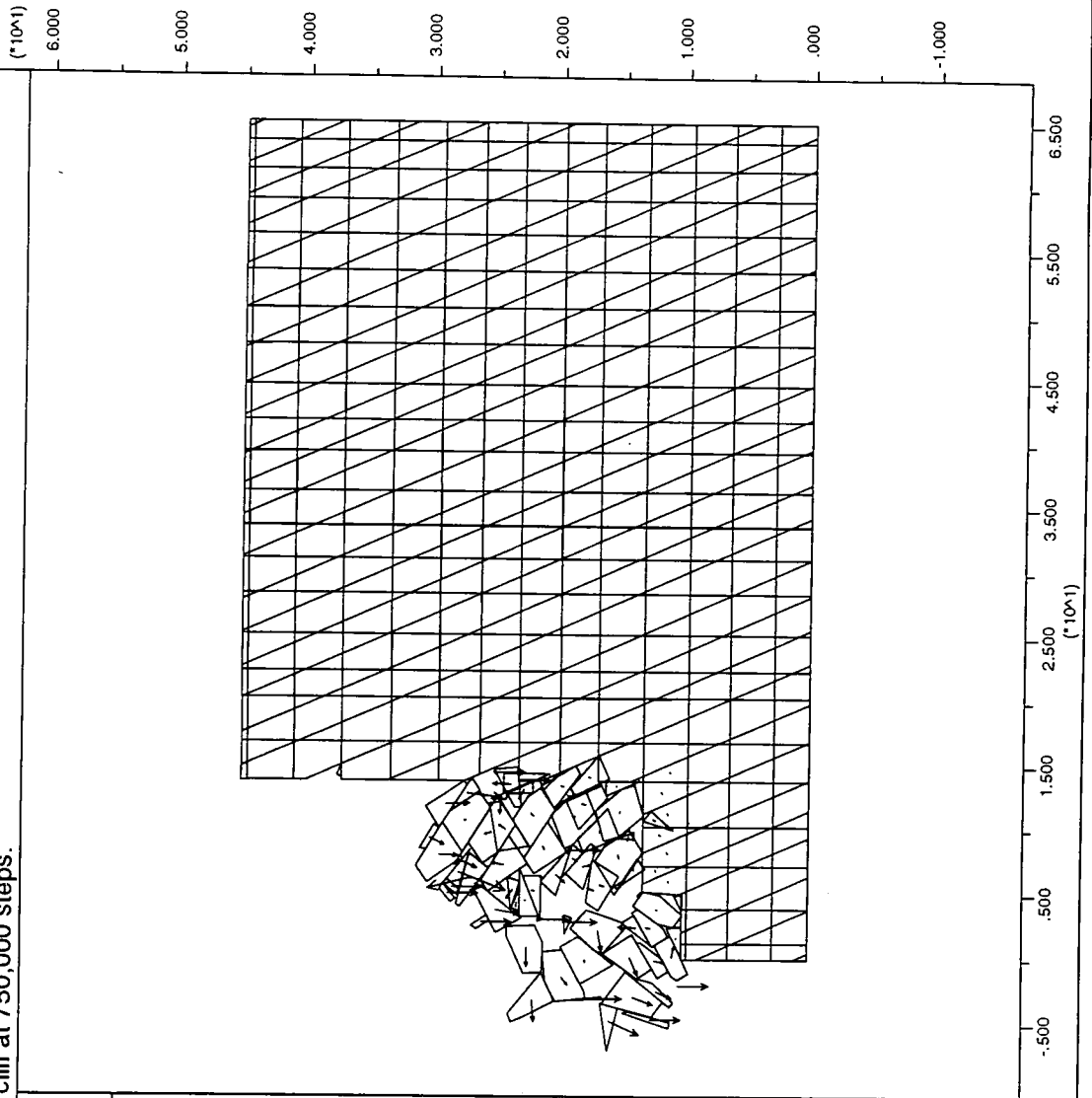
JOB TITLE : Figure 6.41b: Winspit cliff at 750,000 steps.

UDEC (Version 2.00)

LEGEND

1/04/1980 15:11
cycle 750000
time 1.227E+01 sec

block plot
velocity vectors
maximum = 1.859E-01



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JOB TITLE : Figure 6.41c: Winspit cliff at 2,400,000 steps.

UDEC (Version 2.00)

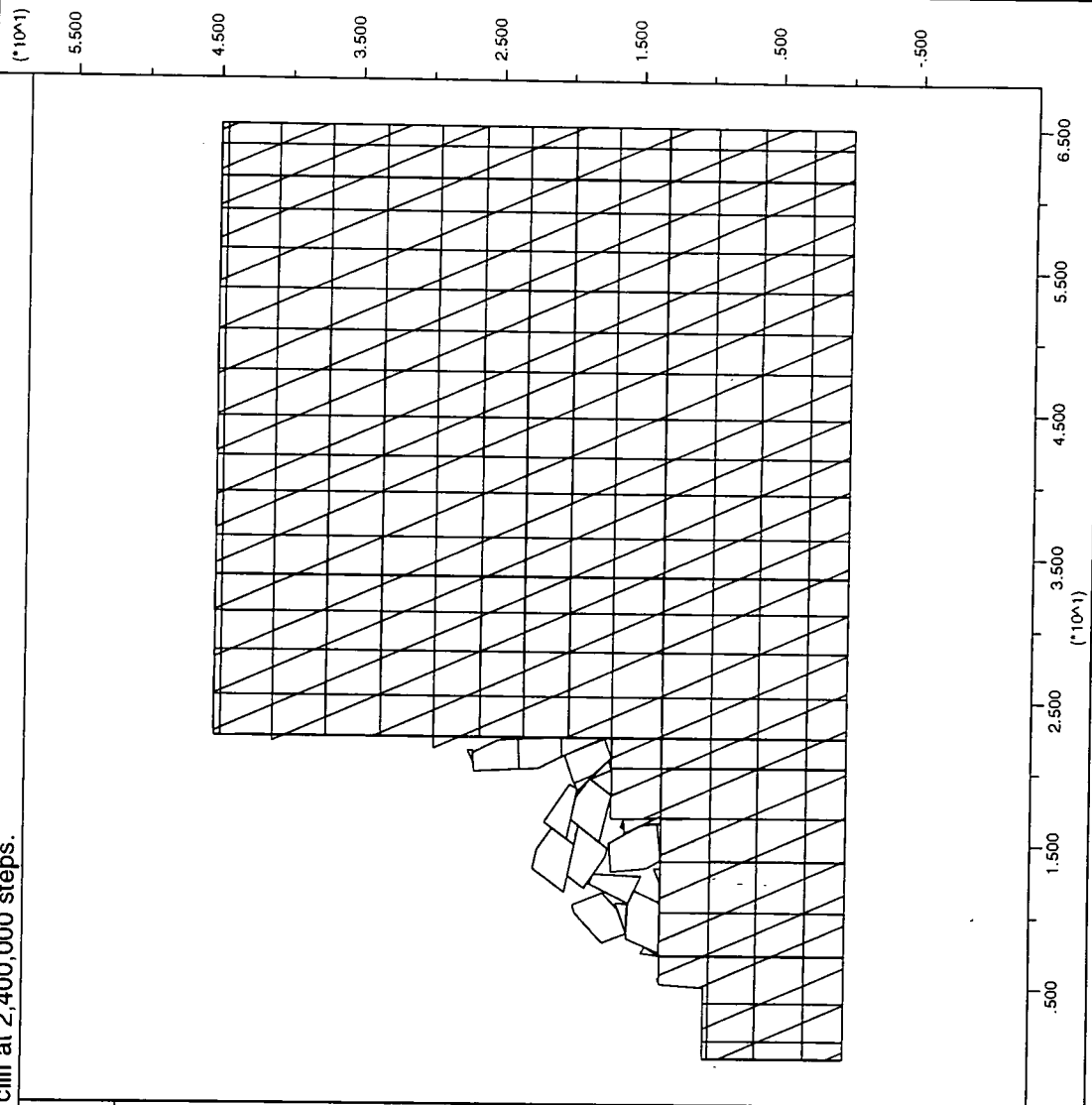
LEGEND

1/04/1980 15:12

cycle *****

time 3.924E+01 sec

block plot



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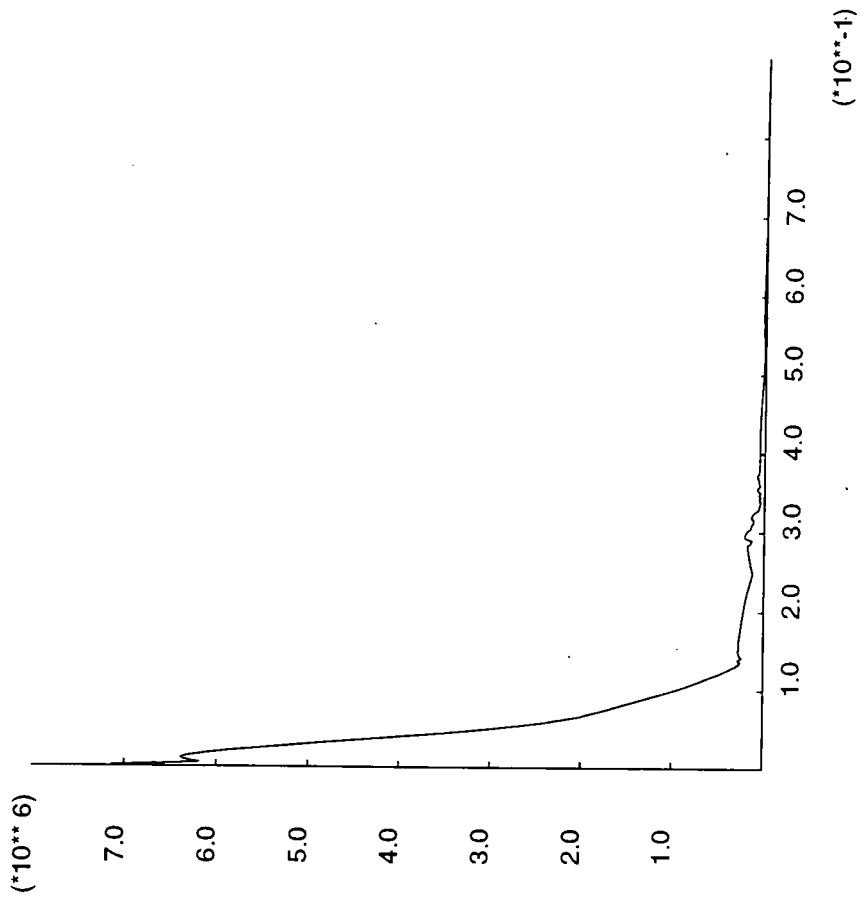
JOB TITLE : Figure 6.42: Total unbalanced forces for Fossil Forest at equilibrium.

UDEC (Version 2.00)

LEGEND

1/04/1980 15:33
cycle 6000
time 8.584E-01 sec

1.17E+03 <hist 2> 7.13E+06



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JOB TITLE : Figure 6.43a: Fossil Forest at 14,000 steps.

UDEC (Version 2.00)

LEGEND

1/04/1980 15:35

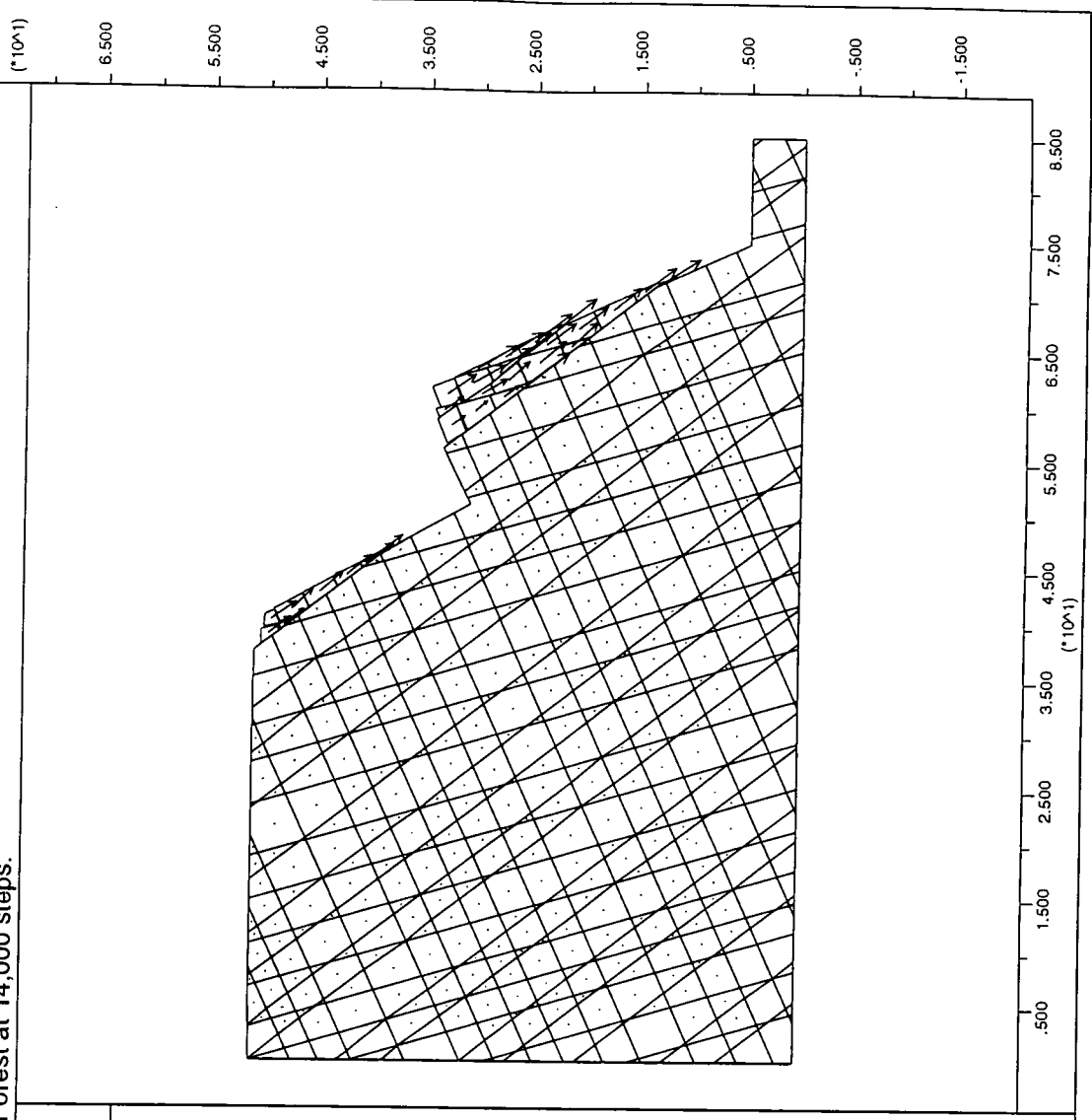
cycle 14000

time 2.011E+00 sec

block plot

velocity vectors

maximum = 3.041E+00



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JOB TITLE : Figure 6.43b: Fossil Forest at 100,000 steps.

UDEC (Version 2.00)

LEGEND

1/04/1980 15:36

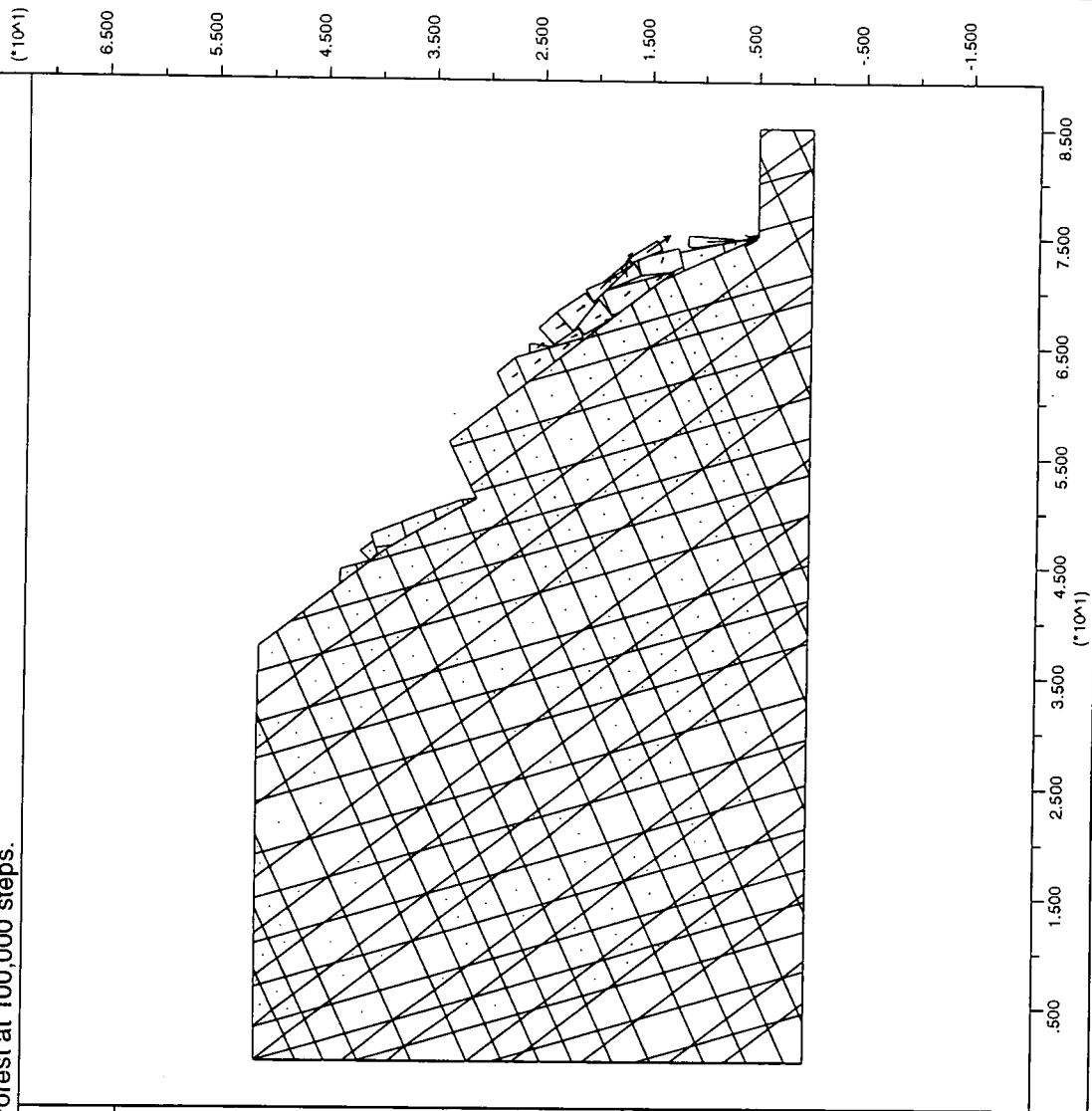
cycle 100000

time 1.447E+01 sec

block plot

velocity vectors

maximum = 1.184E+00



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JOB TITLE : Figure 6.43c: Fossil Forest at 200,000 steps.

UDEC (Version 2.00)

LEGEND

1/04/1980 15:37

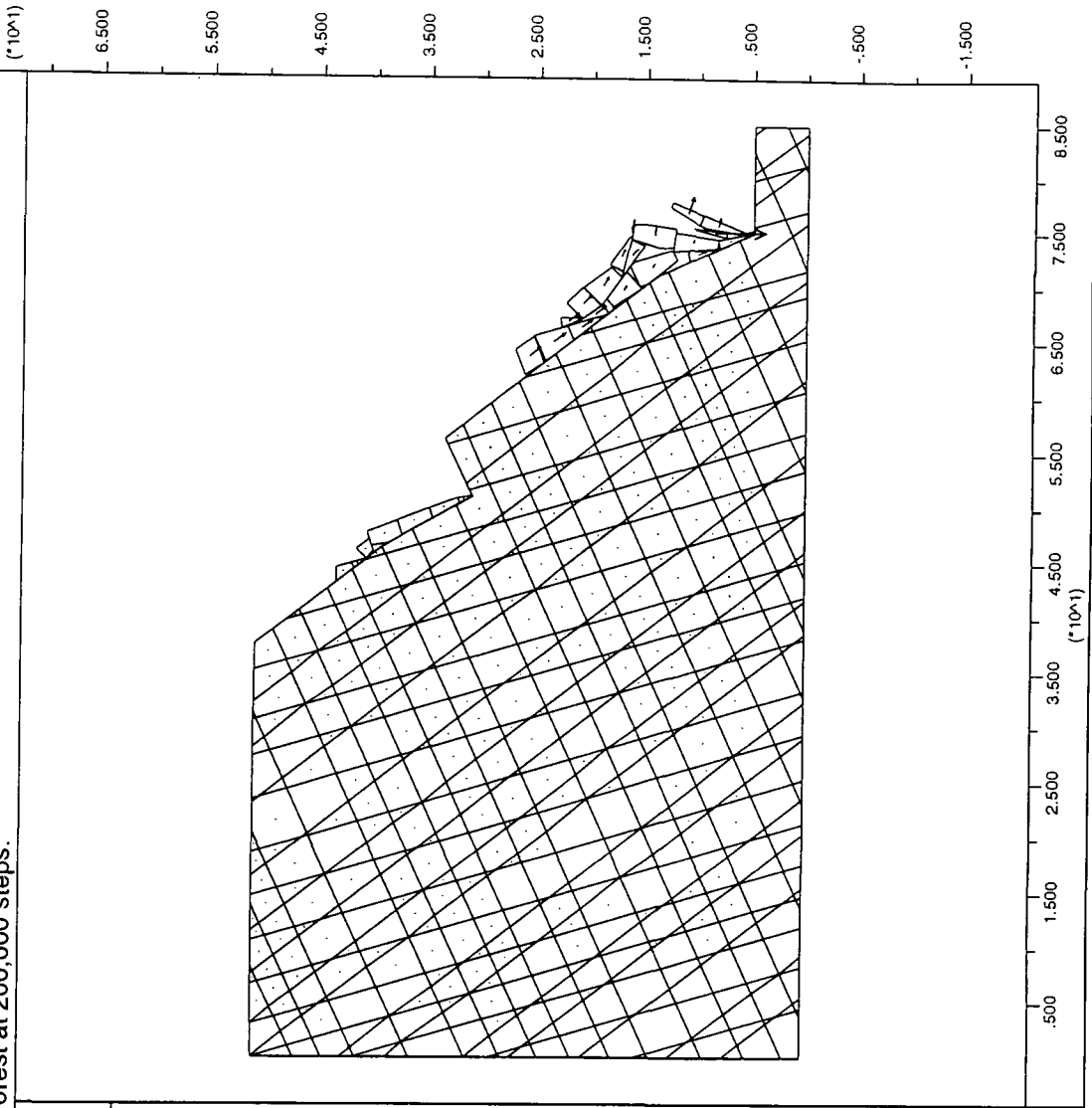
cycle 200000

time 2.896E+01 sec

block plot

velocity vectors

maximum = 1.006E+00



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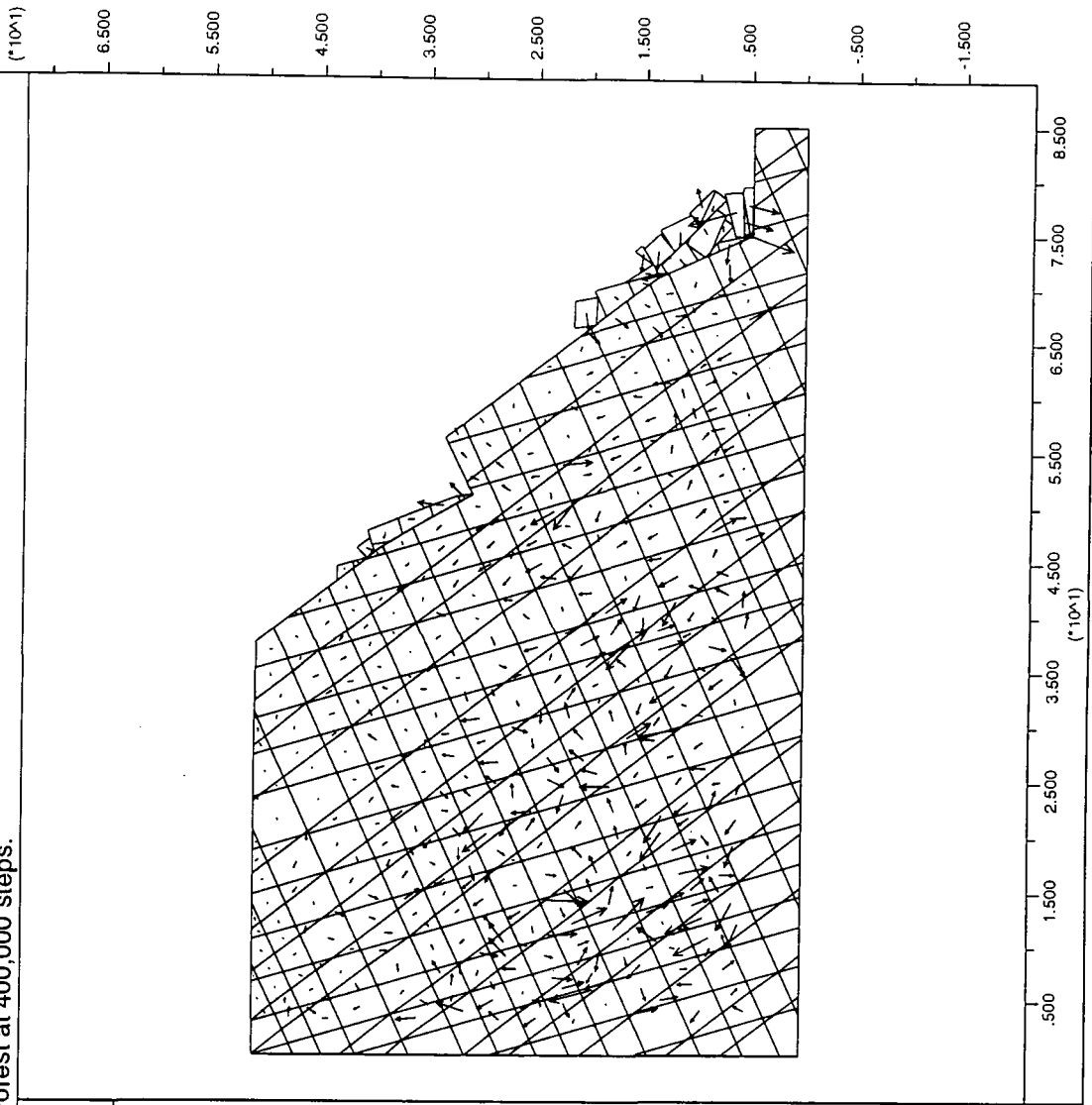
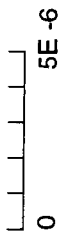
JOB TITLE : Figure 6.43d: Fossil Forest at 400,000 steps.

UDEC (Version 2.00)

LEGEND

1/04/1980 15:38
cycle 400000
time 5.795E+01 sec

block plot
velocity vectors
maximum = 1.434E-06



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JOB TITLE : Figure 6.44: Total unbalanced forces for Fossil Forest at 400,000 steps.

UDEC (Version 2.00)

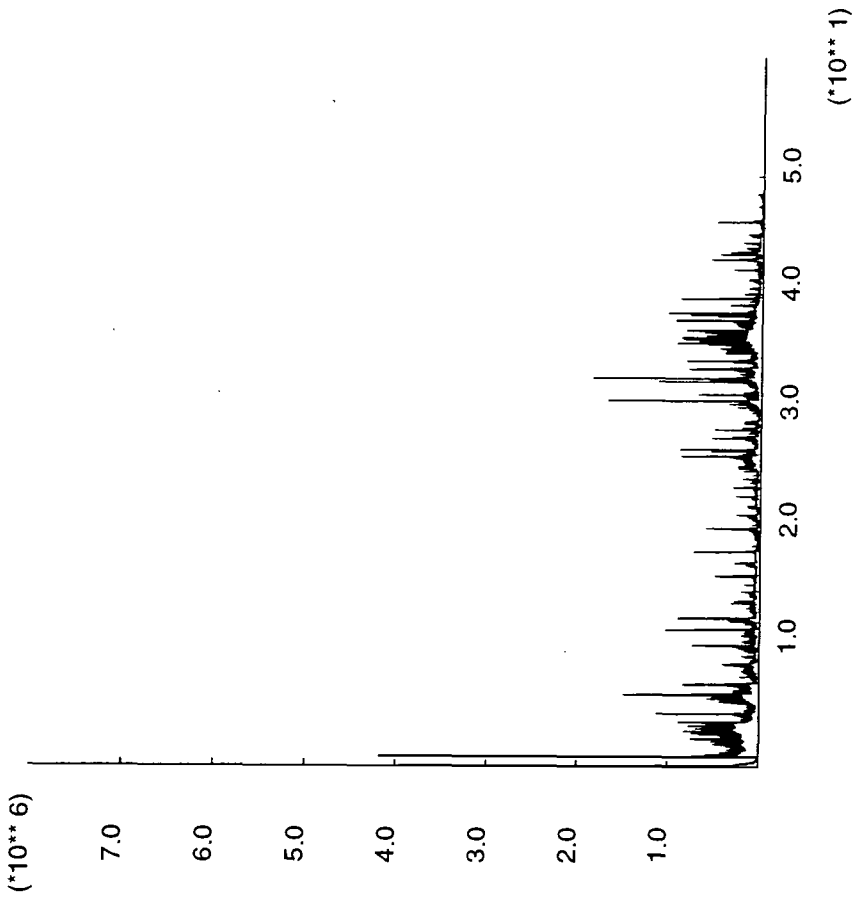
LEGEND

1/04/1980 15:39

cycle 400000

time 5.795E+01 sec

3.59E-01 <hist 2> 7.13E+06



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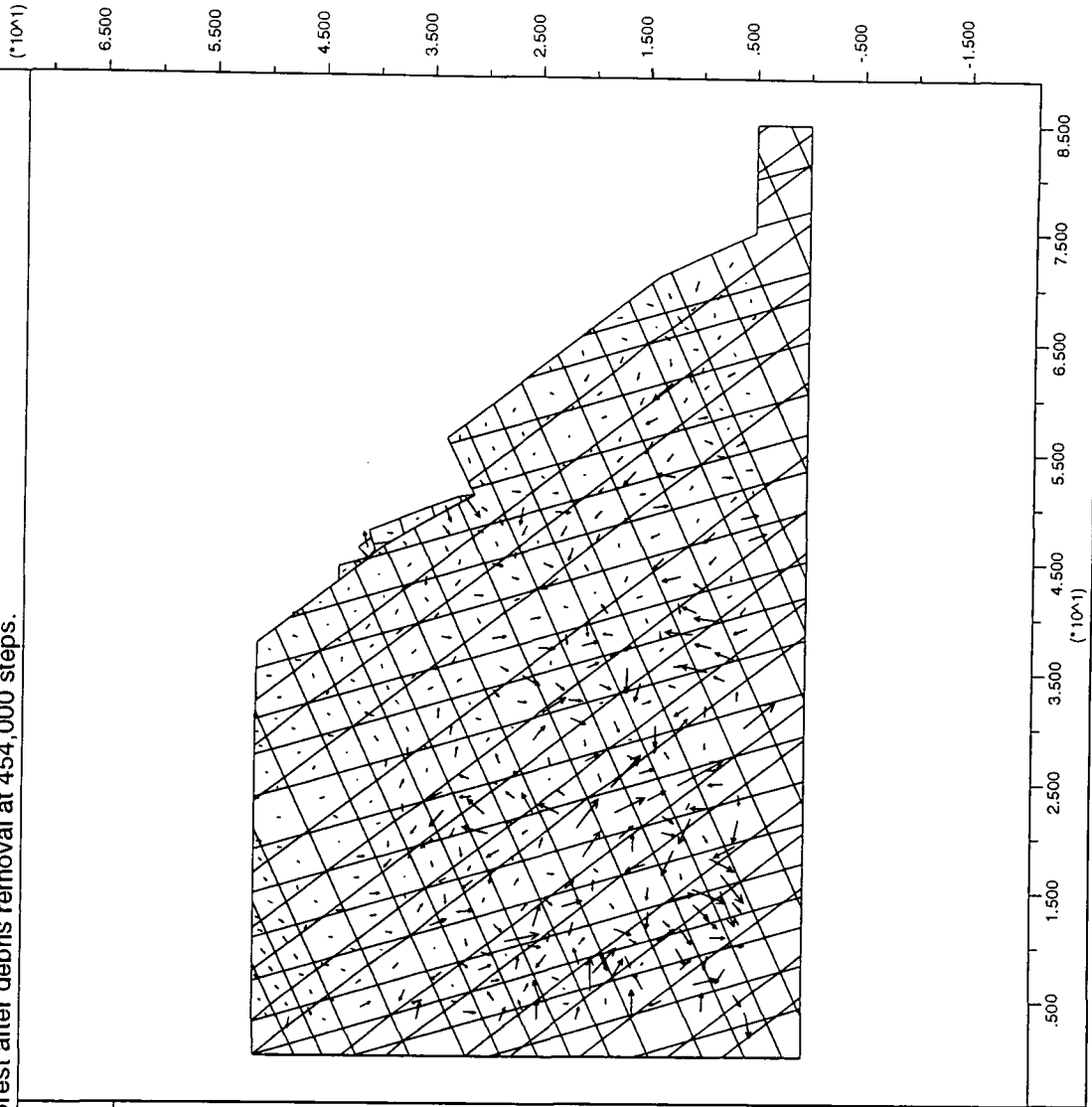
JOB TITLE : Figure 6.45: Fossil Forest after debris removal at 454,000 steps.

UDEC (Version 2.00)

LEGEND

1/04/1980 16:17
cycle 454000
time 6.570E+01 sec

block plot
velocity vectors
maximum = 1.727E-06



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JOB TITLE : Figure 6.46: Forces for the Lulworth Cove pincer at equilibrium.

UDEC (Version 2.00)

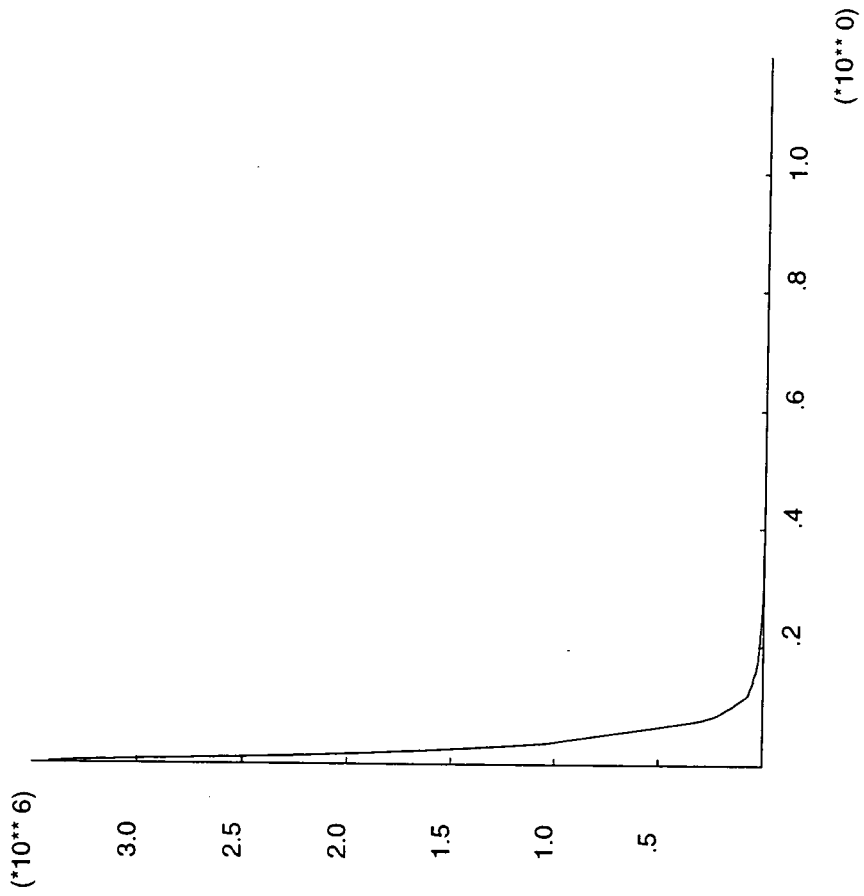
LEGEND

1/04/1980 16:27

cycle 6000

time 1.174E+00 sec

6.88E-01 <hist 3> 3.42E+06 ———



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JOB TITLE : Figure 6.47a: Lulworth Cove pincer at 10,000 steps.

UDEC (Version 2.00)

LEGEND

1/04/1980 16:27

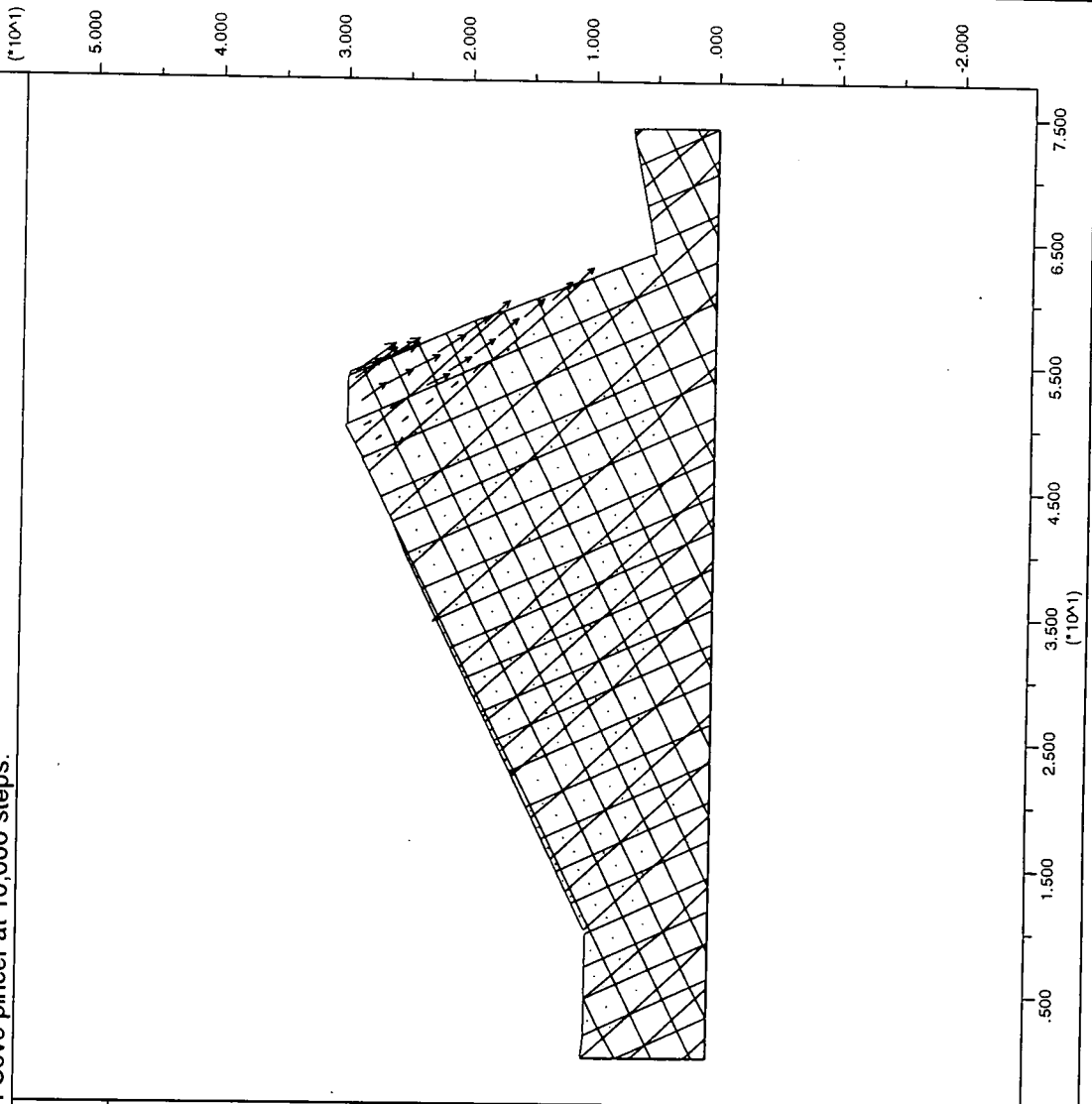
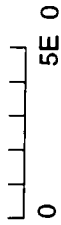
cycle 10000

time 1.959E+00 sec

block plot

velocity vectors

maximum = 1.493E+00



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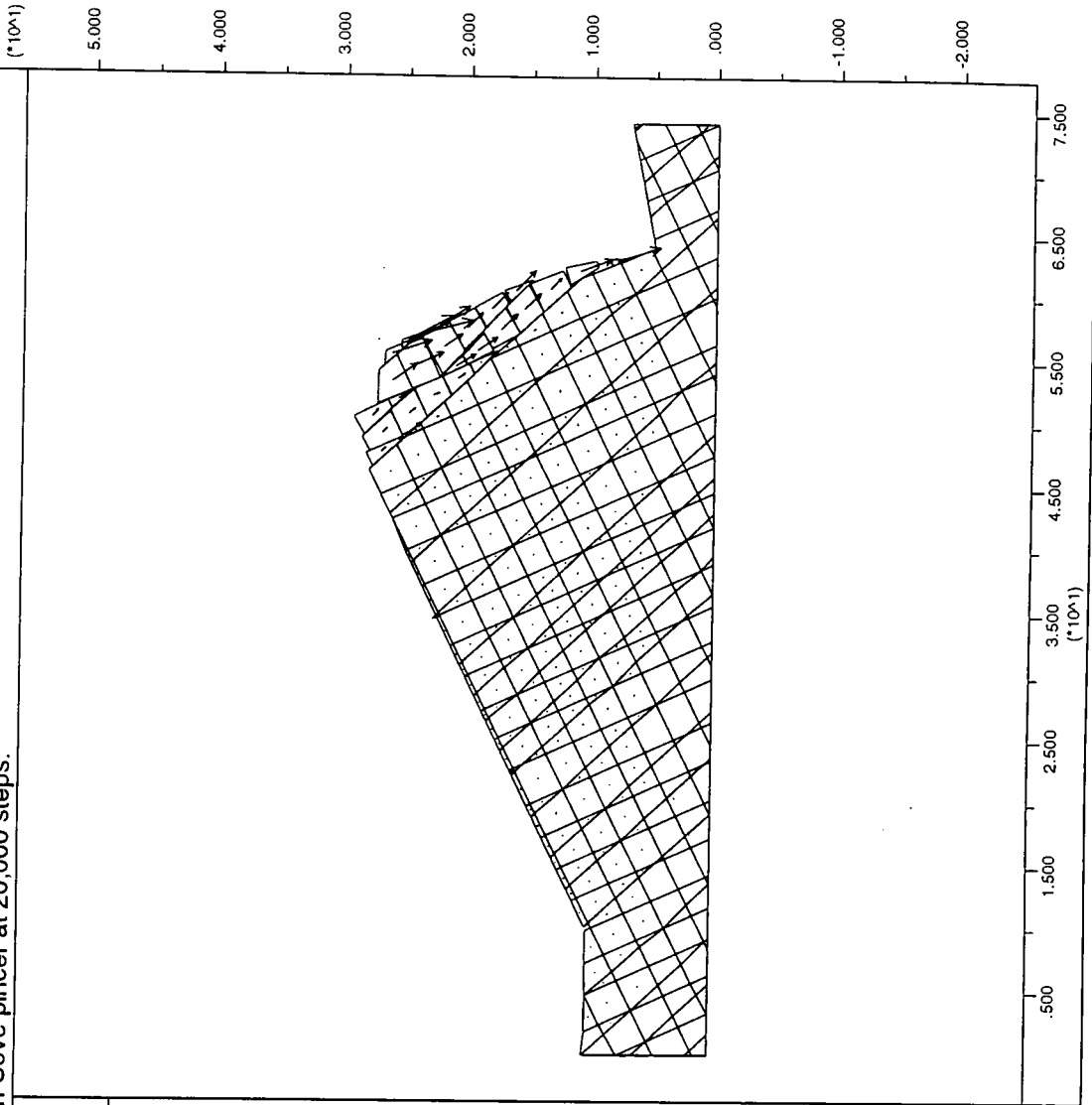
JOB TITLE : Figure 6.47b: Lulworth Cove pincer at 20,000 steps.

UDEC (Version 2.00)

LEGEND

1/04/1980 16:29
cycle 20000
time 3.944E+00 sec

block plot
velocity vectors
maximum = 8.697E-01



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JOB TITLE : Figure 6.47c: Lulworth Cove pincer at 40,000 steps.

UDEC (Version 2.00)

LEGEND

1/04/1980 16:29

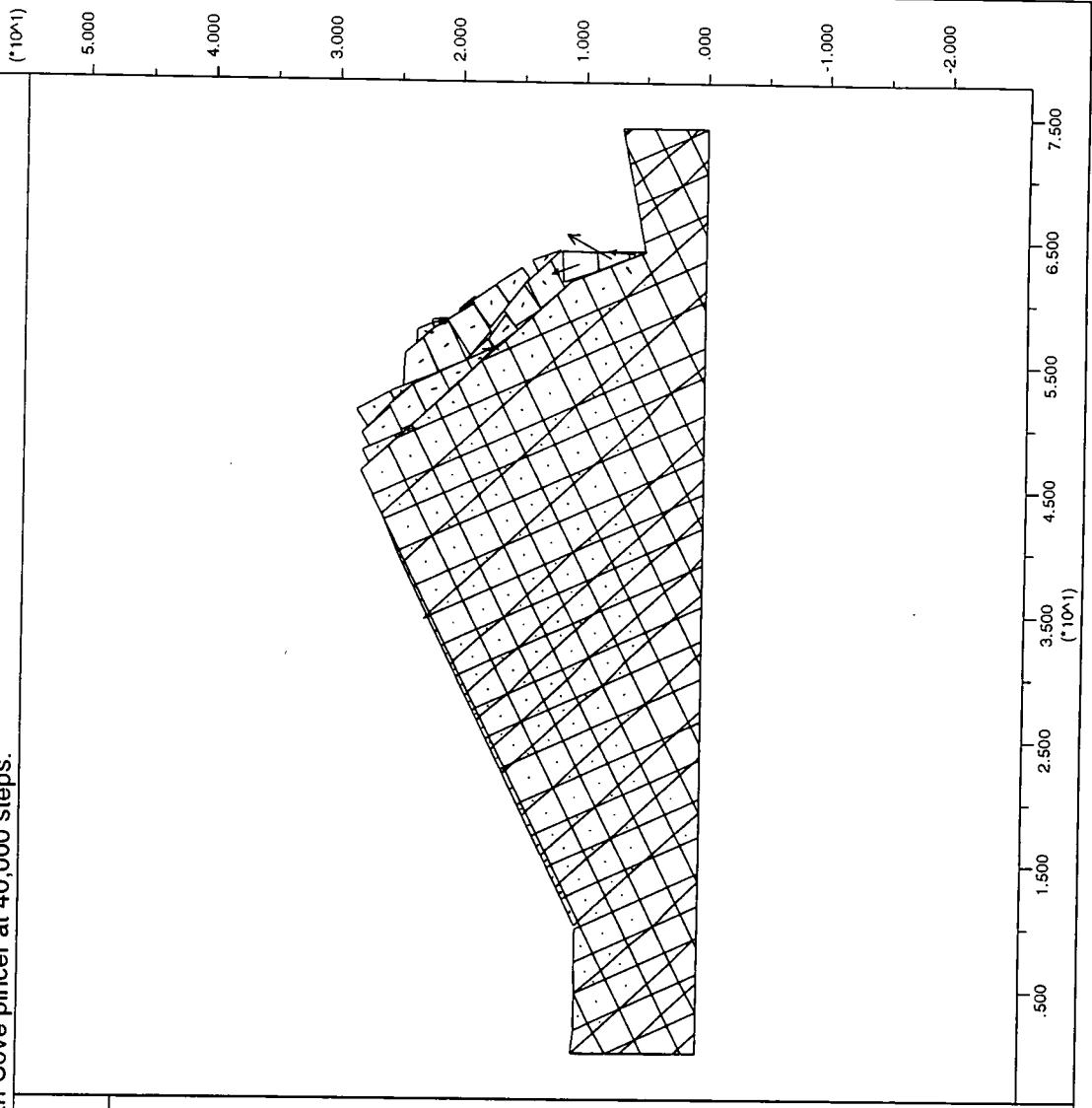
cycle 40000

time 7.940E+00 sec

block plot

velocity vectors

maximum = 1.495E-01



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JOB TITLE : Figure 6.47d: Lulworth Cove pincer at 60,000 steps.

UDEEC (Version 2.00)

LEGEND

1/04/1980 16:30

cycle 60000

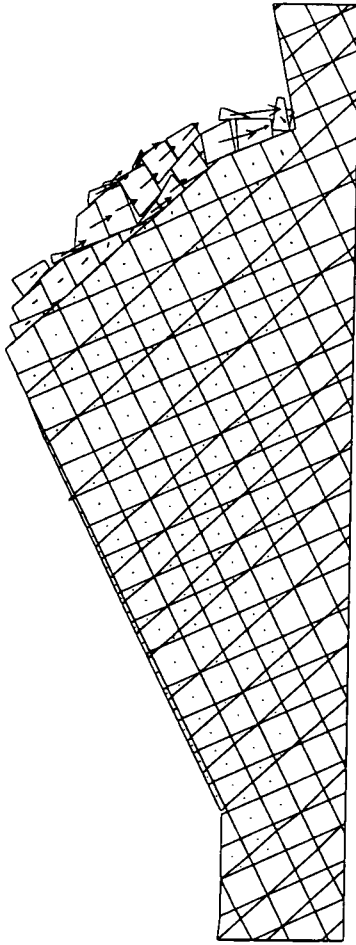
time 1.195E+01 sec

block plot

velocity vectors

maximum = 8.006E-01

0 2E 0



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JOB TITLE : Figure 6.47e: Lulworth Cove pincer at 100,000 steps.

UDEC (Version 2.00)

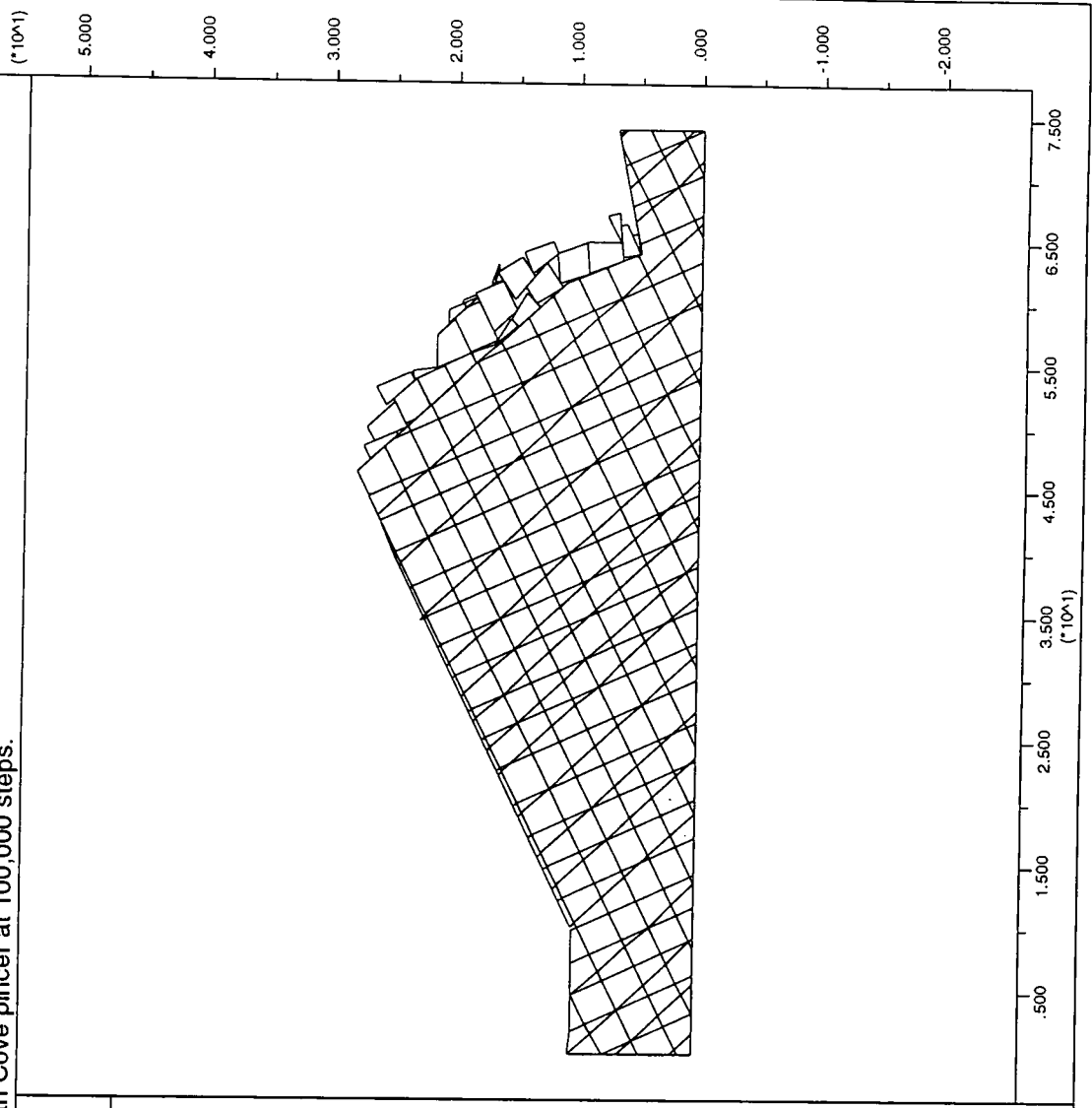
LEGEND

1/04/1980 16:32

cycle 100000

time 1.999E+01 sec

block plot



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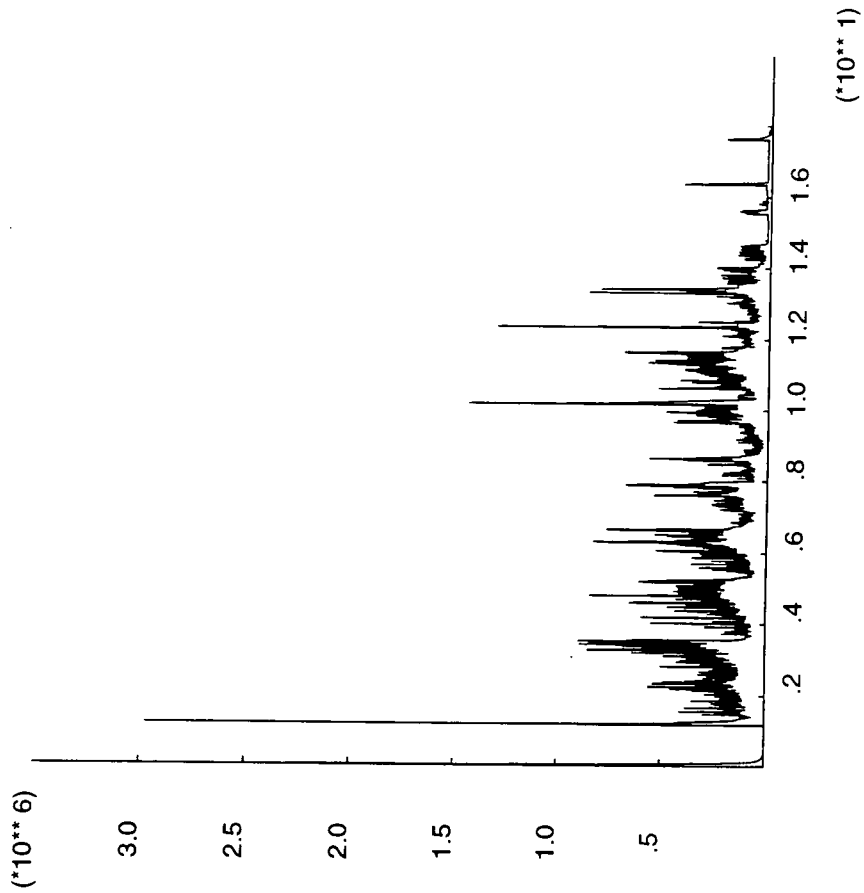
JOB TITLE : Figure 6.48: Forces for the Lulworth Cove pincer at 100,000 steps.

UDEC (Version 2.00)

LEGEND

1/04/1980 16:33
cycle 100000
time 1.999E+01 sec

2.12E-01 <hist 3> 3.42E+06 ———



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JOB TITLE : Figure 6.49: Forces for the Lulworth Cove cliff at equilibrium.

UDEC (Version 2.00)

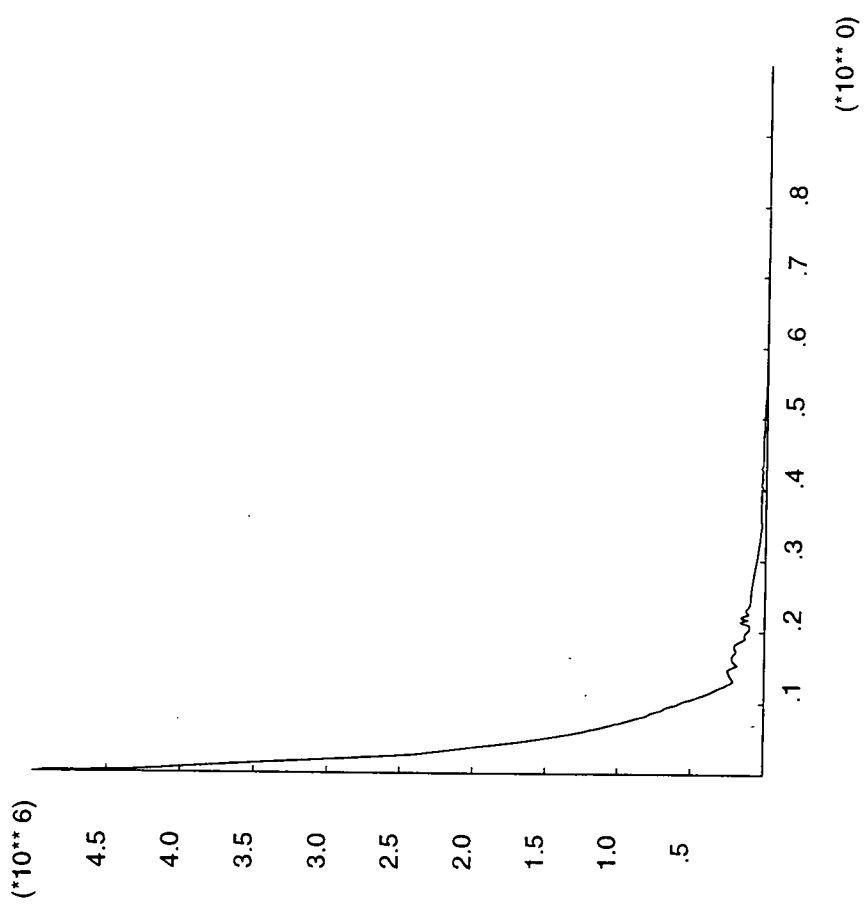
LEGEND

1/04/1980 16:45

cycle 6000

time 9.318E-01 sec

3.58E+01 <hist 2> 4.96E+06



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JOB TITLE : Figure 6.50a: Lulworth Cove cliff at 14,000 steps.

UDEC (Version 2.00)

LEGEND

1/04/1980 16:46

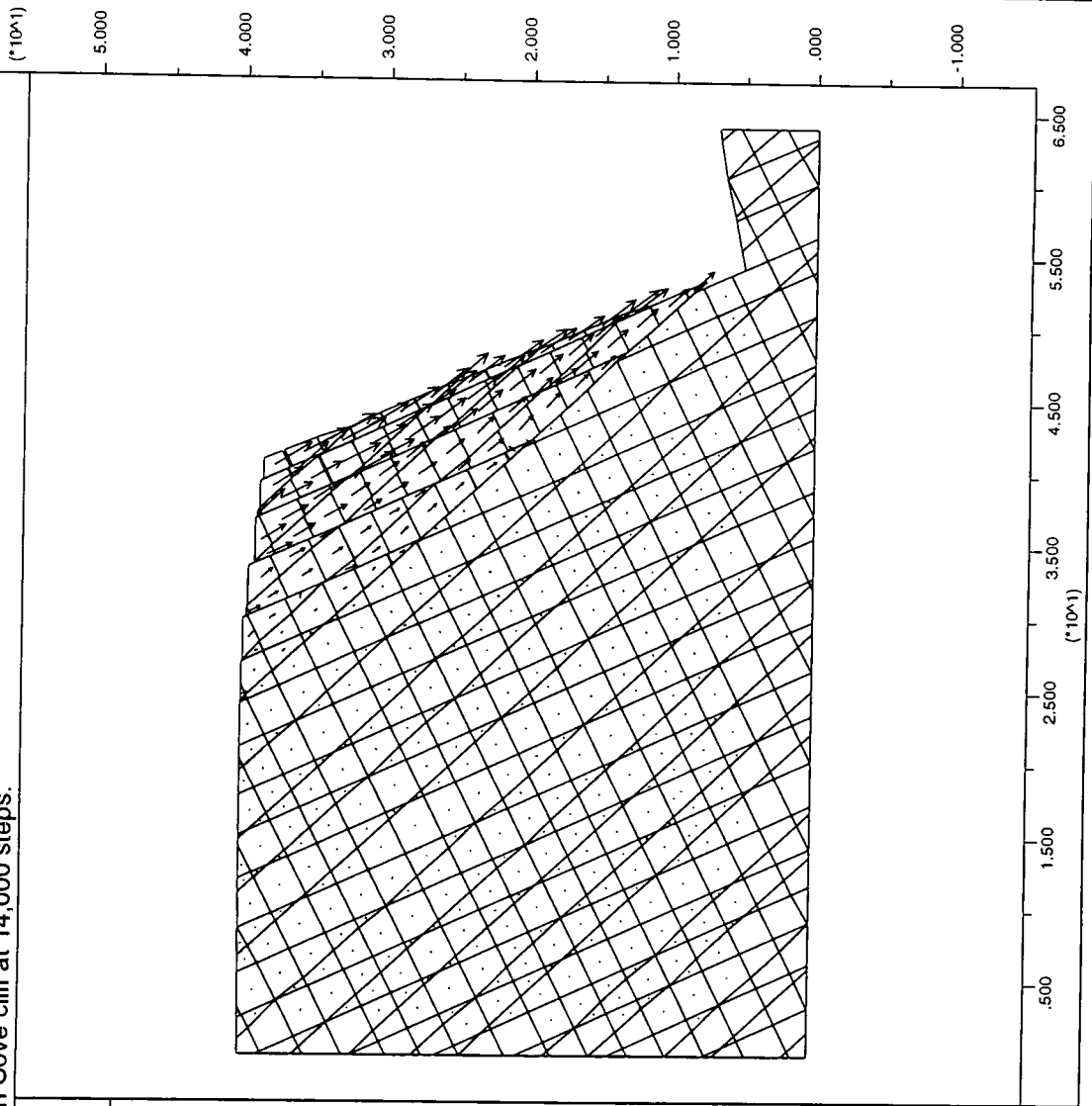
cycle 14000

time 2.186E+00 sec

block plot

velocity vectors

maximum = 2.898E+00



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JOB TITLE : Figure 6.50b: Lulworth Cove cliff at 54,000 steps.

UDEC (Version 2.00)

LEGEND

1/04/1980 16:46

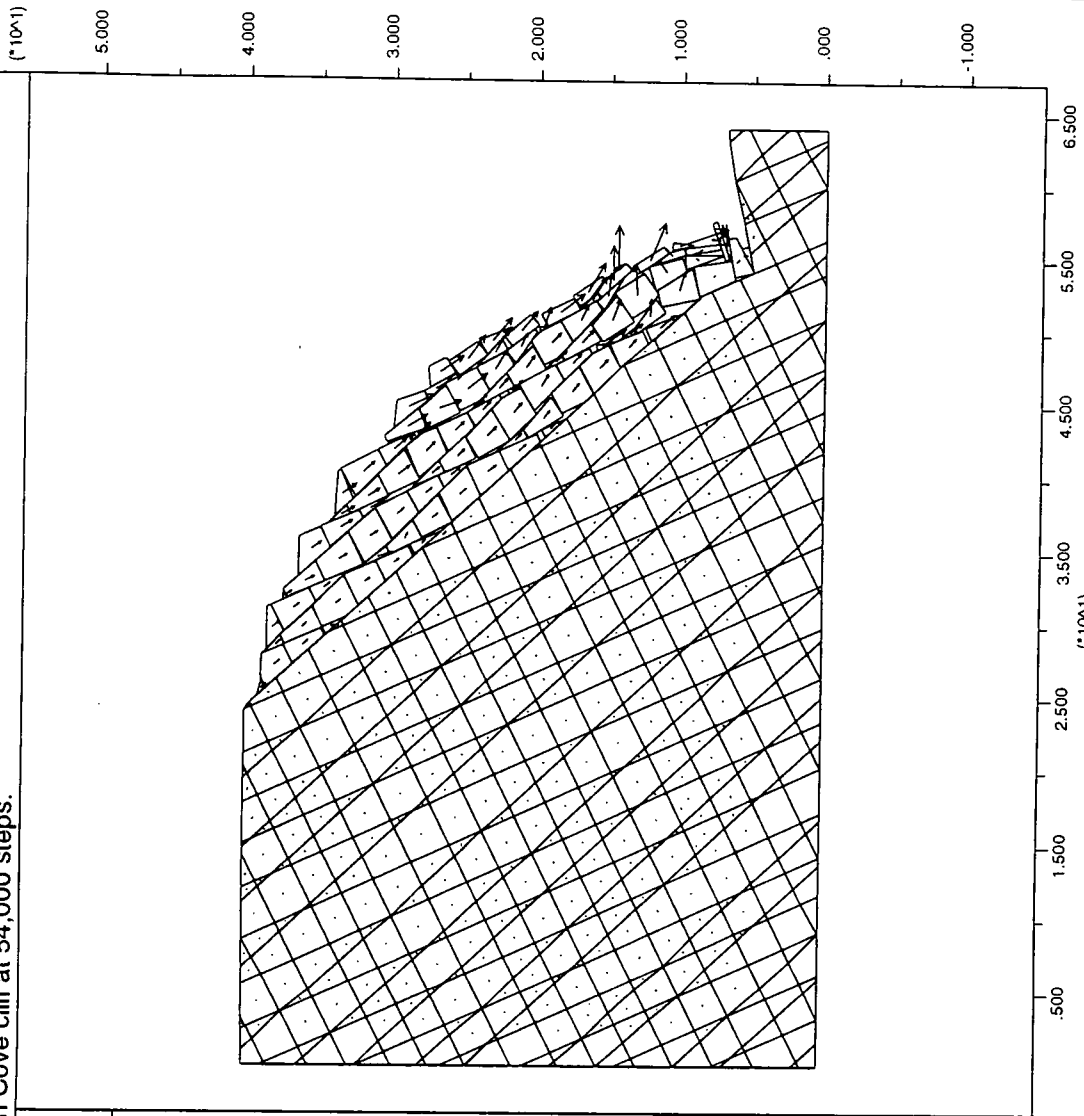
cycle 54000

time 8.628E+00 sec

block plot

velocity vectors

maximum = 3.077E+00



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JOB TITLE : Figure 6.50c: Lulworth Cove cliff at 200,000 steps.

UDEC (Version 2.00)

LEGEND

1/04/1980 16:47

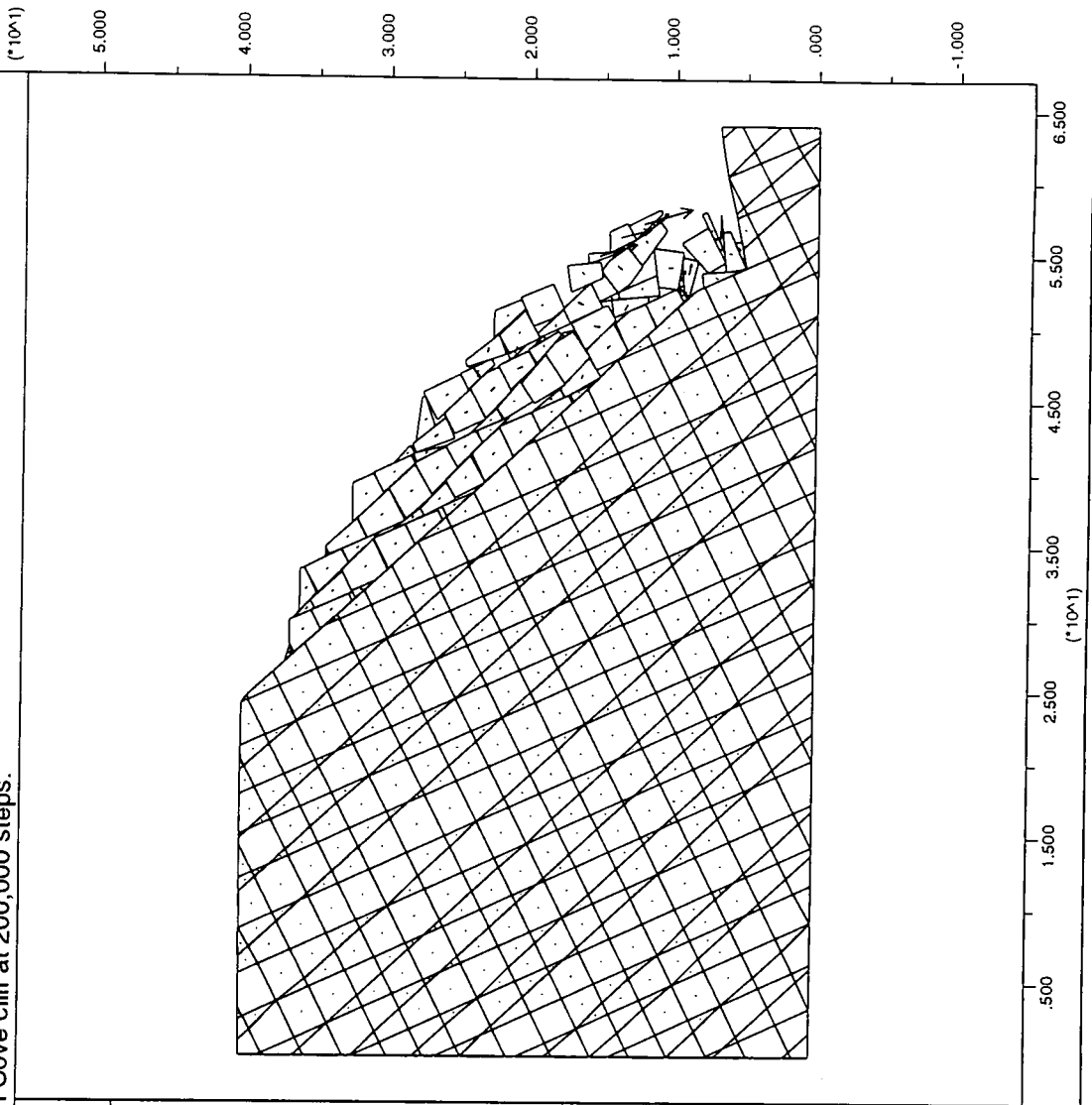
cycle 200000

time 3.205E+01 sec

block plot

velocity vectors

maximum = 2.369E-02



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JOB TITLE : Figure 6.50d: Lulworth Cove cliff at 600,000 steps.

UDEC (Version 2.00)

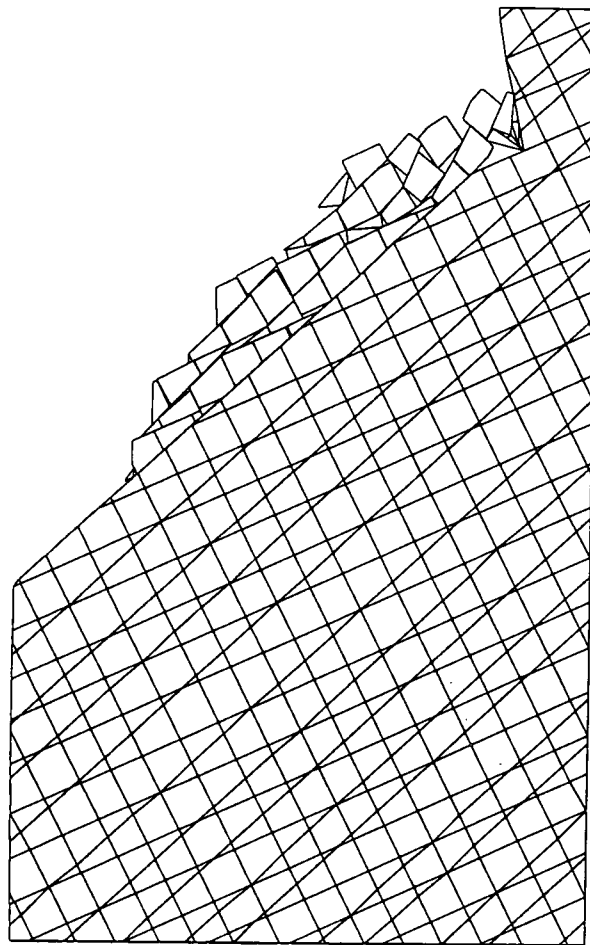
LEGEND

1/04/1980 16:49

cycle 600000

time 9.559E+01 sec

block plot



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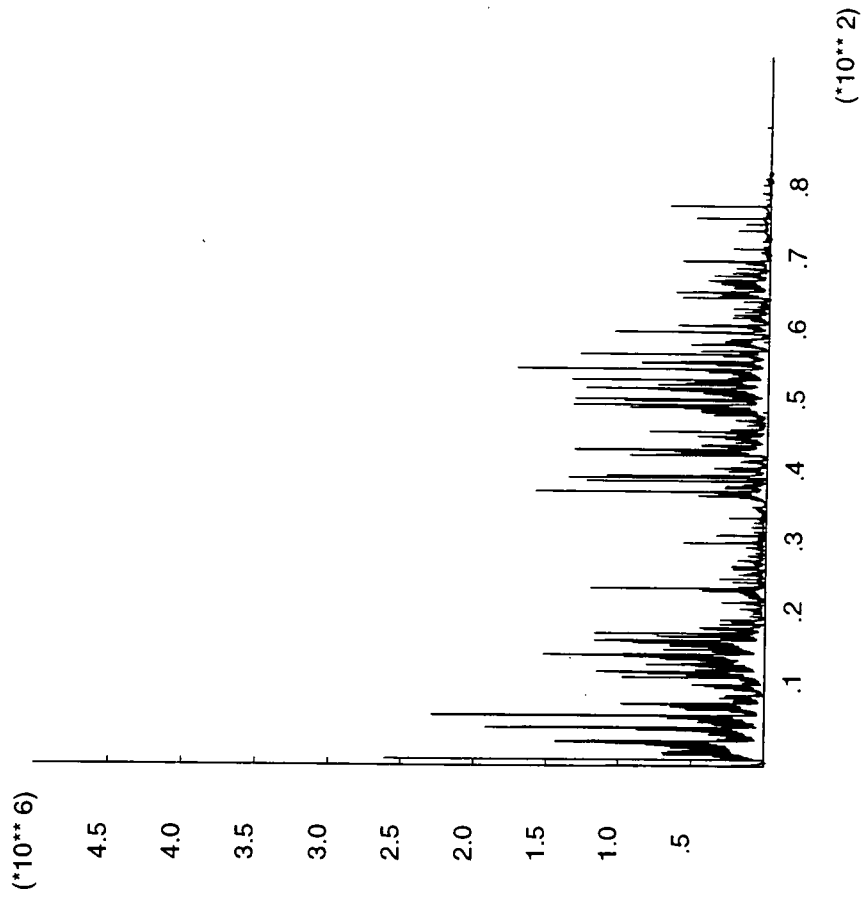
JOB TITLE : Figure 6.51: Forces for the Lulworth Cove cliff at 600,000 steps.

UDEC (Version 2.00)

LEGEND

1/04/1980 16:50
cycle 600000
time 9.559E+01 sec

2.77E-01 <hist 2> 4.96E+06 —



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JOB TITLE : Figure 6.52: Forces for the eastern Durdle Promontory at equilibrium.

UDEC (Version 2.00)

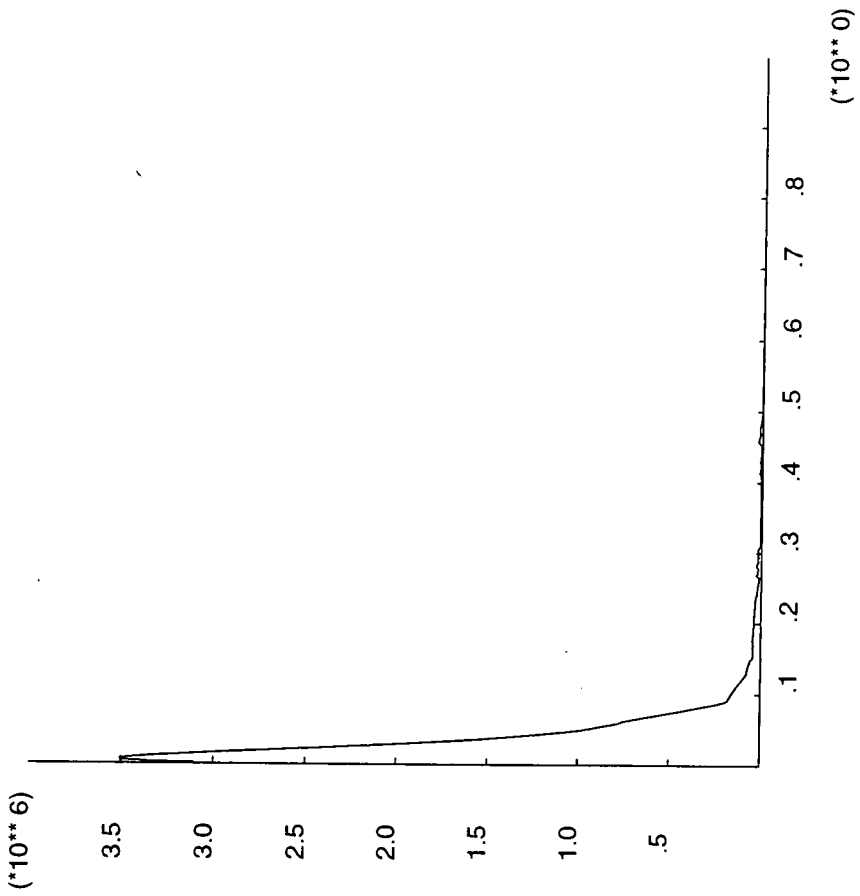
LEGEND

1/04/1980 17:28

cycle 6000

time 9.492E-01 sec

2.25E+00 <hist 3> 3.51E+06



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JOB TITLE : Figure 6.53a: Eastern Durdle Promontory section at 10,000 steps.

UDEC (Version 2.00)

LEGEND

1/04/1980 17:29

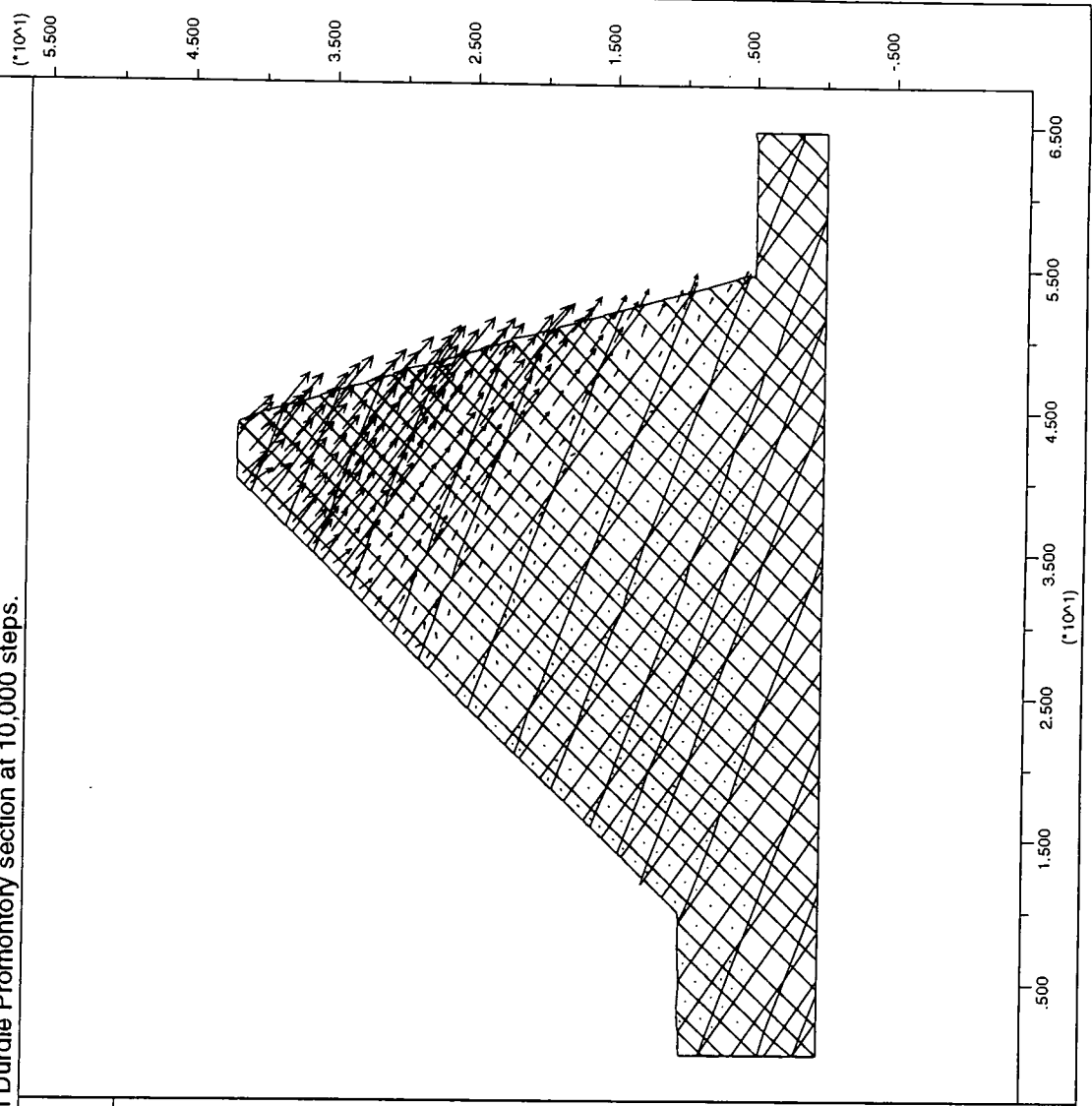
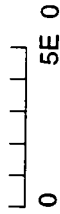
cycle 10000

time 1.584E+00 sec

block plot

velocity vectors

maximum = 1.595E+00



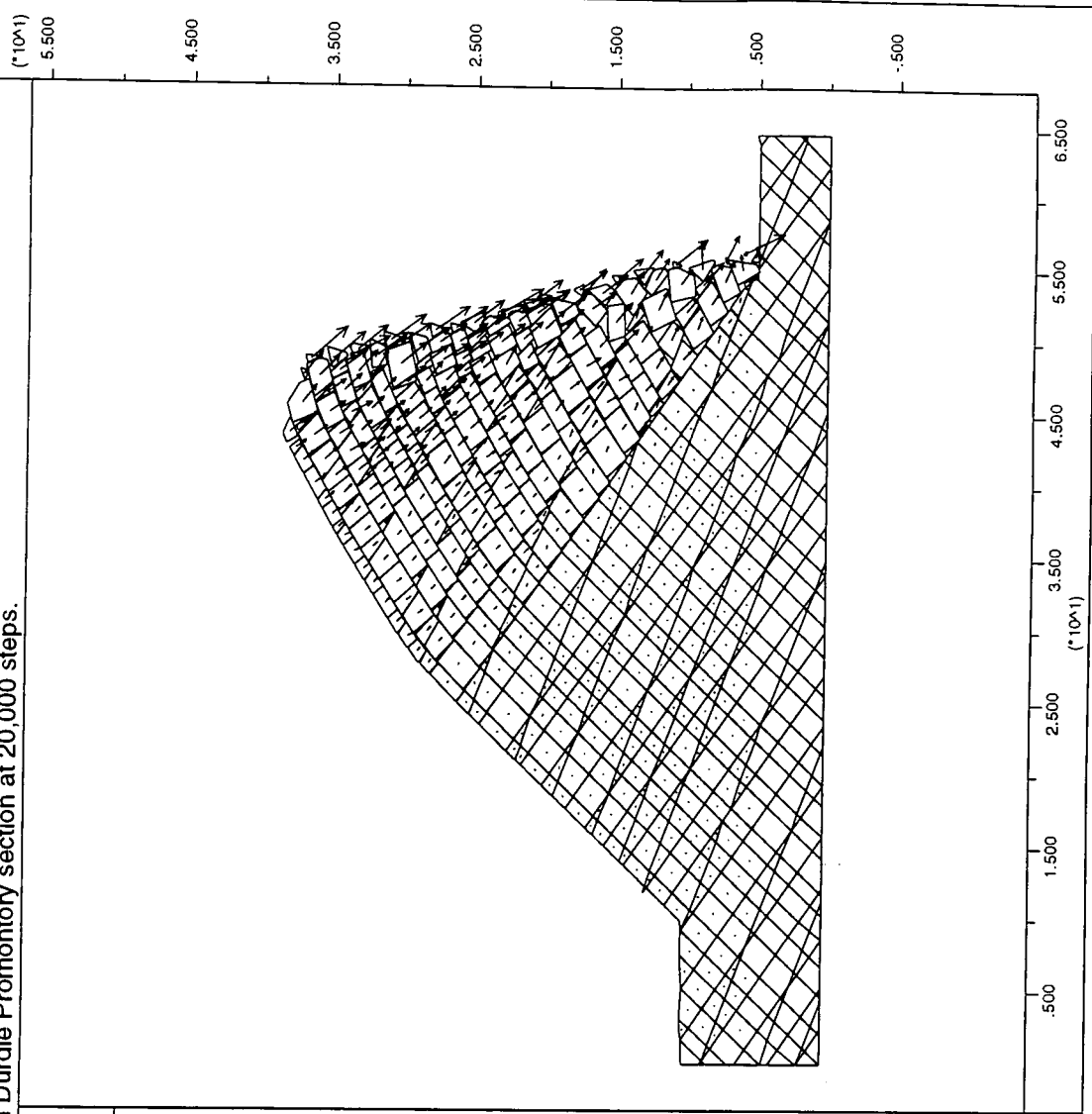
DEPARTMENT OF GEOGRAPHY
UNIVERSITY OF DURHAM

JOB TITLE : Figure 6.53b: Eastern Durdle Promontory section at 20,000 steps.

UDEC (Version 2.00)

LEGEND

1/04/1980 17:31
cycle 20000
time 3.257E+00 sec
block plot
velocity vectors
maximum = 6.941E+00
0 2E 1



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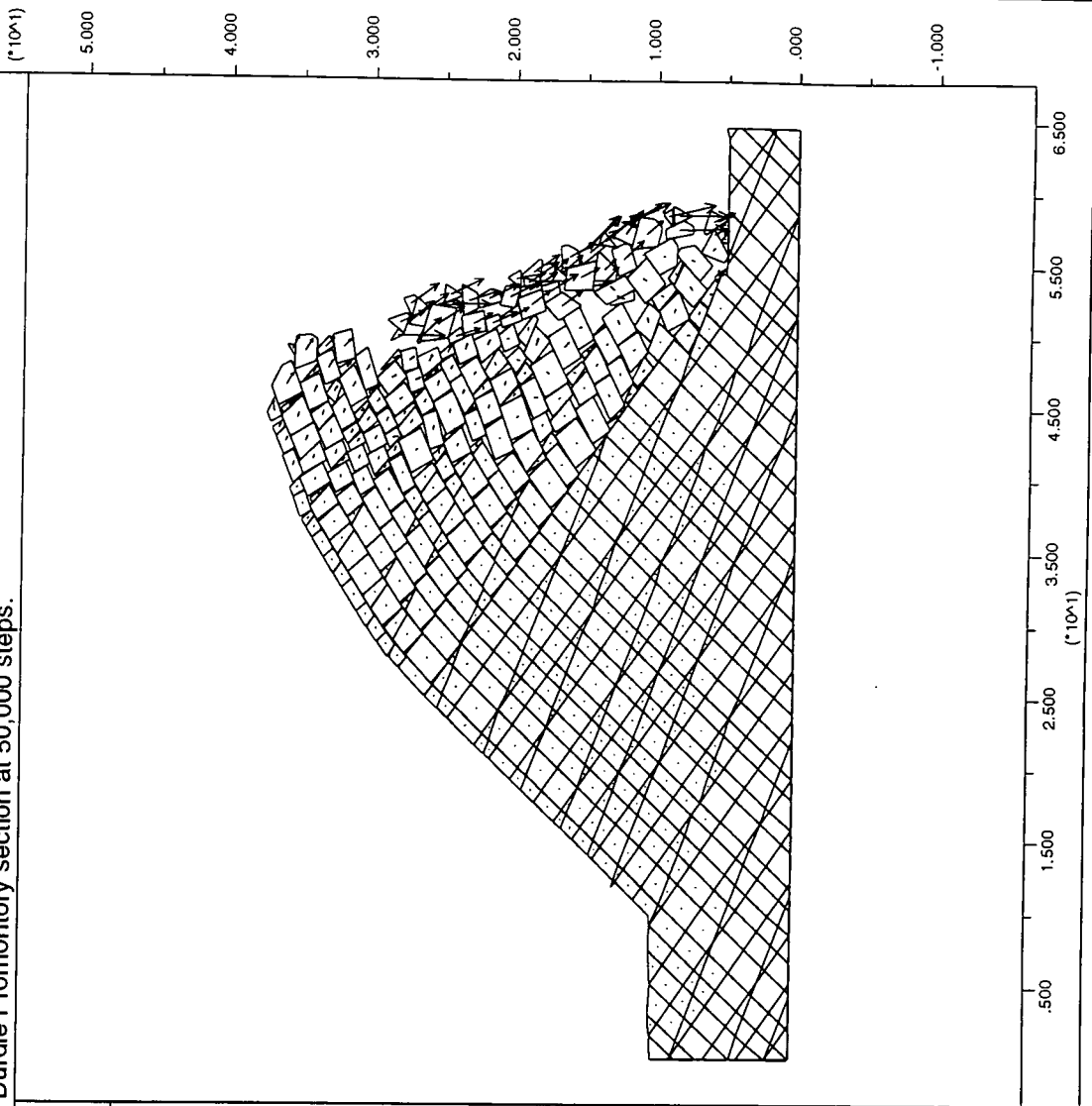
JOB TITLE : Figure 6.53c: Eastern Durdle Promontory section at 50,000 steps.

UDEC (Version 2.00)

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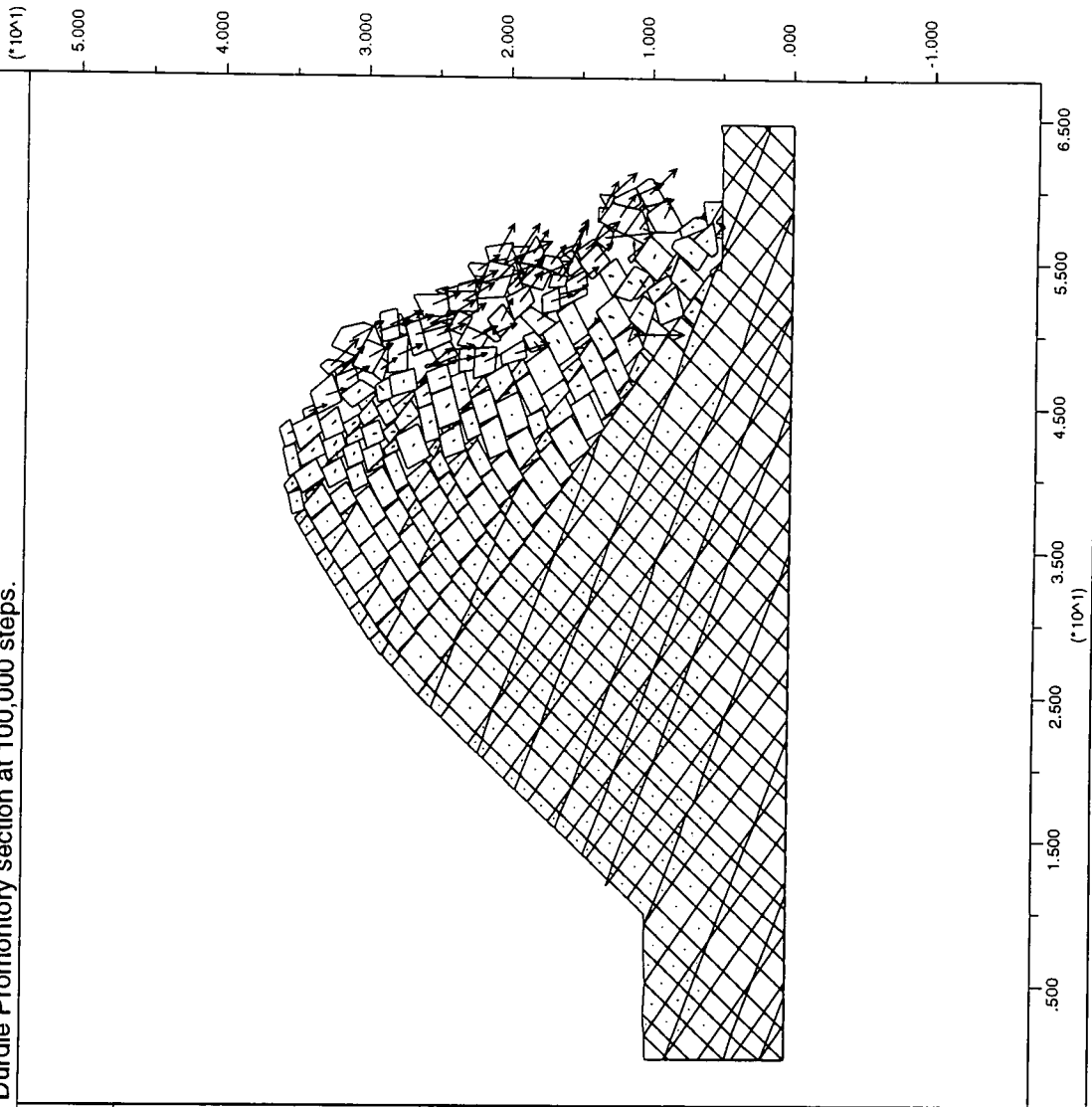
JOB TITLE : Figure 6.53d: Eastern Durdle Promontory section at 100,000 steps.

UDEC (Version 2.00)

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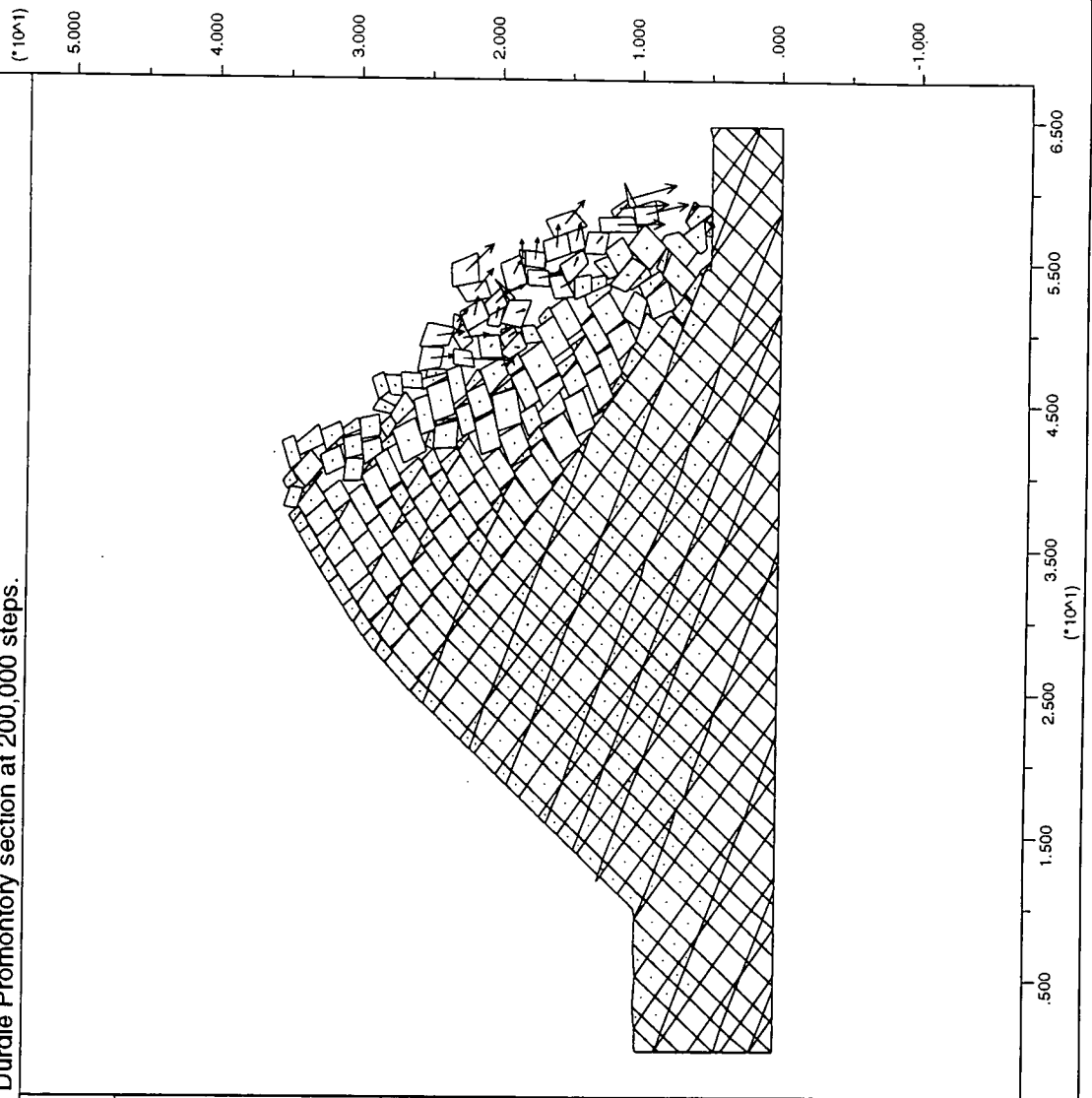
JOB TITLE : Figure 6.53e: Eastern Durdle Promontory section at 200,000 steps.

UDEC (Version 2.00)

LEGEND

1/04/1980 17:34
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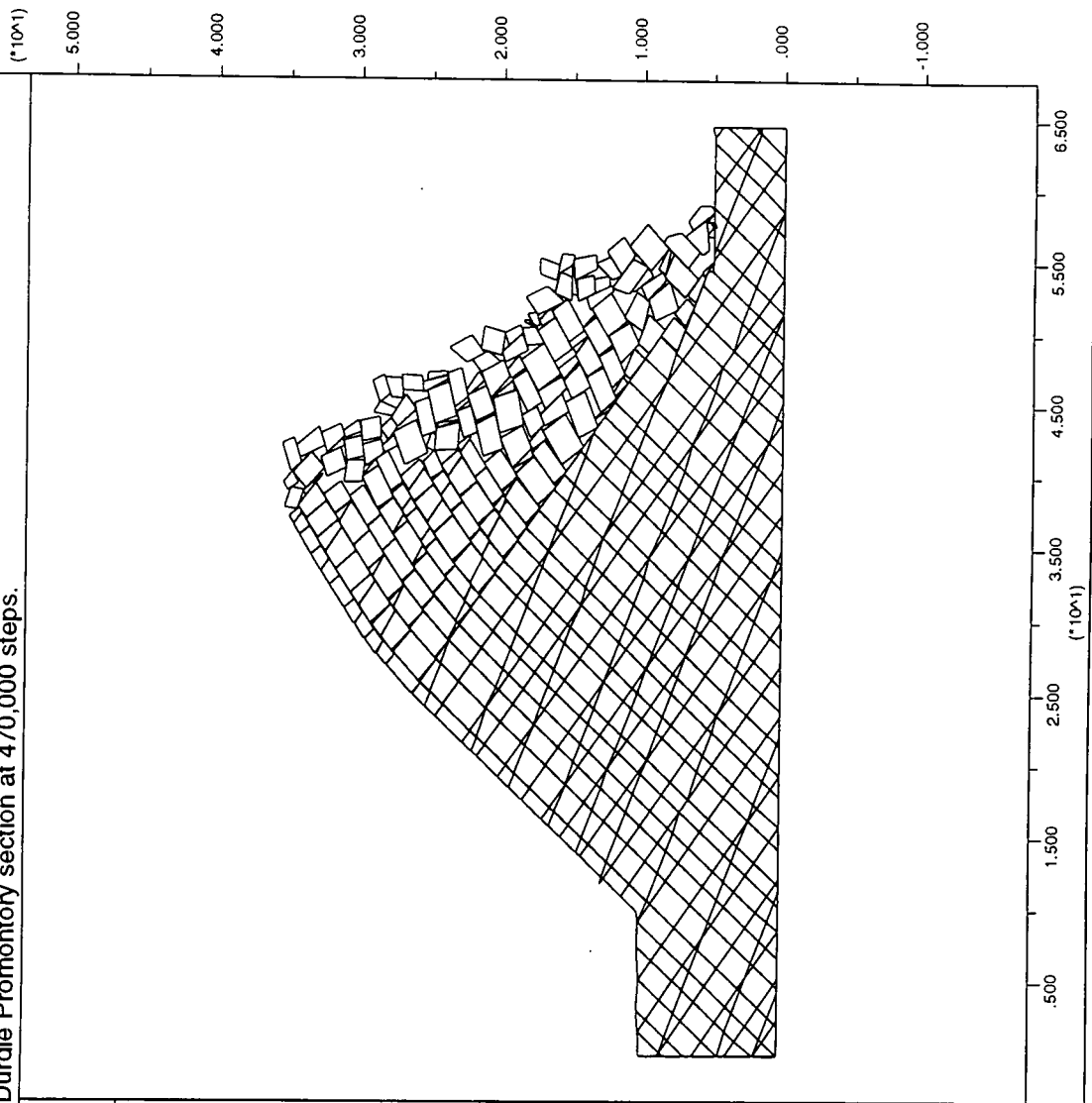
JOB TITLE : Figure 6.53f: Eastern Durdle Promontory section at 470,000 steps.

UDEC (Version 2.00)

LEGEND

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time 8.097E+01 sec

block plot



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JOB TITLE : Figure 6.54: Forces for the eastern Durdle Promontory at 470,000 steps.

UDEC (Version 2.00)

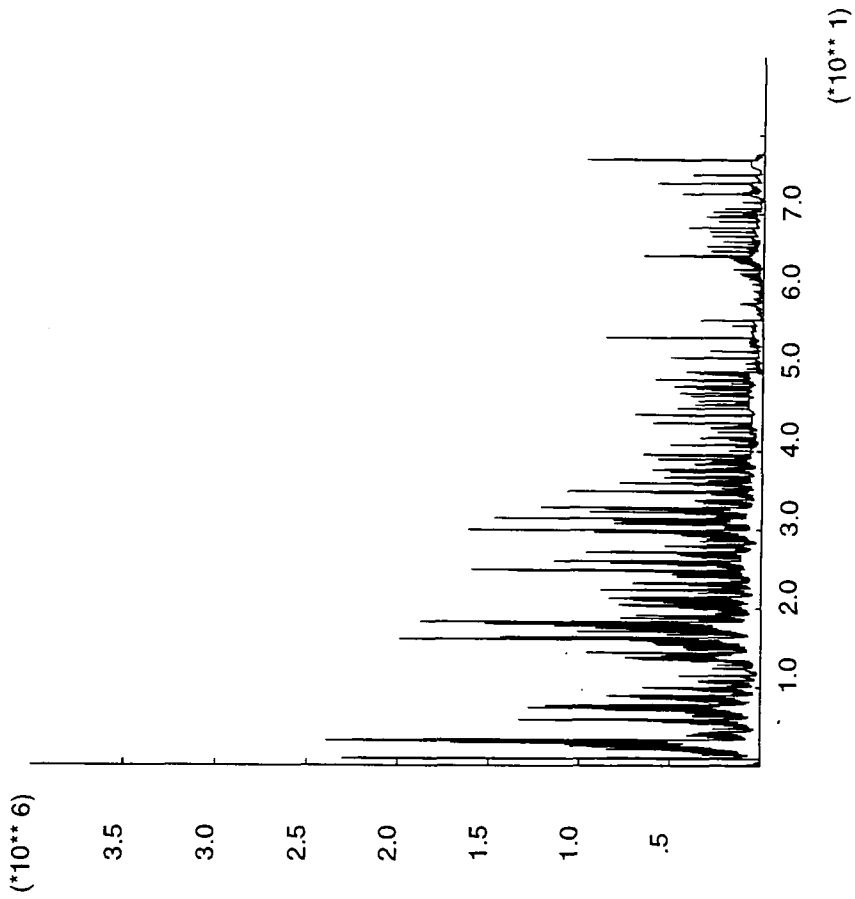
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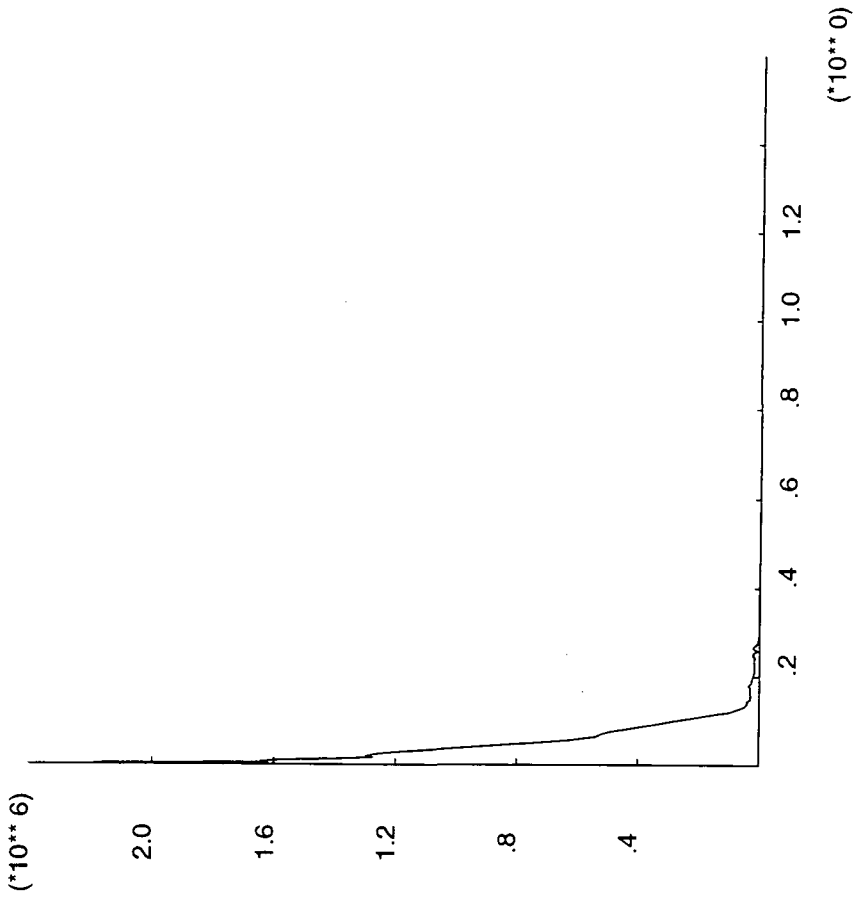
JOB TITLE : Figure 6.55: Forces for the western Durdle Door section at equilibrium.

UDEC (Version 2.00)

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1/04/1980 17:47
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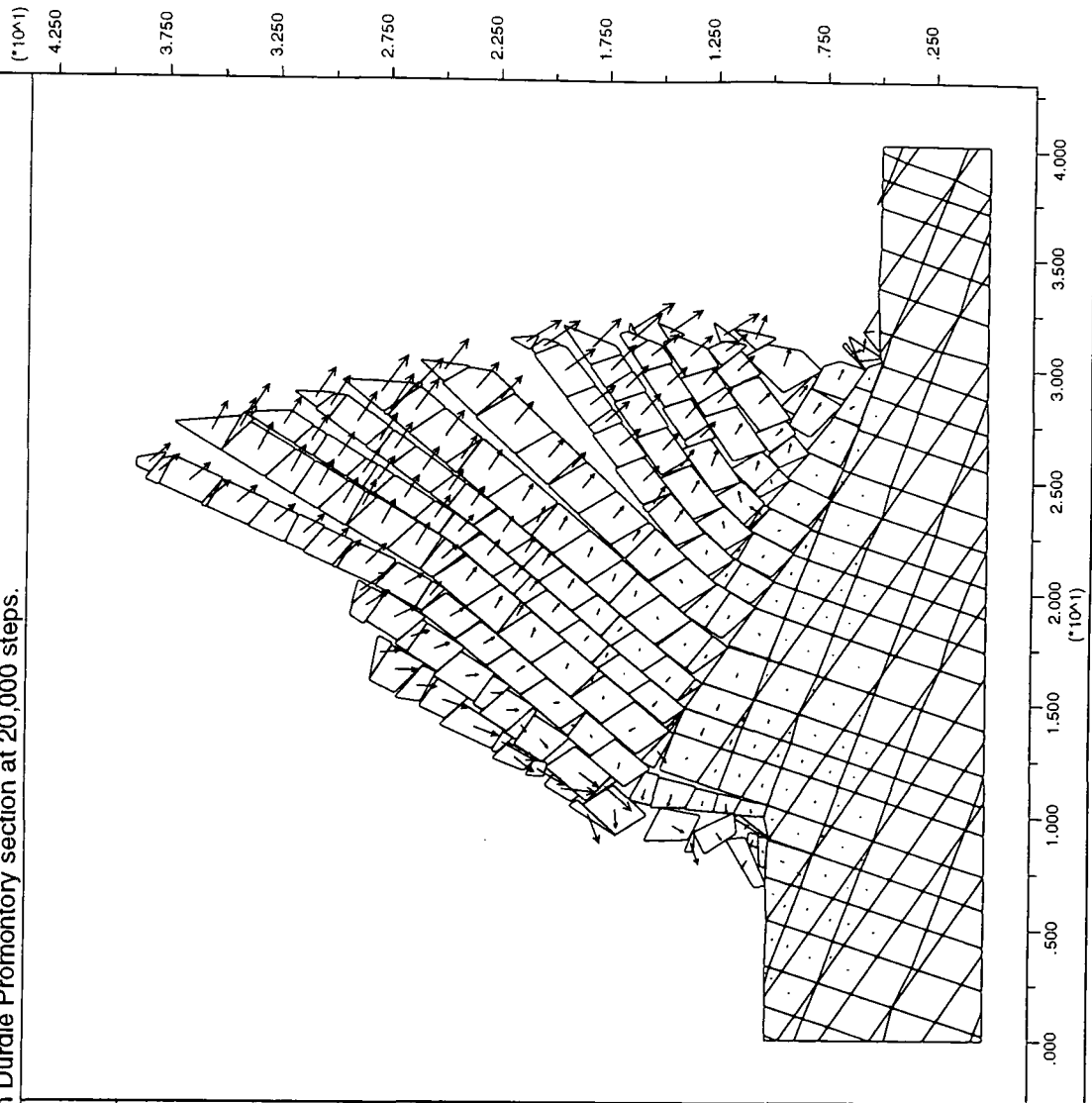
JOB TITLE : Figure 6.56b: Western Durdle Promontory section at 20,000 steps.

UDEC (Version 2.00)

LEGEND

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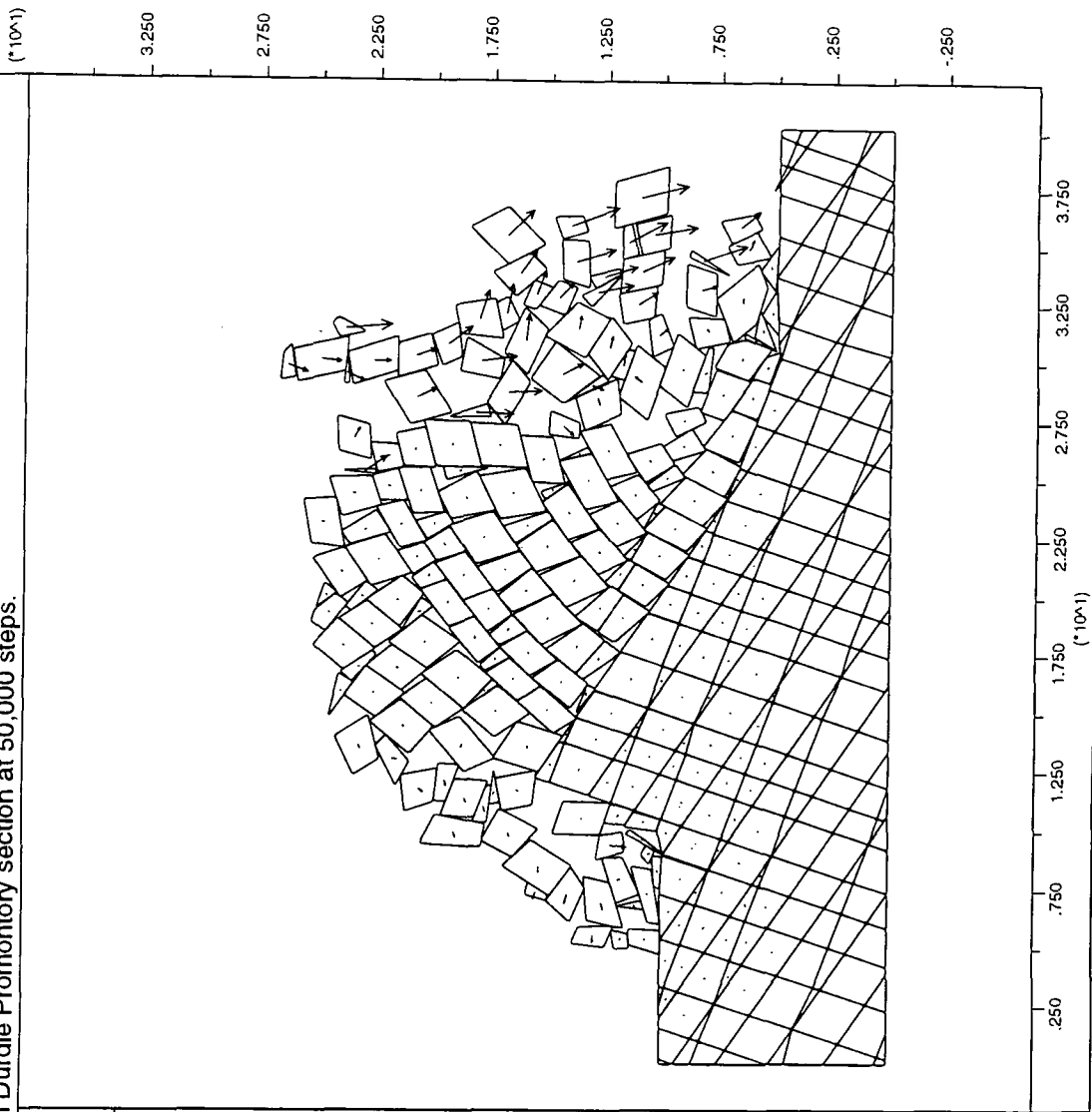
JOB TITLE : Figure 6.56c: Western Durdle Promontory section at 50,000 steps.

UDEC (Version 2.00)

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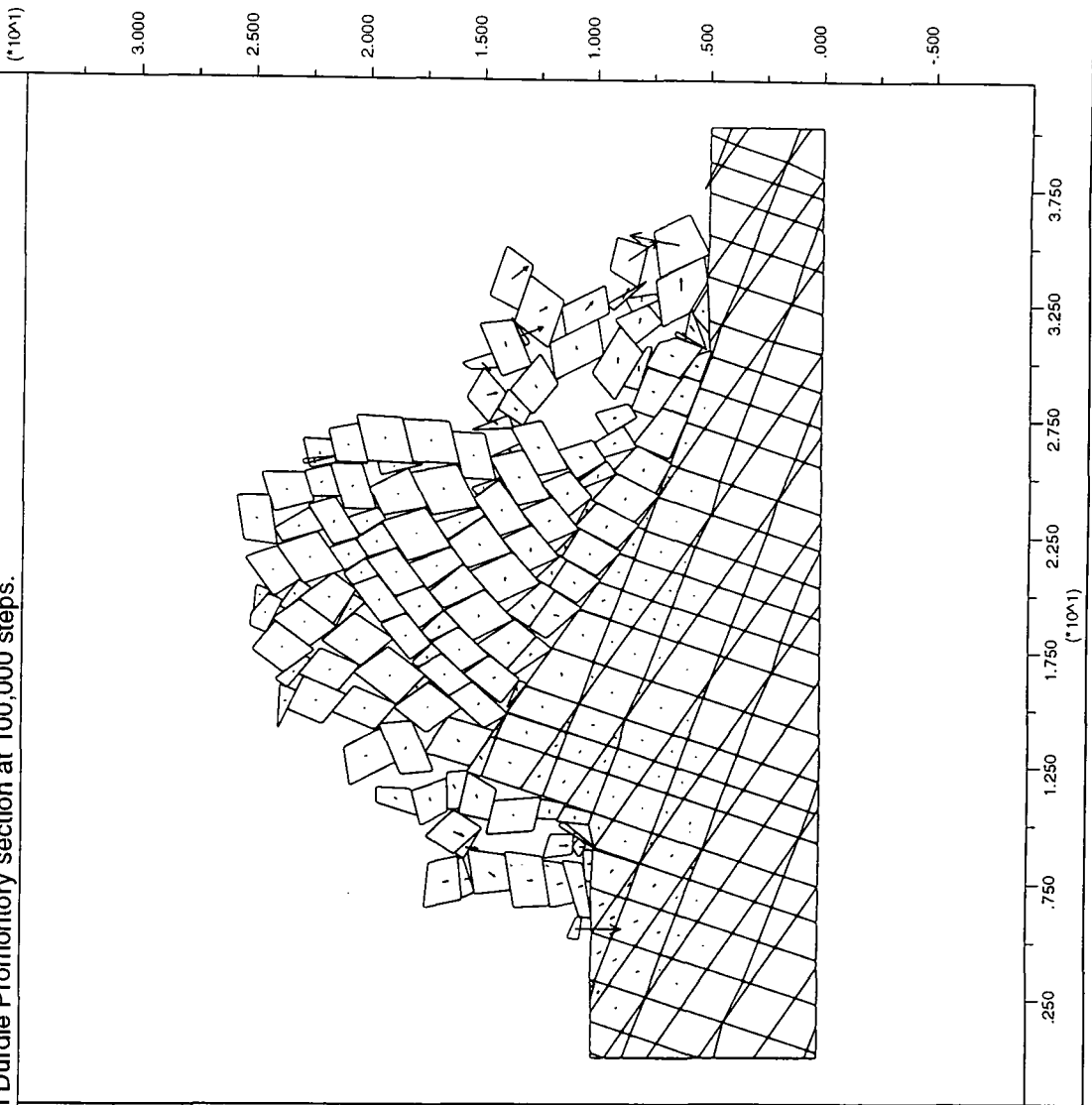
JOB TITLE : Figure 6.56d: Western Durdle Promontory section at 100,000 steps.

UDEC (Version 2.00)

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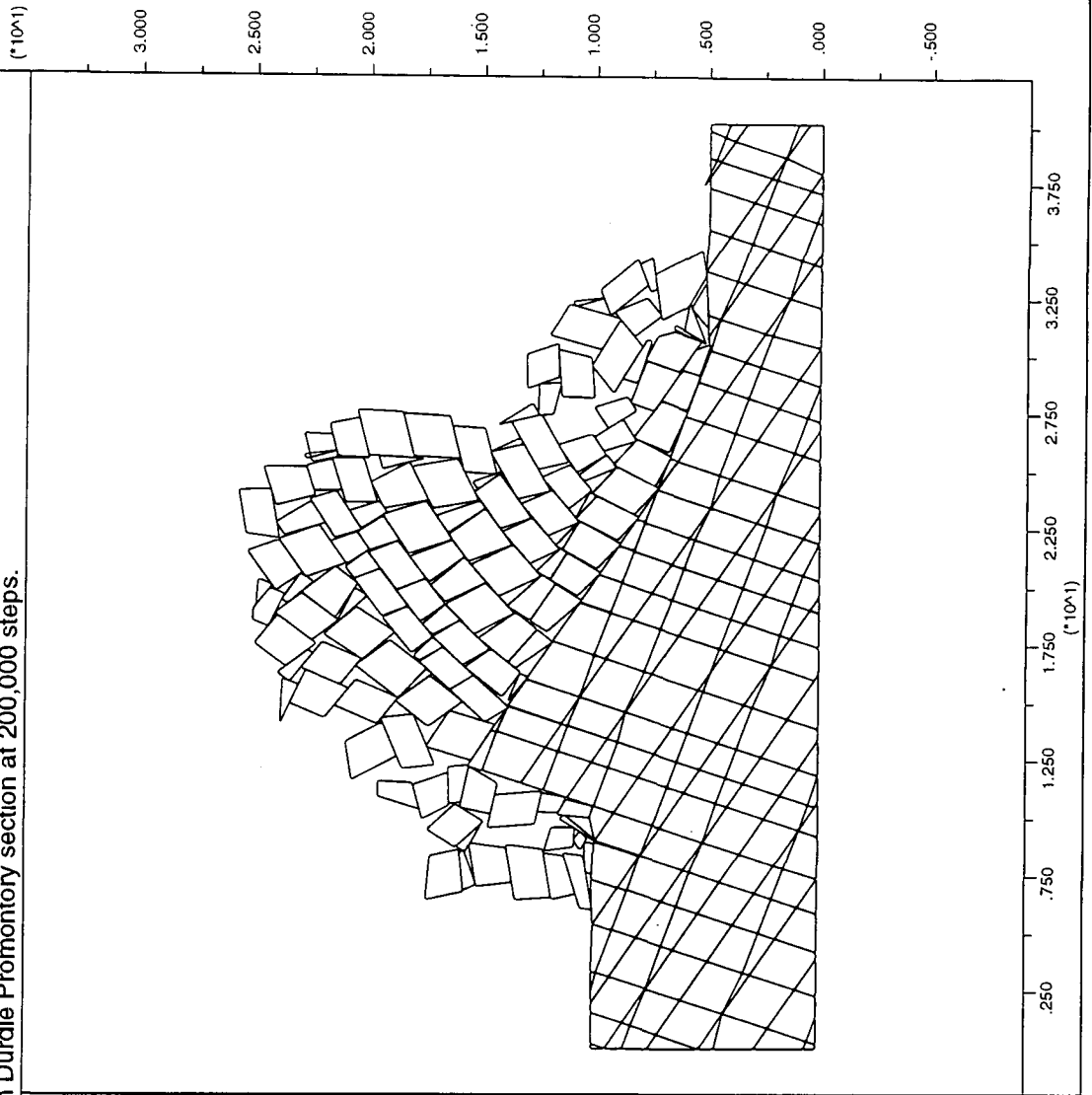
DEPARTMENT OF GEOGRAPHY
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JOB TITLE : Figure 6.56e: Western Durdle Promontory section at 200,000 steps.

UDEC (Version 2.00)

LEGEND

1/04/1980 17:52
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time 5.482E+01 sec
block plot



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JOB TITLE : Figure 6.57: Forces for western Durdle Promontory at 200,000 steps.

UDEC (Version 2.00)

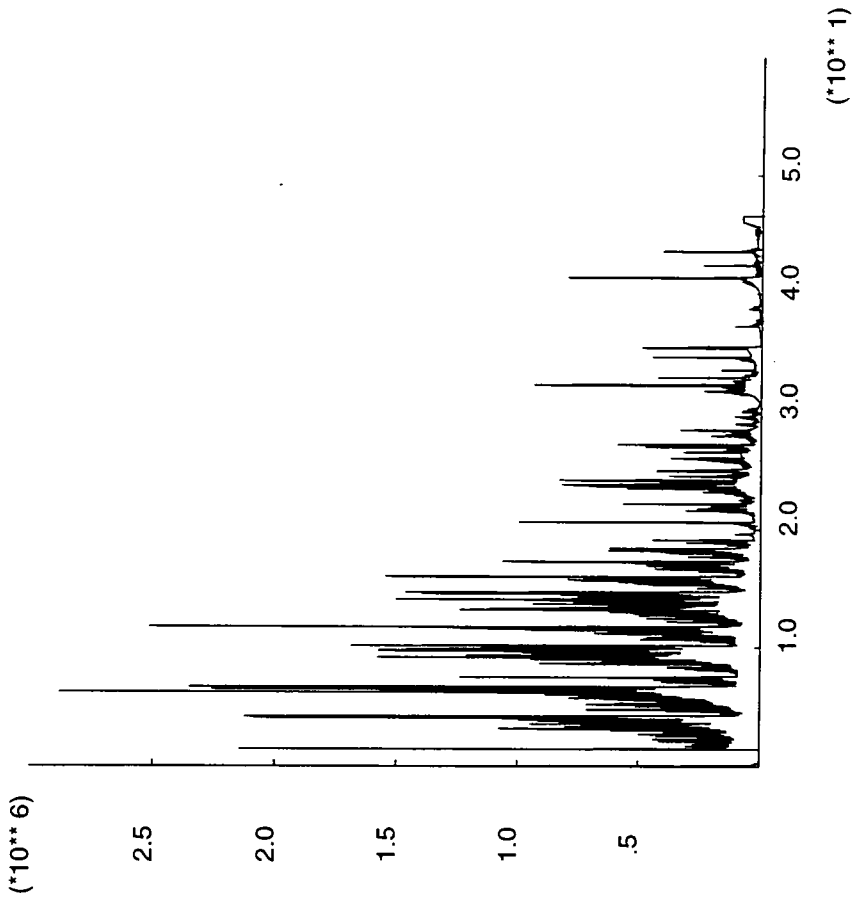
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1/04/1980 17:54

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JOB TITLE : Figure 6.58: Forces for the Durdle Door sea arch at equilibrium.

UDEC (Version 2.00)

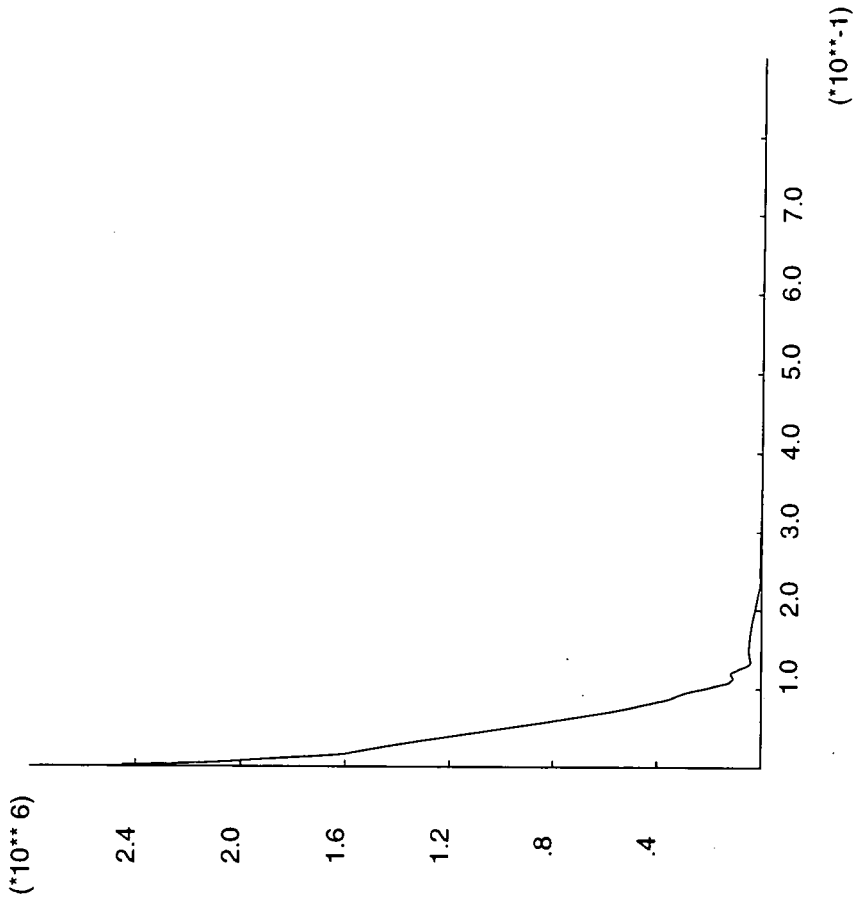
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8/28/1998 18:07

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JOB TITLE : Figure 6.59a: Durdle Door sea arch at 10,000 steps.

UDEC (Version 2.00)

LEGEND

9/06/1998 17:18

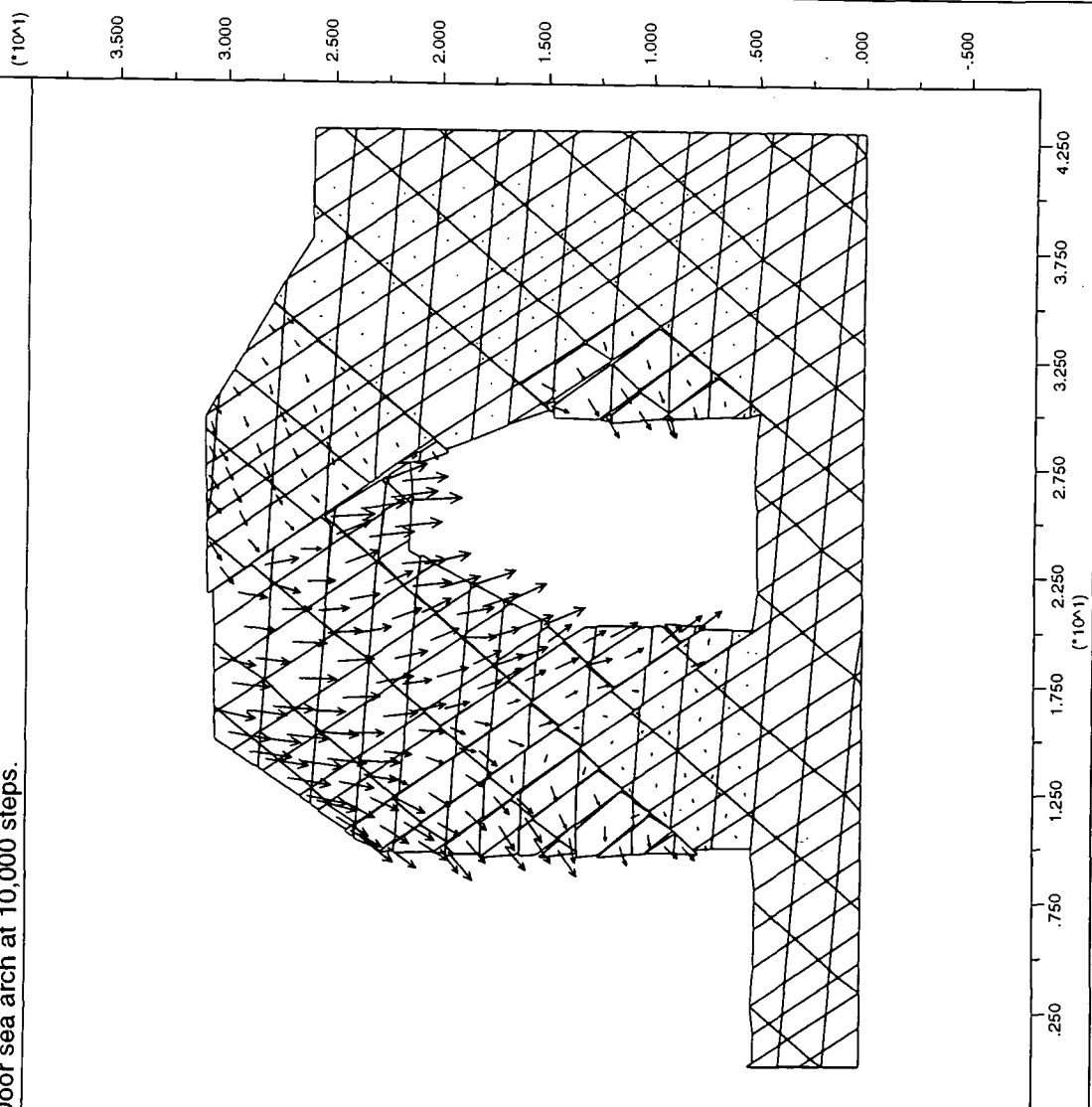
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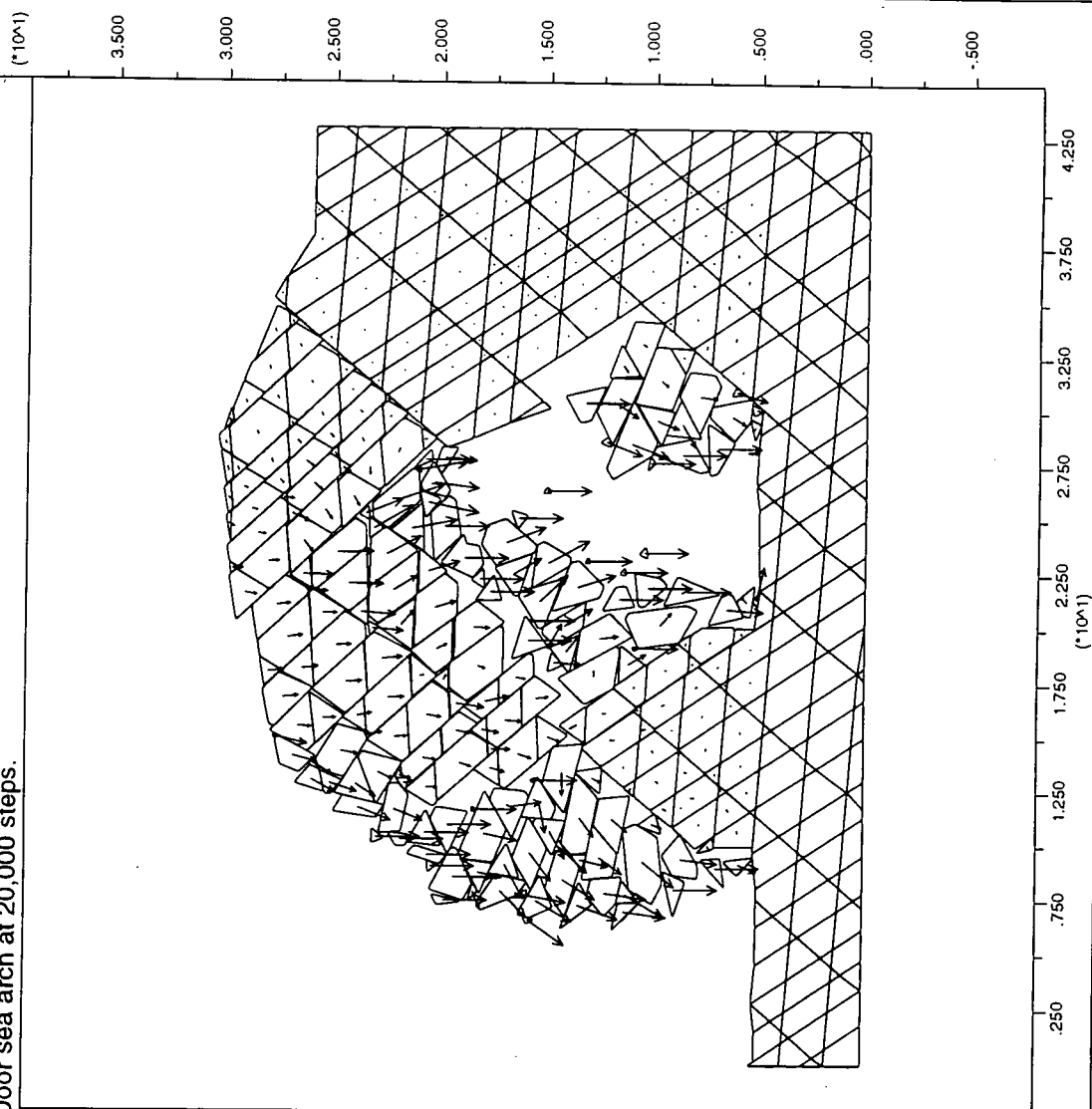
JOB TITLE : Figure 6.59b: Durdle Door sea arch at 20,000 steps.

UDEC (Version 2.00)

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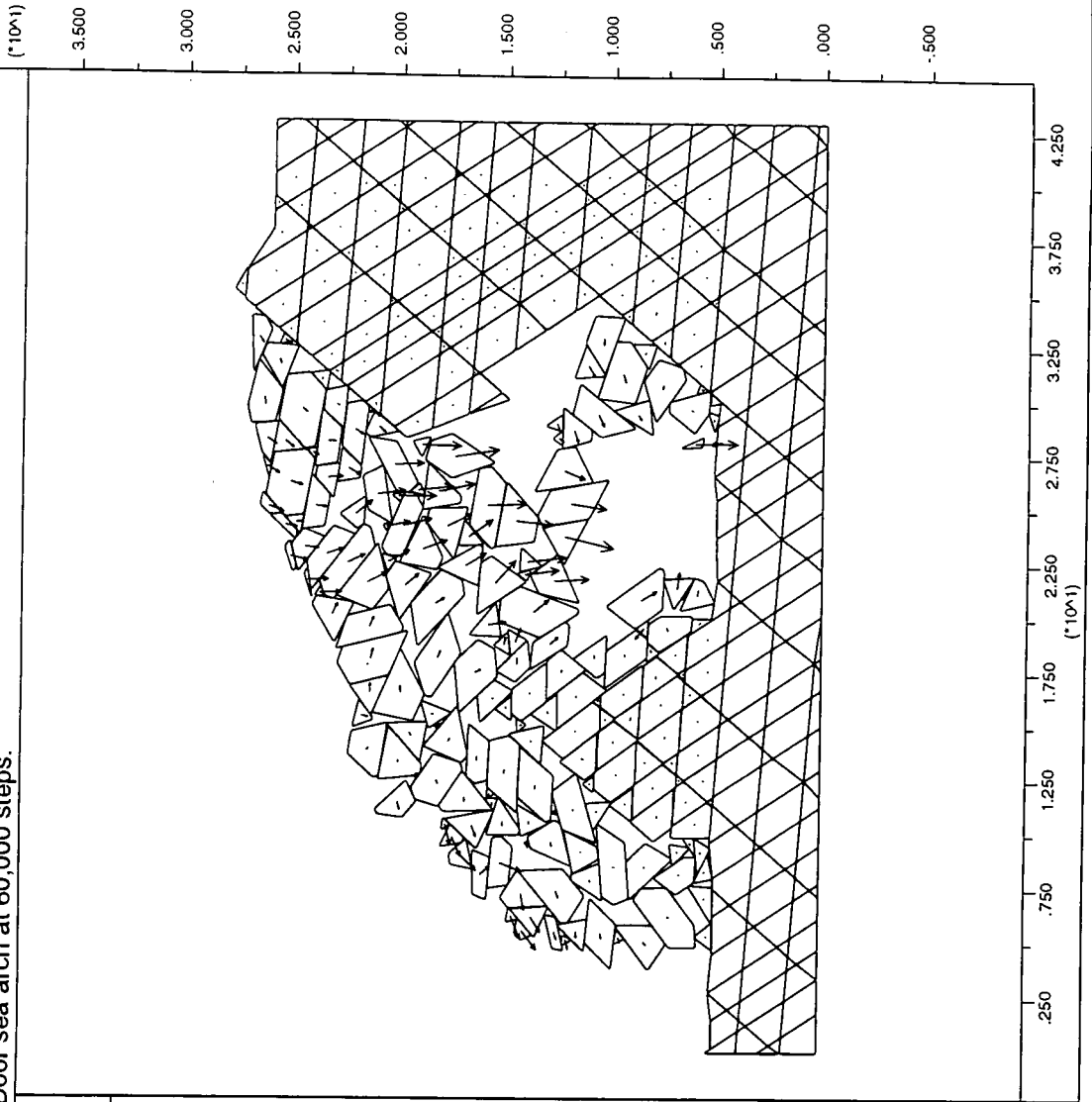
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UDEC (Version 2.00)

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JOB TITLE : Figure 6.59d: Durdle Door sea arch at 100,000 steps.

UDEC (Version 2.00)

LEGEND

8/28/1998 18:17

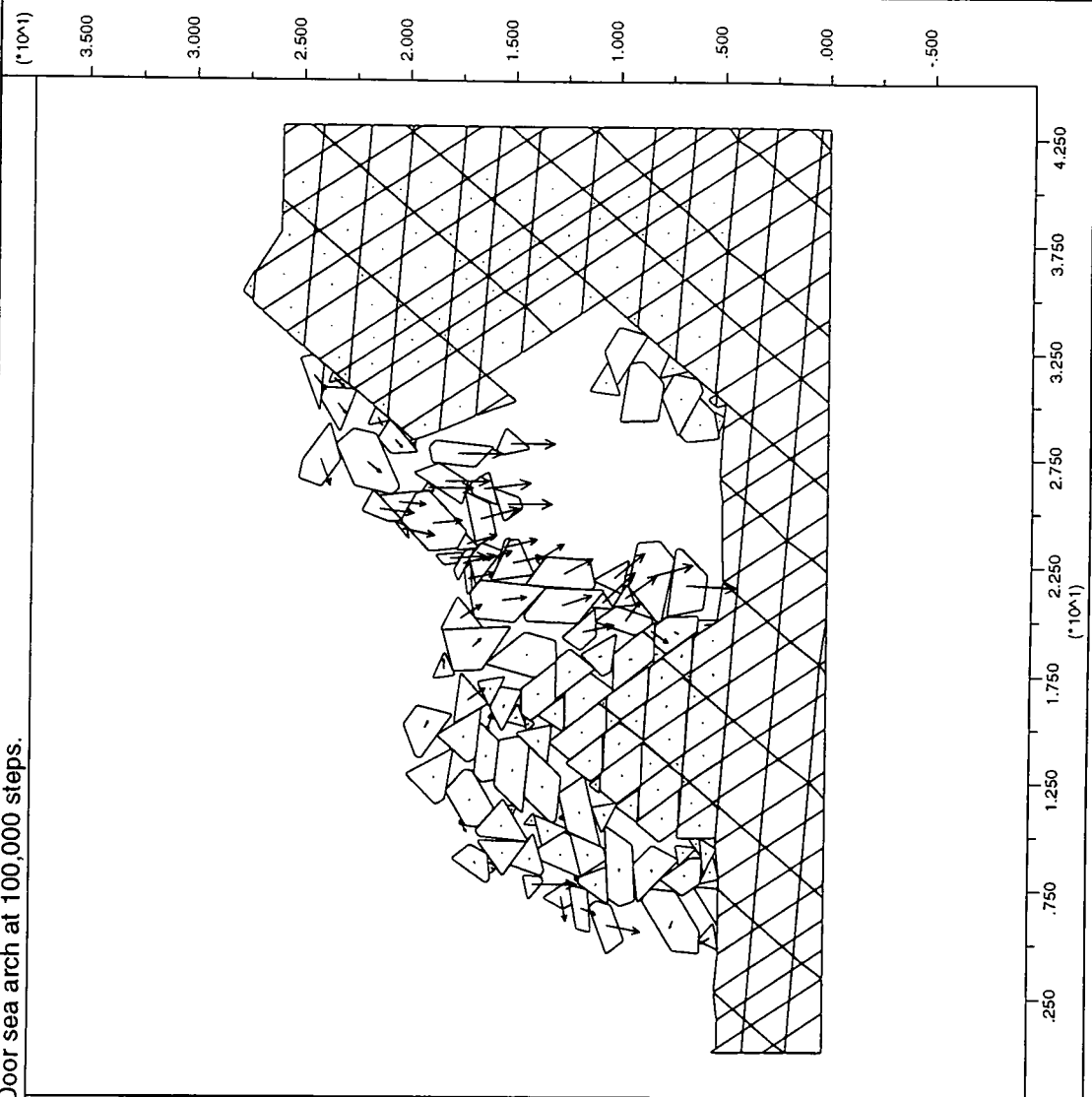
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velocity vectors

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JOB TITLE : Figure 6.59e: Durdle Door sea arch at 110,000 steps.

UDEC (Version 2.00)

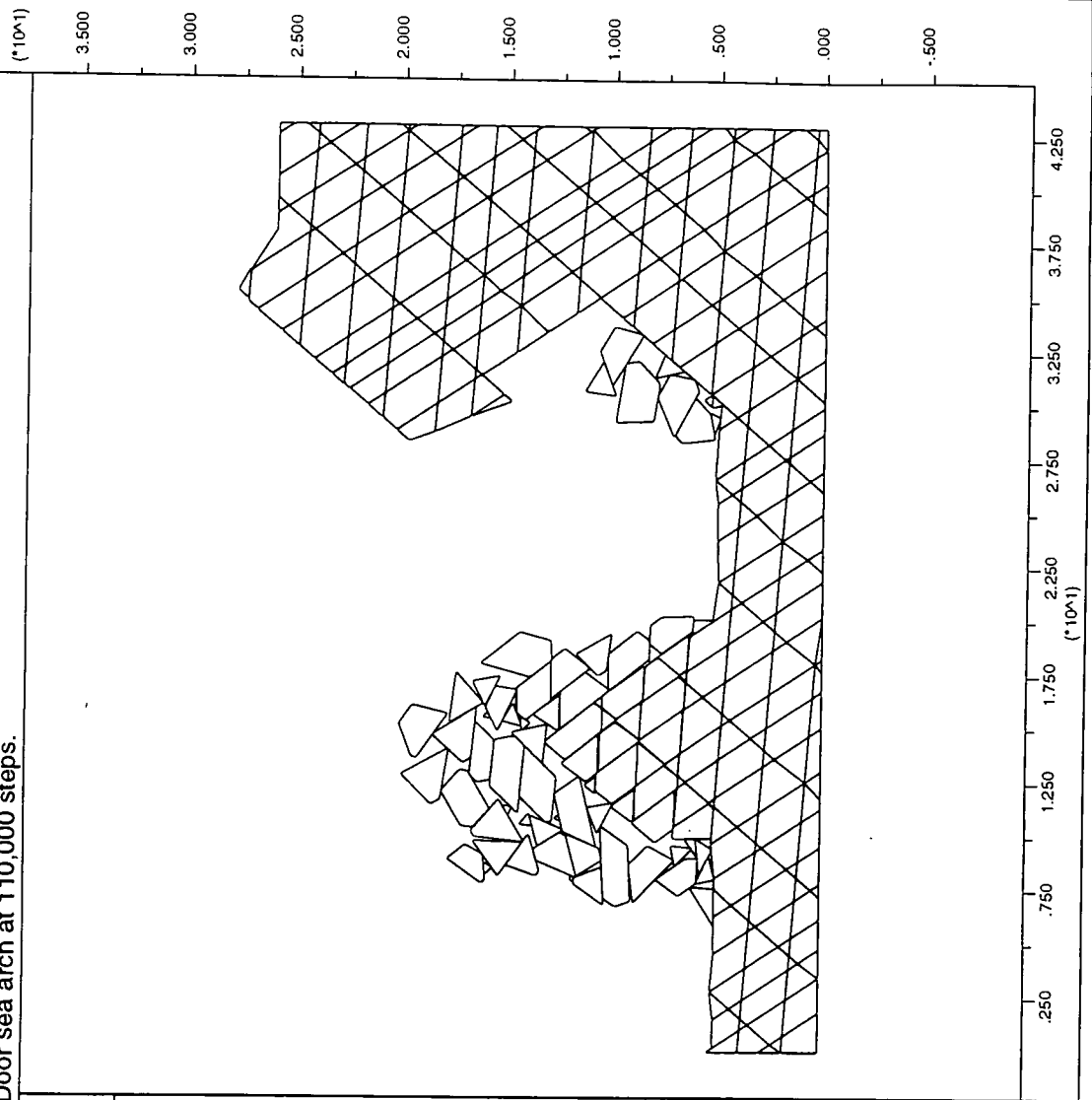
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block plot



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JOB TITLE : Figure 6.60: Forces for the Durdle Door sea arch at 110,000 steps.

UDEC (Version 2.00)

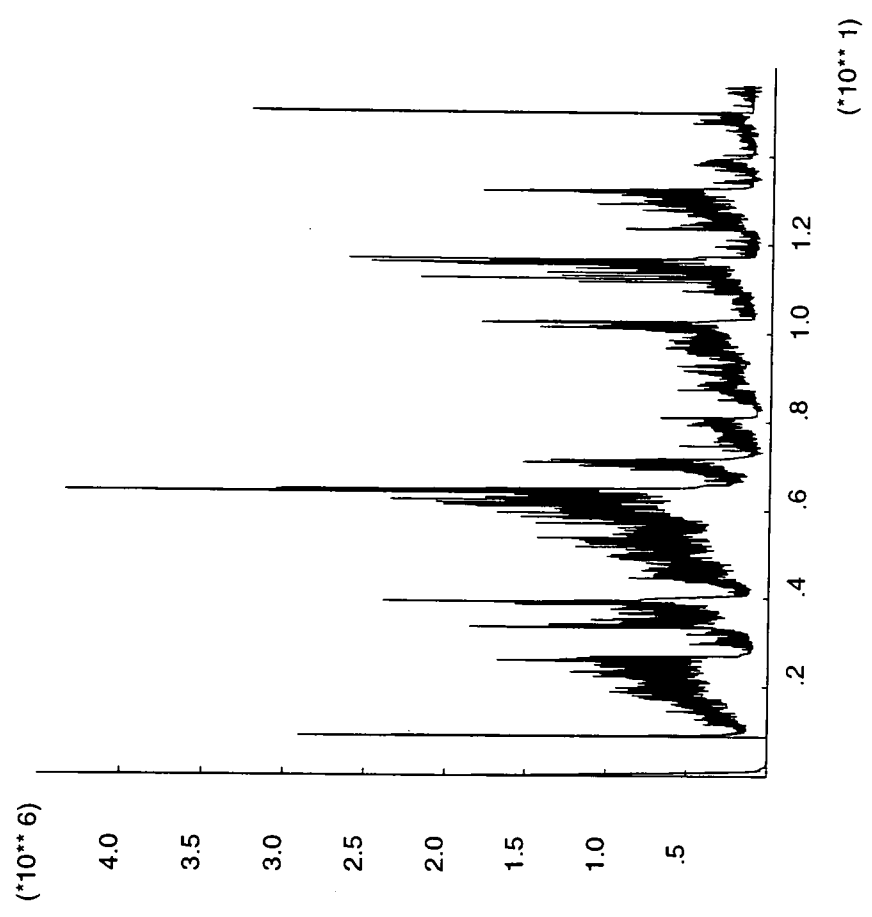
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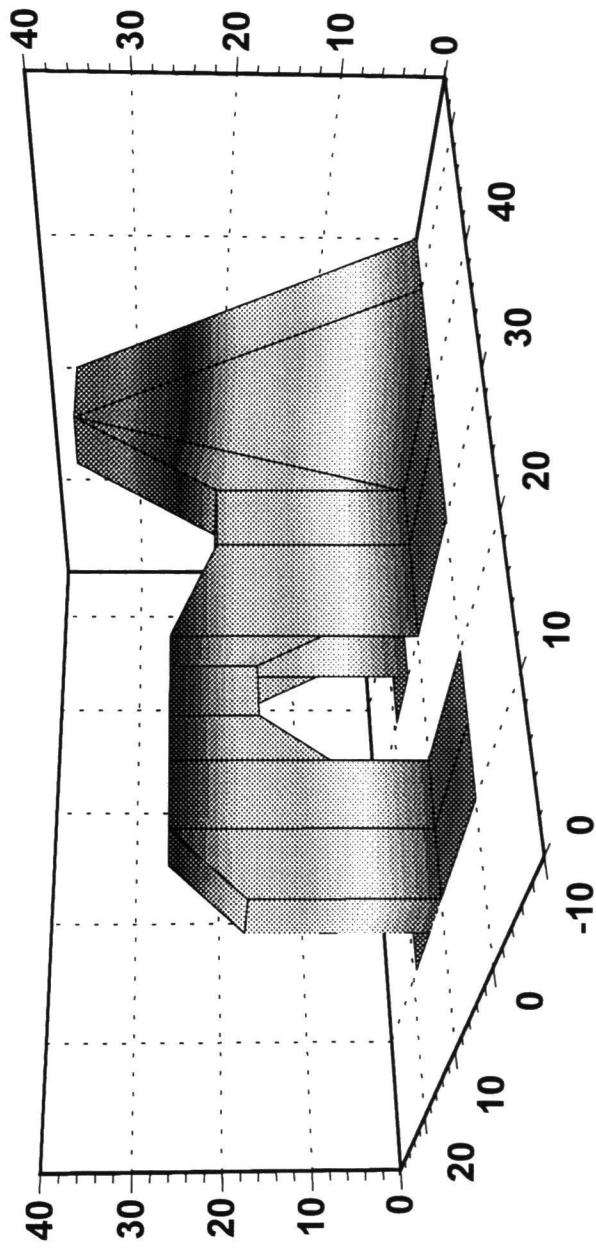


Figure 6.6 1a: Three-dimensional image of the western part of the present-day Durdle Promontory from the south-west.

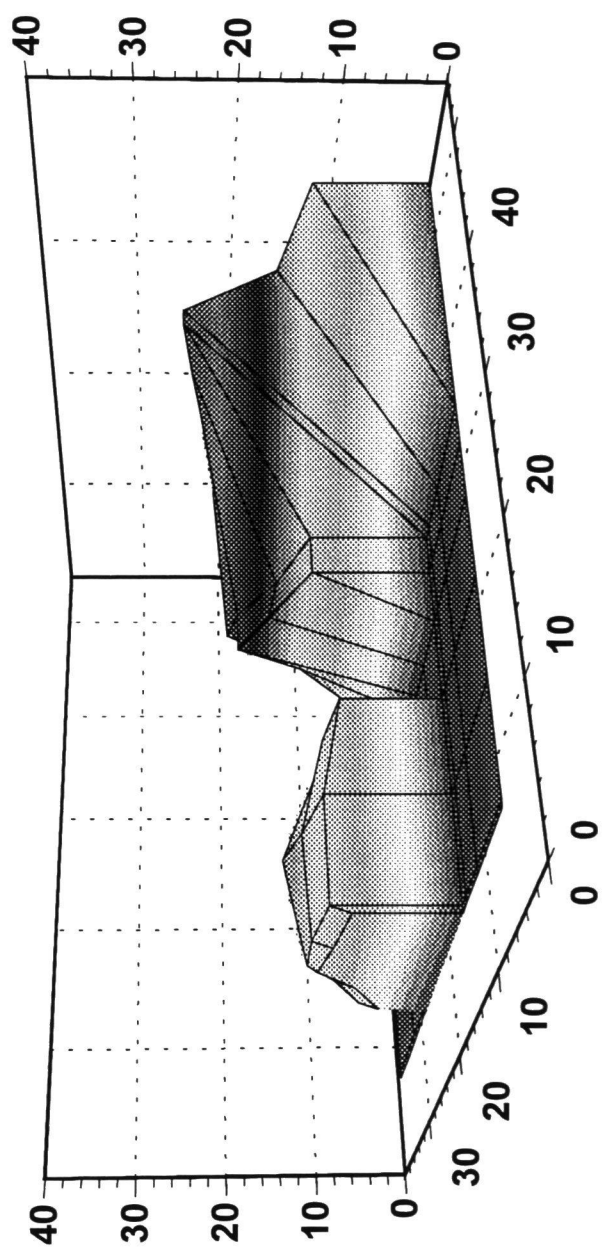


Figure 6.61b: Three-dimensional image of the western part of the present-day Durdle Promontory from the south-west after 100,000 model cycles.

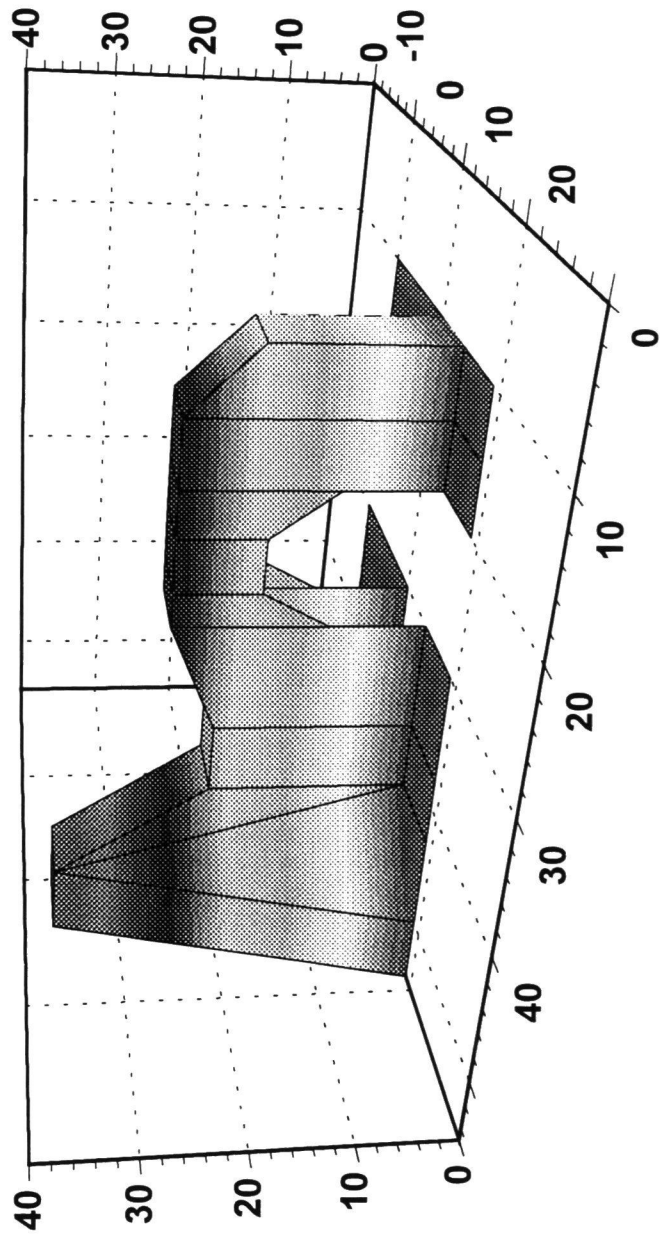


Figure 6.62a: Three-dimensional image of the western part of the present-day Durdle Promontory from the north-west.

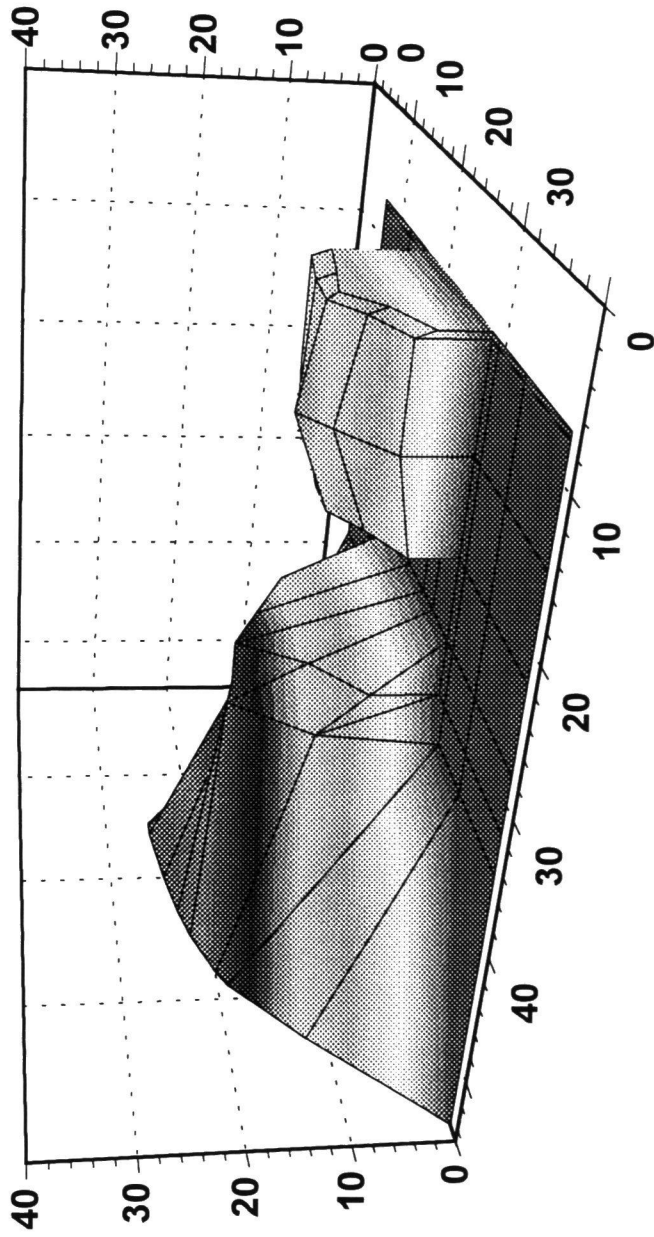


Figure 6.62b: Three-dimensional image of the western part of the present-day Durdle Promontory from the north-west after 100,000 model cycles.

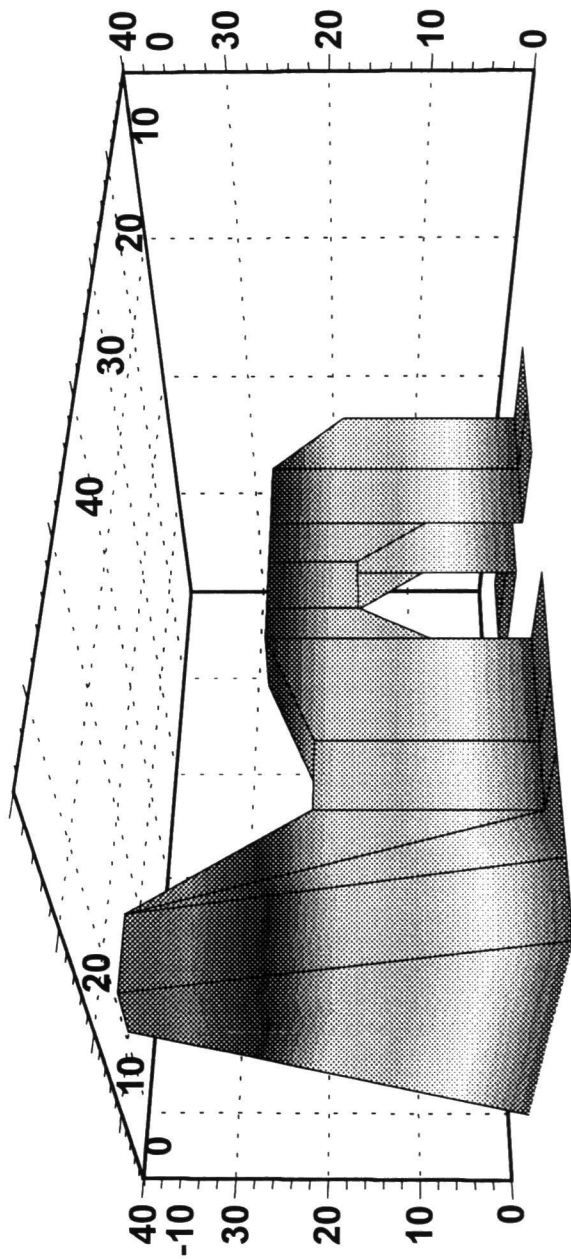


Figure 6.63a: Three-dimensional image of the western part of the present-day Durdle Promontory from the north-east.

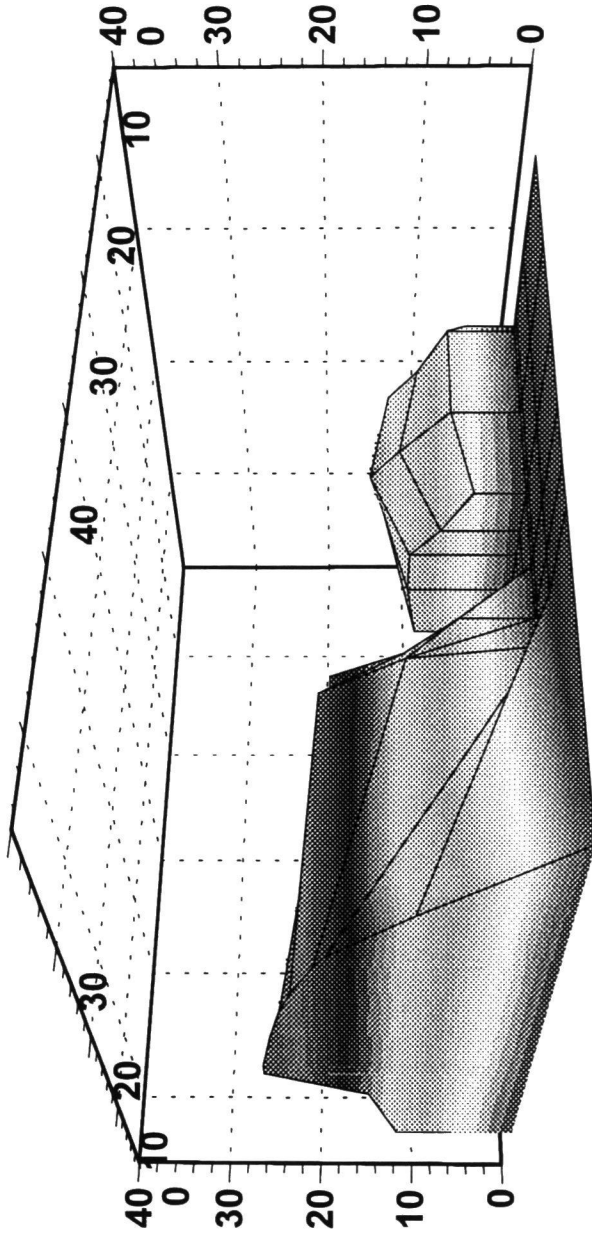


Figure 6.63b: Three-dimensional image of the western part of the present-day Durdle Promontory from the north-east after 100,000 model cycles.

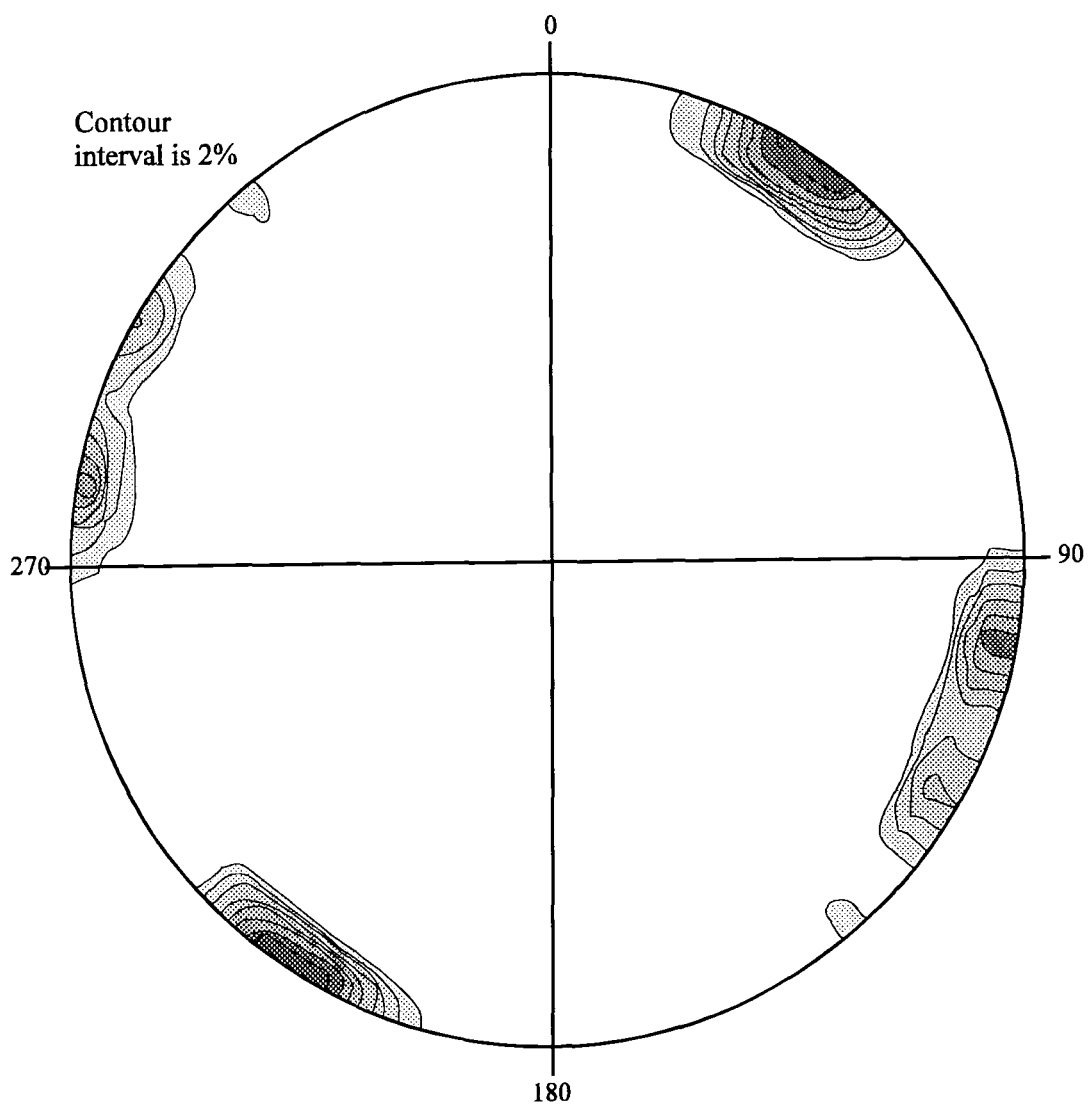


Figure 7.1: Polar projection for the discontinuities in the Kayenta Formation at site DH4E.

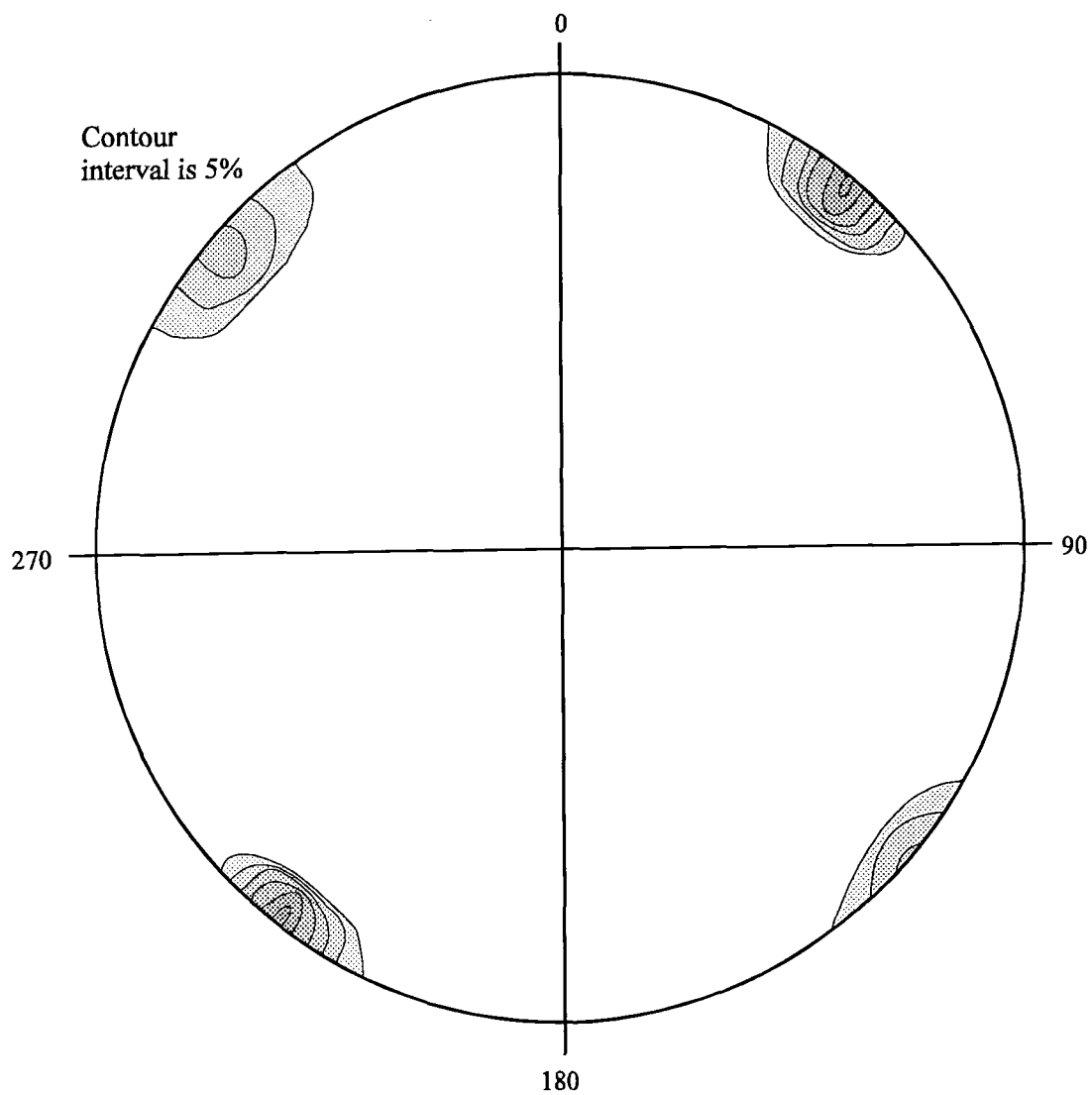


Figure 7.2: Polar projection for the discontinuities in the Kayenta Formation at site DH5H.

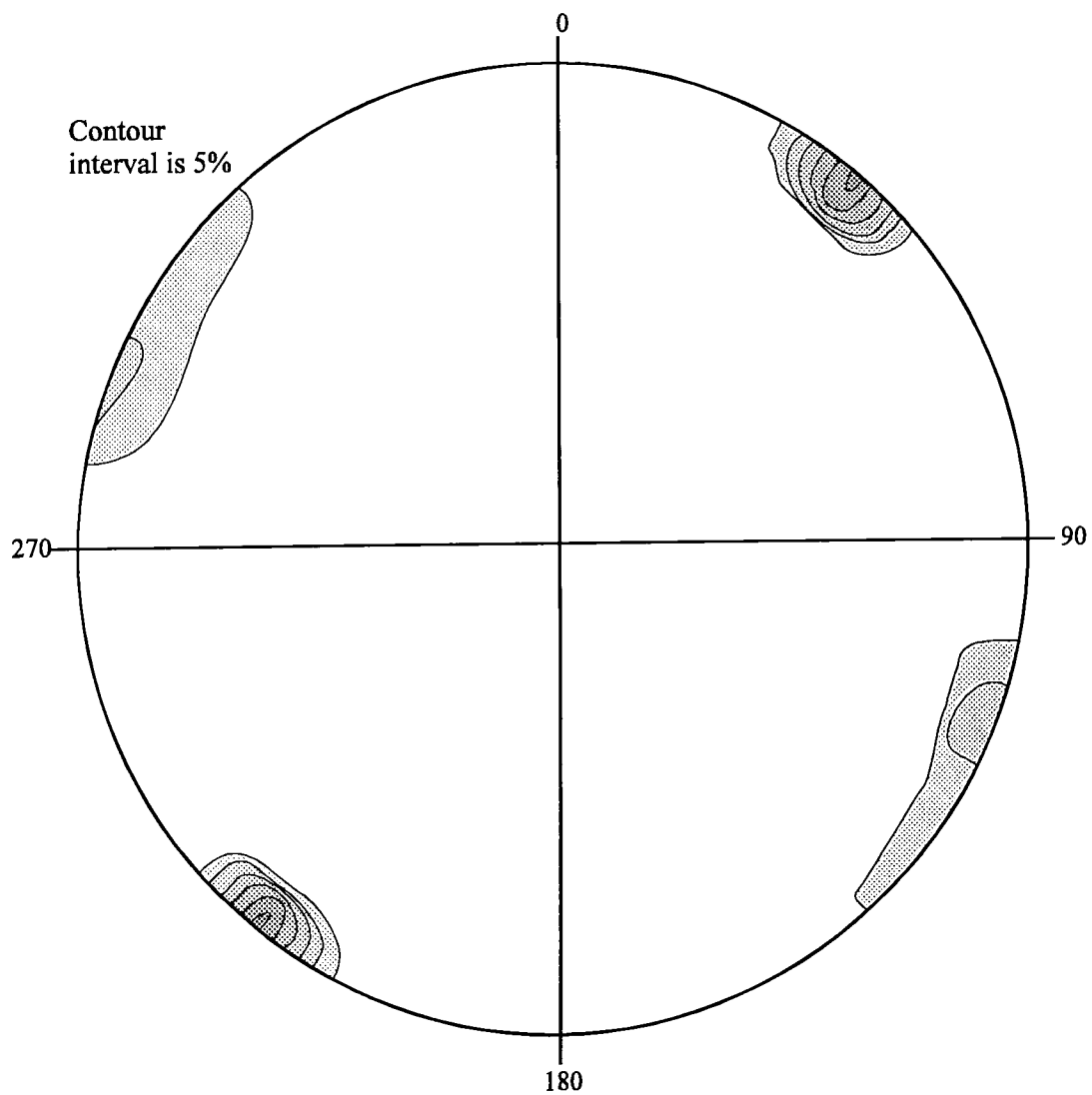


Figure 7.3: Polar projection for the discontinuities in the Kayenta Formation at site DH7E.

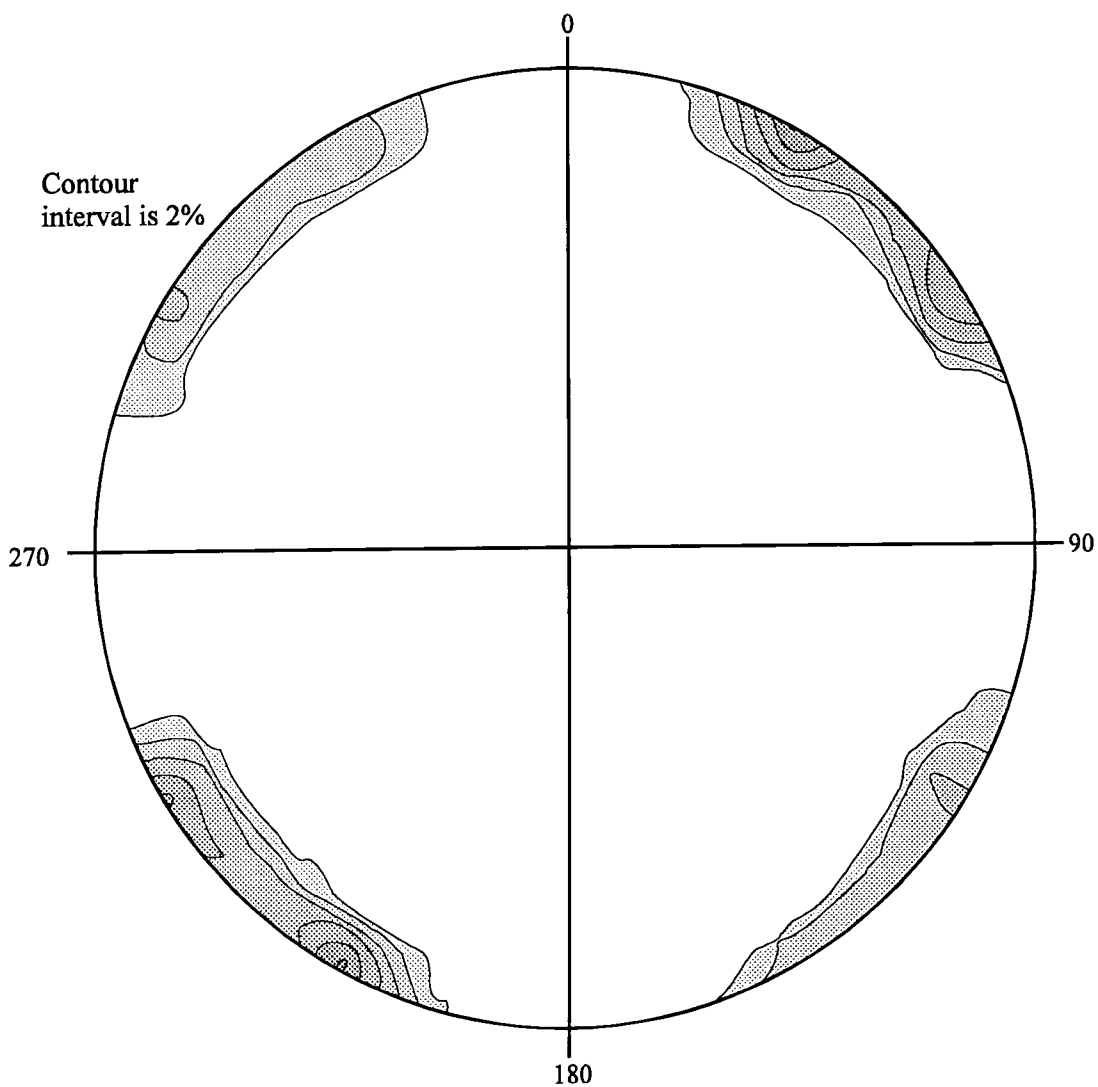


Figure 7.4: Polar projection for the discontinuities in the Kayenta Formation at site DH11H.

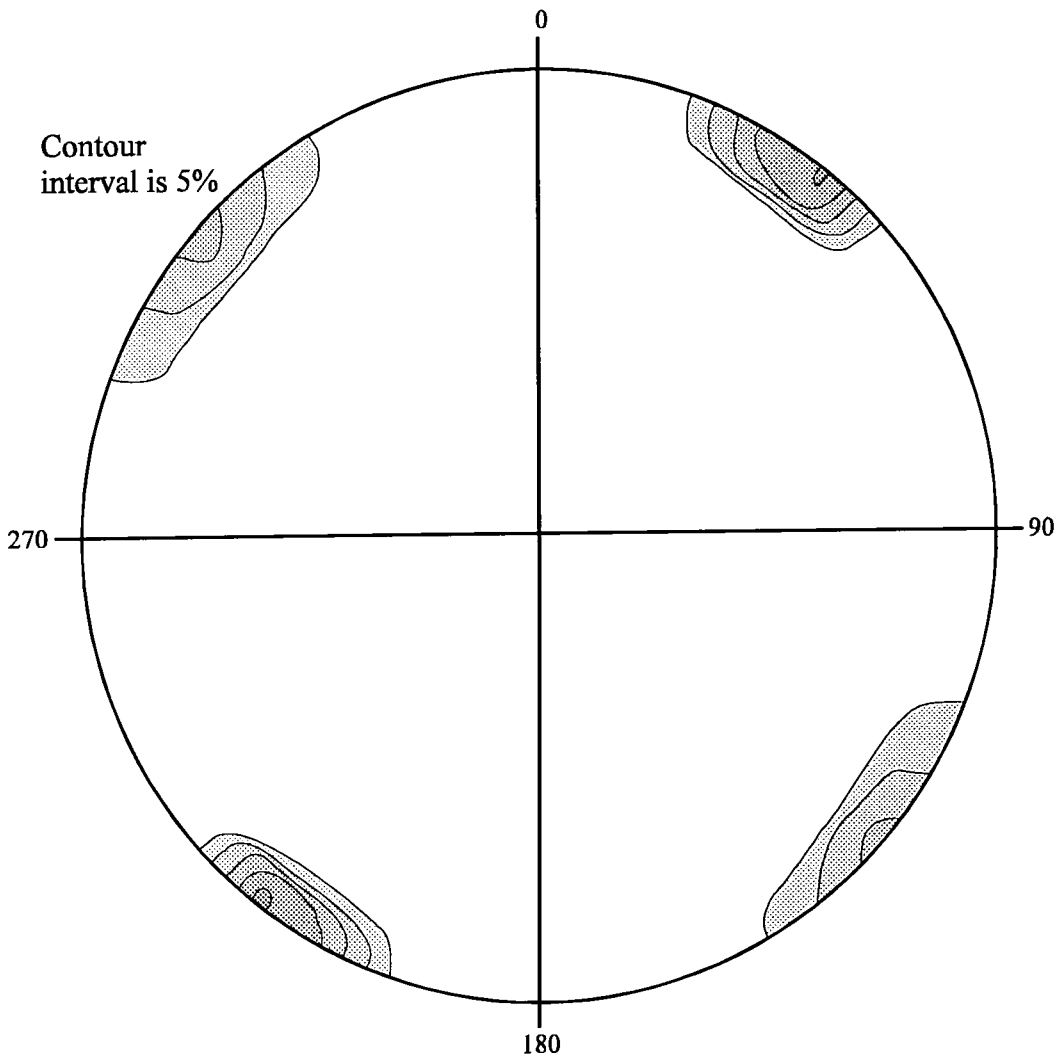


Figure 7.5: Polar projection for the discontinuities in the Kayenta Formation for all of the headland sites at Dead Horse Point.

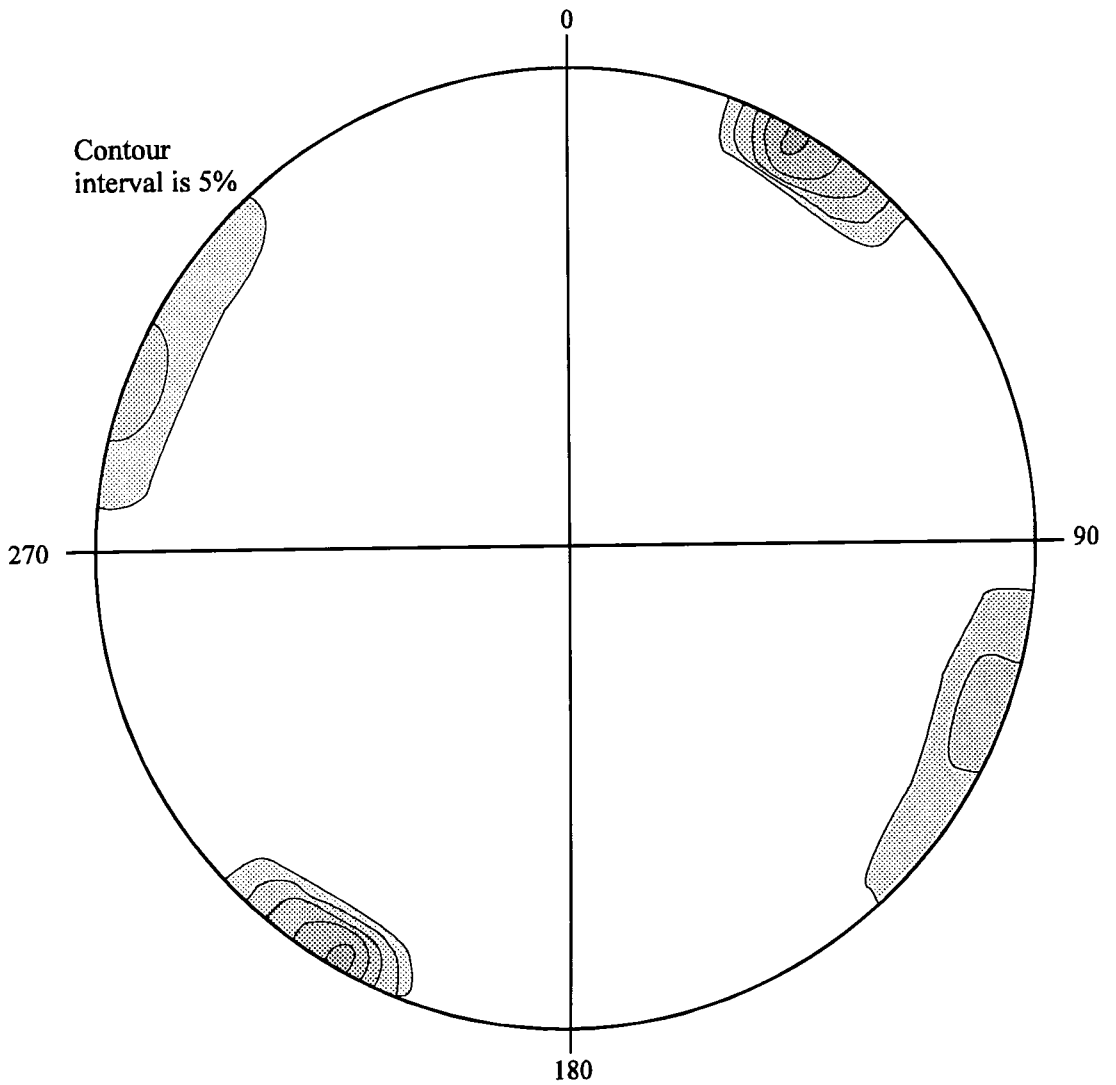


Figure 7.6: Polar projection for the discontinuities in the Kayenta Formation for all of the embayment sites at Dead Horse Point.

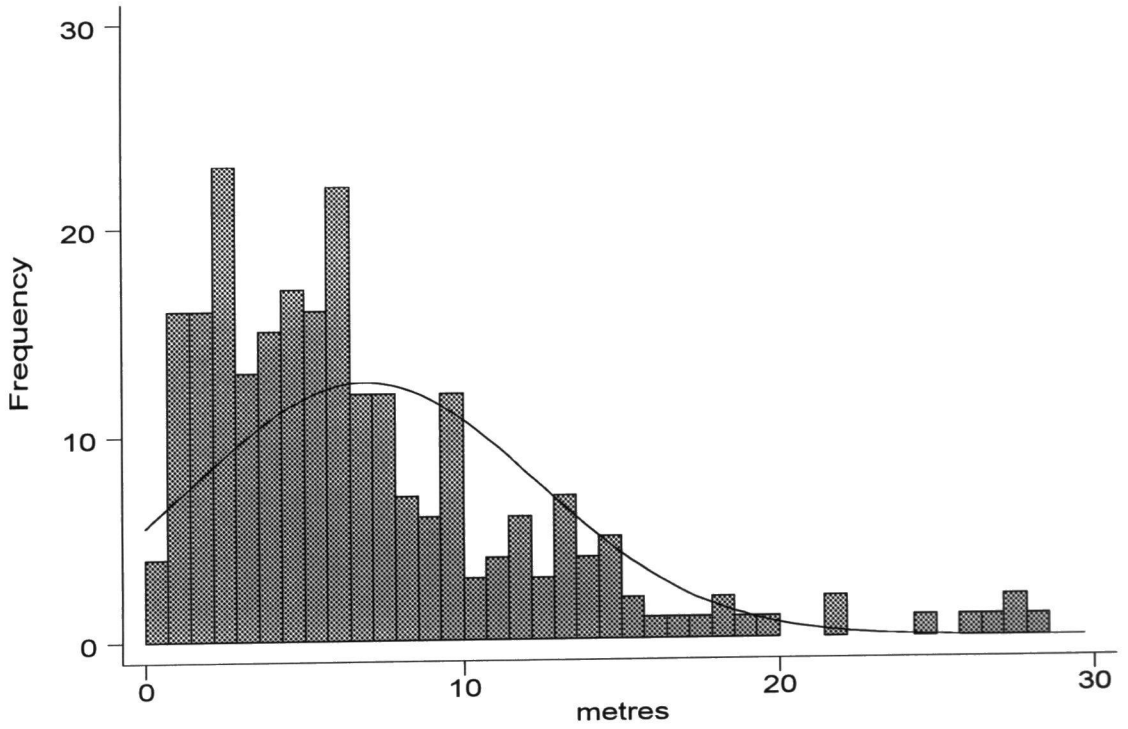


Figure 7.7: Frequency distribution of the total joint spacing readings from Dead Horse Point.

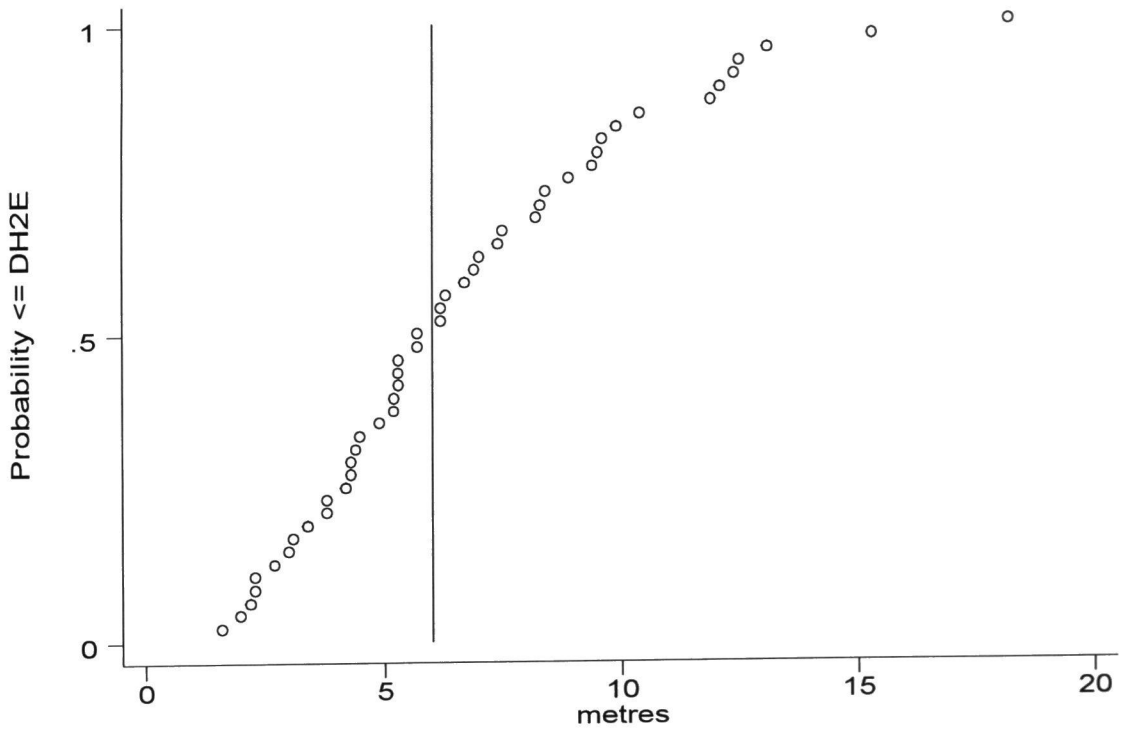


Figure 7.8: The distribution of joint spacing readings from site DH2E against the average for Dead Horse Point.

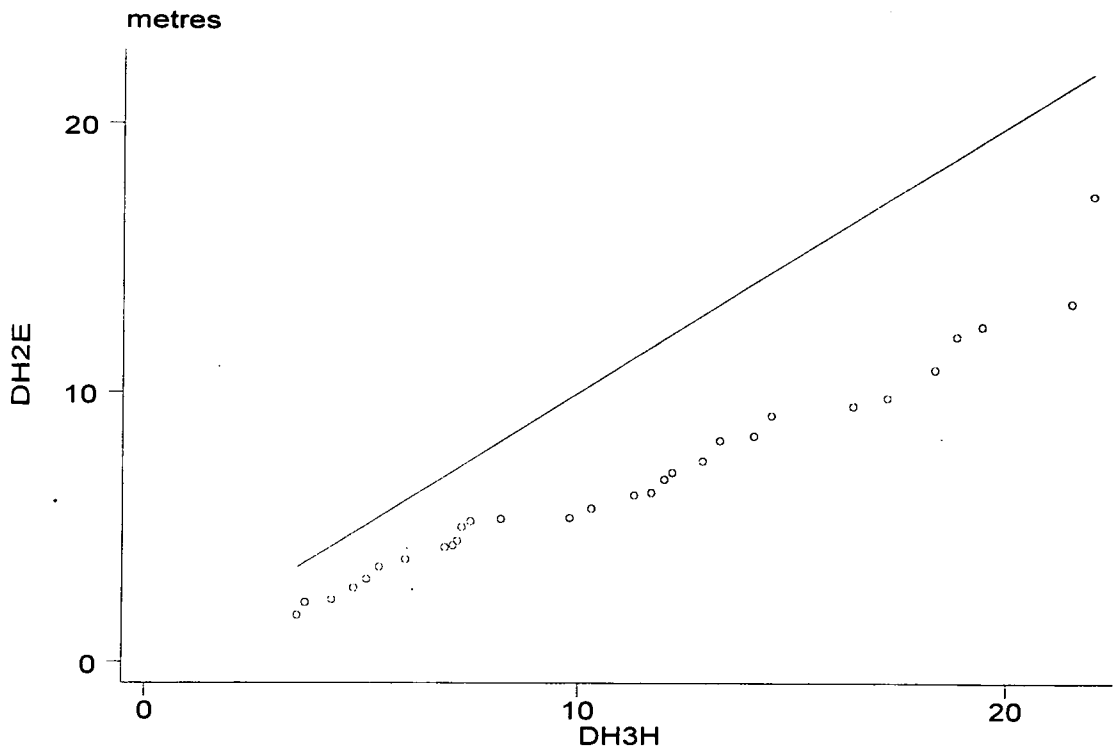


Figure 7.9: A quantile-quantile plot for total joint spacing readings from DH2E and DH3H.

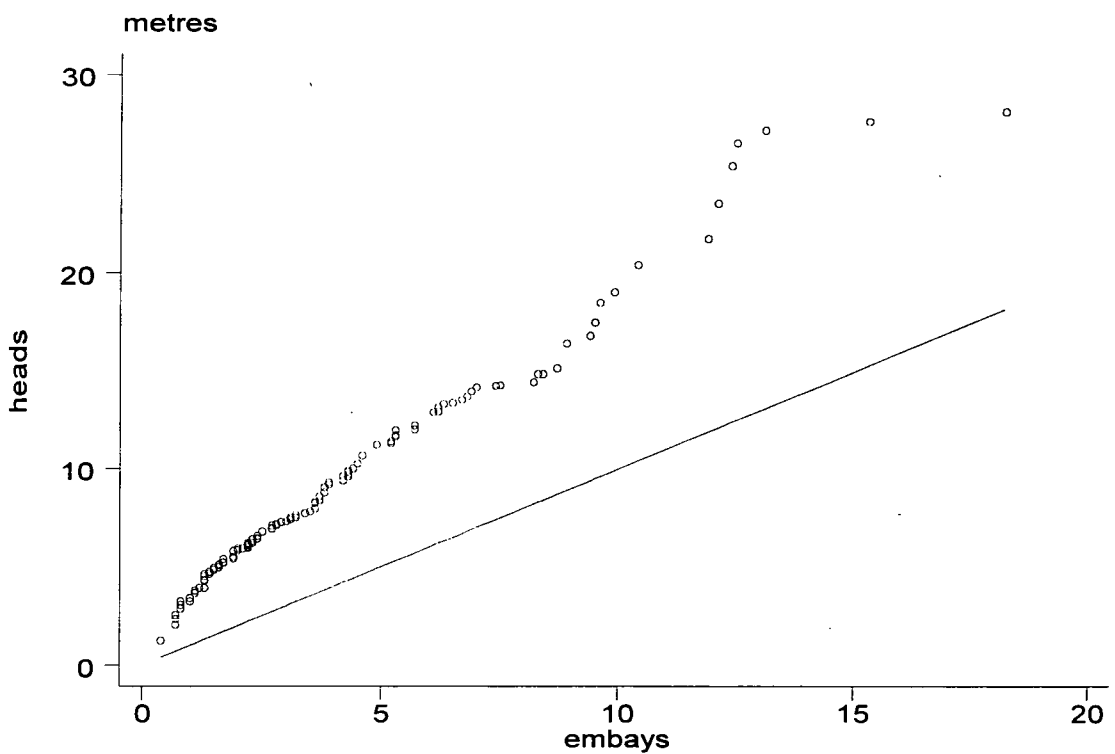


Figure 7.10: A quantile-quantile plot for total joint spacing readings from all headland sites and all embayment sites at Dead Horse Point.

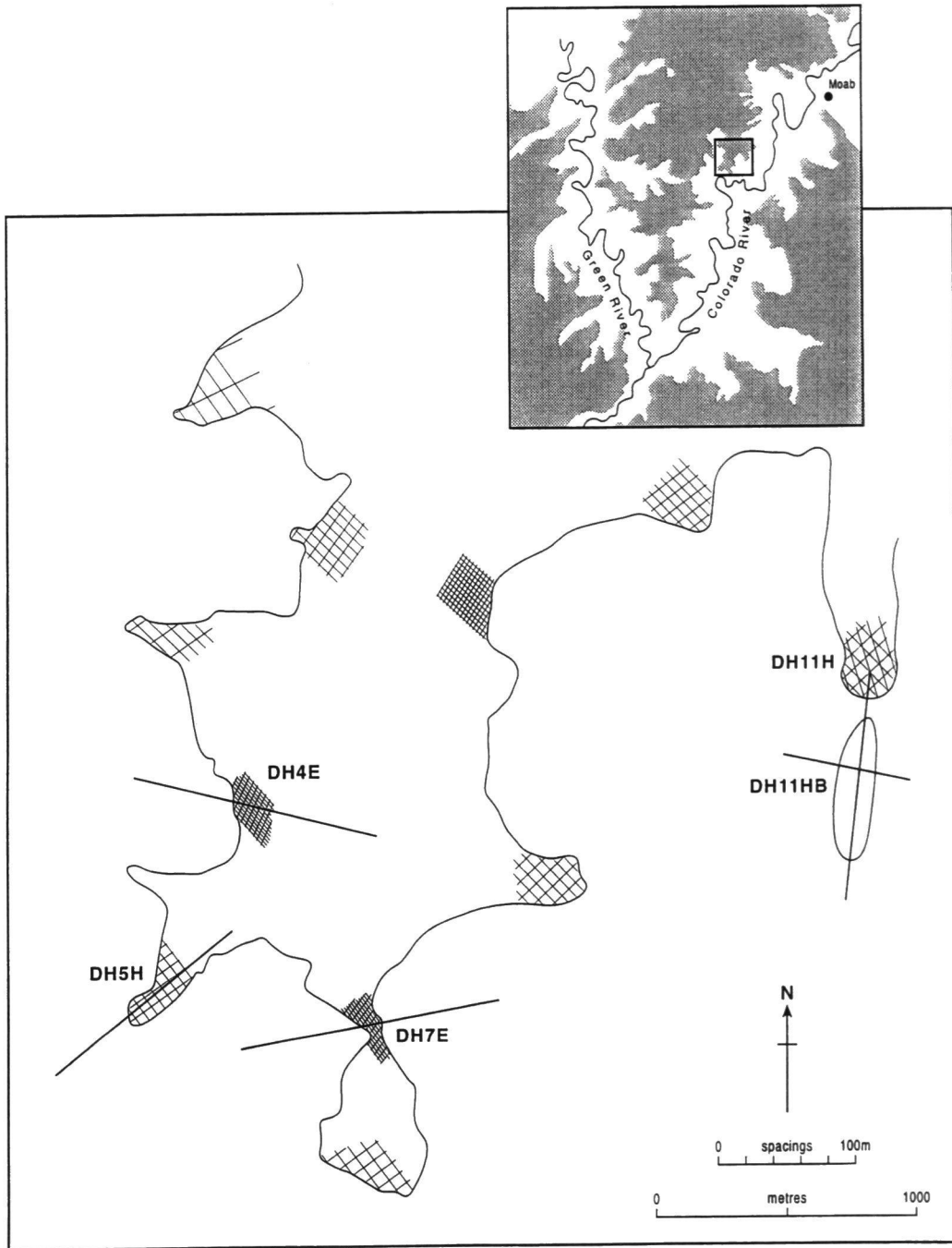


Figure 7.11: Plan of the cliffs at Dead Horse Point State Park showing the surface joint geometry for the field sites.

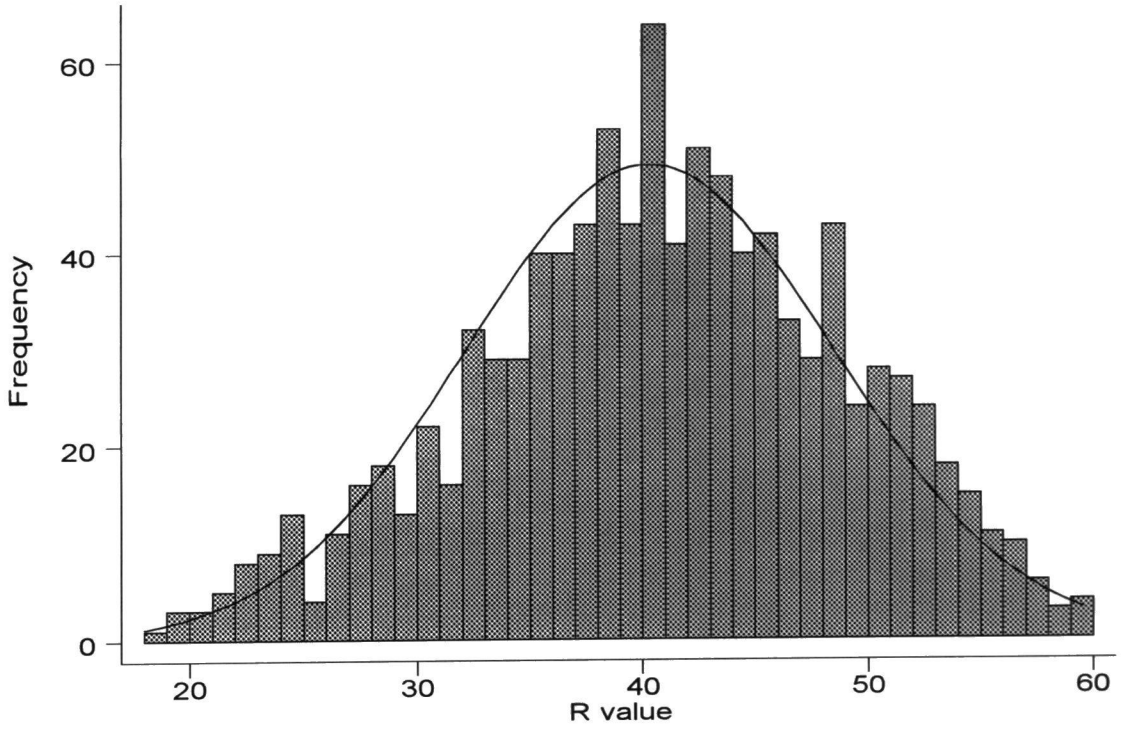


Figure 7.12: Frequency distribution of total Schmidt hammer readings from Dead Horse Point.

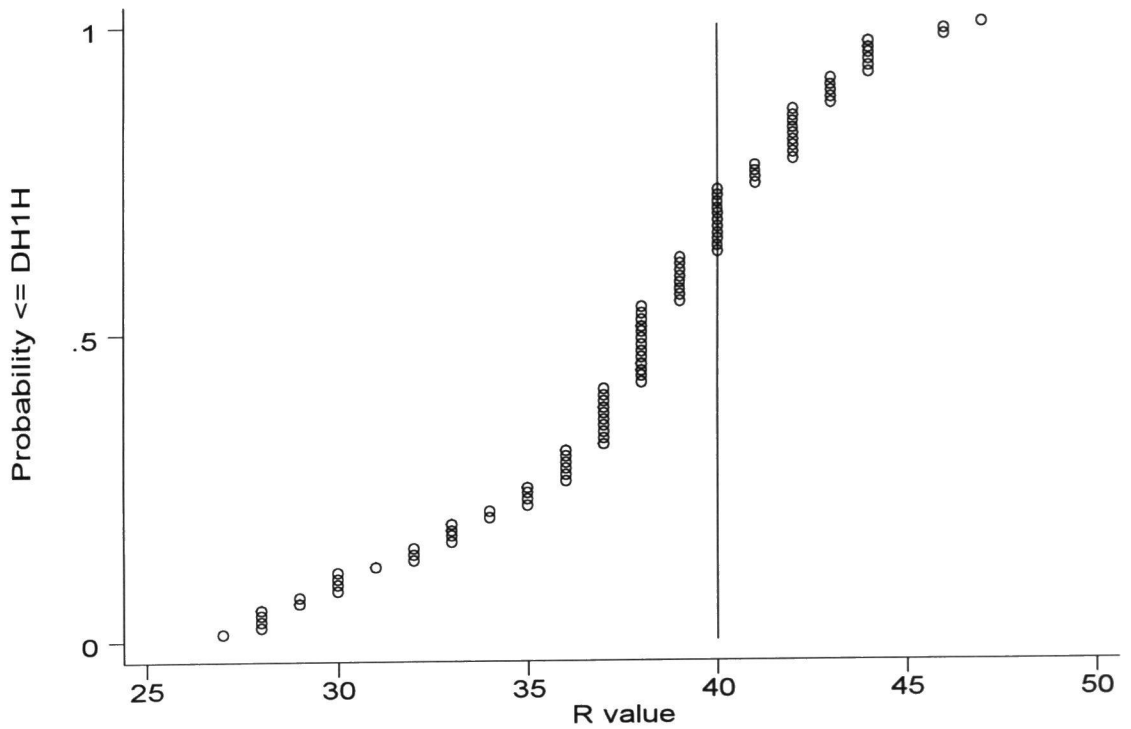


Figure 7.13: The distribution of Schmidt hammer readings from site DH1H against the average for Dead Horse Point.

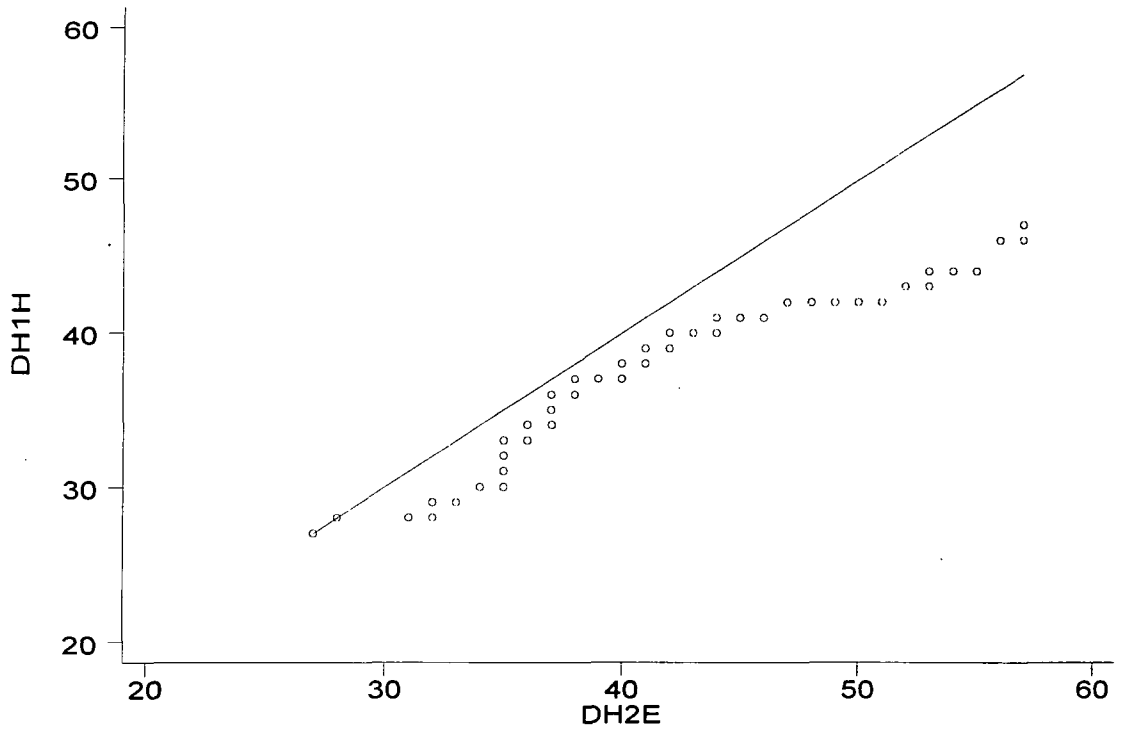


Figure 7.14: A quantile-quantile plot for Schmidt hammer readings from DH1H and DH2E.

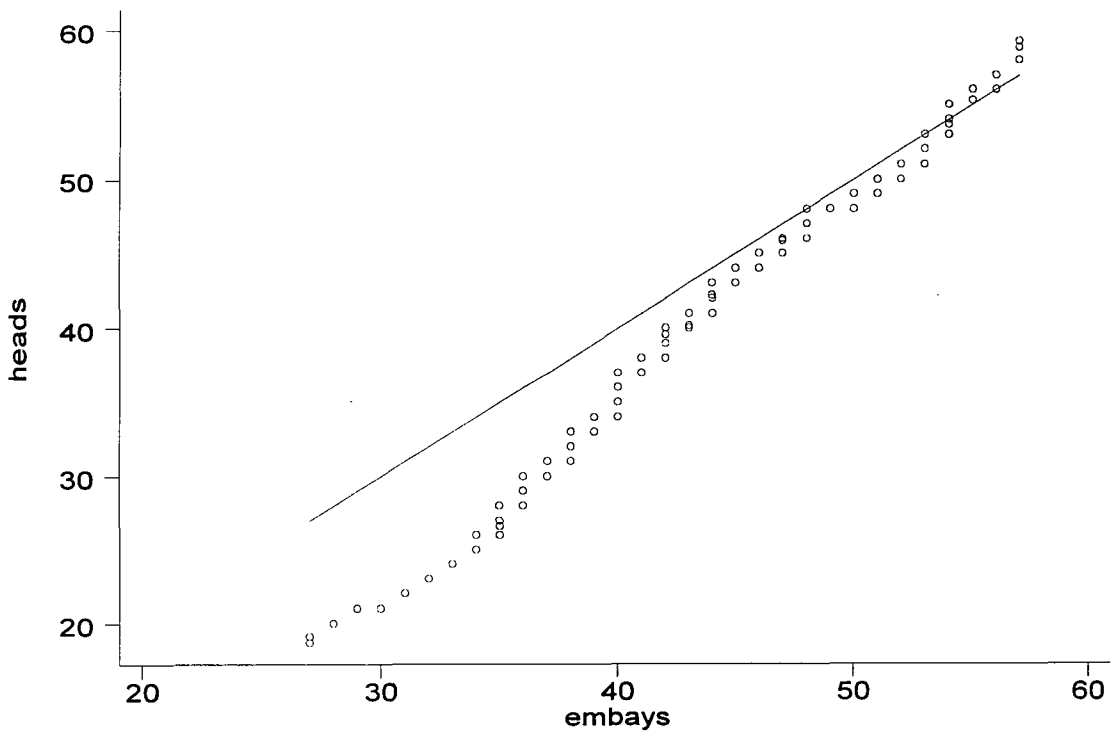


Figure 7.15: A quantile-quantile plot for total Schmidt hammer readings from all headland sites and all embayment sites at Dead Horse Point.

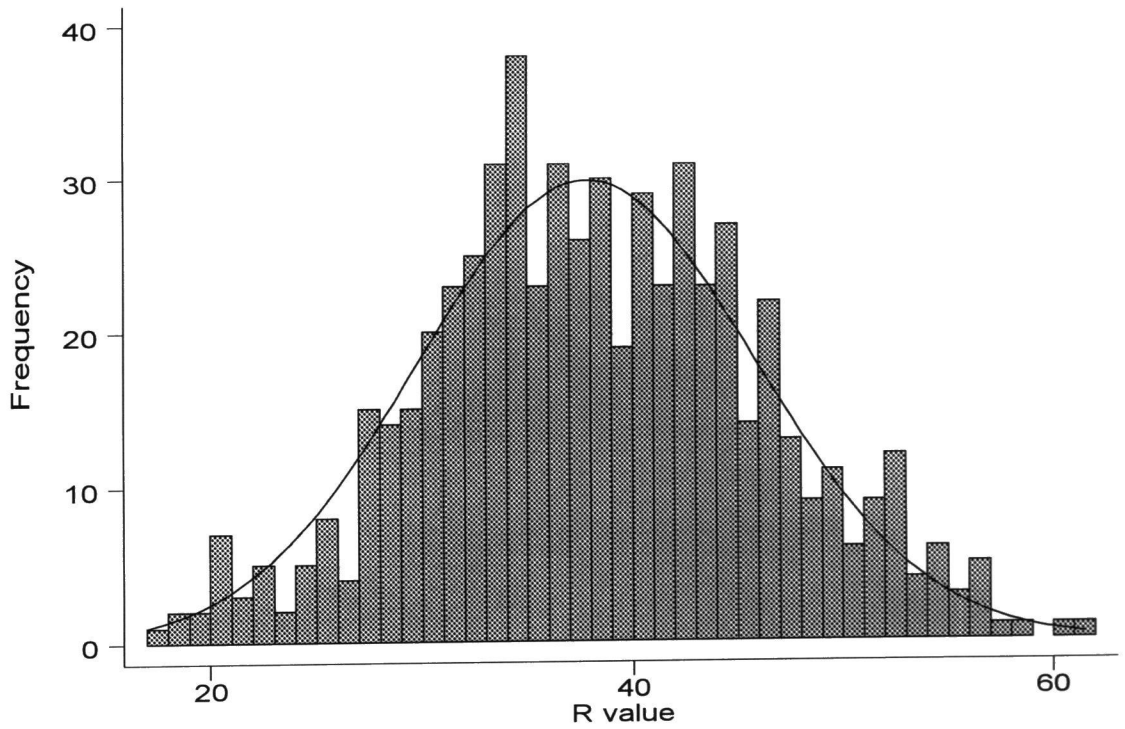


Figure 7.16: Frequency distribution of total Schmidt hammer readings from Canyonlands National Park.

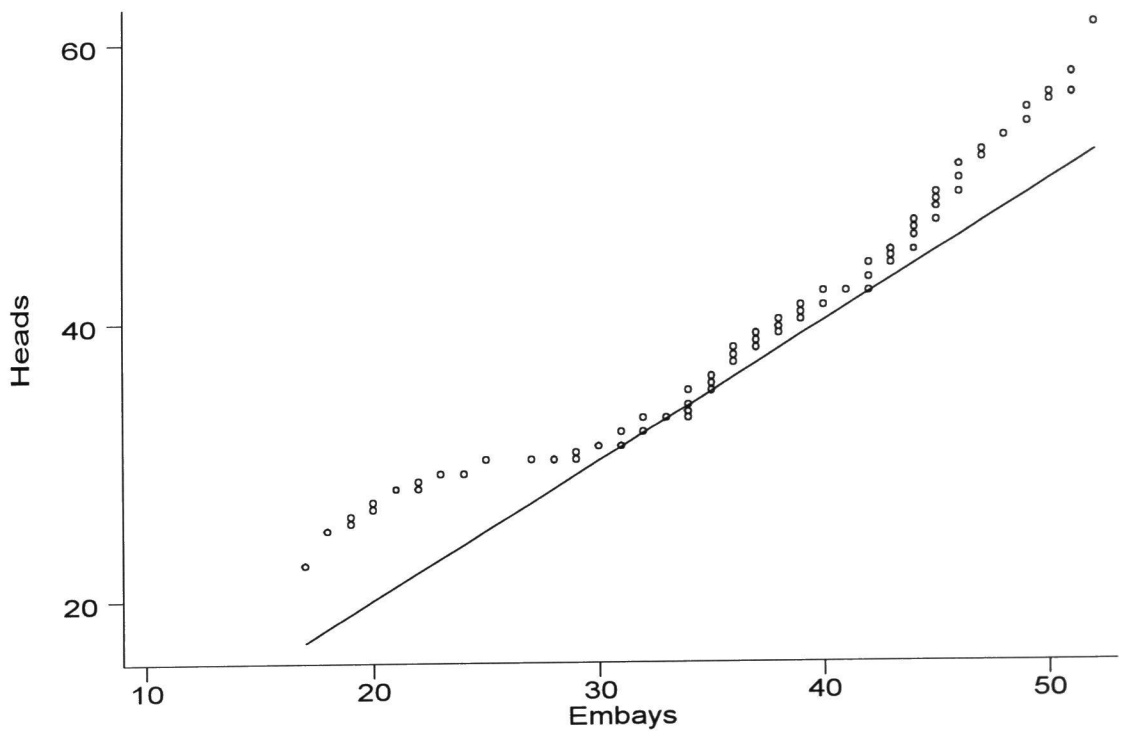


Figure 7.17: A quantile-quantile plot for total Schmidt hammer readings from all headland sites and all embayment sites at Canyonlands National Park.

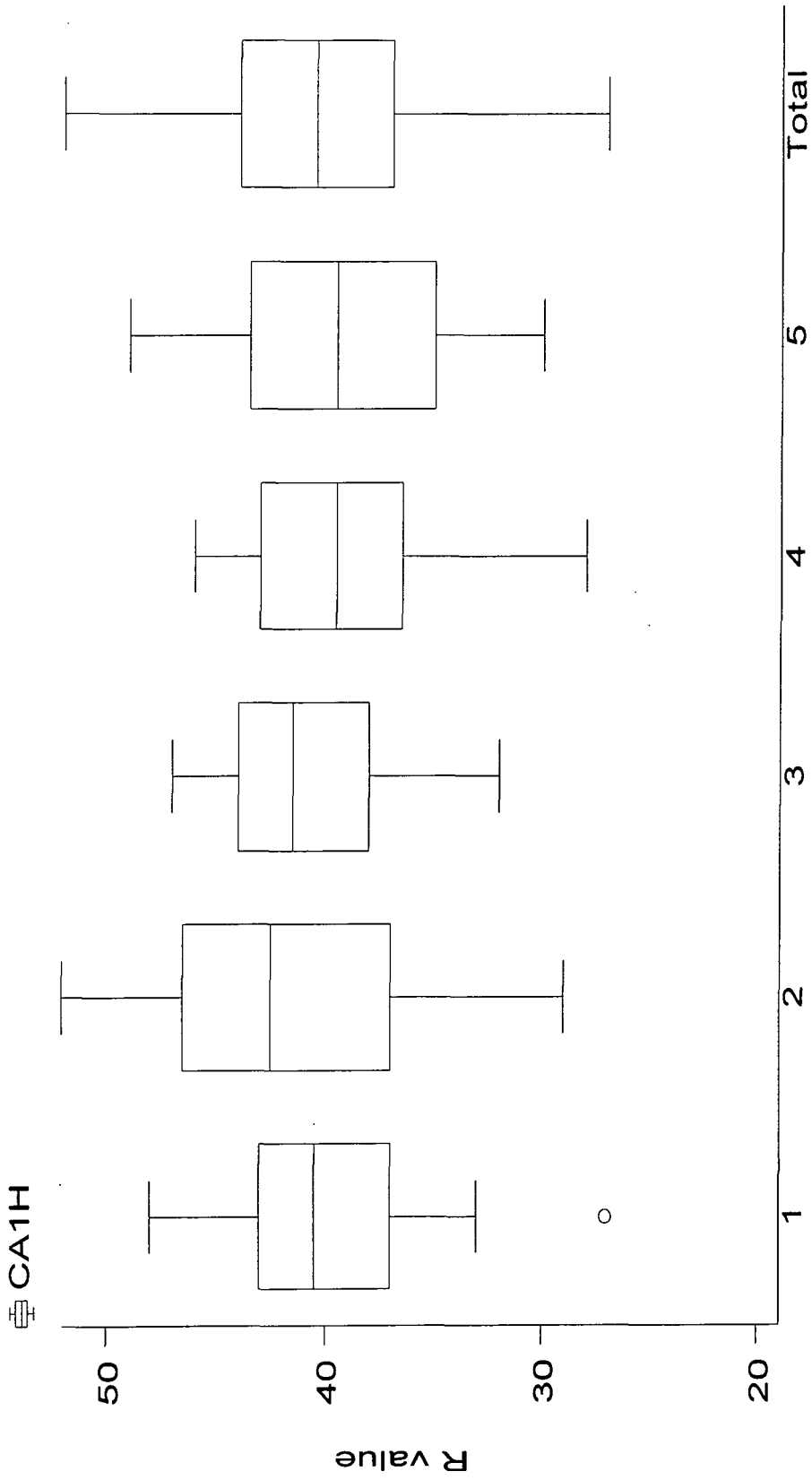
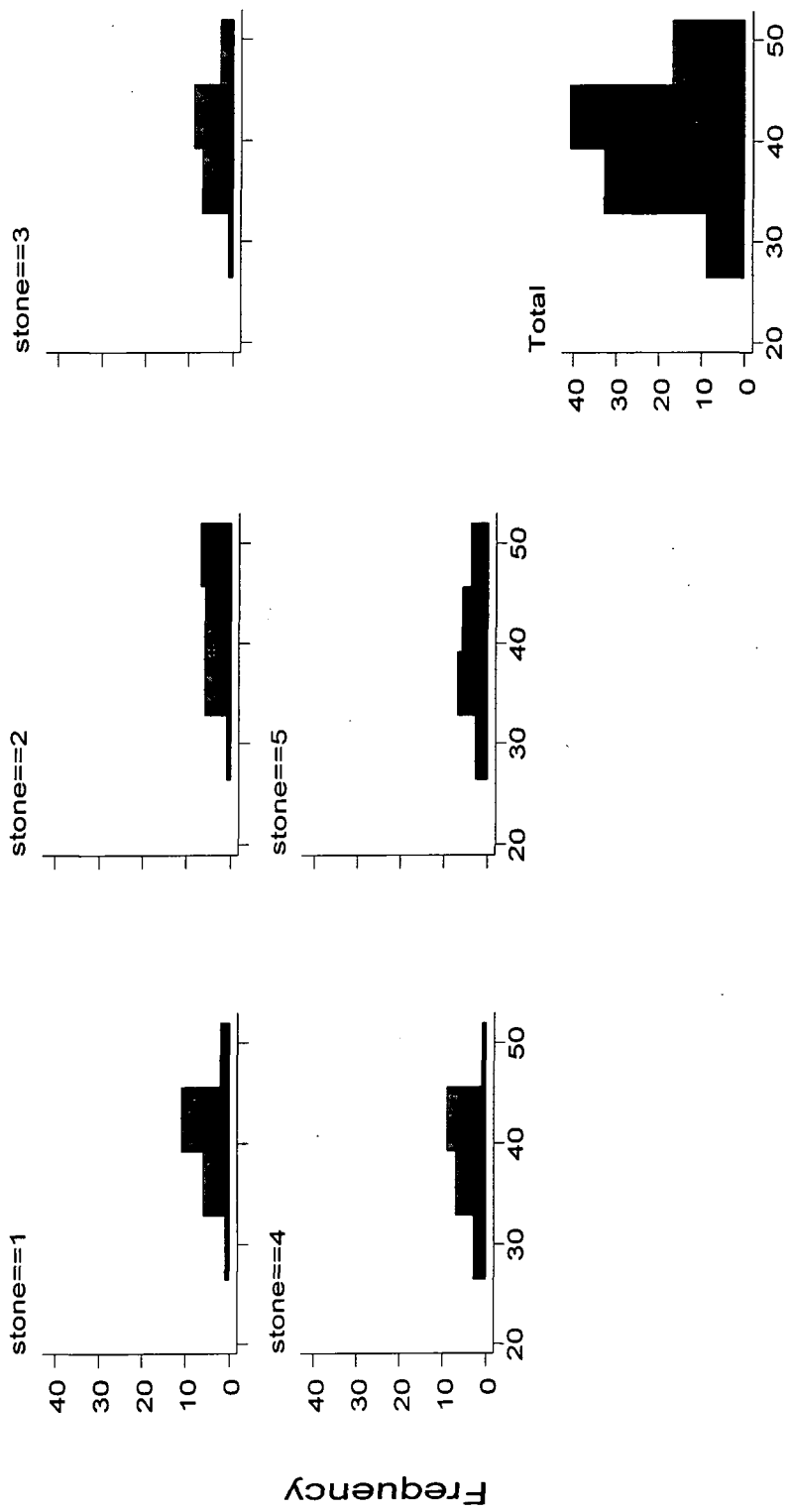


Figure 7.18: The distribution of Schmidt hammer readings on each of the five rock surfaces at site CA1H.



CA1H Histograms by block

Figure 7.19: Frequency distributions of Schmidt hammer readings for each rock surface at site CA1H.

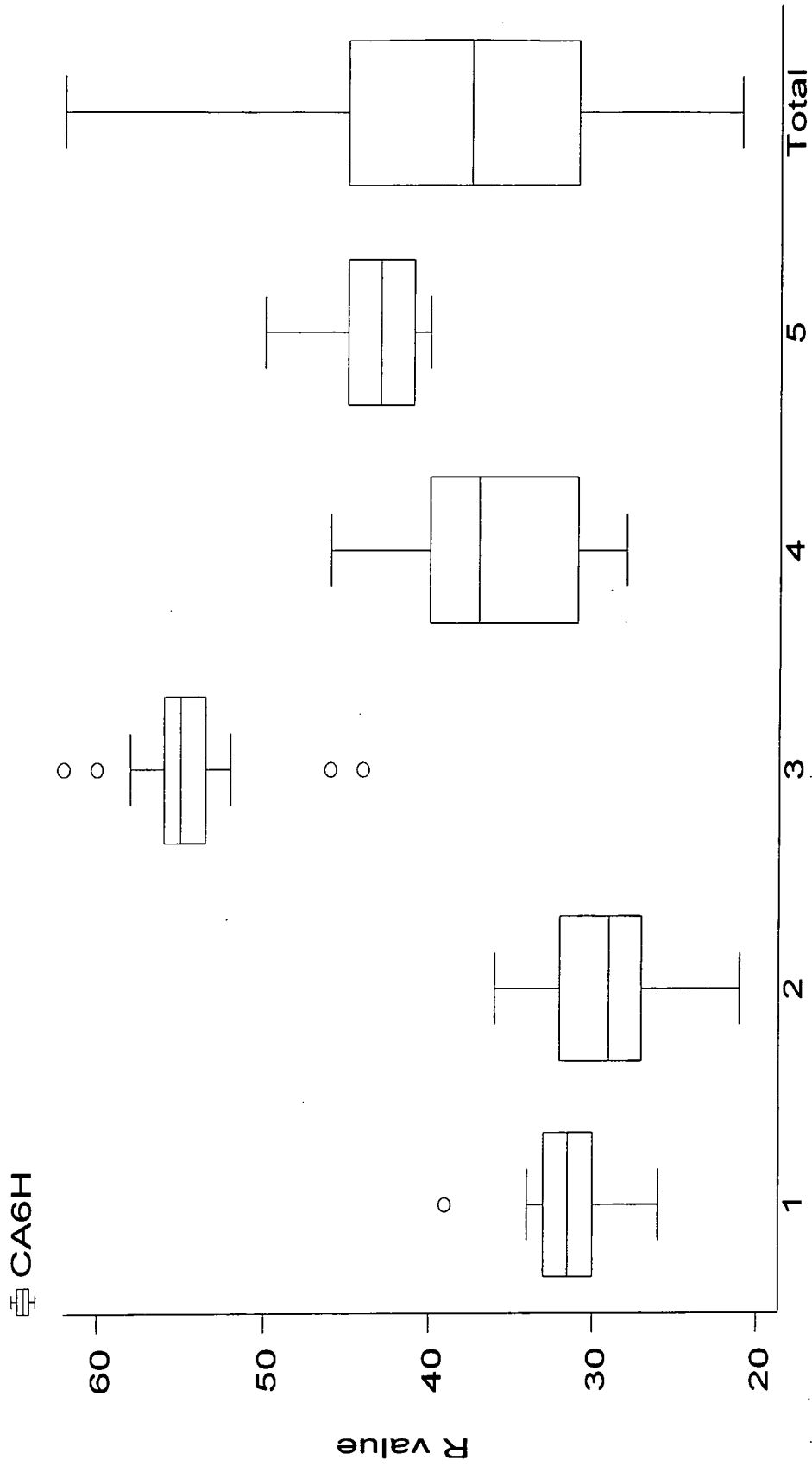
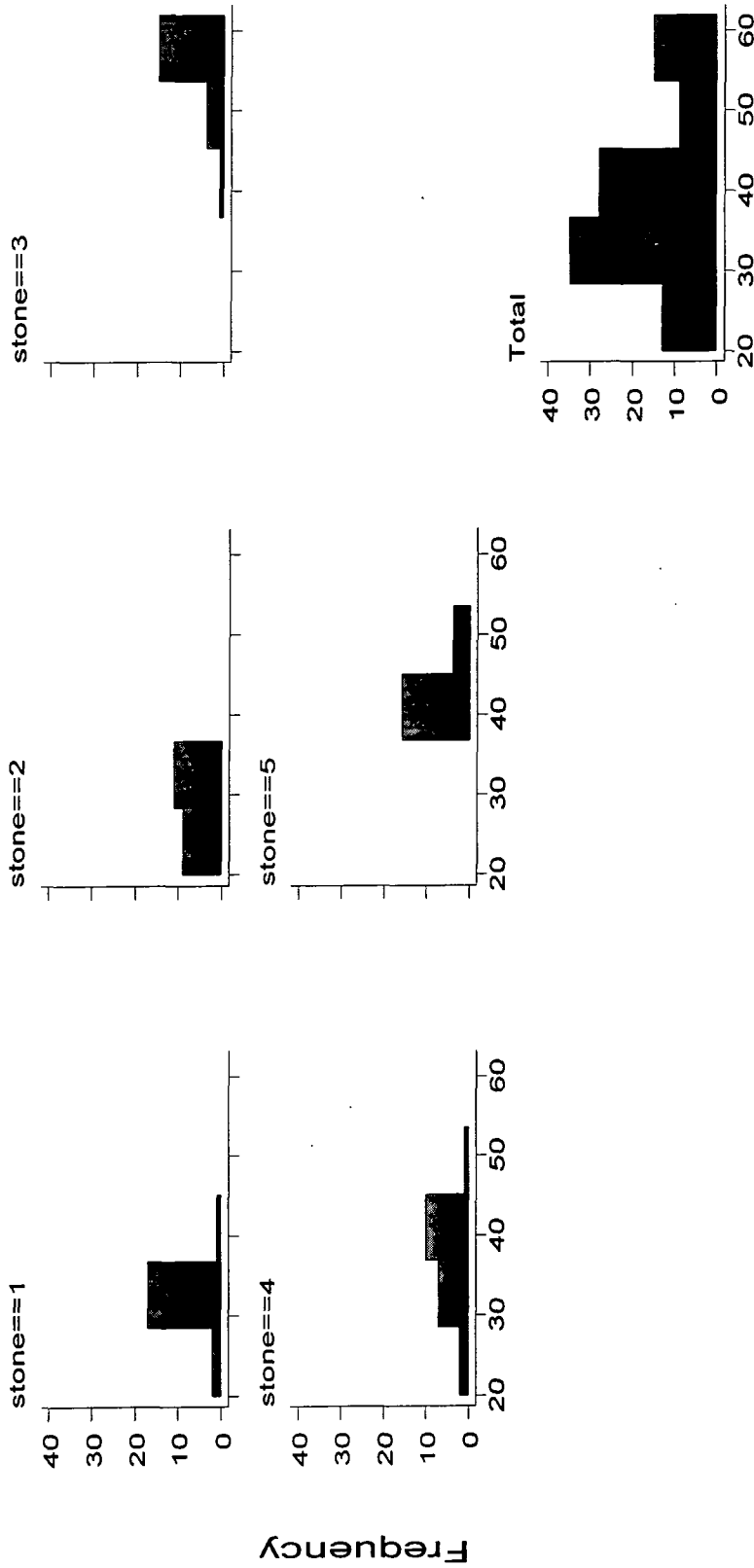


Figure 7.20: The distribution of Schmidt hammer readings on each of the five rock surfaces at site CA6H.



CA6H
Histograms by block

Figure 7.21: Frequency distributions of Schmidt hammer readings for each rock surface at site CA6H.

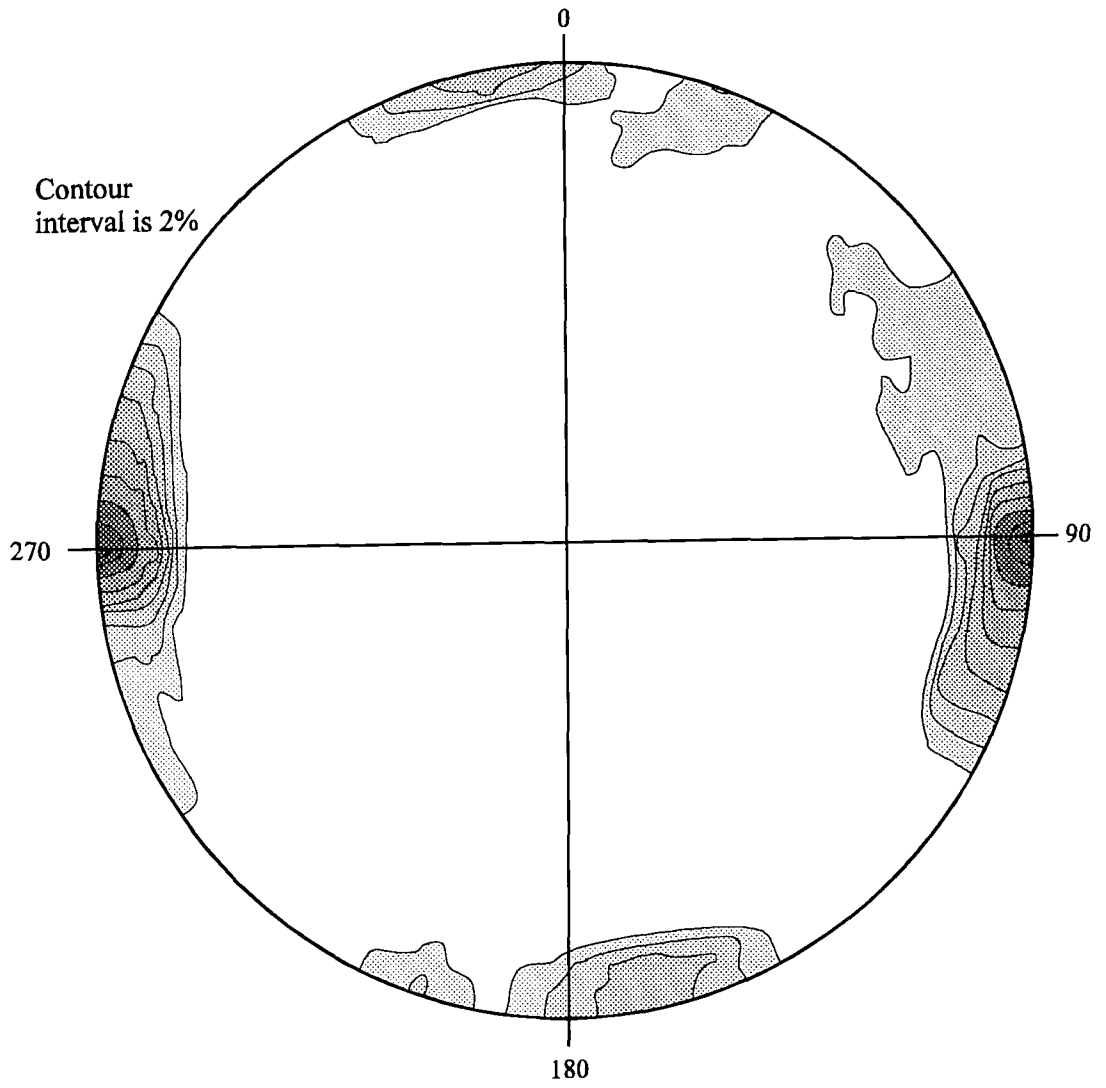


Figure 7.22: Polar projection for the discontinuities in the Kayenta Formation at site CO19E.

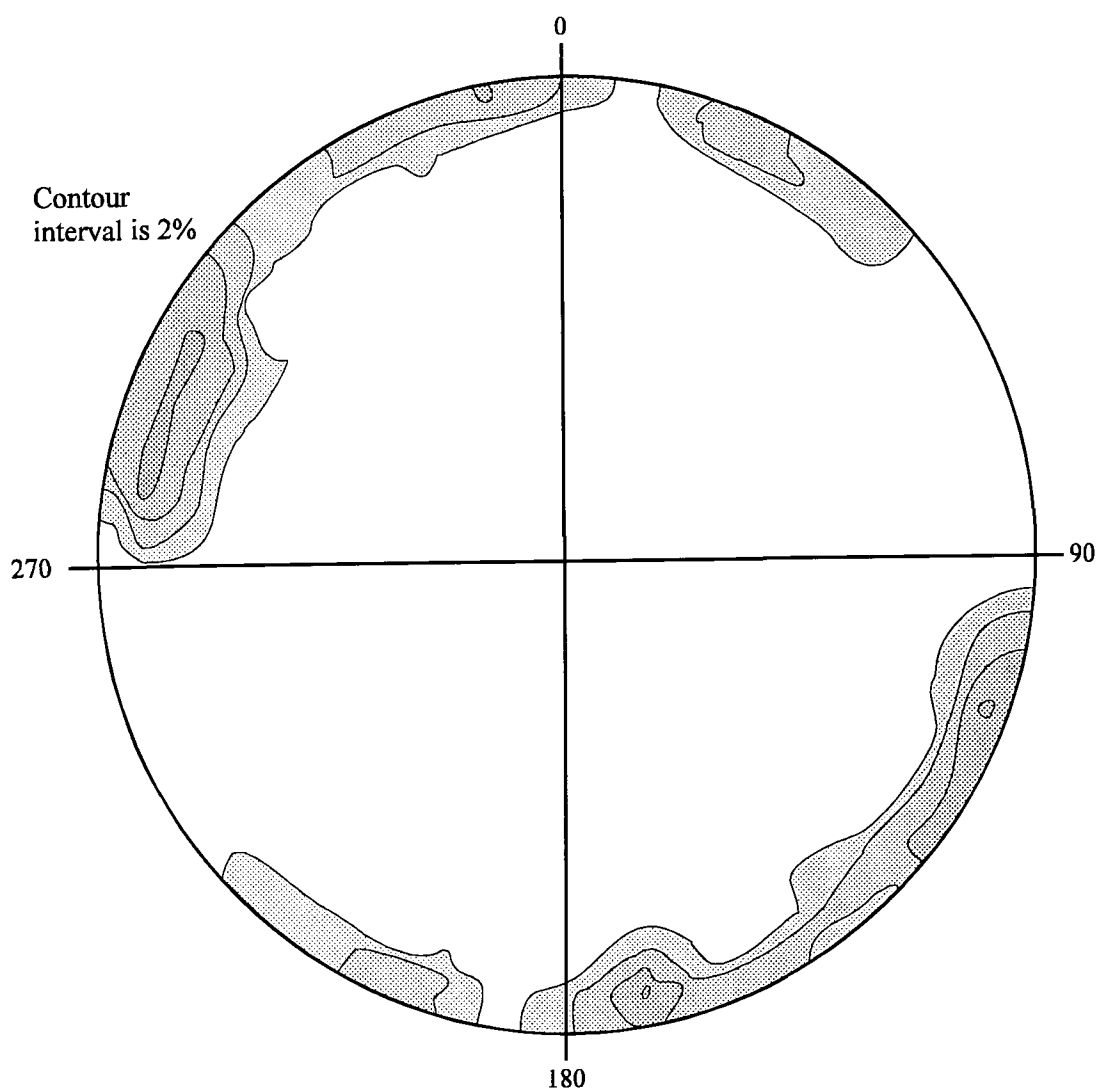


Figure 7.23: Polar projection for the discontinuities in the Kayenta Formation at site CO9E.

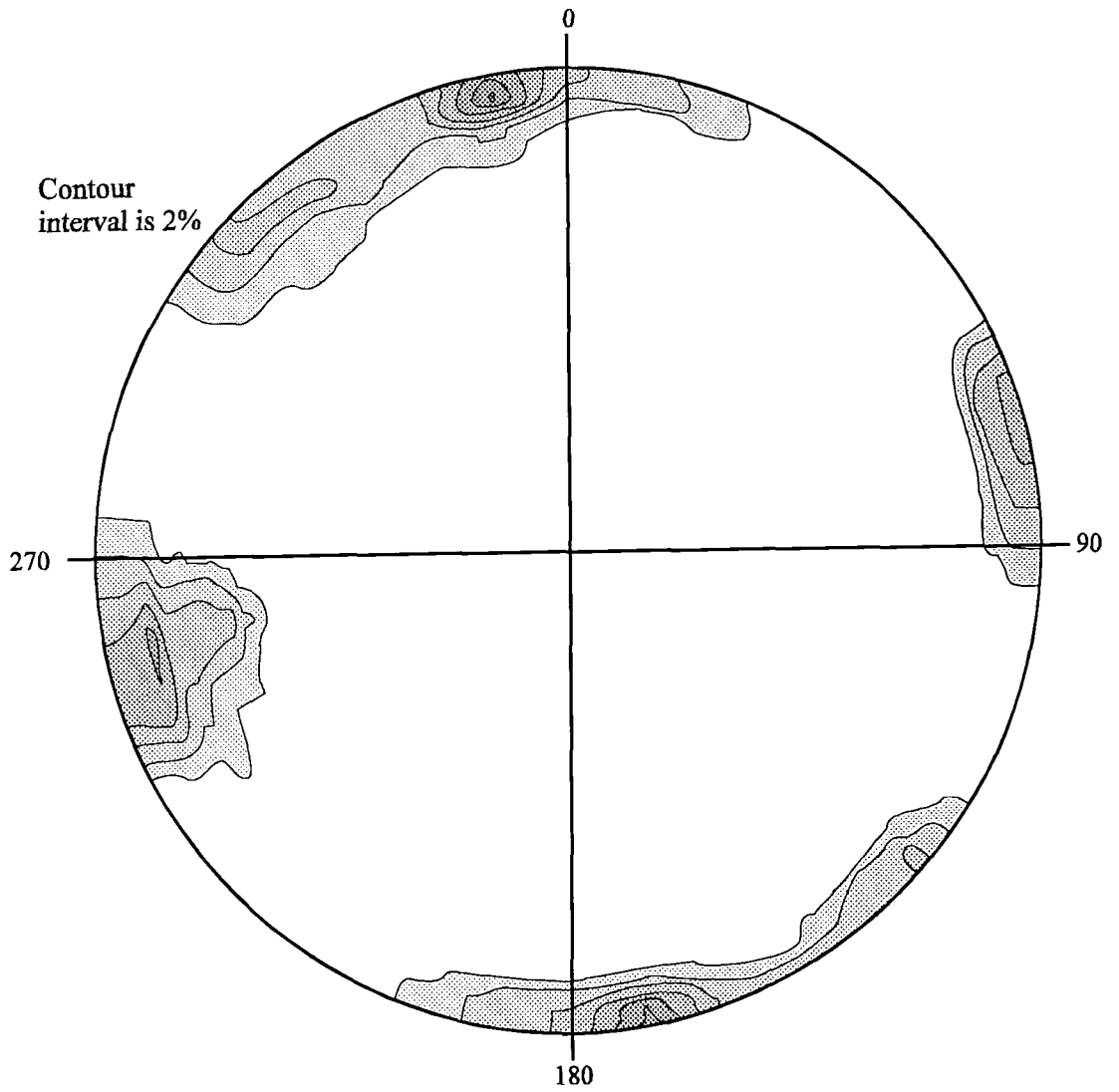


Figure 7.24: Polar projection for the discontinuities in the Kayenta Formation at site CO56H.

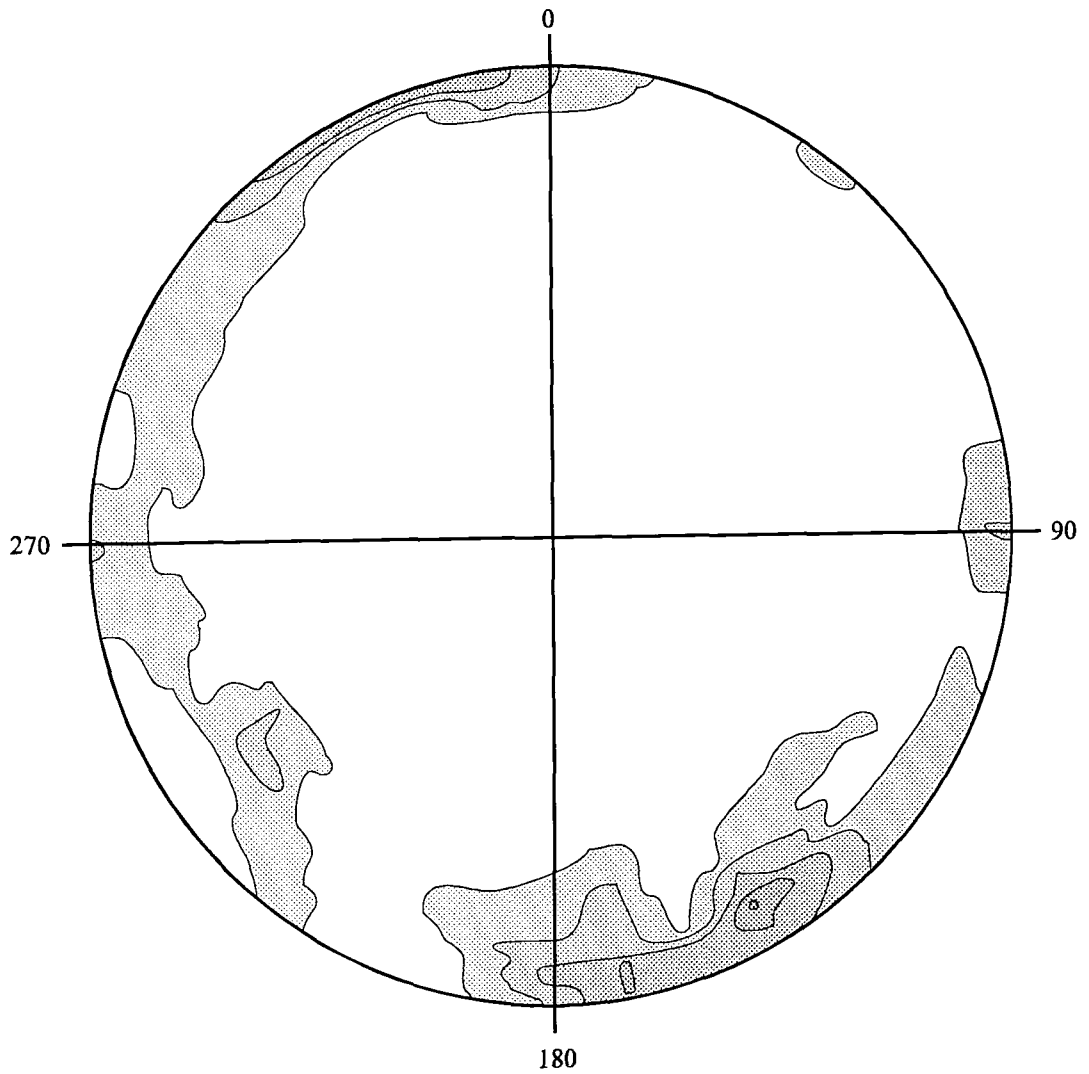


Figure 7.25: Polar projection for the discontinuities in the Kayenta Formation at site CO12E.

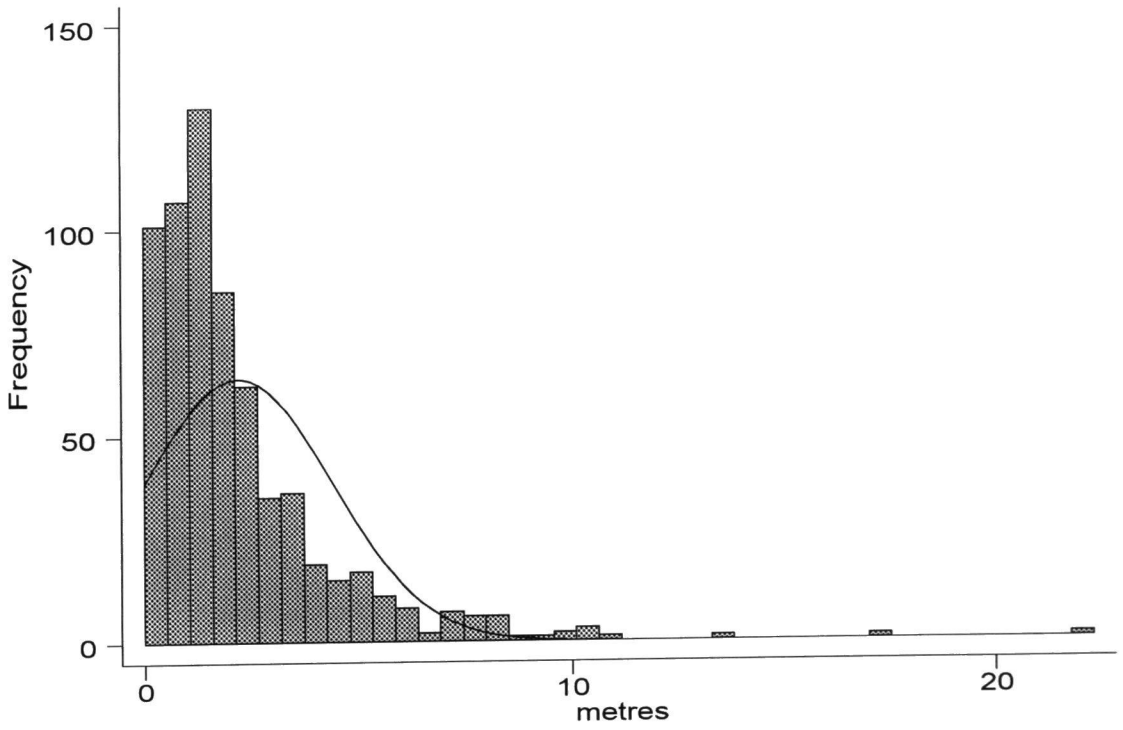


Figure 7.26: Frequency distribution of the total joint spacing readings from the Colorado National Monument.

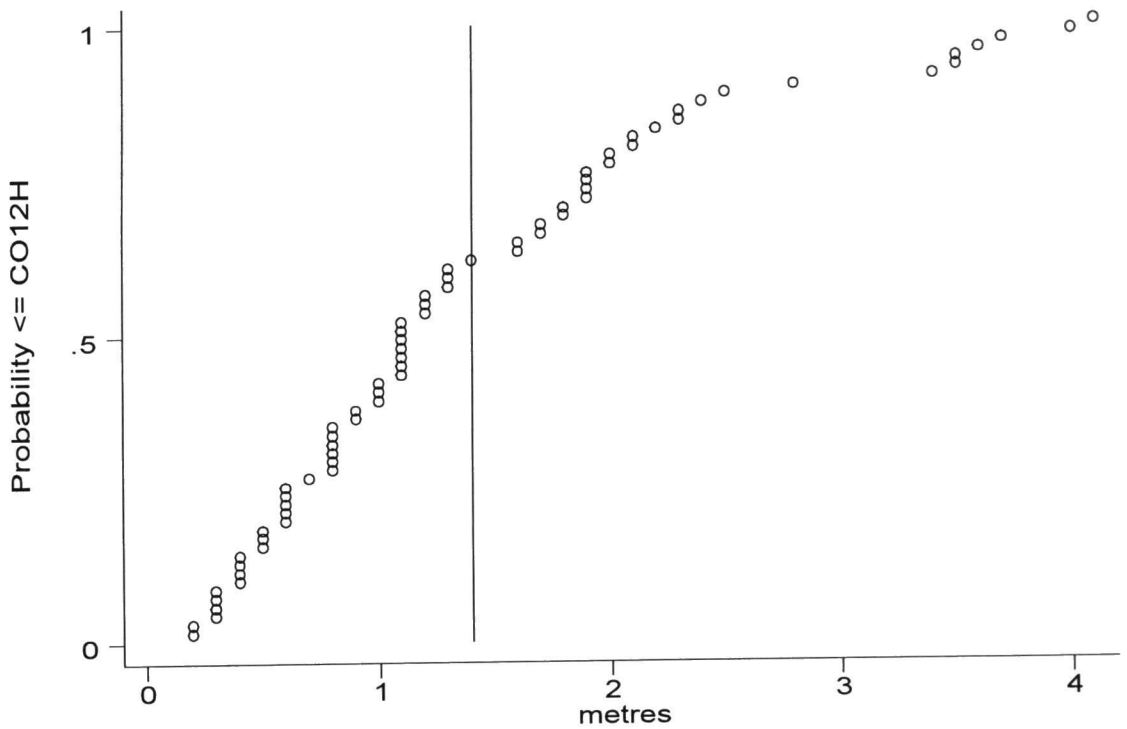


Figure 7.27: The distribution of joint spacing readings from site CO12H against the average for the Colorado National Monument.



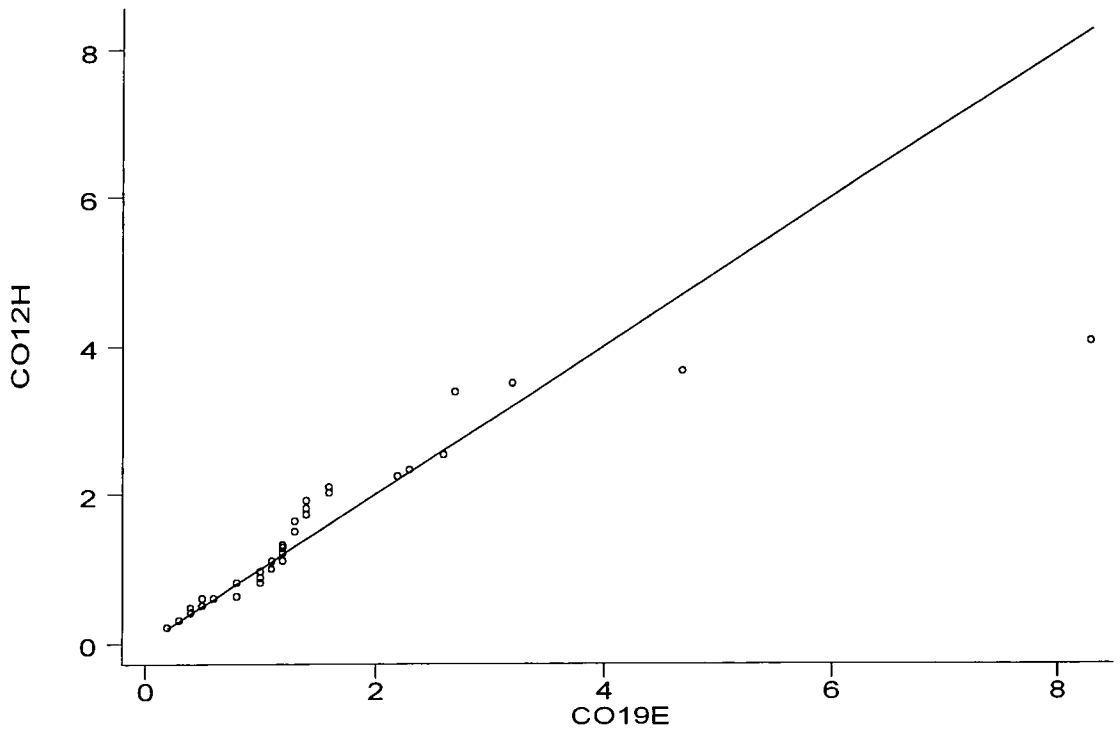


Figure 7.28: A quantile-quantile plot for total joint spacing readings from CO12H and CO19E.

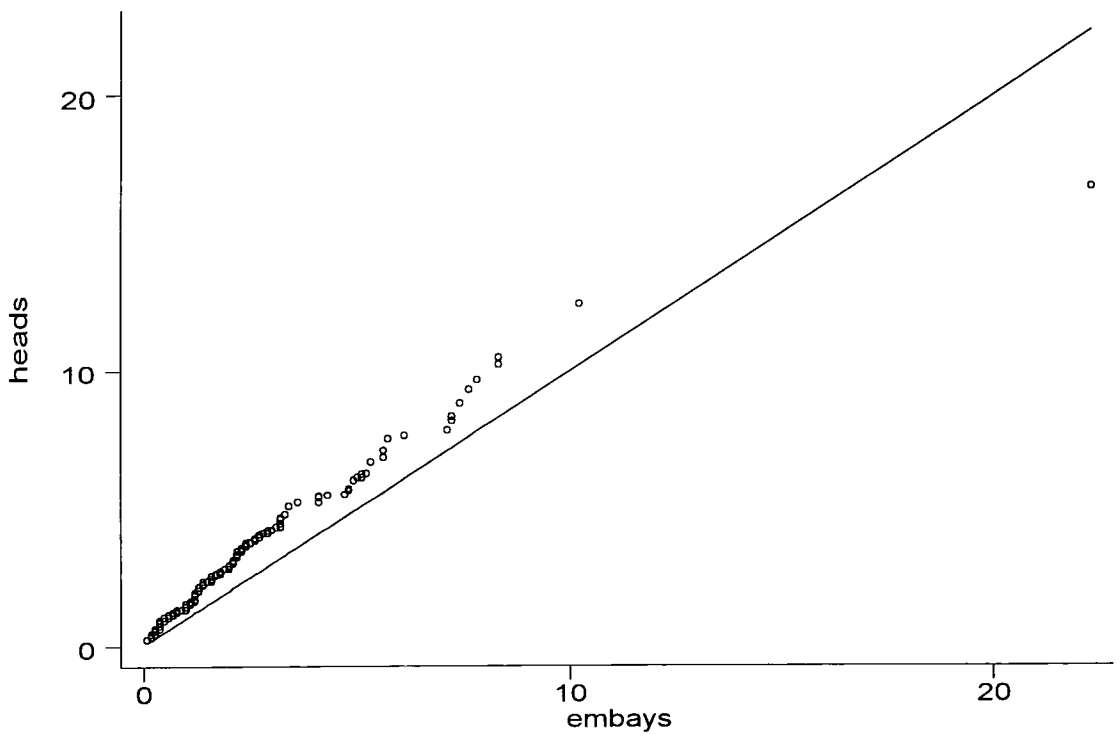


Figure 7.29: A quantile-quantile plot for total joint spacing readings from all headland sites and all embayment sites at the Colorado National Monument.

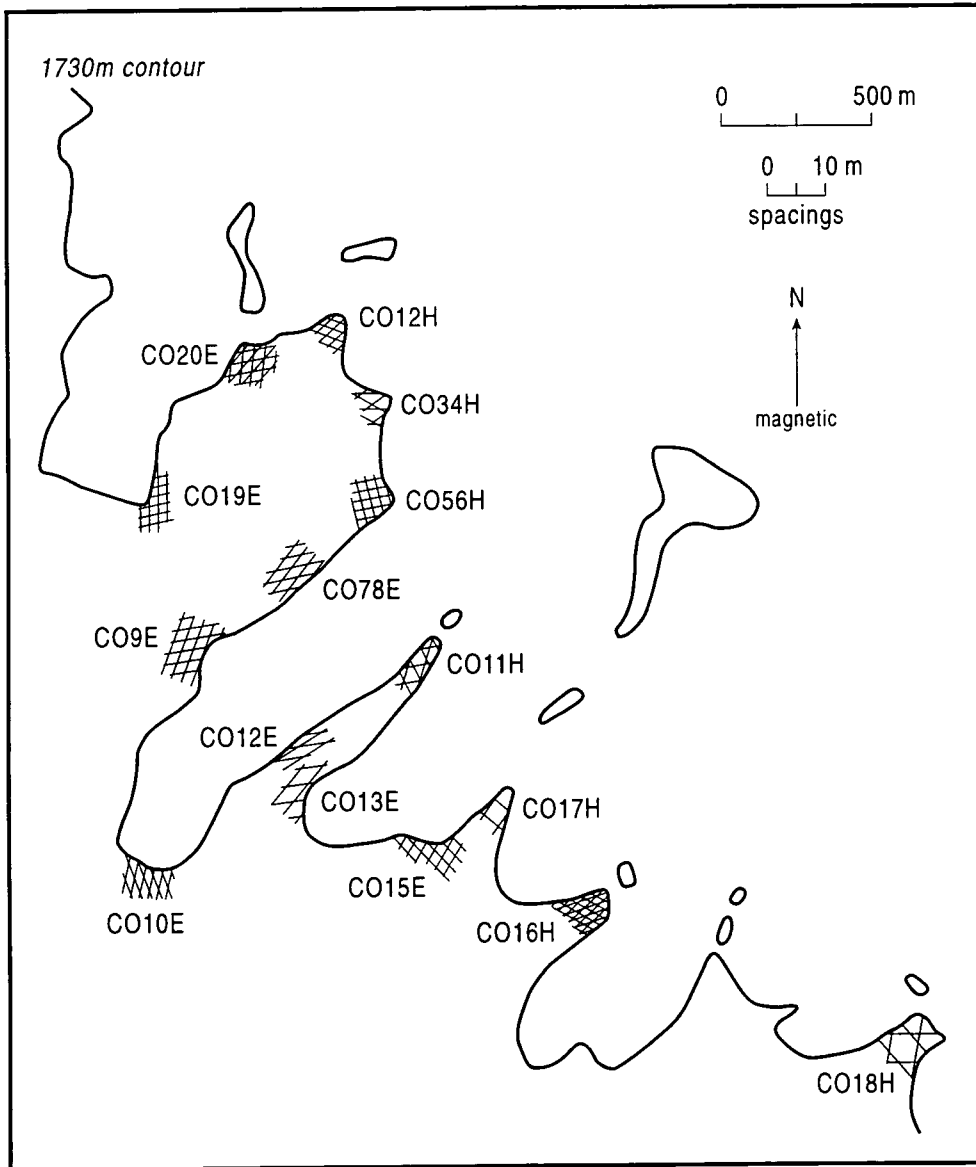


Figure 7.30: Plan of the cliffs at the Colorado National Monument showing the surface joint geometry for the field sites.

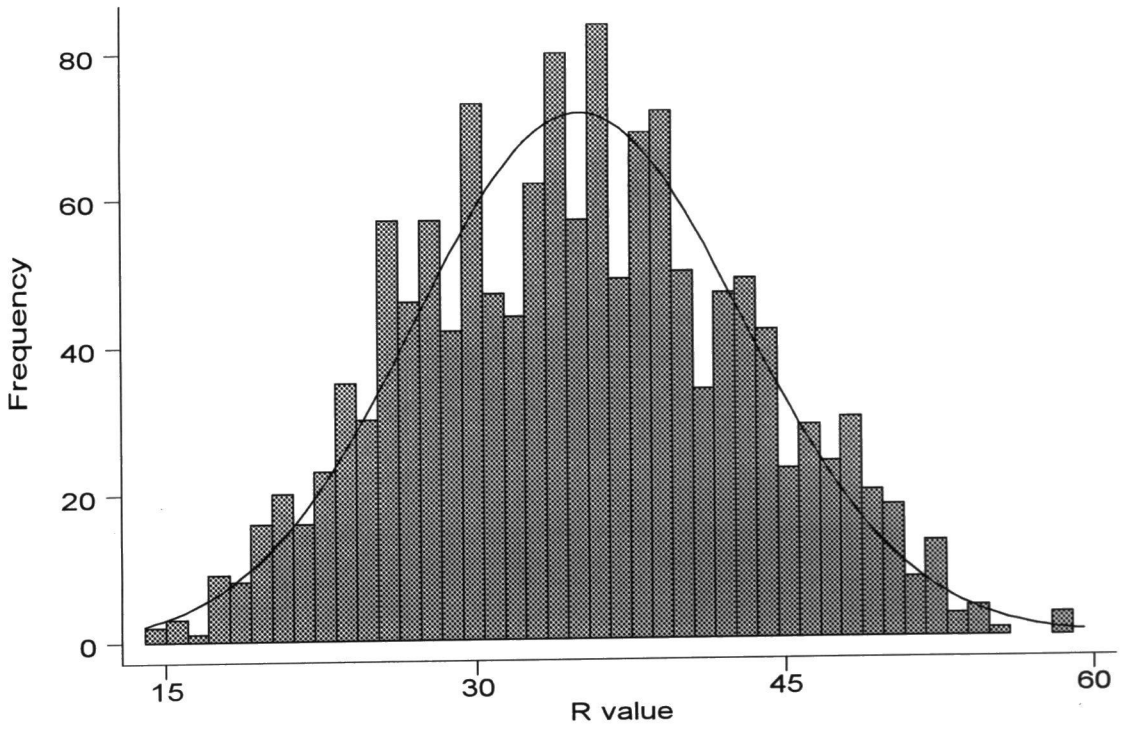


Figure 7.31: Frequency distribution of total Schmidt hammer readings from the Colorado National Monument.

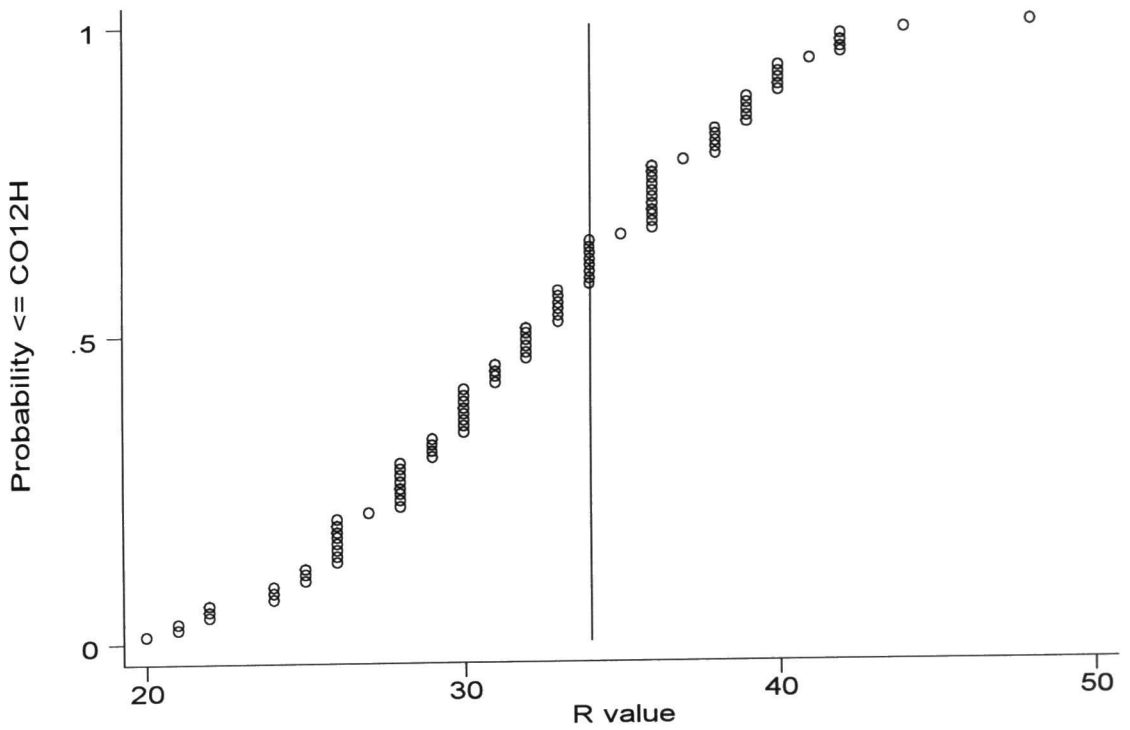


Figure 7.32: The distribution of Schmidt hammer readings from site CO12H against the average for the Colorado National Monument.

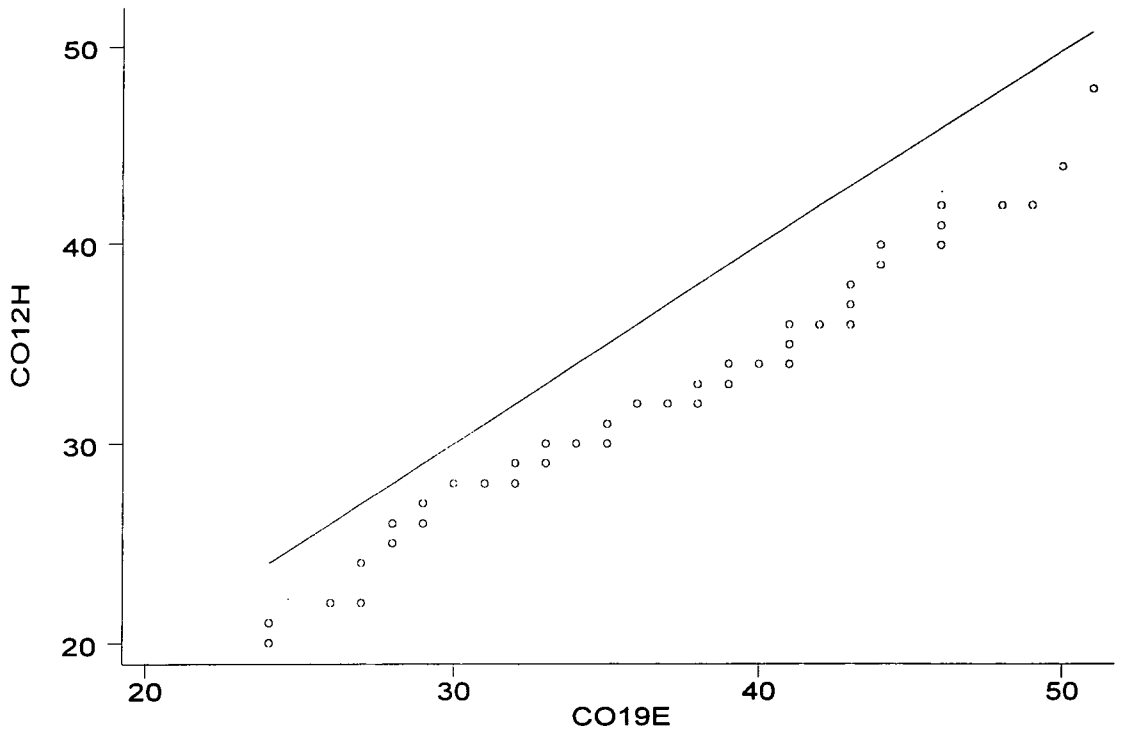


Figure 7.33: A quantile-quantile plot for Schmidt hammer readings from CO12H and CO19E.

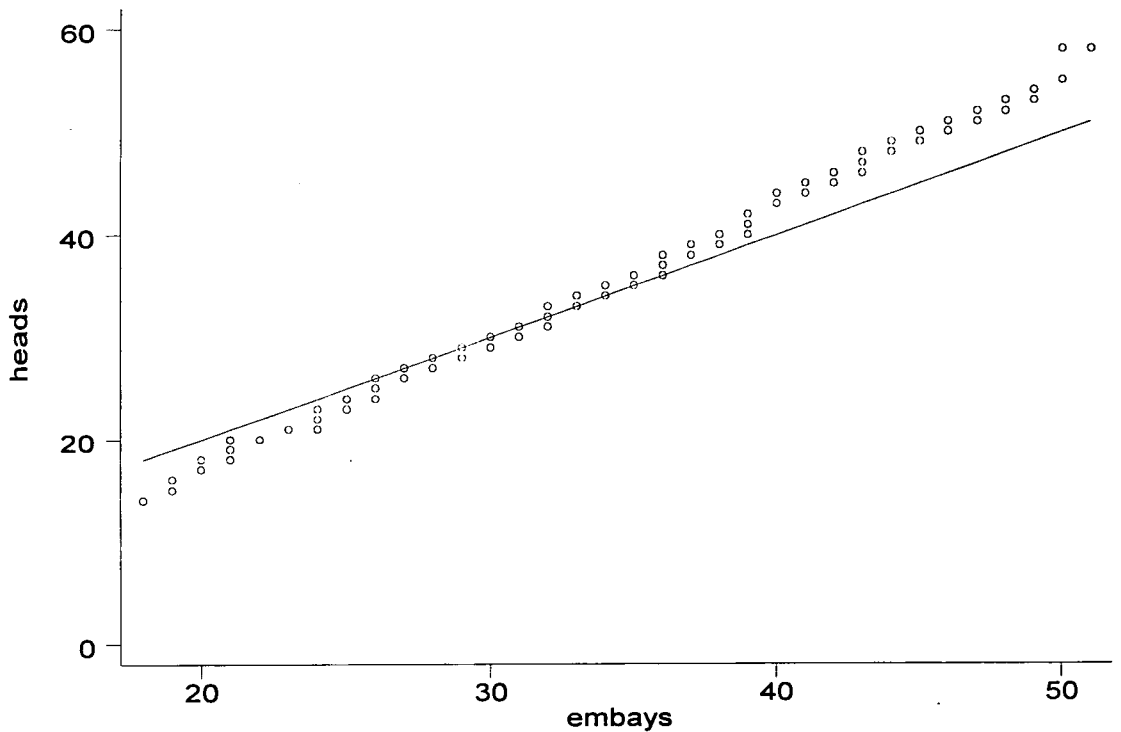


Figure 7.34: A quantile-quantile plot for total Schmidt hammer readings from all headland sites and all embayment sites at the Colorado National Monument.

JOB TITLE : Figure 7.35a: DH4E at equilibrium (10,000 steps).

UDEC (Version 2.00)

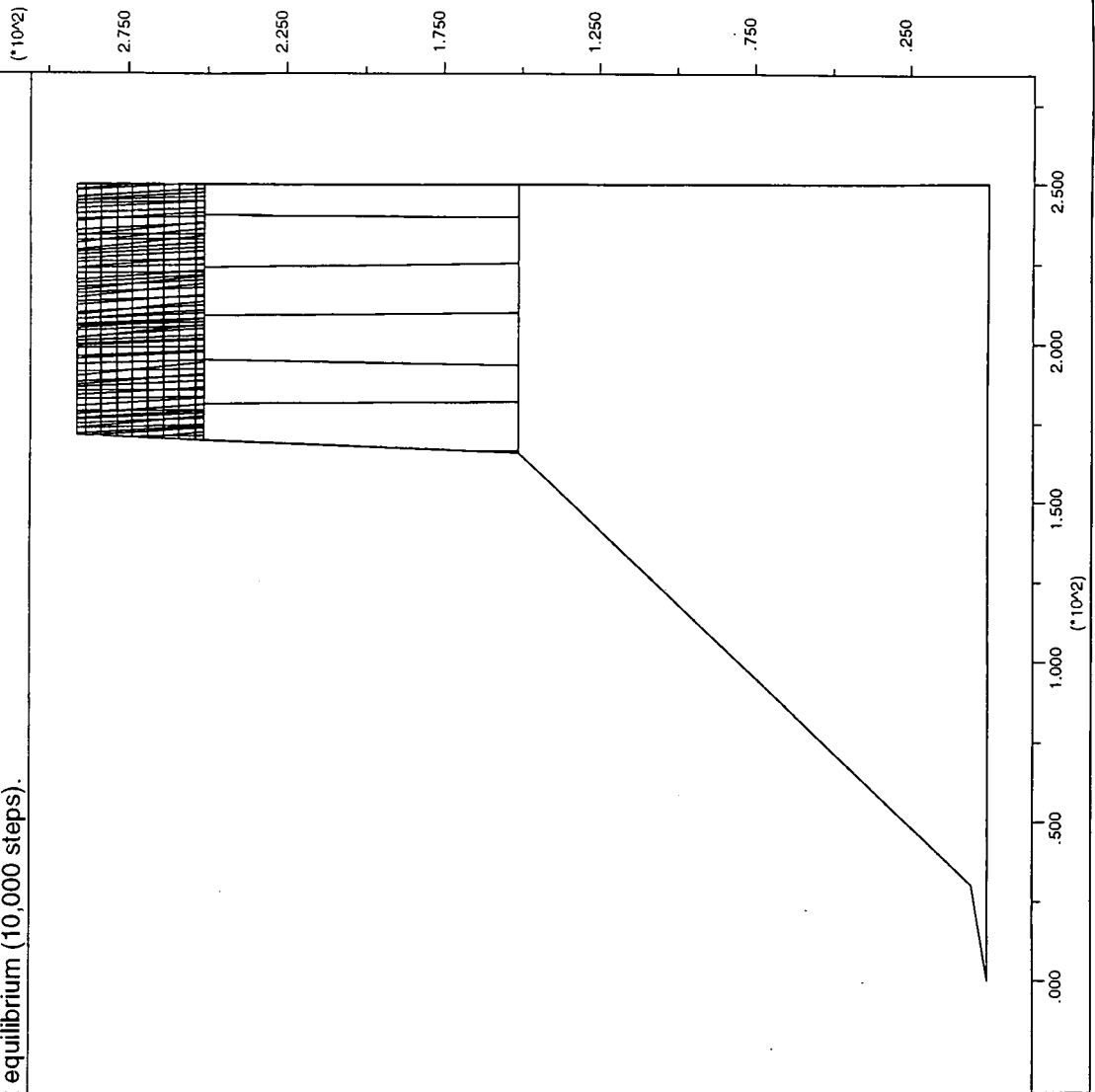
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9/03/1998 10:53

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block plot



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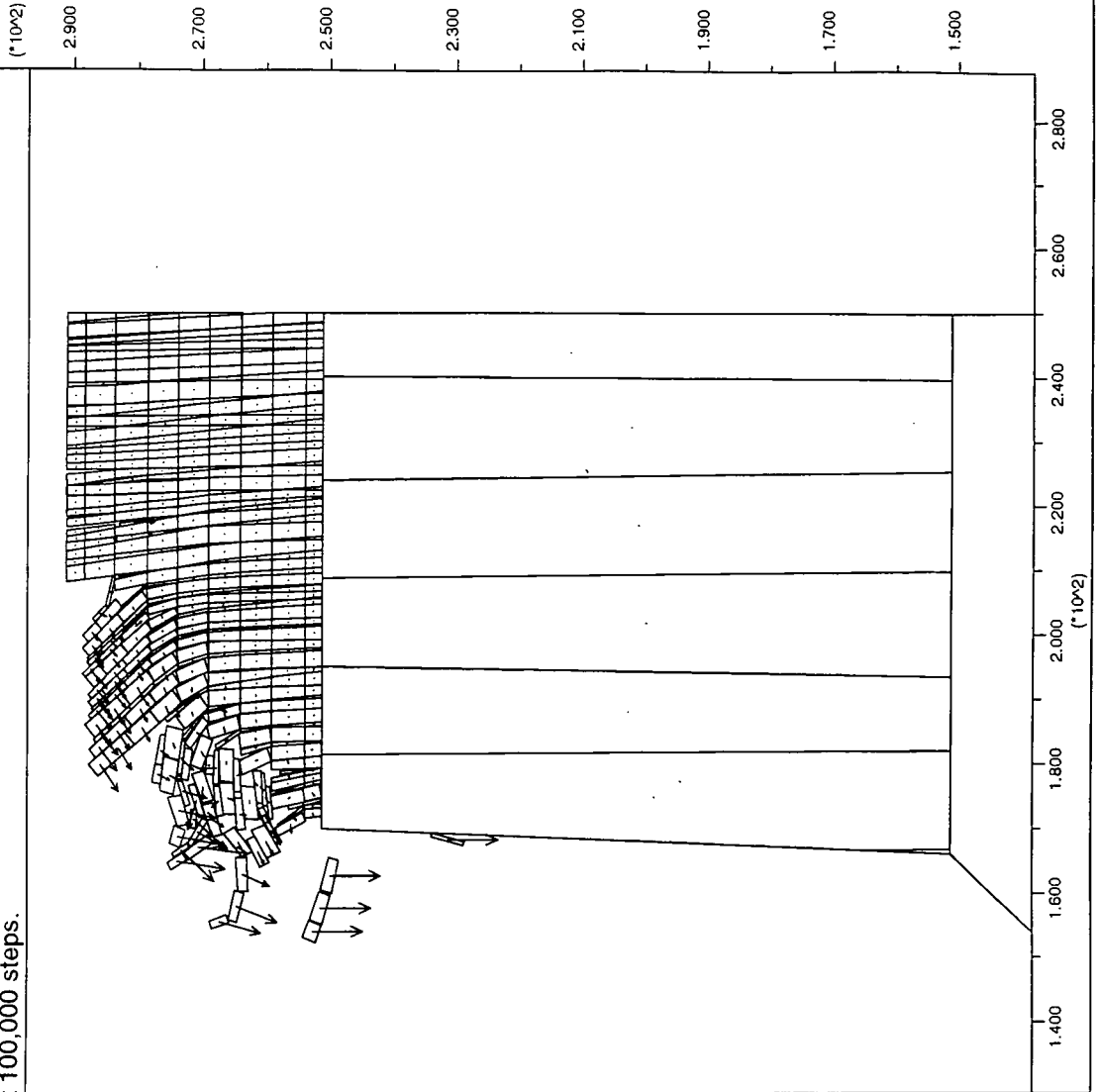
JOB TITLE : Figure 7.35b: DH4E at 100,000 steps.

UDEC (Version 2.00)

LEGEND

9/03/1998 10:55
cycle 100000
time 2.887E+01 sec
block plot
velocity vectors
maximum = 8.095E+00

0 2E 1



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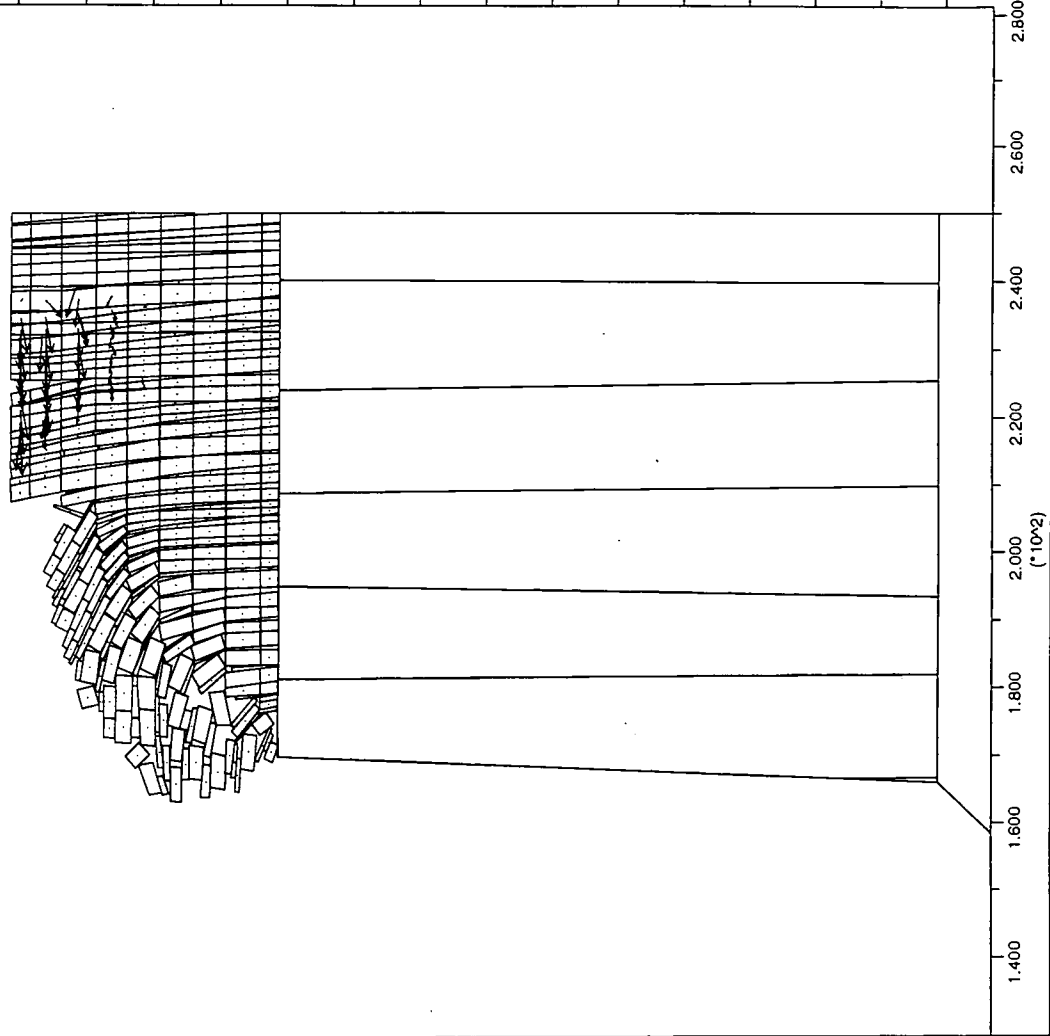
JOB TITLE : Figure 7.35c: DH4E at 200,000 steps.

UDEC (Version 2.00)

LEGEND

9/03/1998 10:57
cycle 200000
time 5.754E+01 sec

block plot
velocity vectors
maximum = 1.133E-02



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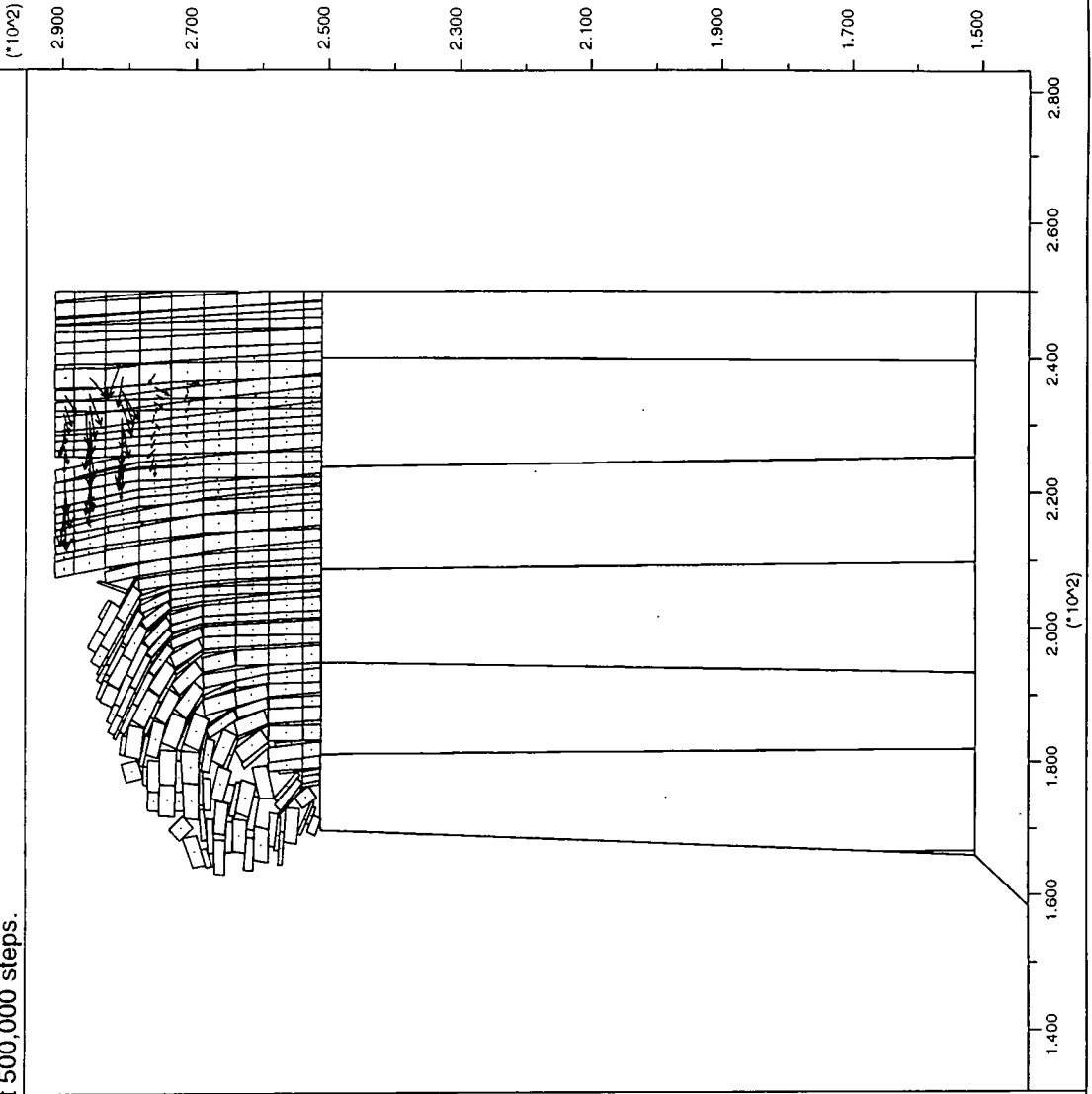
JOB TITLE : Figure 7.35d: DH4E at 500,000 steps.

UDEC (Version 2.00)

LEGEND

9/03/1998 10:58
cycle 500000
time 1.427E+02 sec

block plot
velocity vectors
maximum = 1.353E-03



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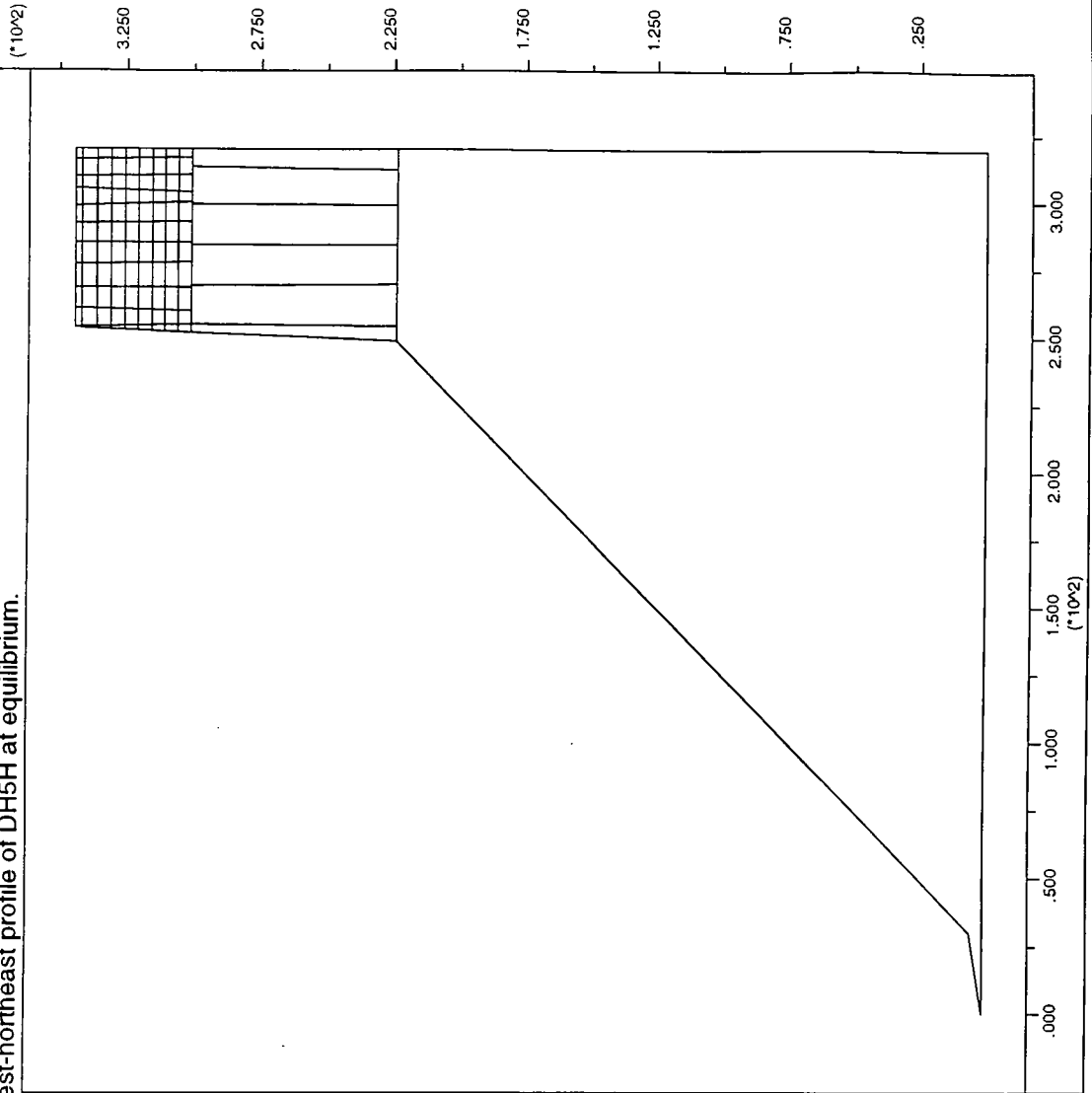
JOB TITLE : Figure 7.36a: Southwest-northeast profile of DH5H at equilibrium.

UDEC (Version 2.00)

LEGEND

9/03/1998 11:03
cycle 10000
time 2.957E+00 sec
block plot

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JOB TITLE : Figure 7.36b: Southwest-northeast profile of DH5H at 100,000 steps.

UDEC (Version 2.00)

LEGEND

9/03/1998 11:04

cycle 100000

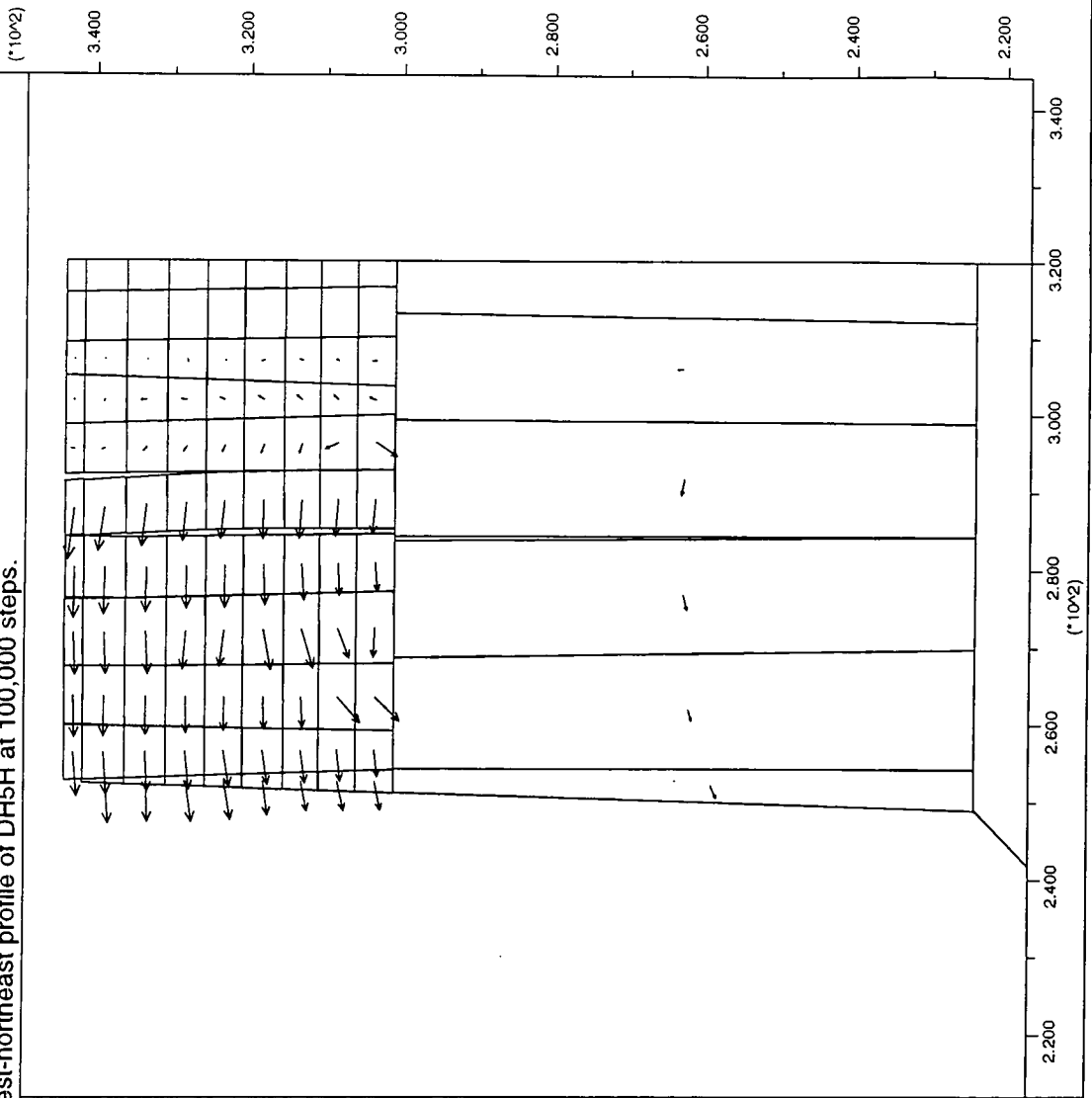
time 3.420E+01 sec

block plot

velocity vectors

maximum = 4.817E-06

0
 |-----|
 2E -5



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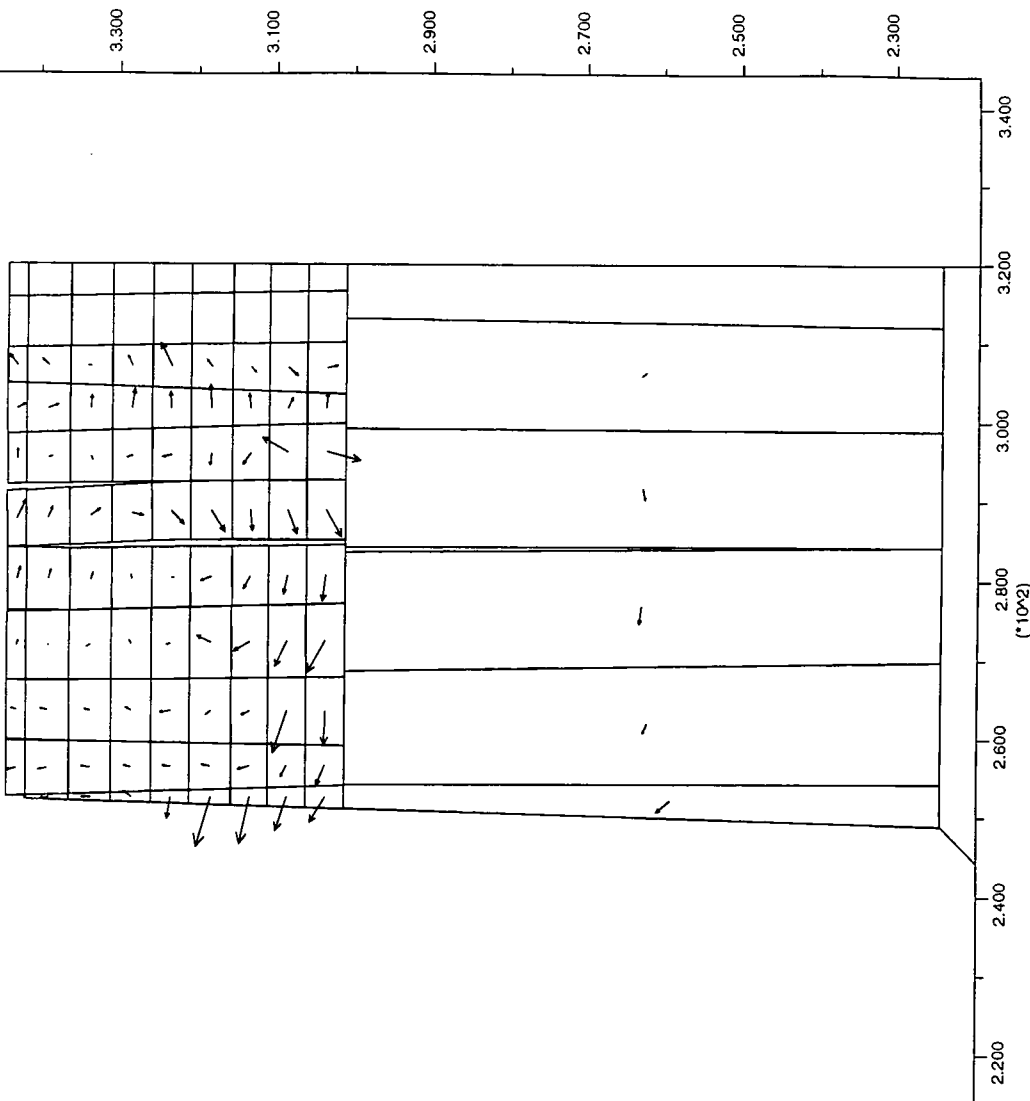
JOB TITLE : Figure 7.36c: Southwest-northeast profile of DH5H at 200,000 steps.

UDEC (Version 2.00)

LEGEND

9/03/1998 11:06
cycle 210000
time 7.443E+01 sec

block plot
velocity vectors
maximum = 4.860E-07



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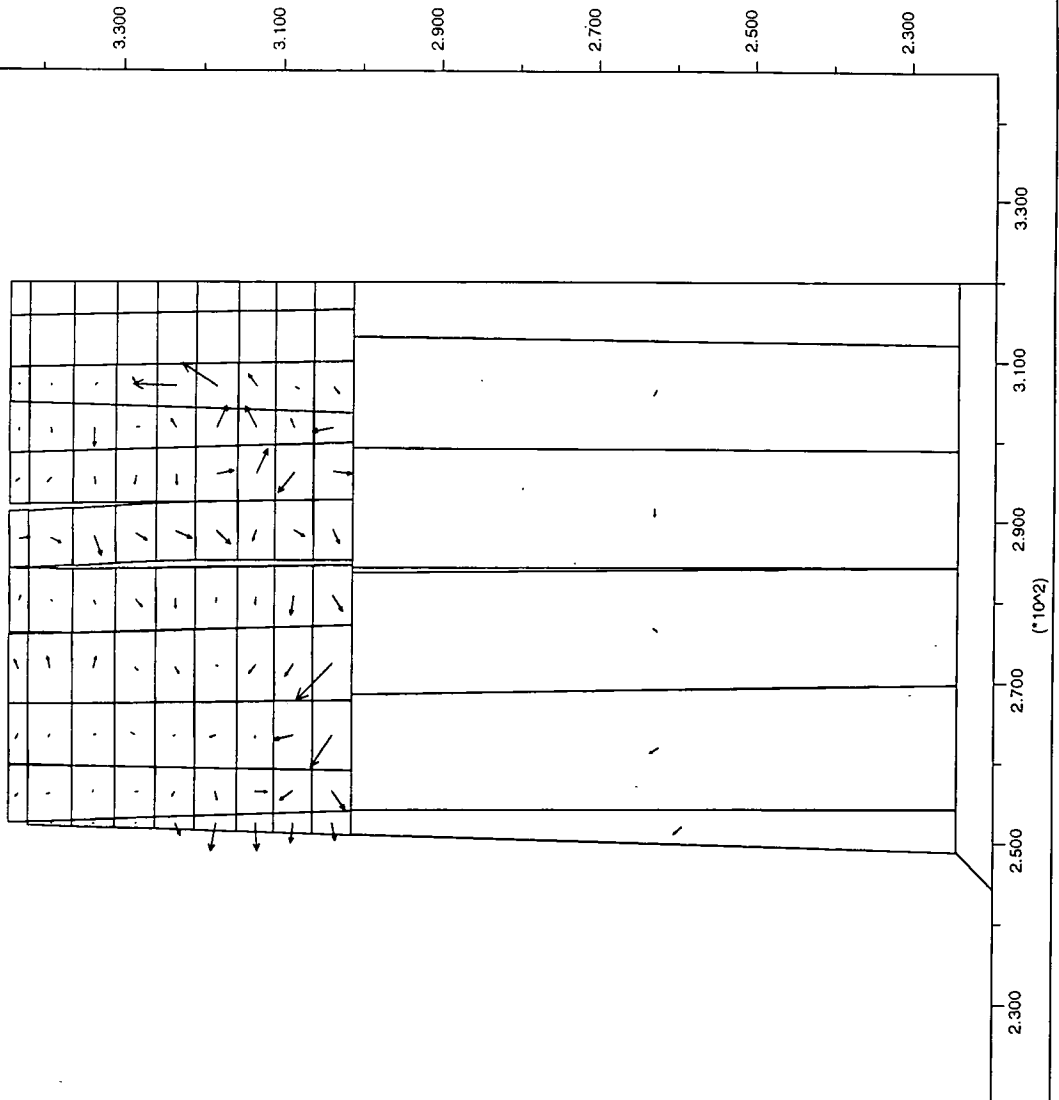
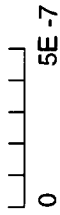
JOB TITLE : Figure 7.36d: Southwest-northeast profile of DH5H at 500,000 steps.

UDEC (Version 2.00)

LEGEND

9/03/1998 11:59
cycle 500000
time 1.805E+02 sec

block plot
velocity vectors
maximum = 1.614E-07



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JOB TITLE : Figure 7.37a: Northwest-southeast profile of DH5H at equilibrium.

UDEC (Version 2.00)

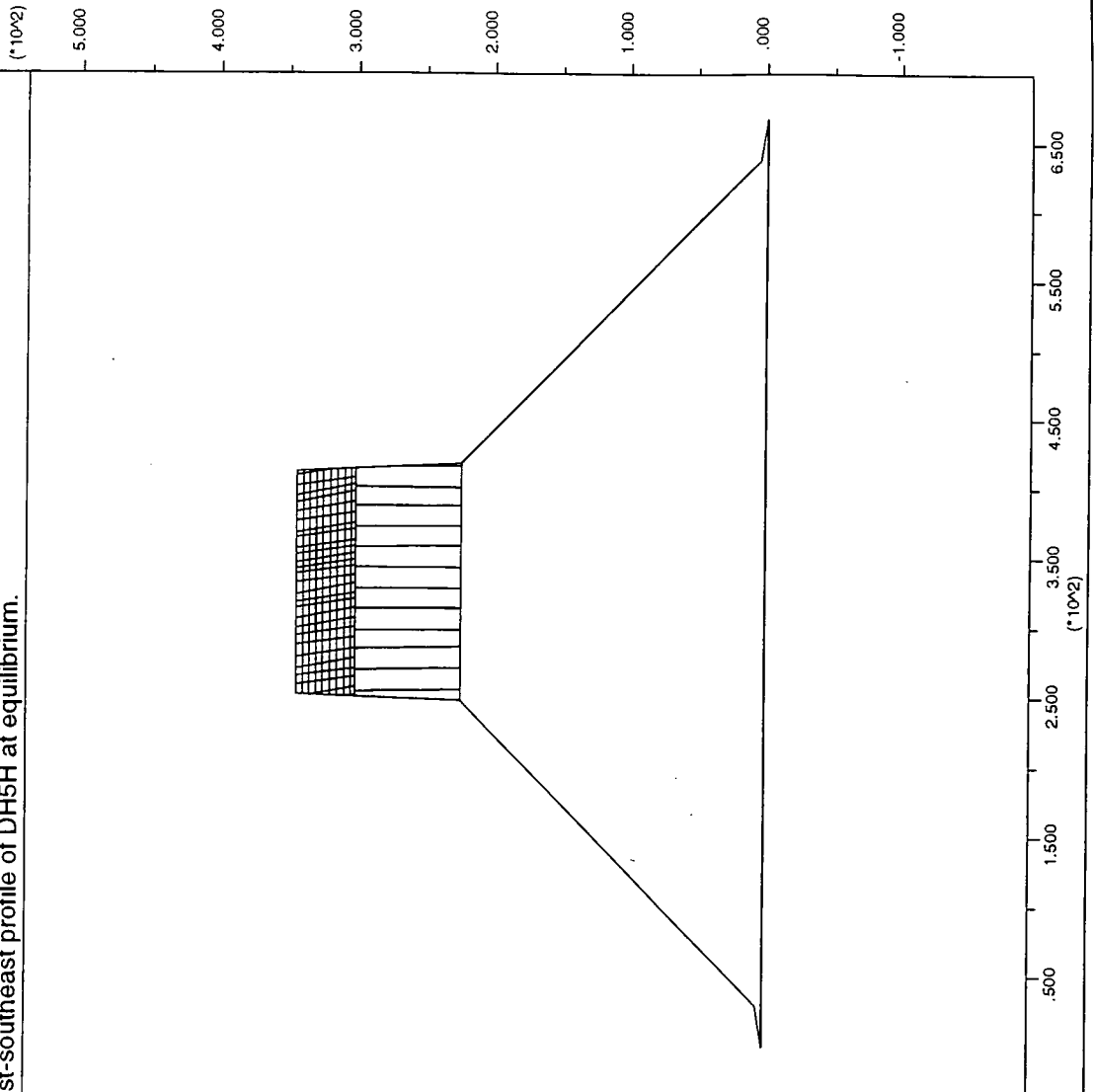
LEGEND

9/03/1998 12:17

cycle 10000

time 2.078E+00 sec

block plot



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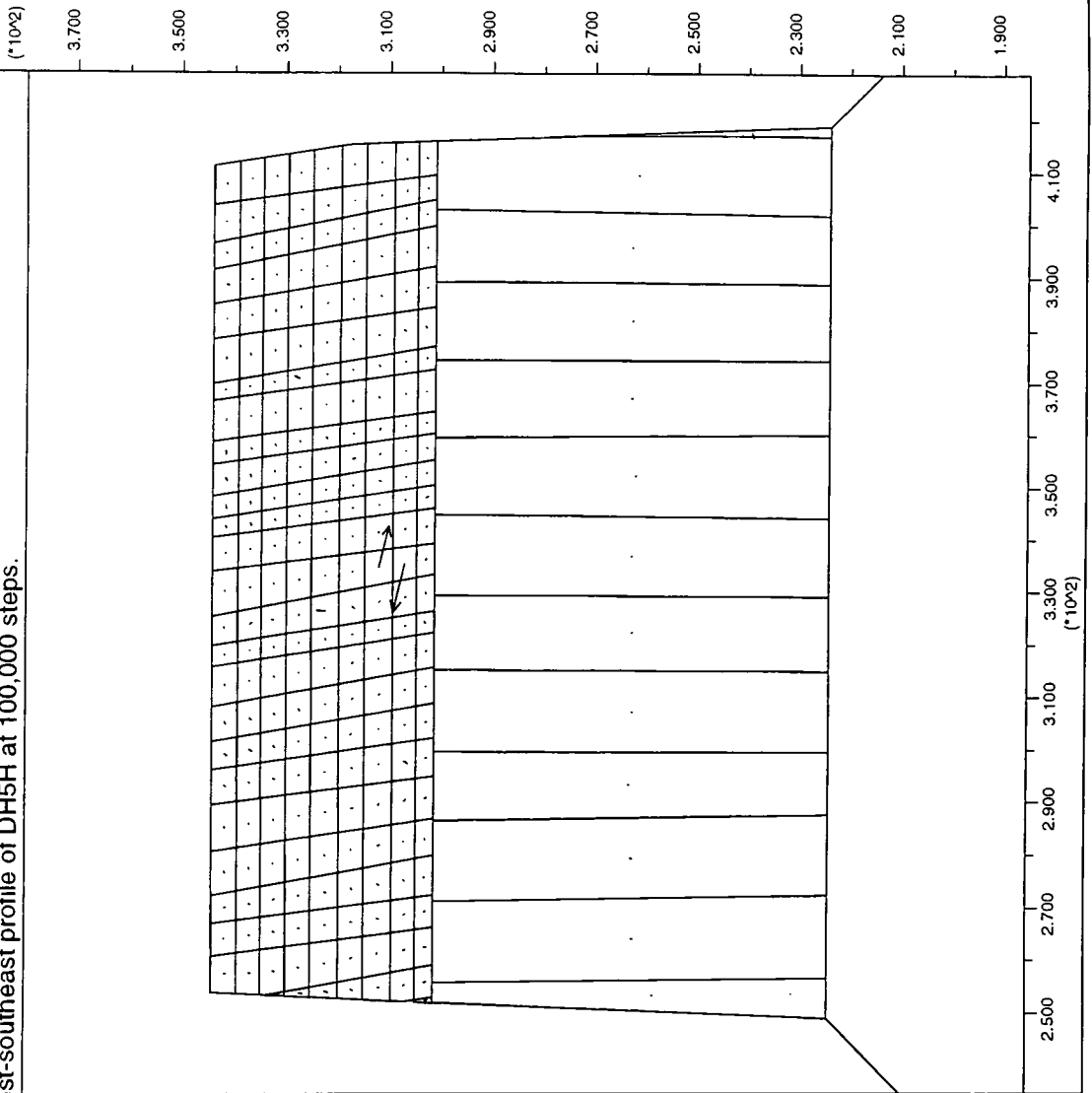
JOB TITLE : Figure 7.37b: Northwest-southeast profile of DH5H at 100,000 steps.

UDEC (Version 2.00)

LEGEND

9/03/1998 12:24
cycle 100000
time 2.251E+01 sec
block plot
velocity vectors
maximum = 5.270E-06

┌──────────┐
0 2E -5



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JOB TITLE : Figure 7.37c: Northwest-southeast profile of DH5H at 200,000 steps.

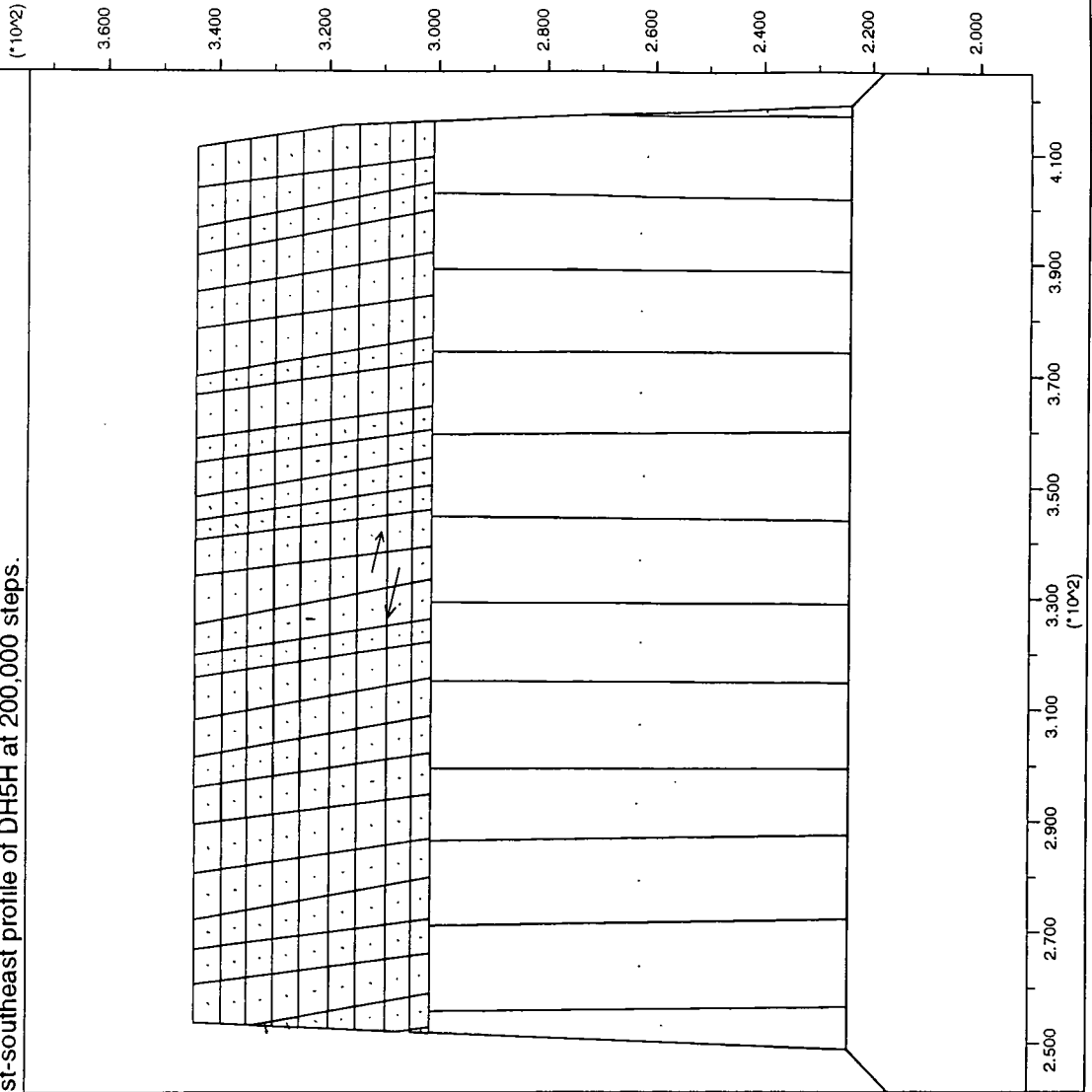
UDEC (Version 2.00)

LEGEND

9/03/1998 12:33
cycle 200000
time 4.536E+01 sec

block plot
velocity vectors
maximum = 5.299E-06

0
2E -5



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JOB TITLE : Figure 7.37d: Northwest-southeast profile of DH5H at 500,000 steps.

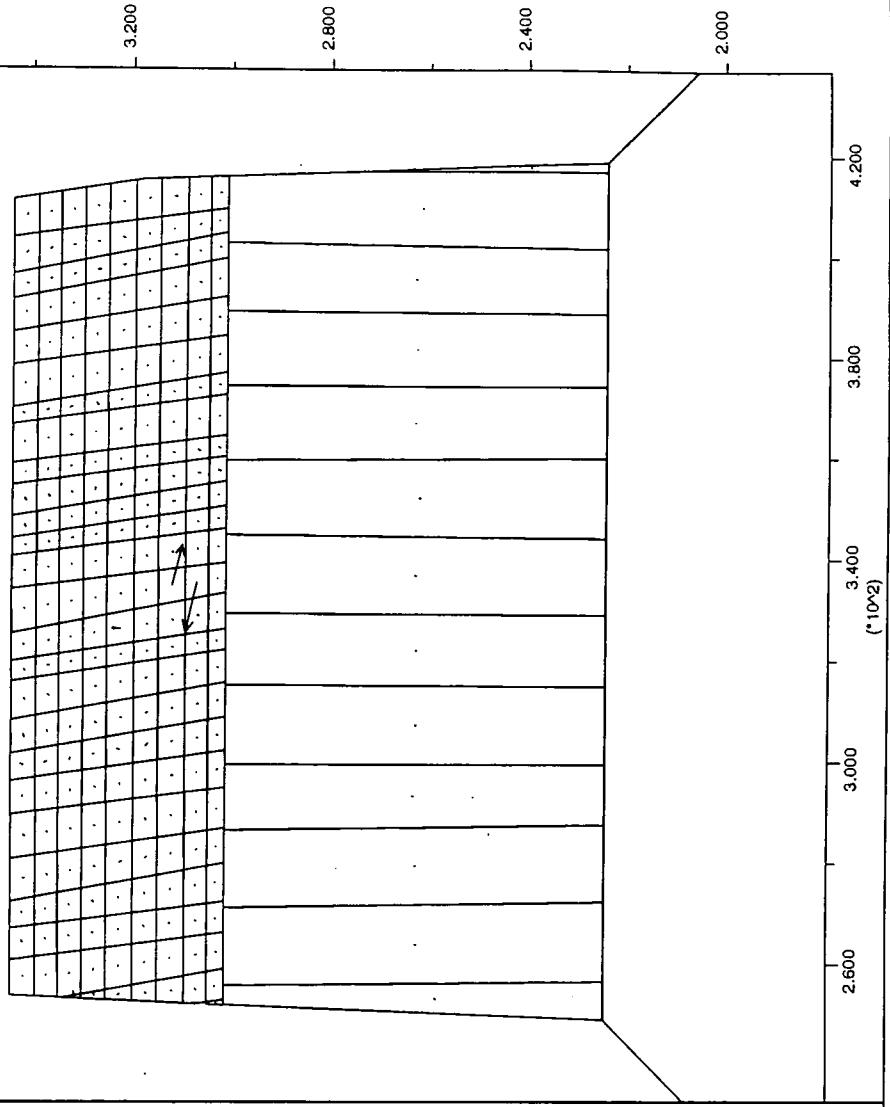
UDEC (Version 2.00)

LEGEND

9/08/1998 09:08
cycle 500000
time 1.139E+02 sec

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velocity vectors
maximum = 5.359E-06

0
2E -5



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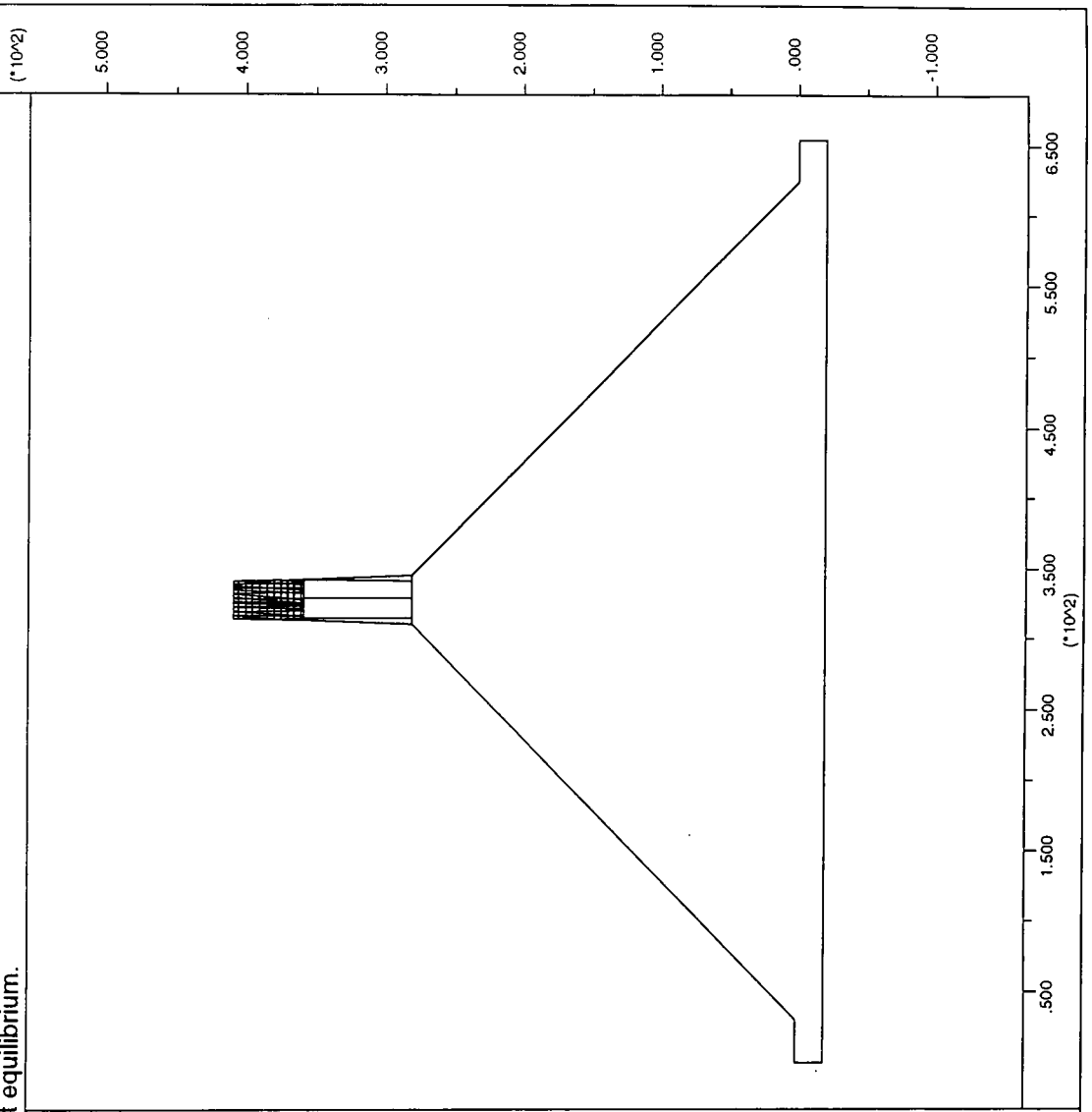
JOB TITLE : Figure 7.38a: DH7E at equilibrium.

UDEC (Version 2.00)

LEGEND

9/03/1998 12:48
cycle 5000
time 1.024E+00 sec
block plot

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JOB TITLE : Figure 7.38b: DH7E at 100,000 steps.

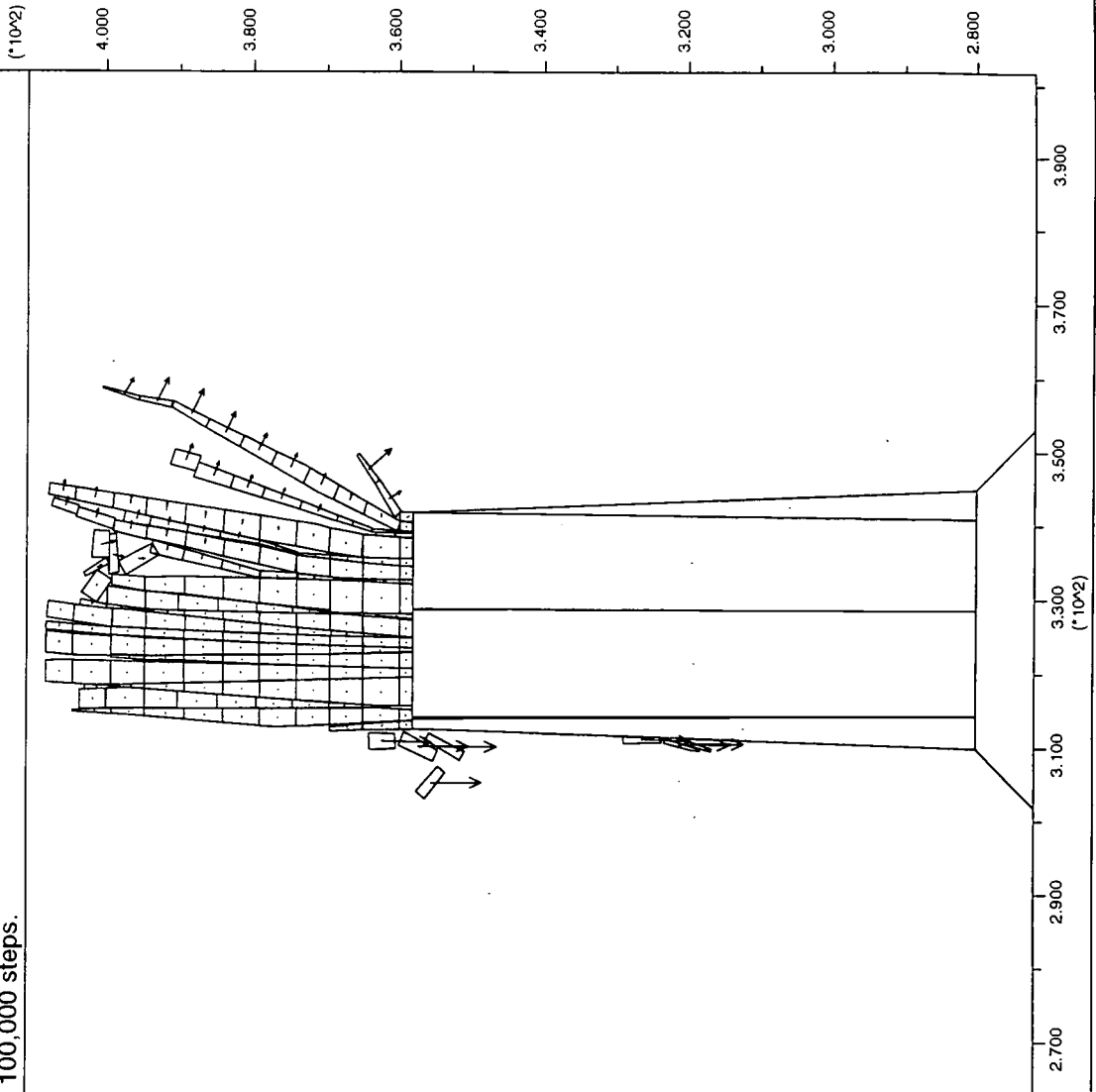
UDEC (Version 2.00)

LEGEND

9/03/1998 13:28
cycle 100000
time 2.507E+01 sec

block plot
velocity vectors
maximum = 7.790E+00

0 2E 1



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JOB TITLE : Figure 7.38c: DH7E at 200,000 steps.

UDEC (Version 2.00)

LEGEND

9/03/1998 14:06

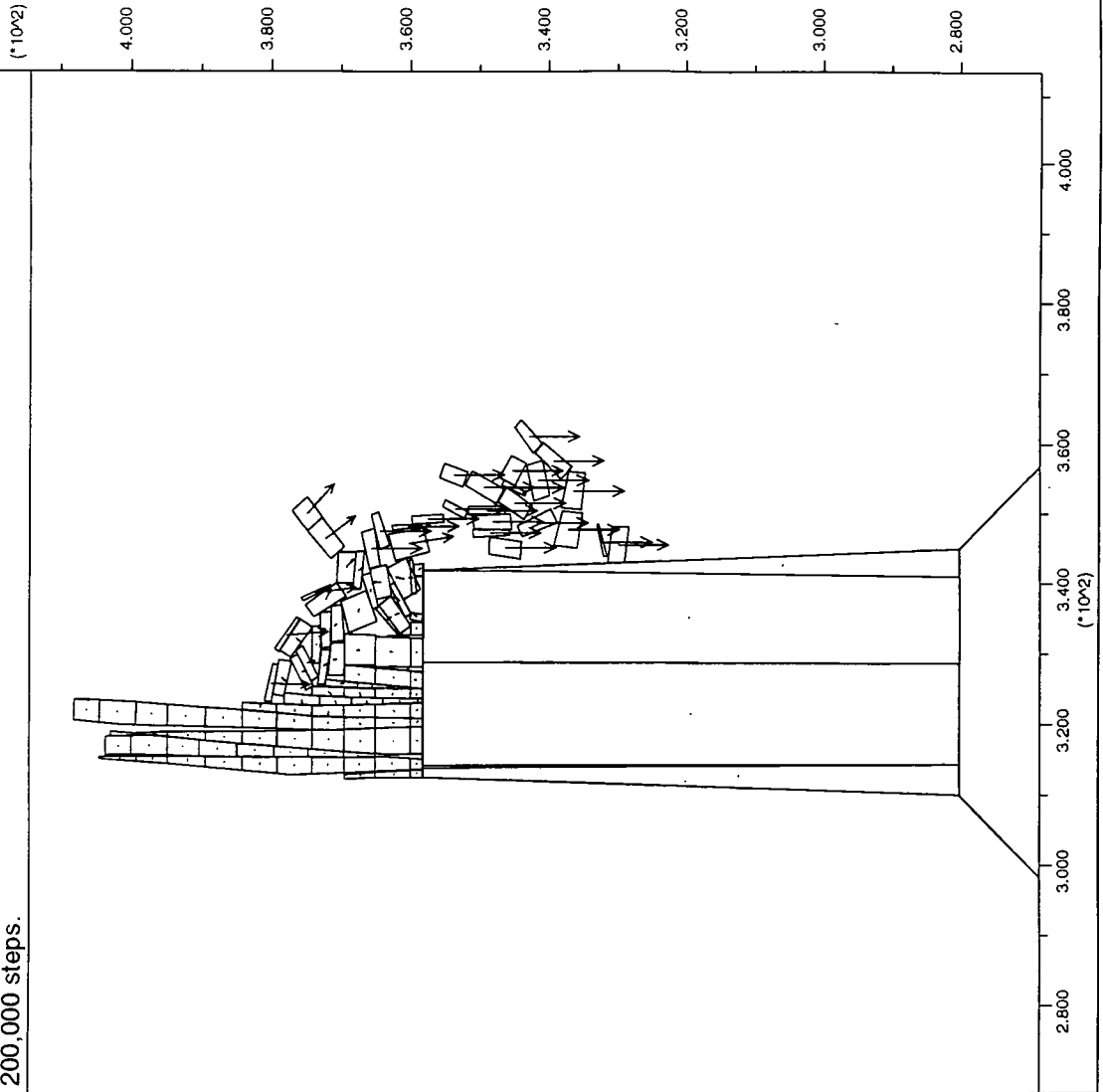
cycle 200000

time 5.438E+01 sec

block plot

velocity vectors

maximum = 1.027E+00



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JOB TITLE : Figure 7.38d: DH7E at 500,000 steps.

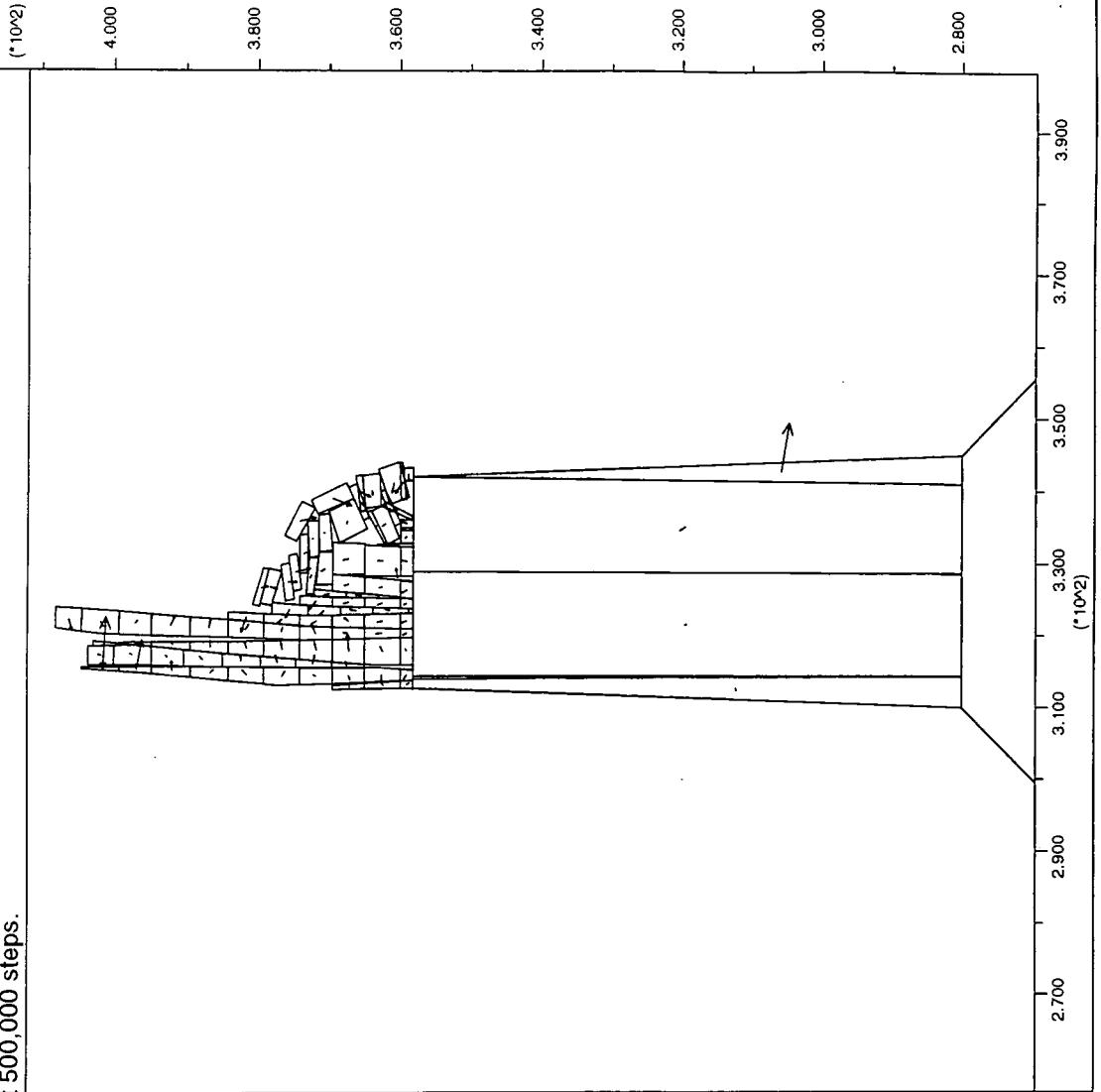
UDEC (Version 2.00)

LEGEND

9/03/1998 14:42
cycle 500000
time 1.513E+02 sec

block plot
velocity vectors
maximum = 3.683E-03

0
|-----|
2E-2



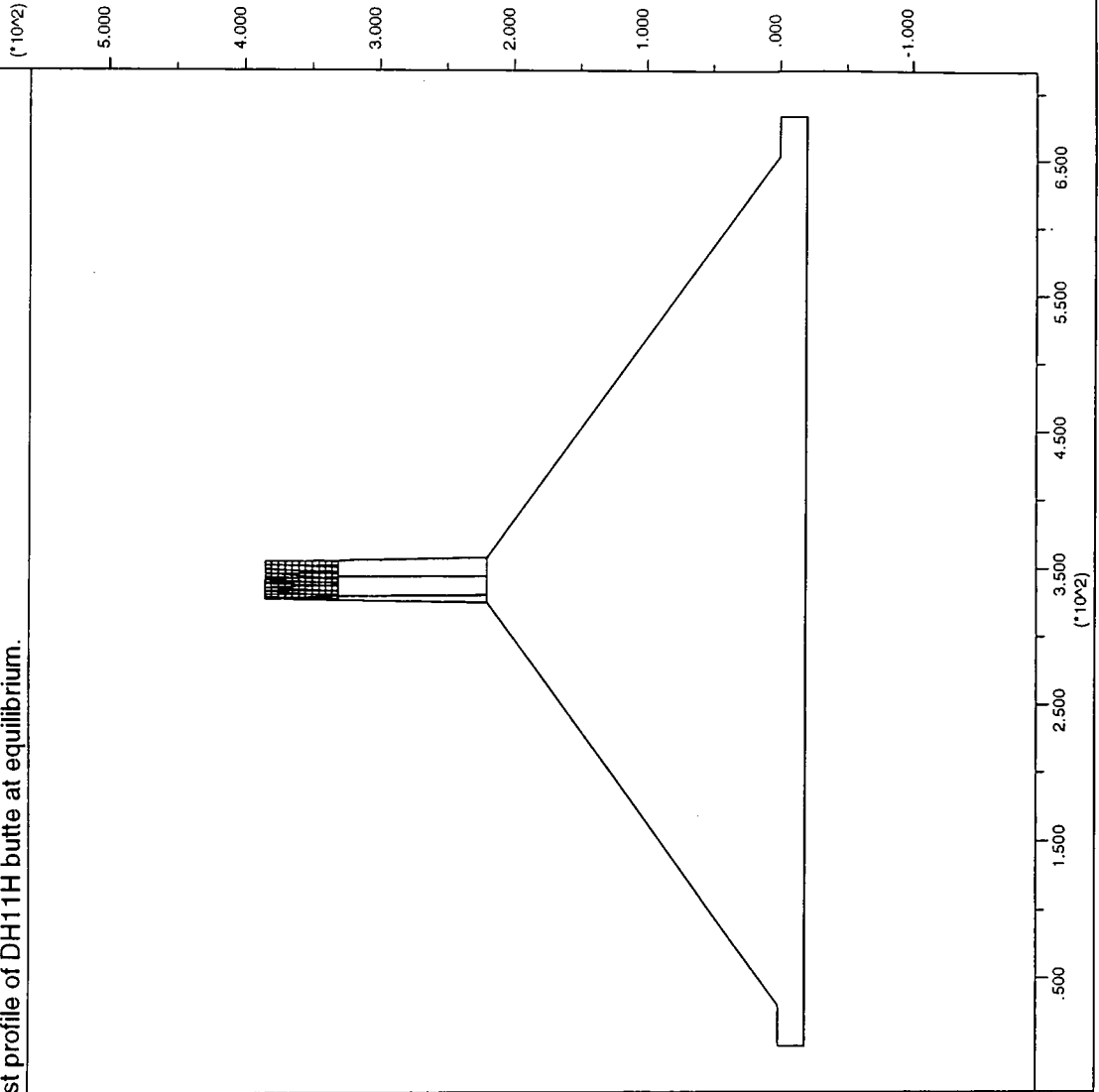
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JOB TITLE : Figure 7.39a: East-west profile of DH11H butte at equilibrium.

UDEC (Version 2.00)

LEGEND

9/03/1998 14:59
cycle 10000
time 1.698E+00 sec
block plot



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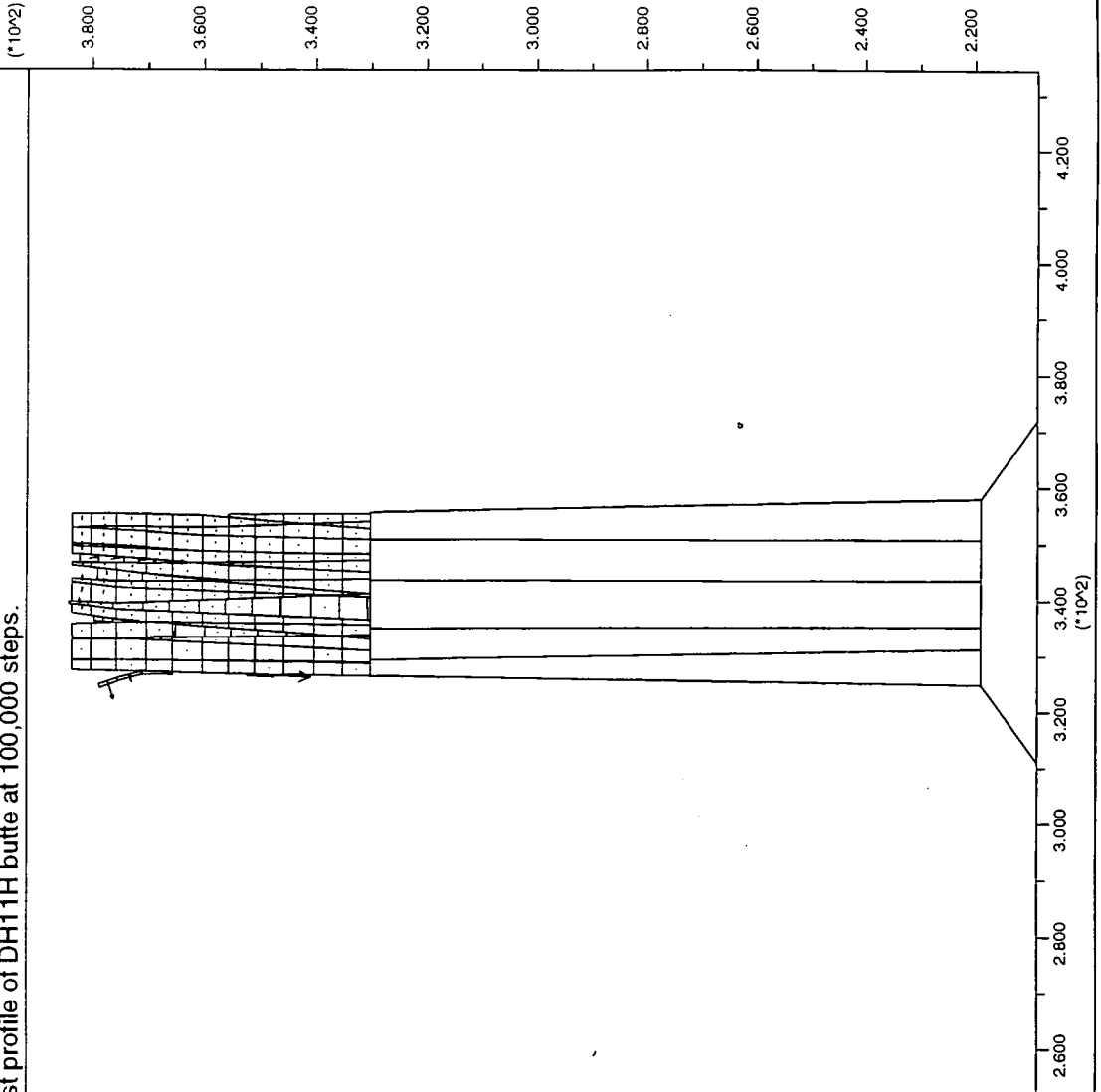
JOB TITLE : Figure 7.39b: East-west profile of DH11H butte at 100,000 steps.

UDEC (Version 2.00)

LEGEND

9/03/1998 15:13
cycle 100000
time 1.701E+01 sec

block plot
velocity vectors
maximum = 1.115E+00



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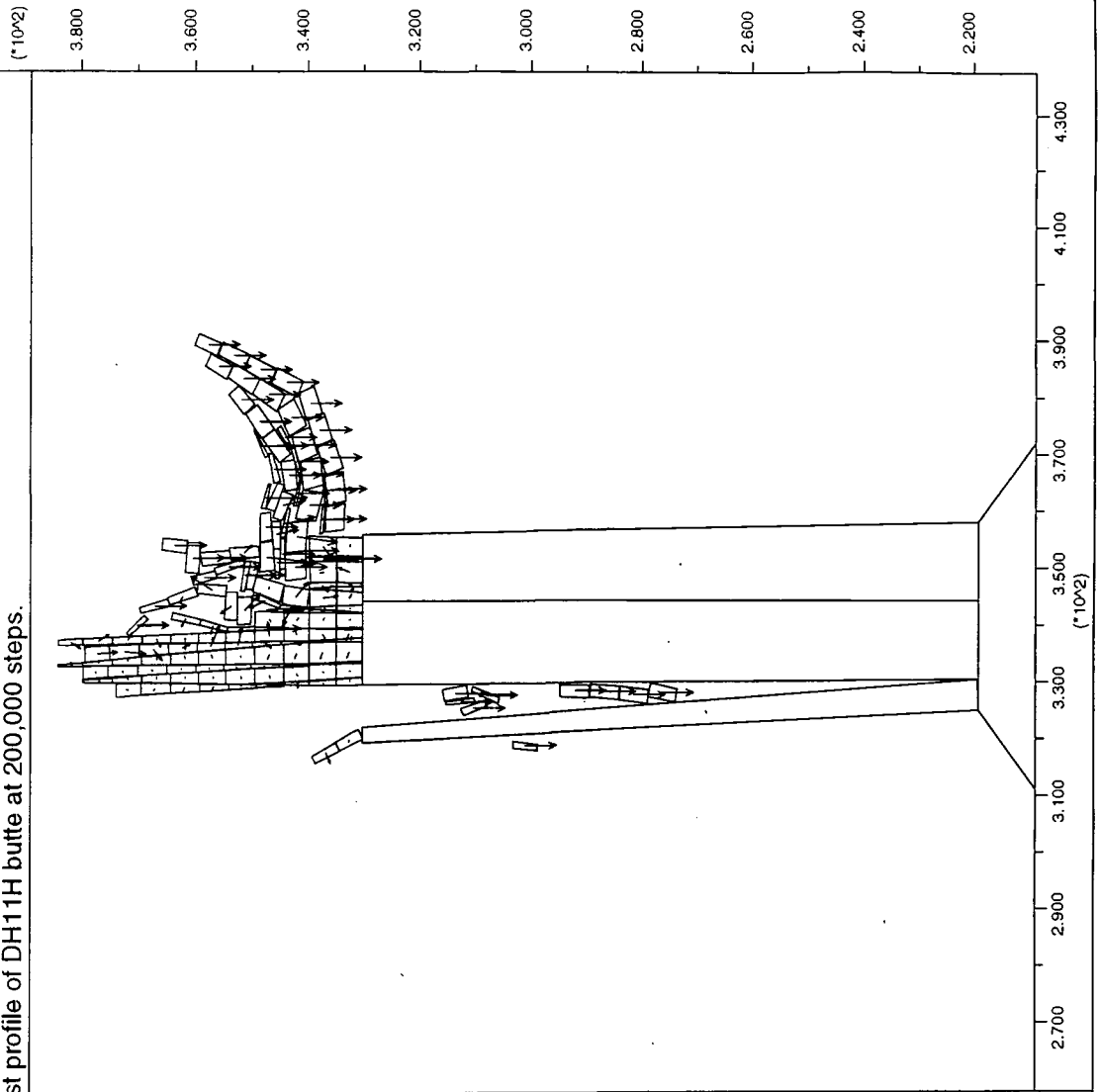
JOB TITLE : Figure 7.39c: East-west profile of DH11H butte at 200,000 steps.

UDEC (Version 2.00)

LEGEND

9/03/1998 15:15
cycle 200000
time 4.510E+01 sec

block plot
velocity vectors
maximum = 2.742E-02



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JOB TITLE : Figure 7.39d: East-west profile of DH11H butte at 500,000 steps.

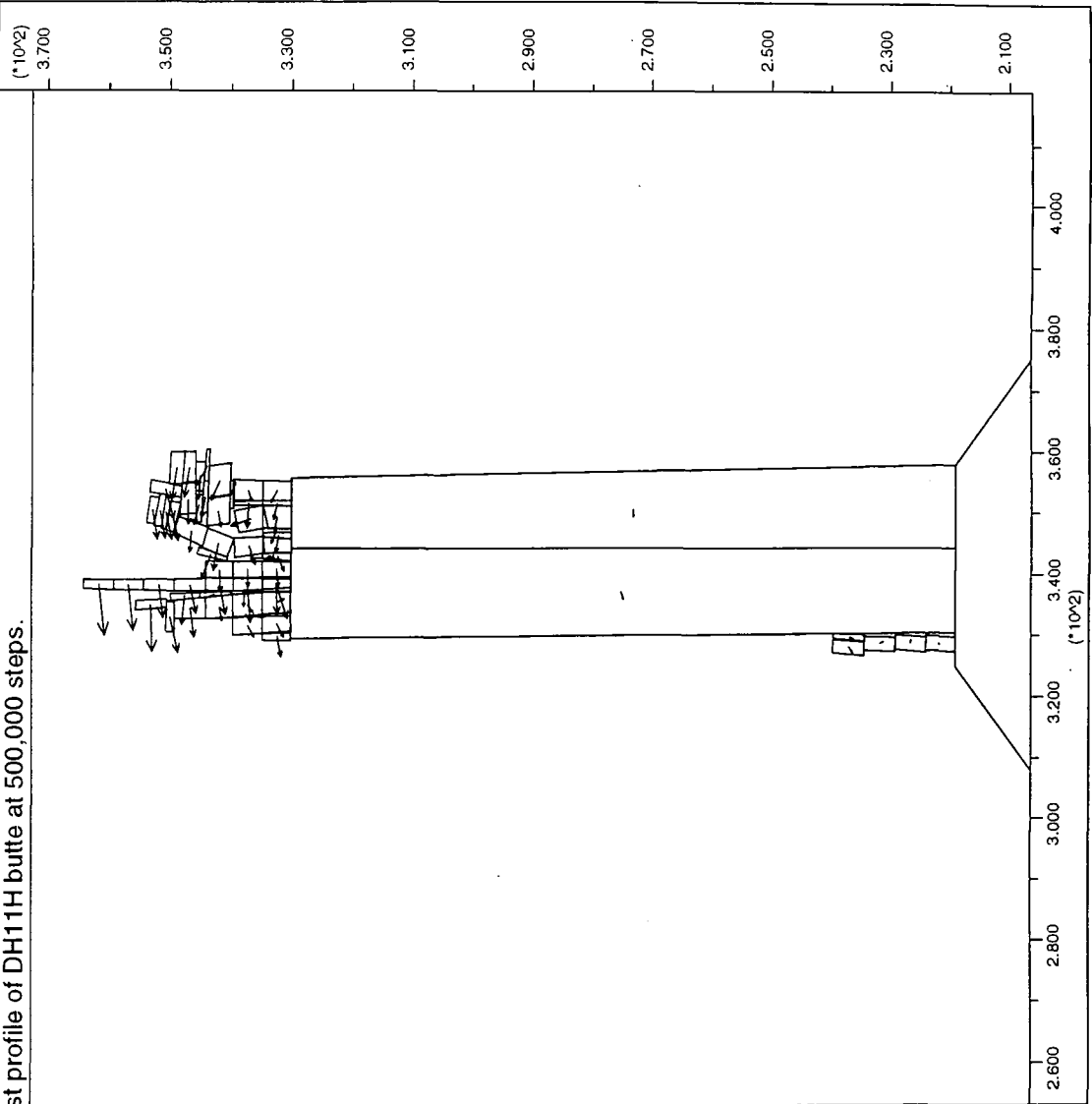
UDEC (Version 2.00)

LEGEND

9/03/1998 15:17
 cycle 500020
 time 1.124E+02 sec

block plot
 velocity vectors
 maximum = 4.596E-07

|||||
 0 2E -6



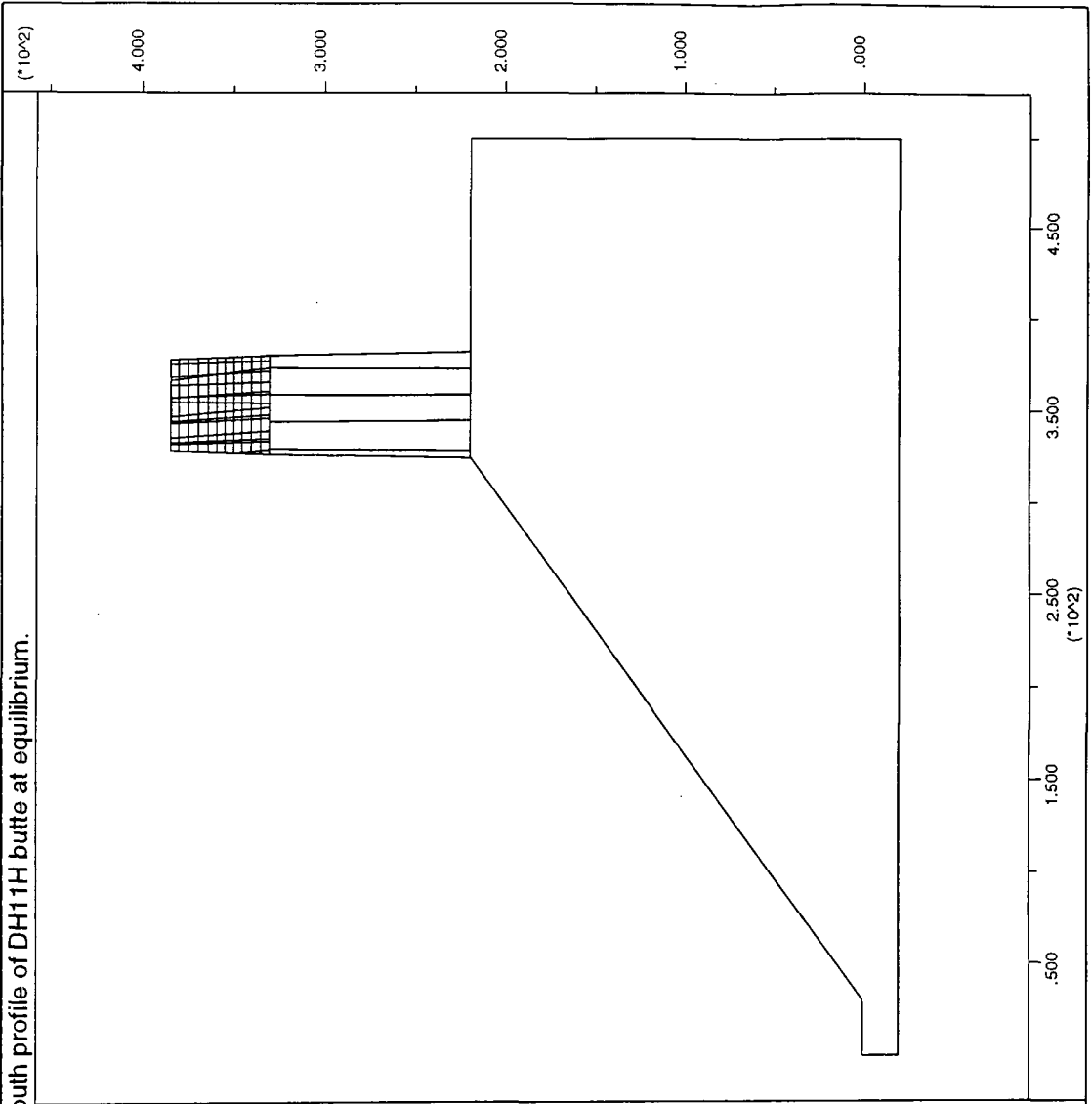
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JOB TITLE : Figure 7.40a: North-south profile of DH11H butte at equilibrium.

UDEC (Version 2.00)

LEGEND

9/03/1998 15:20
cycle 10000
time 4.692E-01 sec
block plot



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JOB TITLE : Figure 7.40b: North-south profile of DH11H butte at 100,000 steps.

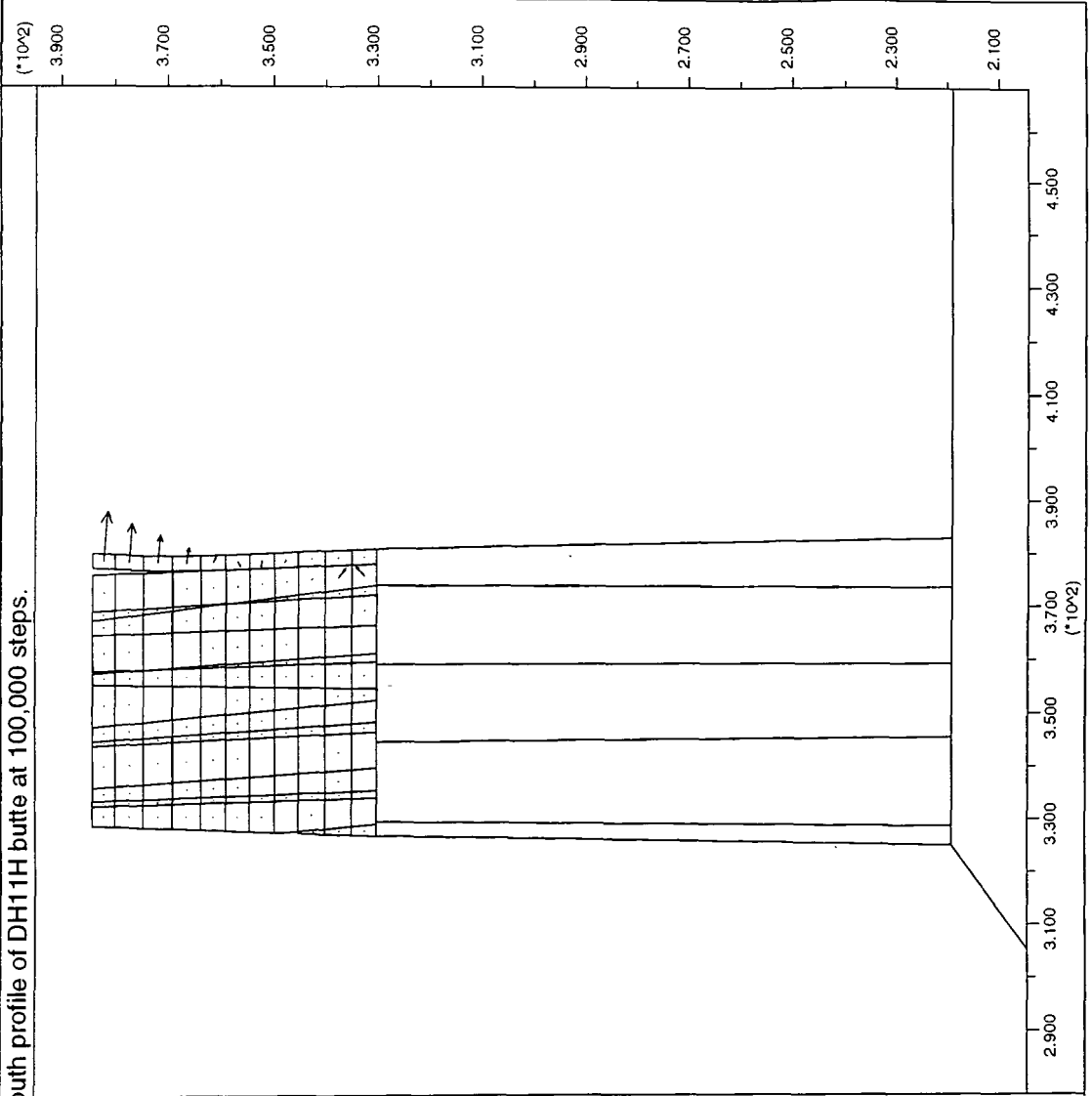
UDEC (Version 2.00)

LEGEND

9/03/1998 15:26
 cycle 100000
 time 5.261E+00 sec

block plot
 velocity vectors
 maximum = 7.979E-01

|||||
 0 2E 0



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JOB TITLE : Figure 7.40c: North-south profile of DH11H butte at 200,000 steps.

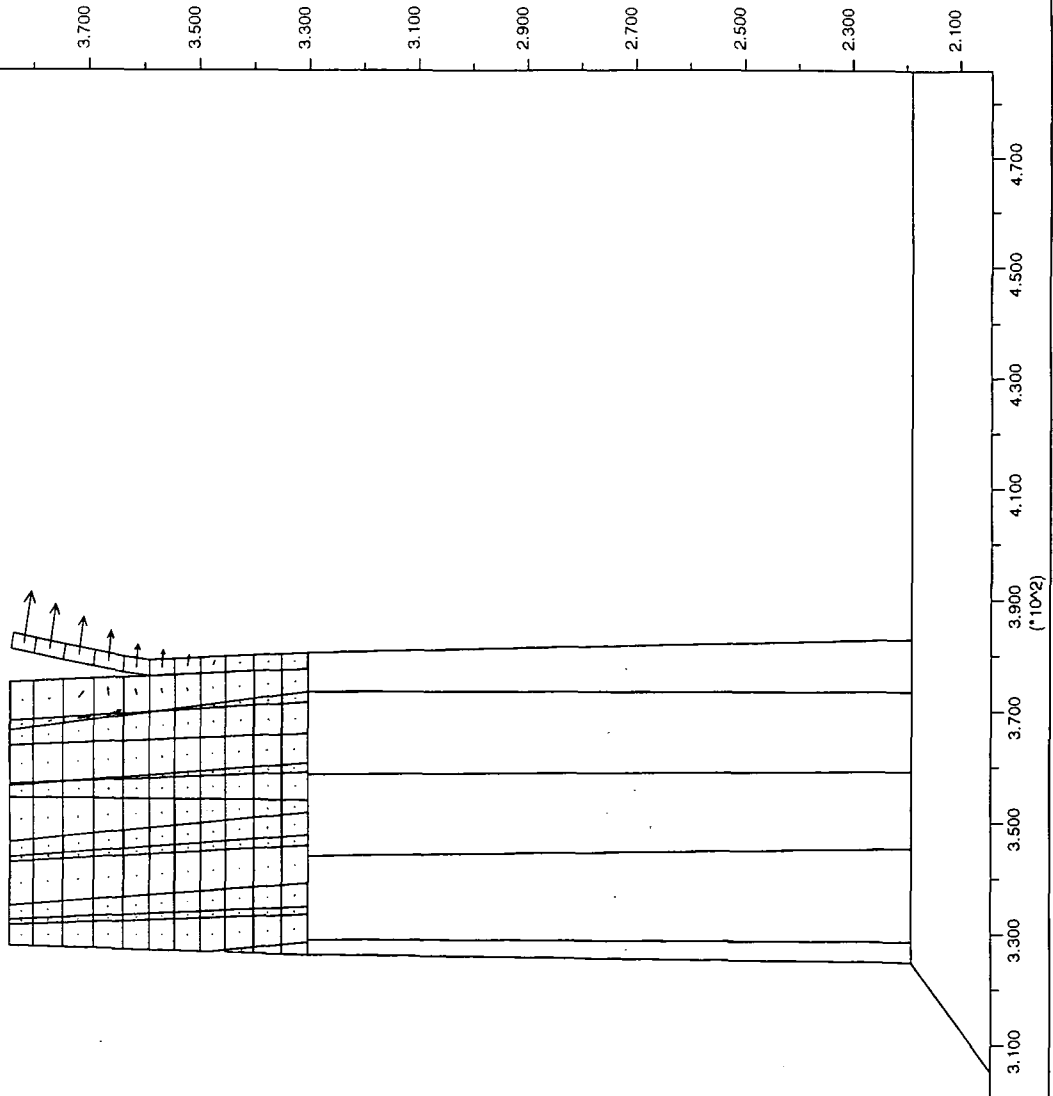
UDEC (Version 2.00)

LEGEND

9/03/1998 15:30
 cycle 200000
 time 1.064E+01 sec

block plot
 velocity vectors
 maximum = 7.726E-01

|||||
 0 2E 0



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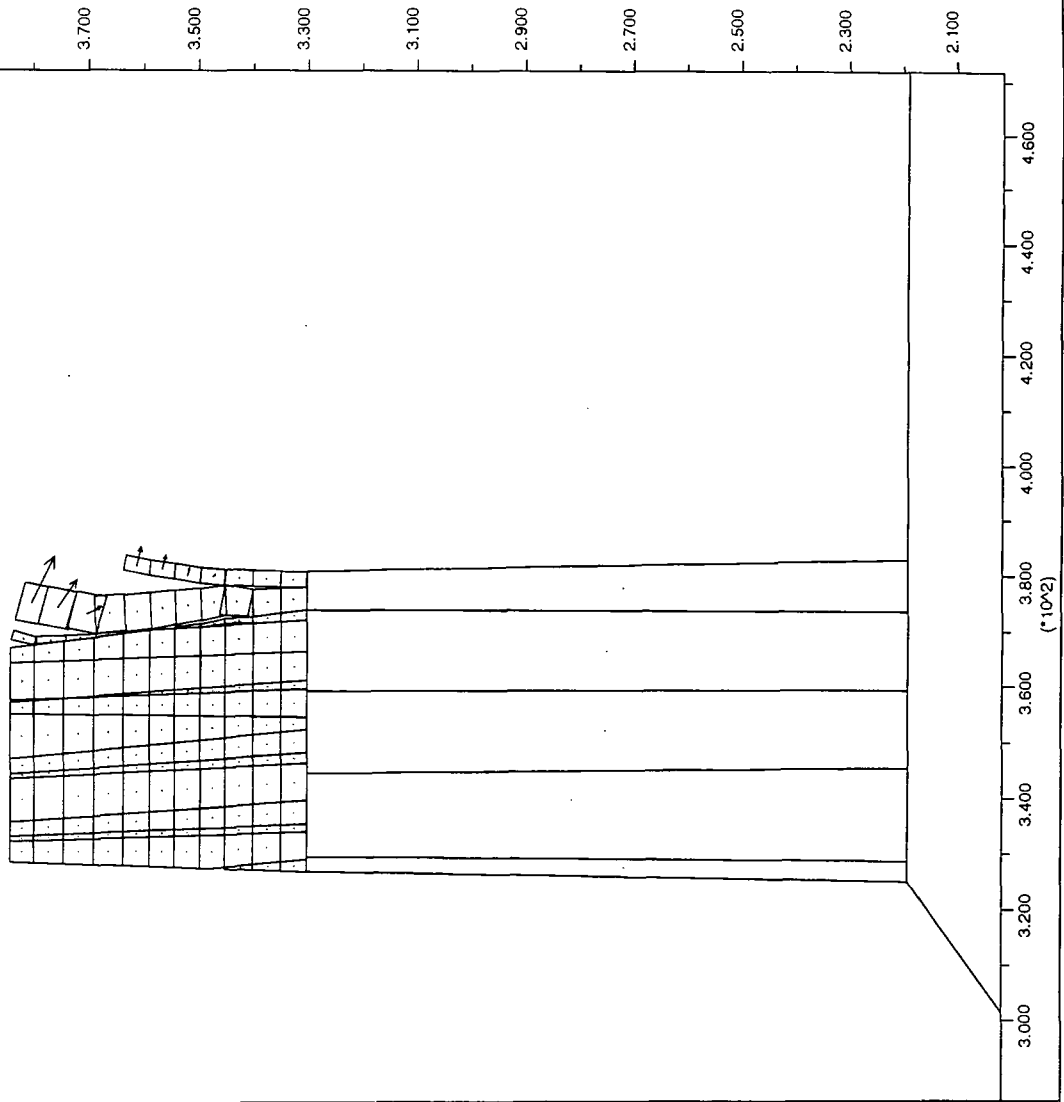
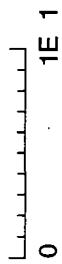
JOB TITLE : Figure 7.40d: North-south profile of DH11H butte at 500,000 steps.

UDEC (Version 2.00)

LEGEND

9/03/1998 15:36
 cycle 500000
 time 2.672E+01 sec

block plot
 velocity vectors
 maximum = 2.441E+00



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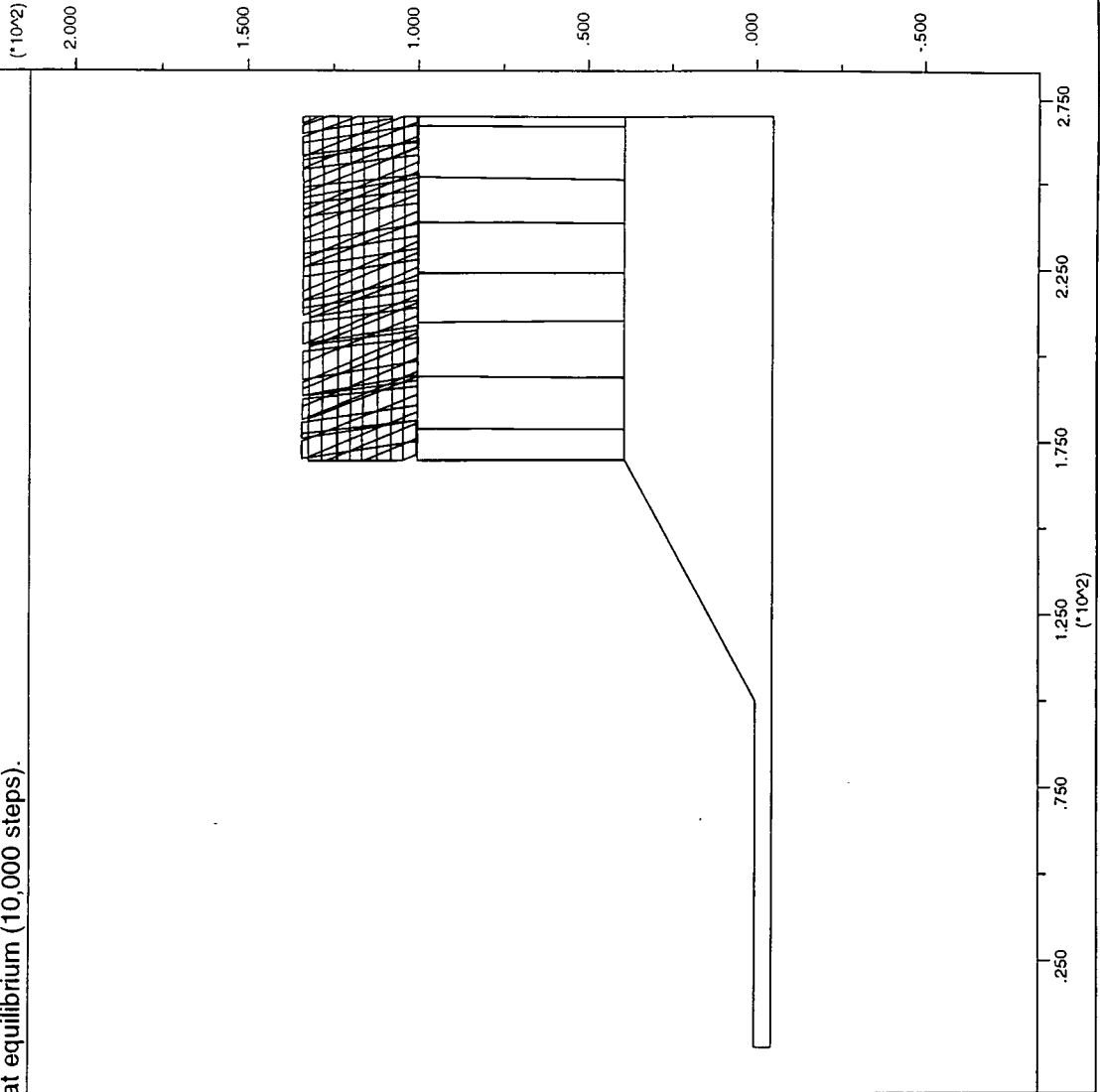
JOB TITLE : Figure 7.41a: CO56H at equilibrium (10,000 steps).

UDEC (Version 2.00)

LEGEND

9/03/1998 16:55
cycle 10000
time 6.958E-01 sec
block plot

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JOB TITLE : Figure 7.41b: CO56H at 100,000 steps.

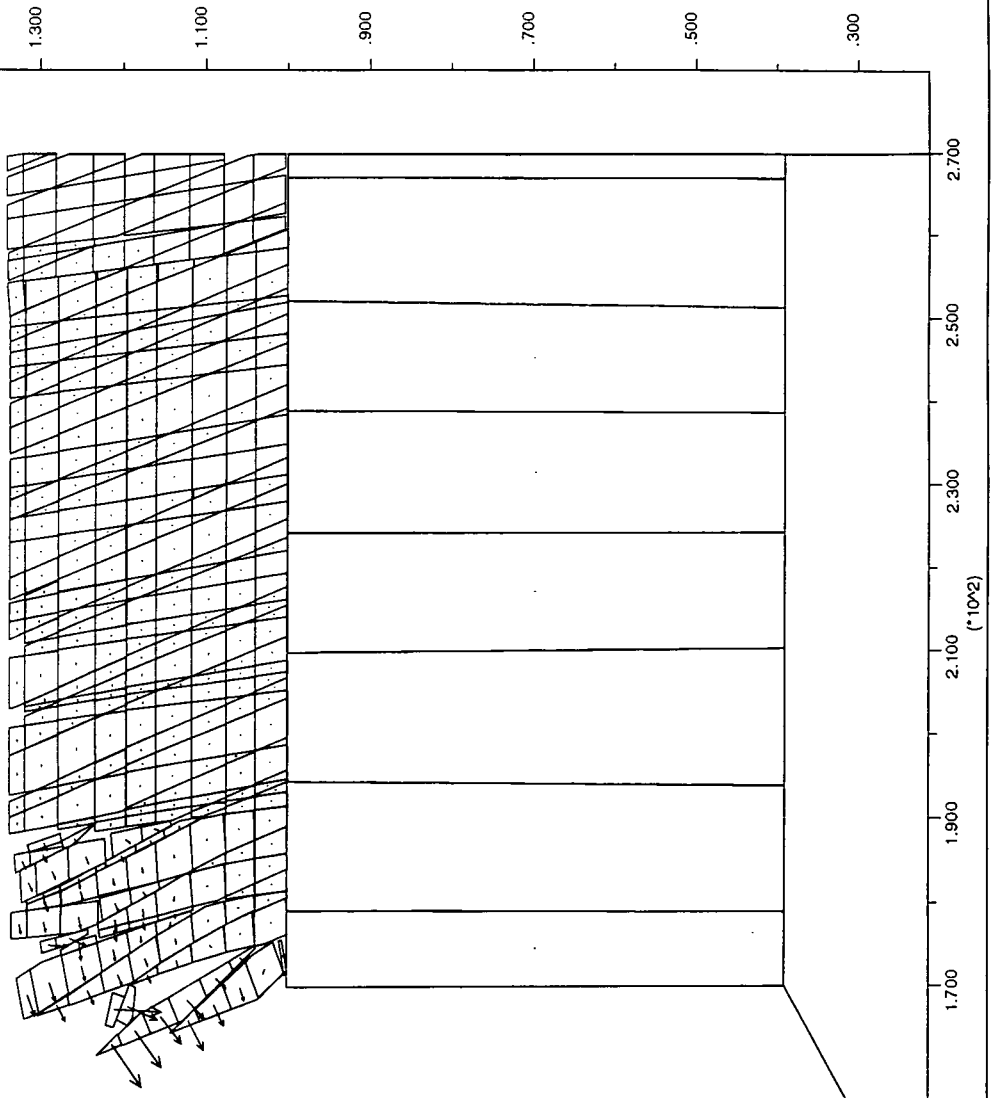
UDEC (Version 2.00)

LEGEND

9/03/1998 16:56
cycle 100000
time 8.334E+00 sec

block plot
velocity vectors
maximum = 6.137E-01

0 2E 0



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JOB TITLE : Figure 7.41c: CO56H at 200,000 steps.

UDEC (Version 2.00)

LEGEND

9/03/1998 16:57

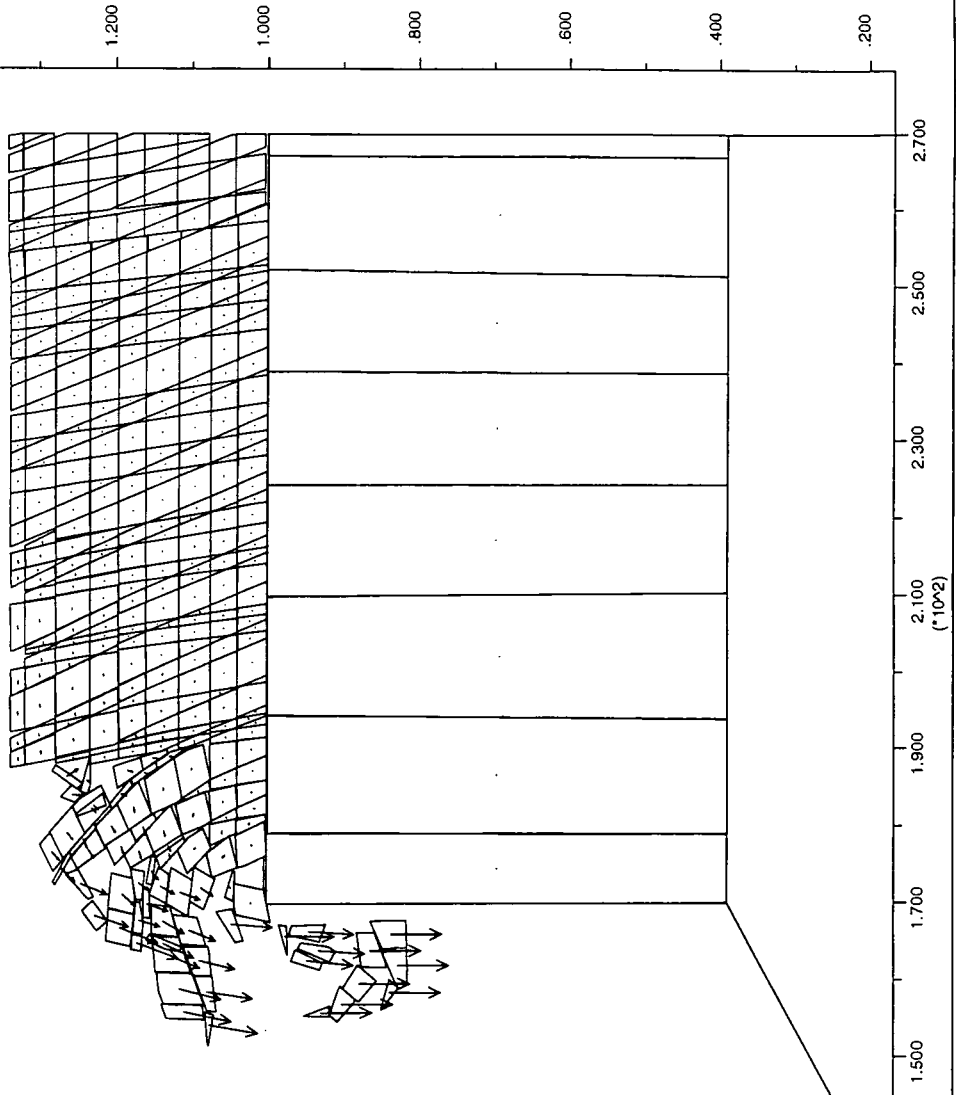
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time 1.690E+01 sec

block plot

velocity vectors

maximum = 9.864E+00



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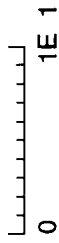
JOB TITLE : Figure 7.41d: CO56H at 500,000 steps.

UDEC (Version 2.00)

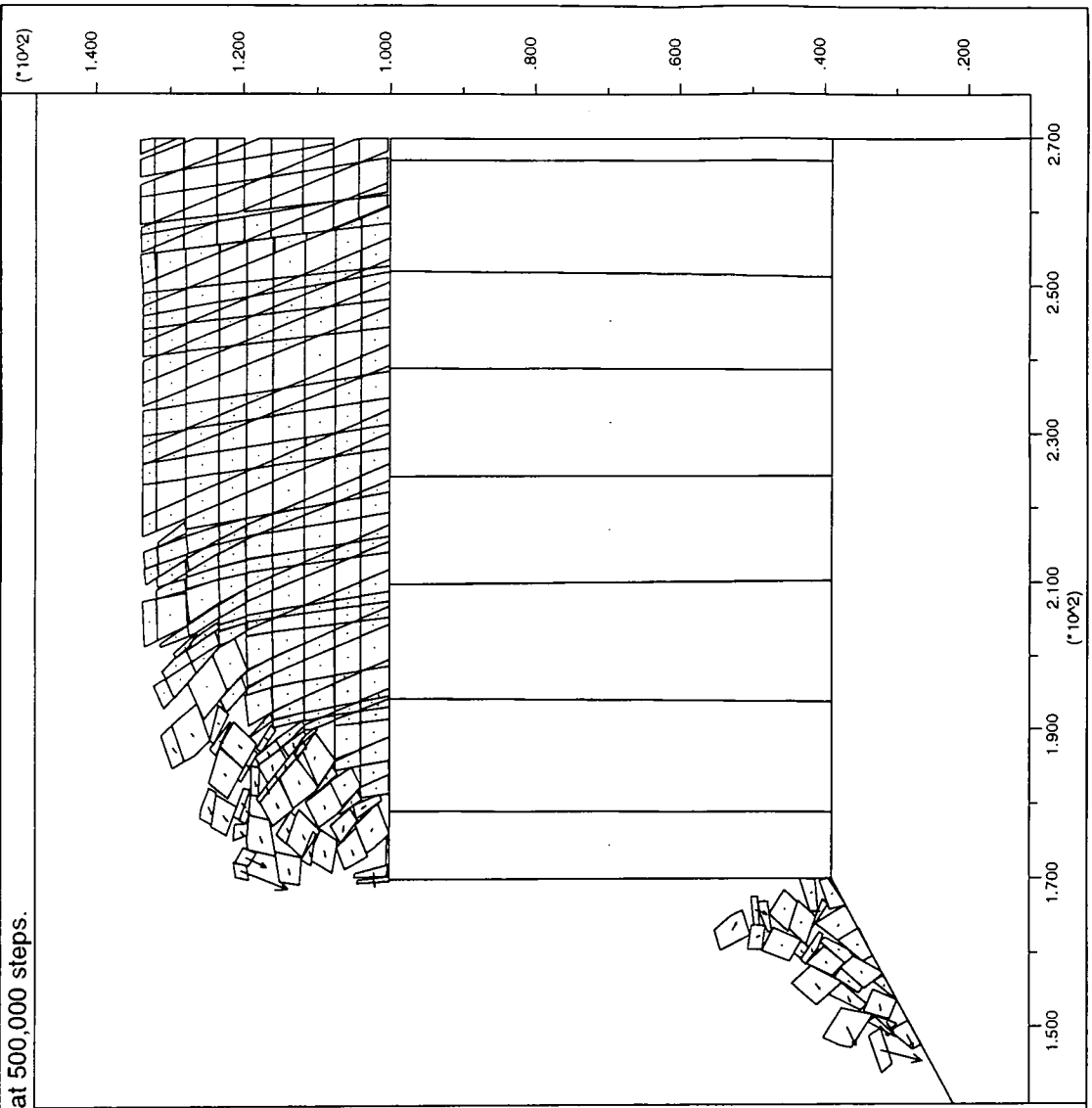
LEGEND

9/03/1998 17:01
cycle 500000
time 4.258E+01 sec

block plot
velocity vectors
maximum = 2.719E+00



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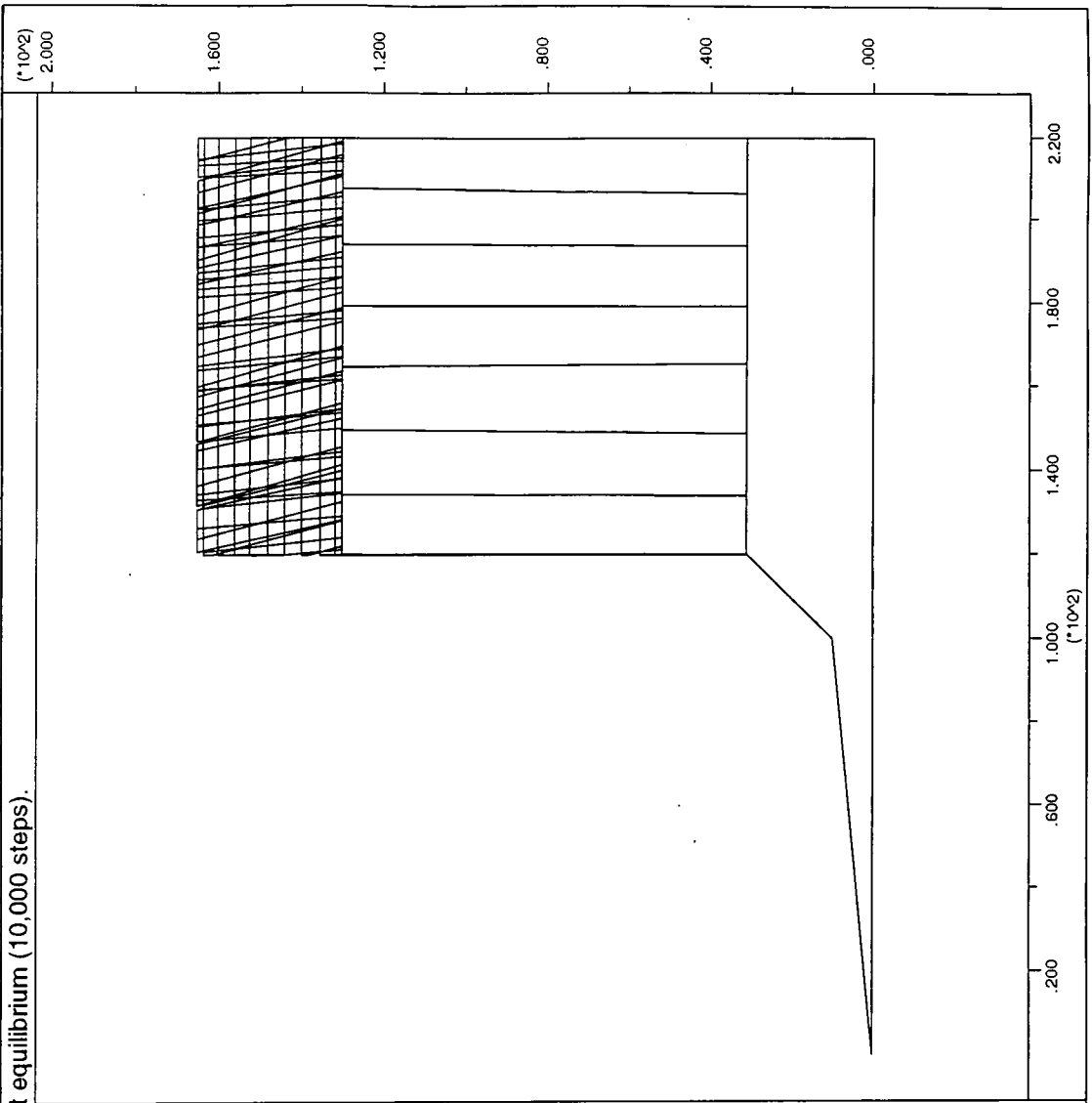
JOB TITLE : Figure 7.42a: CO9E at equilibrium (10,000 steps).

UDEC (Version 2.00)

LEGEND

9/03/1998 17:03
cycle 10000
time 2.372E+00 sec

block plot



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JOB TITLE : Figure 7.42b: CO9E at 100,000 steps.

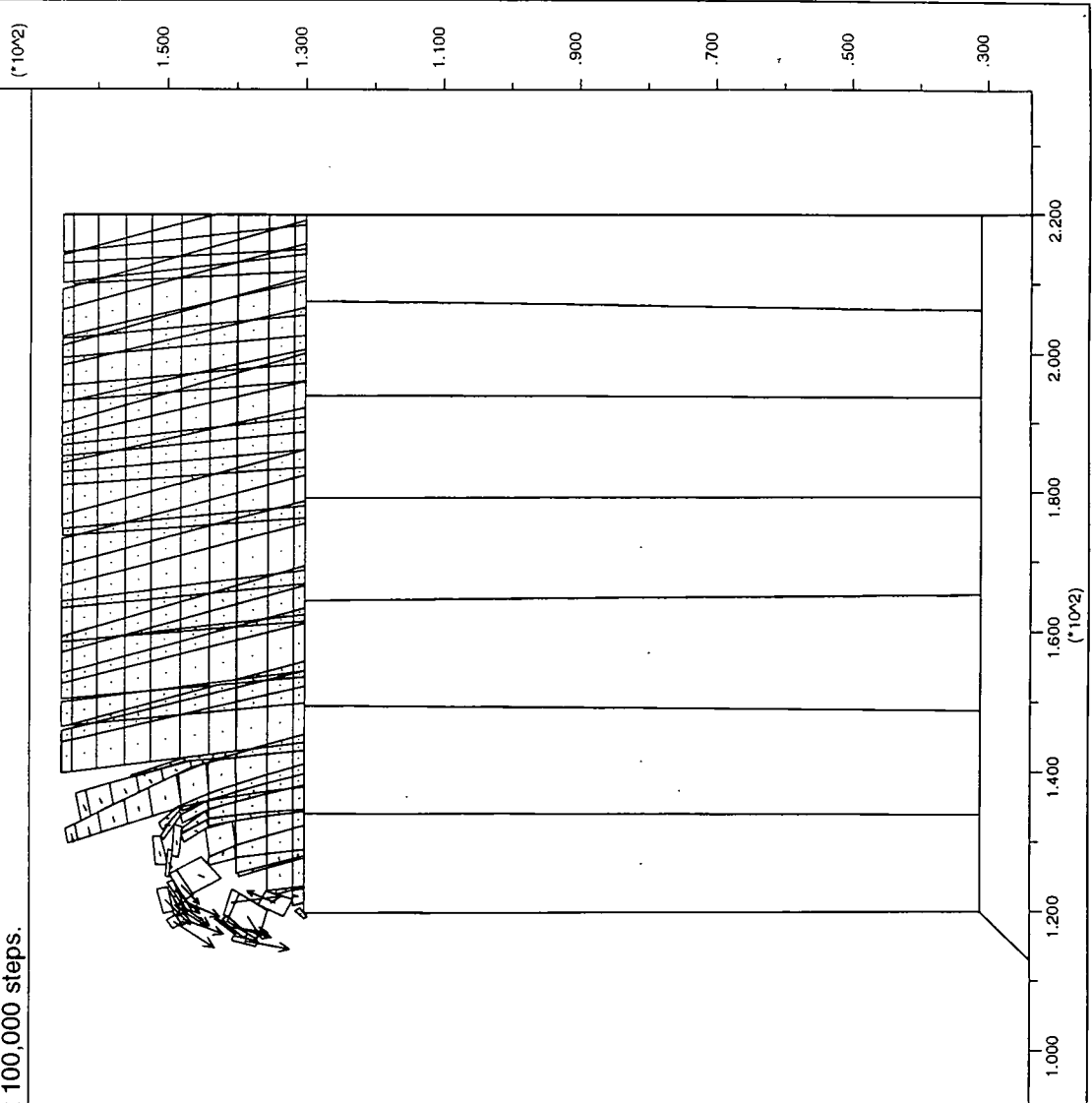
UDEC (Version 2.00)

LEGEND

9/03/1998 17:05
cycle 100000
time 2.554E+01 sec

block plot
velocity vectors
maximum = 4.136E+00

0
2E 1



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JOB TITLE : Figure 7.42c: CO9E at 200,000 steps.

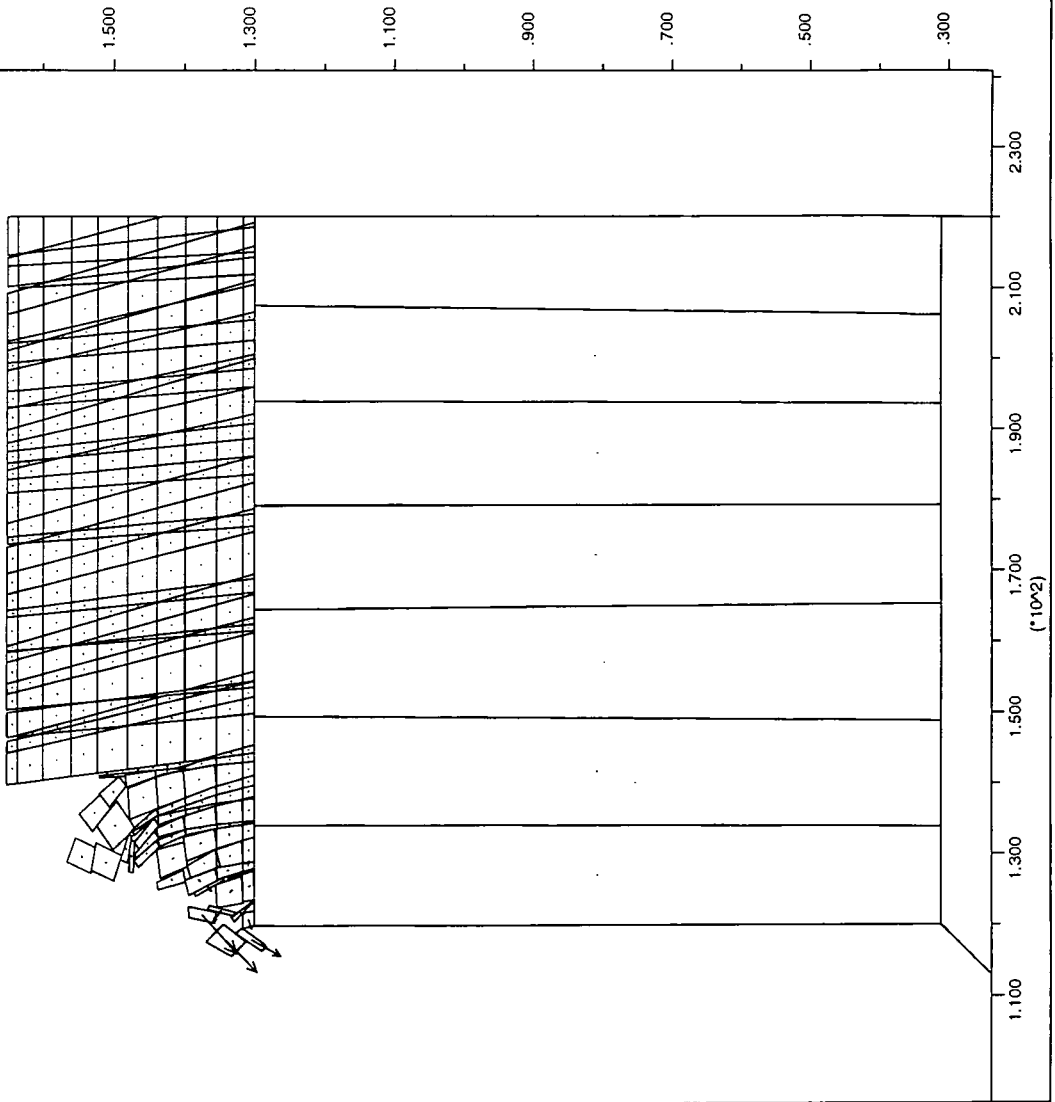
UDEC (Version 2.00)

LEGEND

9/03/1998 17:06
cycle 200000
time 5.140E+01 sec

block plot
velocity vectors
maximum = 5.508E+00

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0 2E 1



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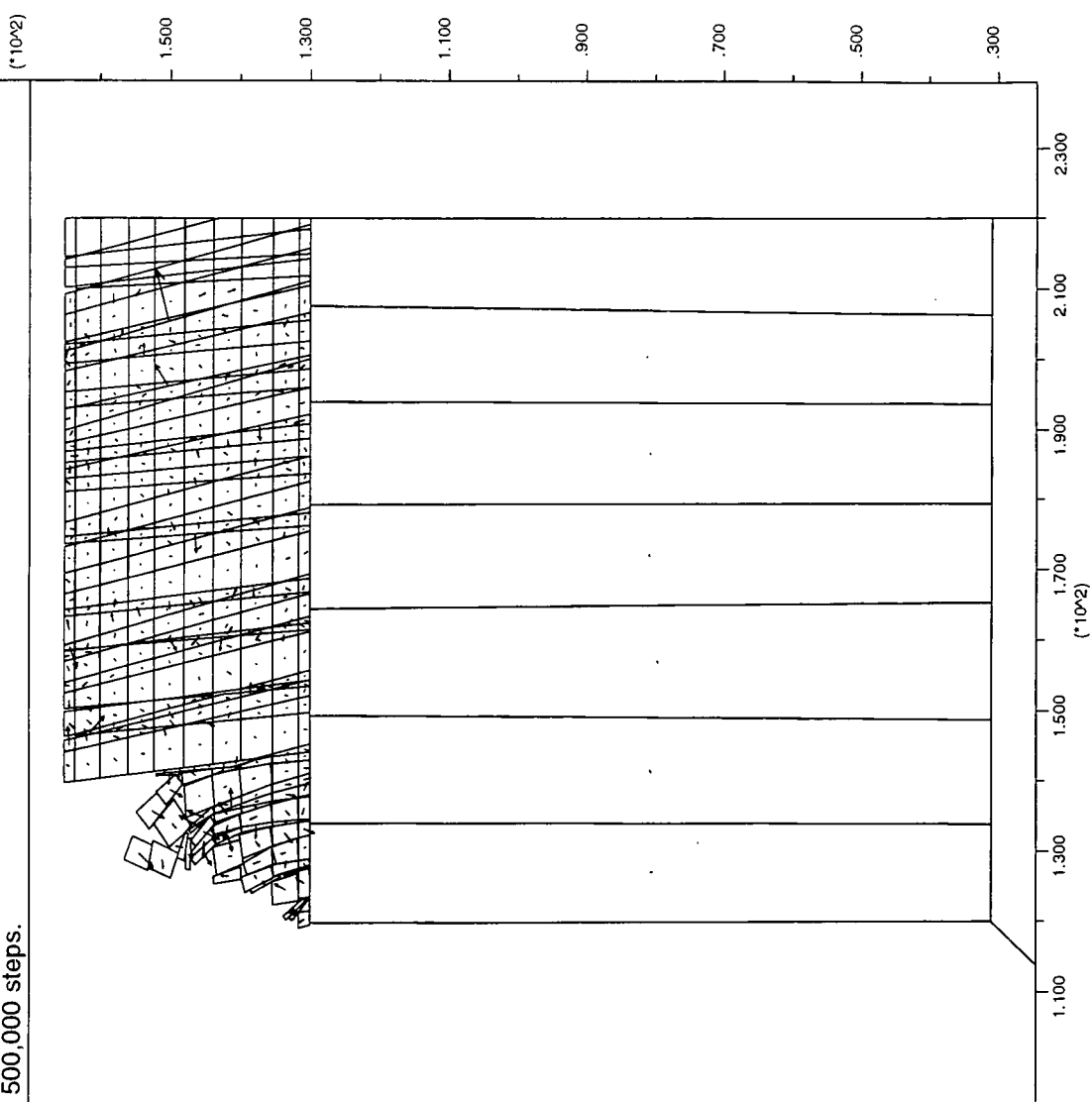
JOB TITLE : Figure 7.42d: CO9E at 500,000 steps.

UDEC (Version 2.00)

LEGEND

9/03/1998 17:07
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time 1.291E+02 sec

block plot
velocity vectors
maximum = 1.921E-06



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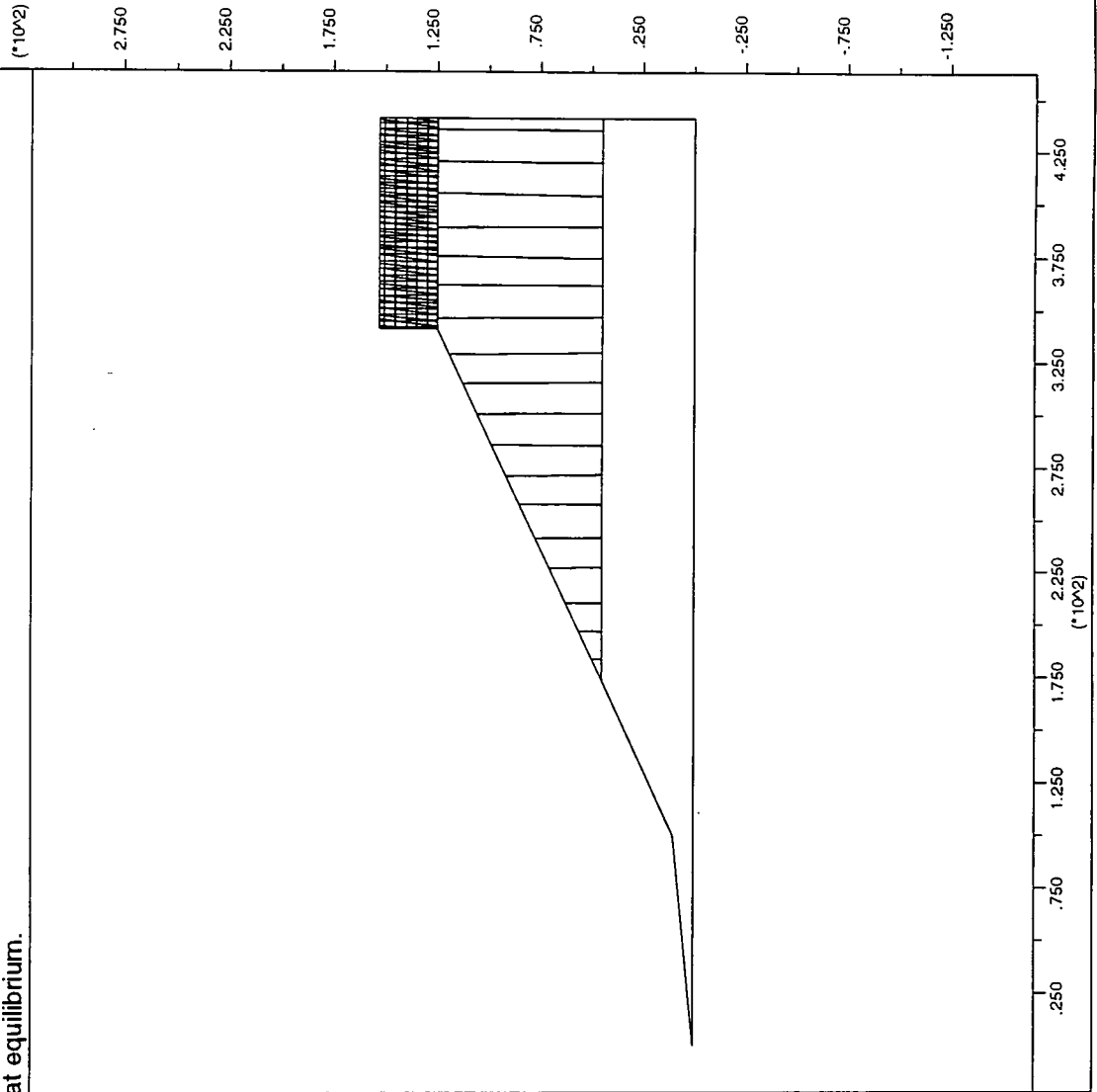
JOB TITLE : Figure 7.43a: CO19E at equilibrium.

UDEC (Version 2.00)

LEGEND

9/03/1998 17:19
cycle 10000
time 2.098E+00 sec
block plot

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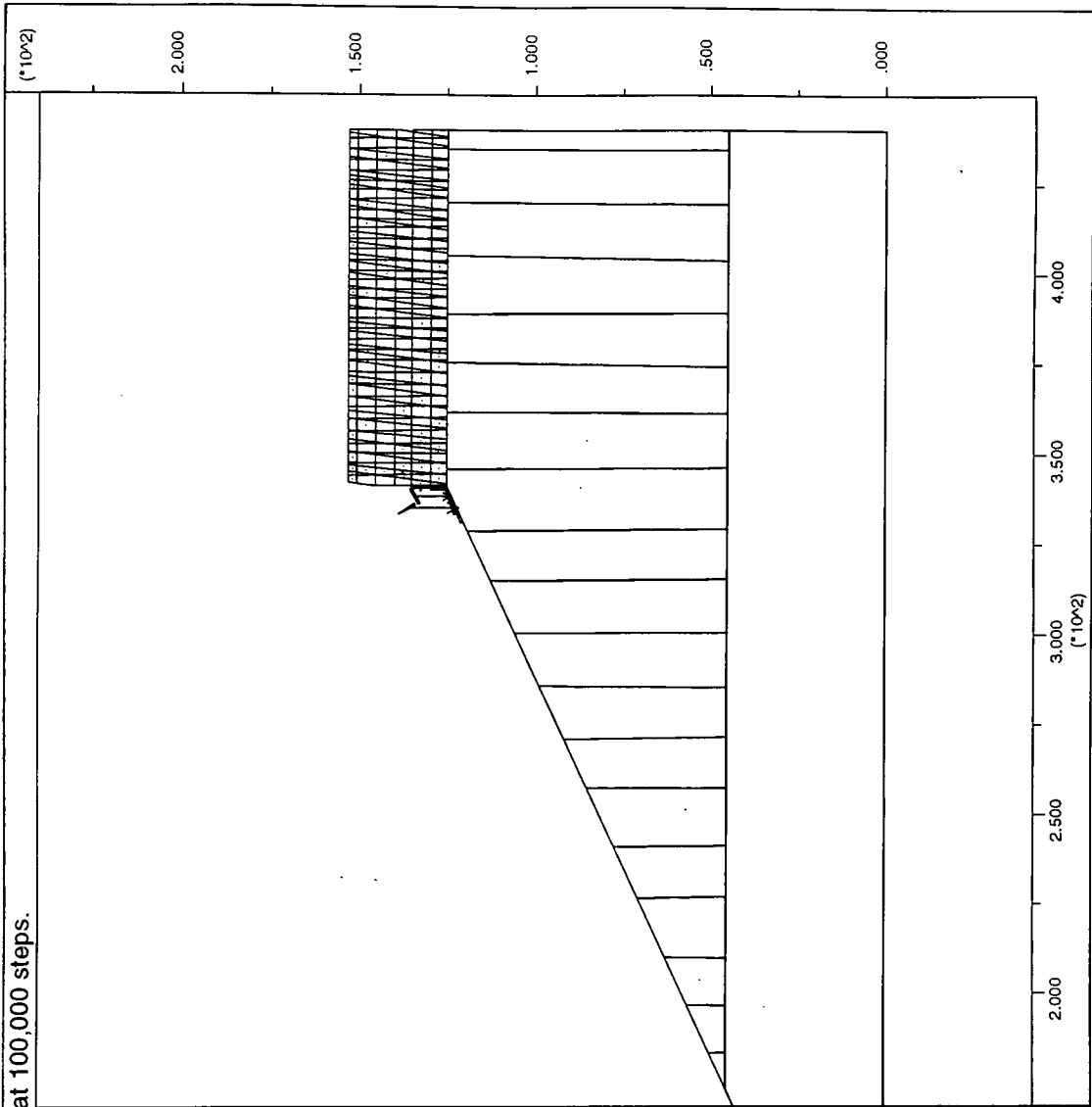
JOB TITLE : Figure 7.43b: CO19E at 100,000 steps.

UDEC (Version 2.00)

LEGEND

9/03/1998 17:20
cycle 100000
time 2.152E+01 sec

block plot
velocity vectors
maximum = 3.657E+00



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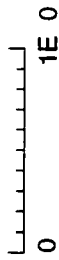
JOB TITLE : Figure 7.43c: CO19E at 200,000 steps.

UDEC (Version 2.00)

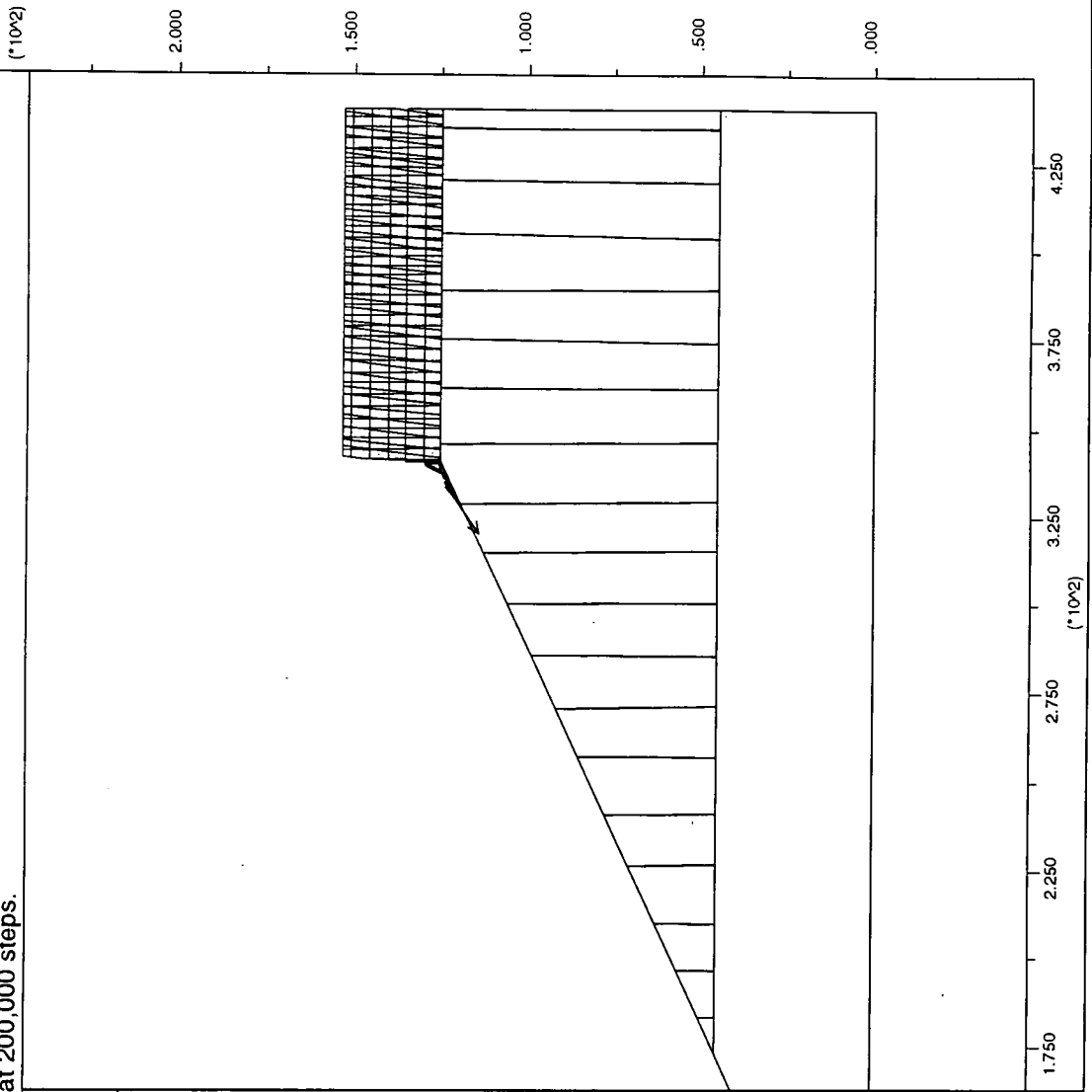
LEGEND

9/03/1998 17:21
cycle 200000
time 4.313E+01 sec

block plot
velocity vectors
maximum = 2.515E-01



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JOB TITLE : Figure 7.43d: CO19E at 500,000 steps.

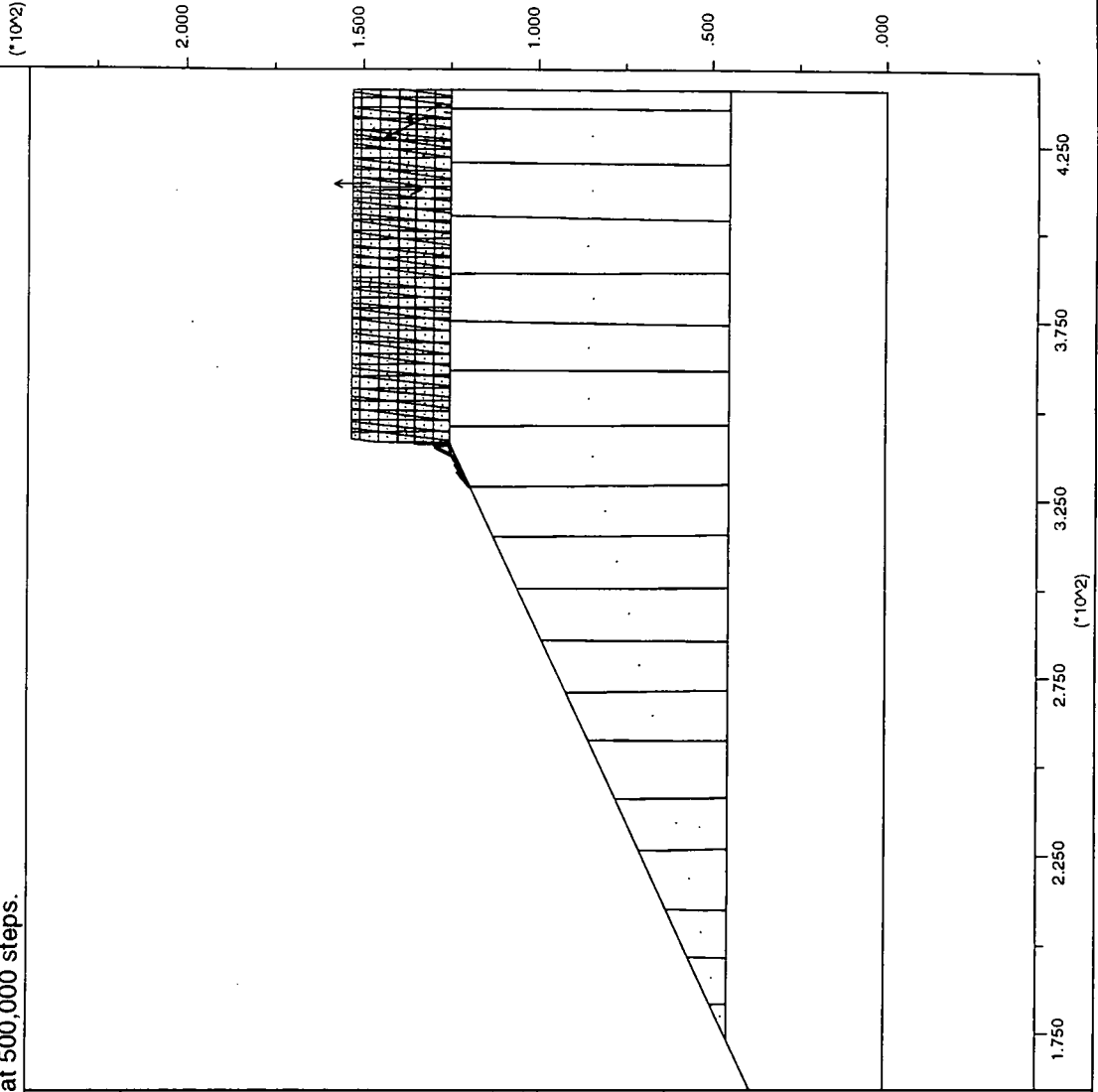
UDEC (Version 2.00)

LEGEND

9/08/1998 08:44
cycle 500000
time 1.080E+02 sec

block plot
velocity vectors
maximum = 5.358E-06

0
2E-5



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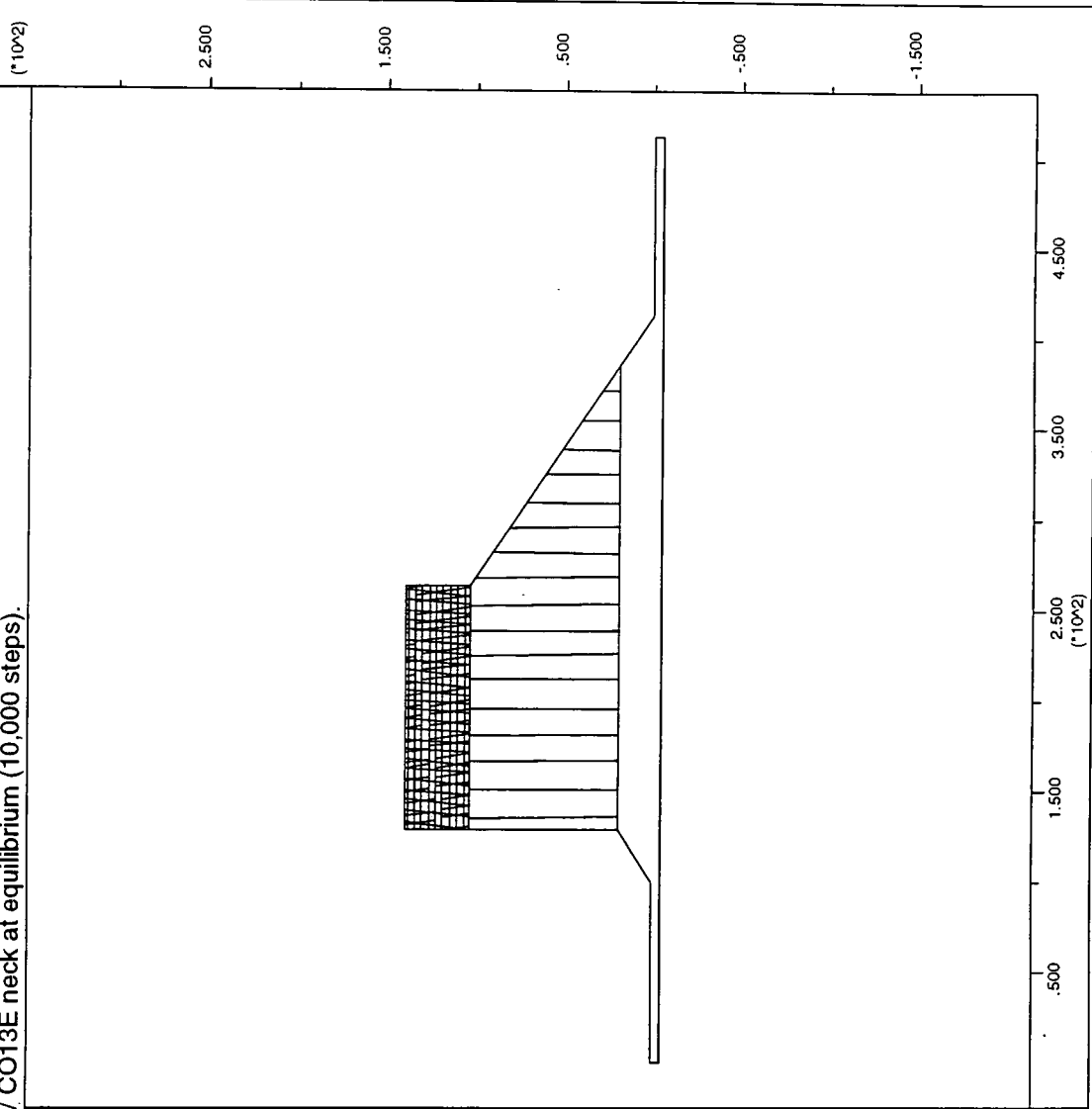
JOB TITLE : Figure 7.44a: CO12E / CO13E neck at equilibrium (10,000 steps).

UDEC (Version 2.00)

LEGEND

9/03/1998 17:24
cycle 10000
time 2.051E+00 sec

block plot



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JOB TITLE : Figure 7.44b: CO12E / CO13E neck at 100,000 steps.

UDEC (Version 2.00)

LEGEND

9/03/1998 17:25

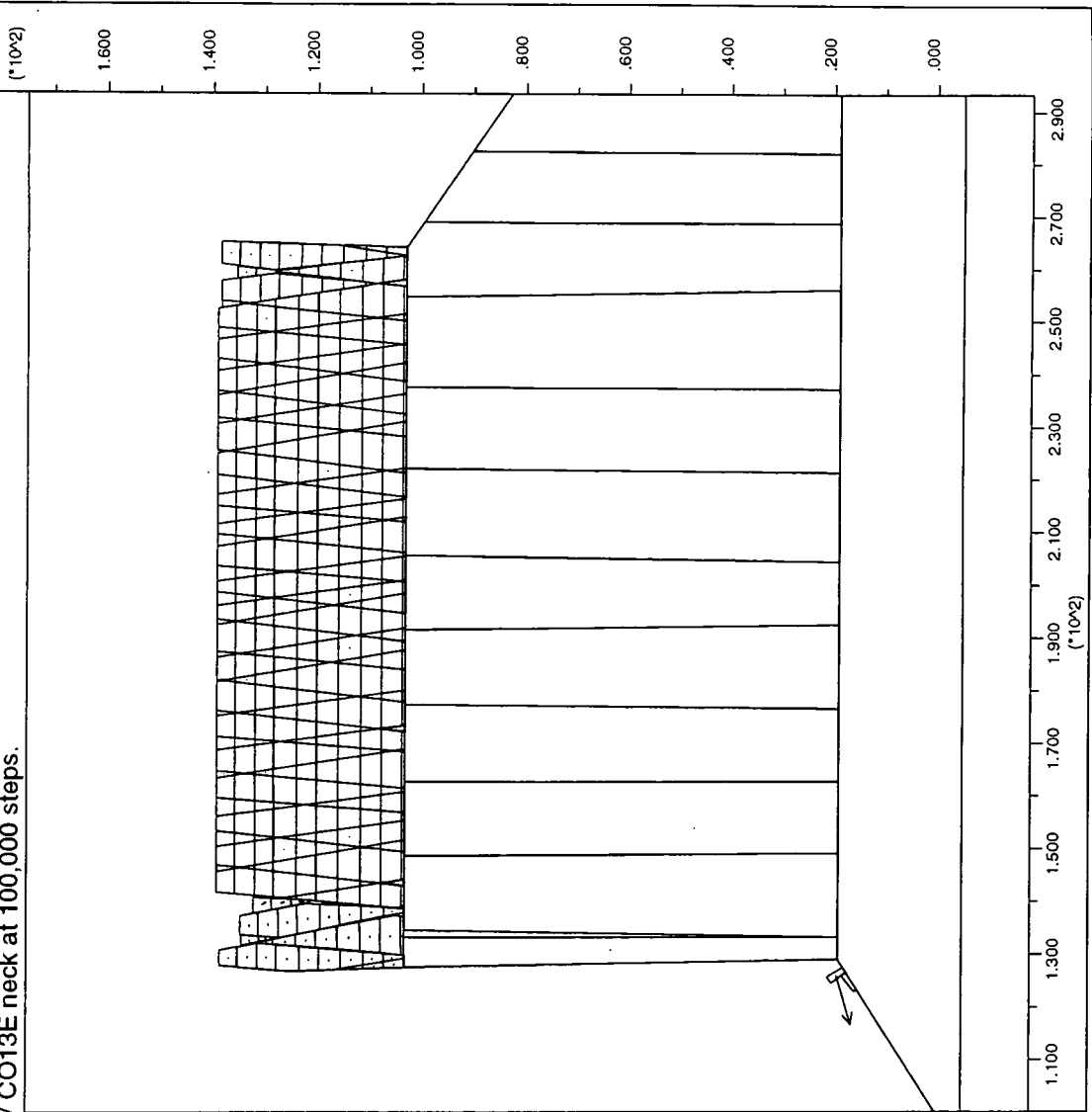
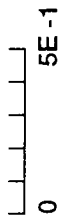
cycle 100000

time 2.120E+01 sec

block plot

velocity vectors

maximum = 1.541E-01



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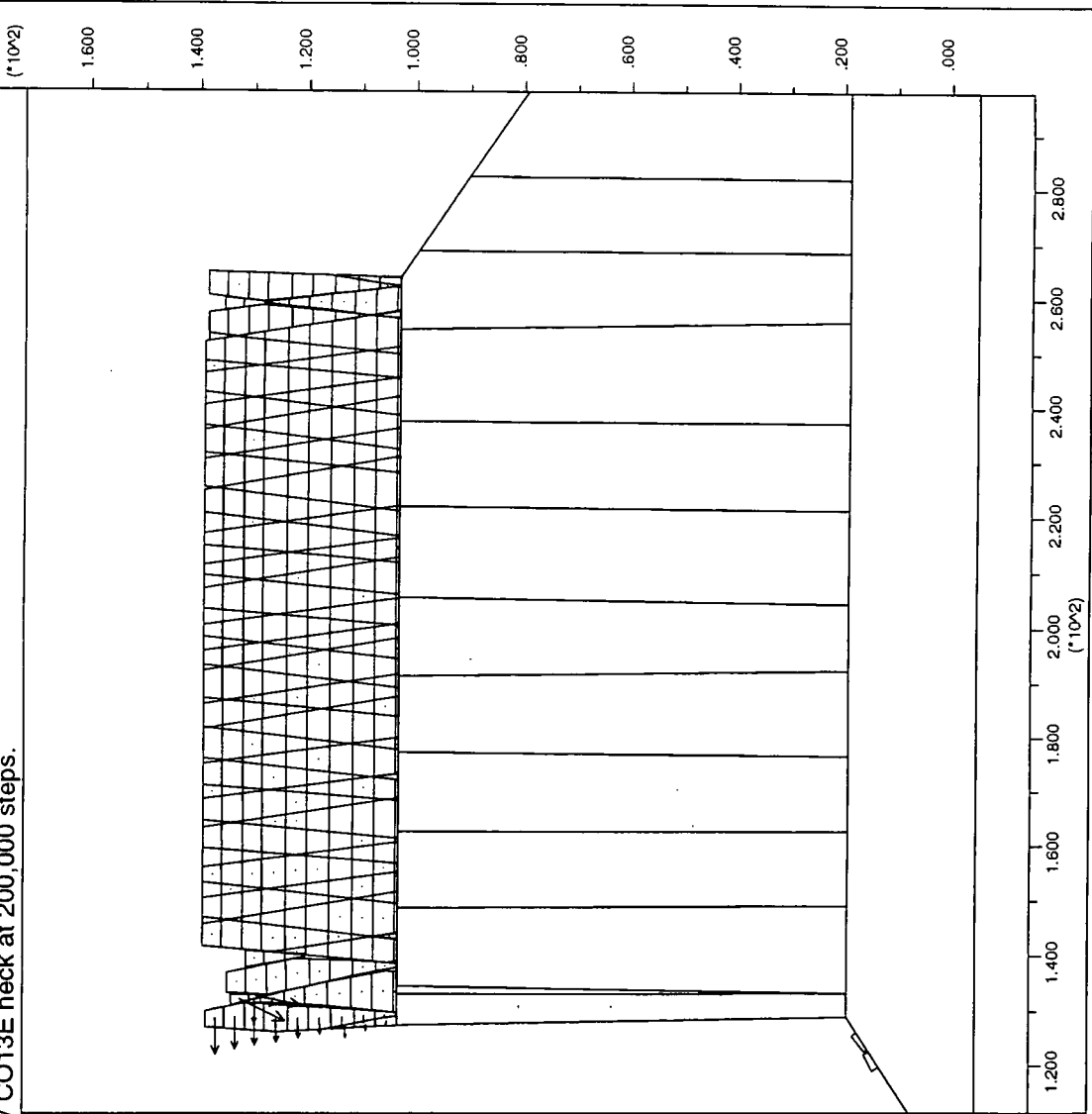
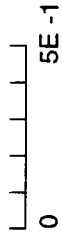
JOB TITLE : Figure 7.44c: CO12E / CO13E neck at 200,000 steps.

UDEC (Version 2.00)

LEGEND

9/03/1998 17:26
cycle 200000
time 4.255E+01 sec

block plot
velocity vectors
maximum = 1.389E-01



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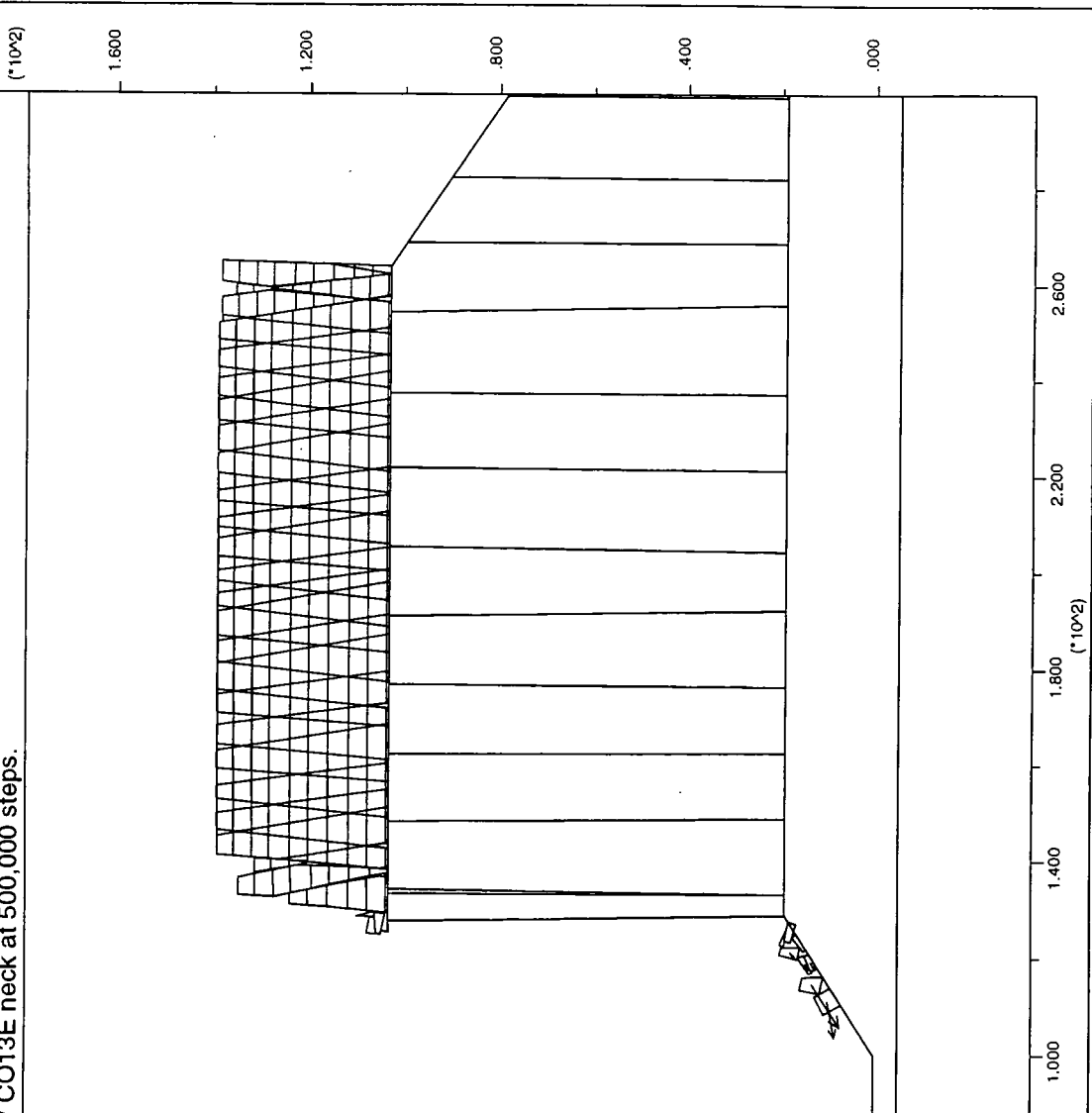
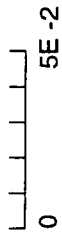
JOB TITLE : Figure 7.44d: CO12E / CO13E neck at 500,000 steps.

UDEC (Version 2.00)

LEGEND

9/03/1998 17:28
cycle 500000
time 1.066E+02 sec

block plot
velocity vectors
maximum = 1.432E-02



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Plates

Plate 5.1: The western pincer at the entrance to Lulworth Cove. Portland Limestone forms the sea cliff, with the contorted Purbeck Beds behind.



Plate 5.2: Portland Limestone reef across St. Oswald's Bay.



Plate 5.3: Durdle Door arch and the western part of the Durdle Promontory.



Plate 5.4: Portland Limestone cliffs at Stair Hole and the Lulworth Crumple in the Purbeck Beds.

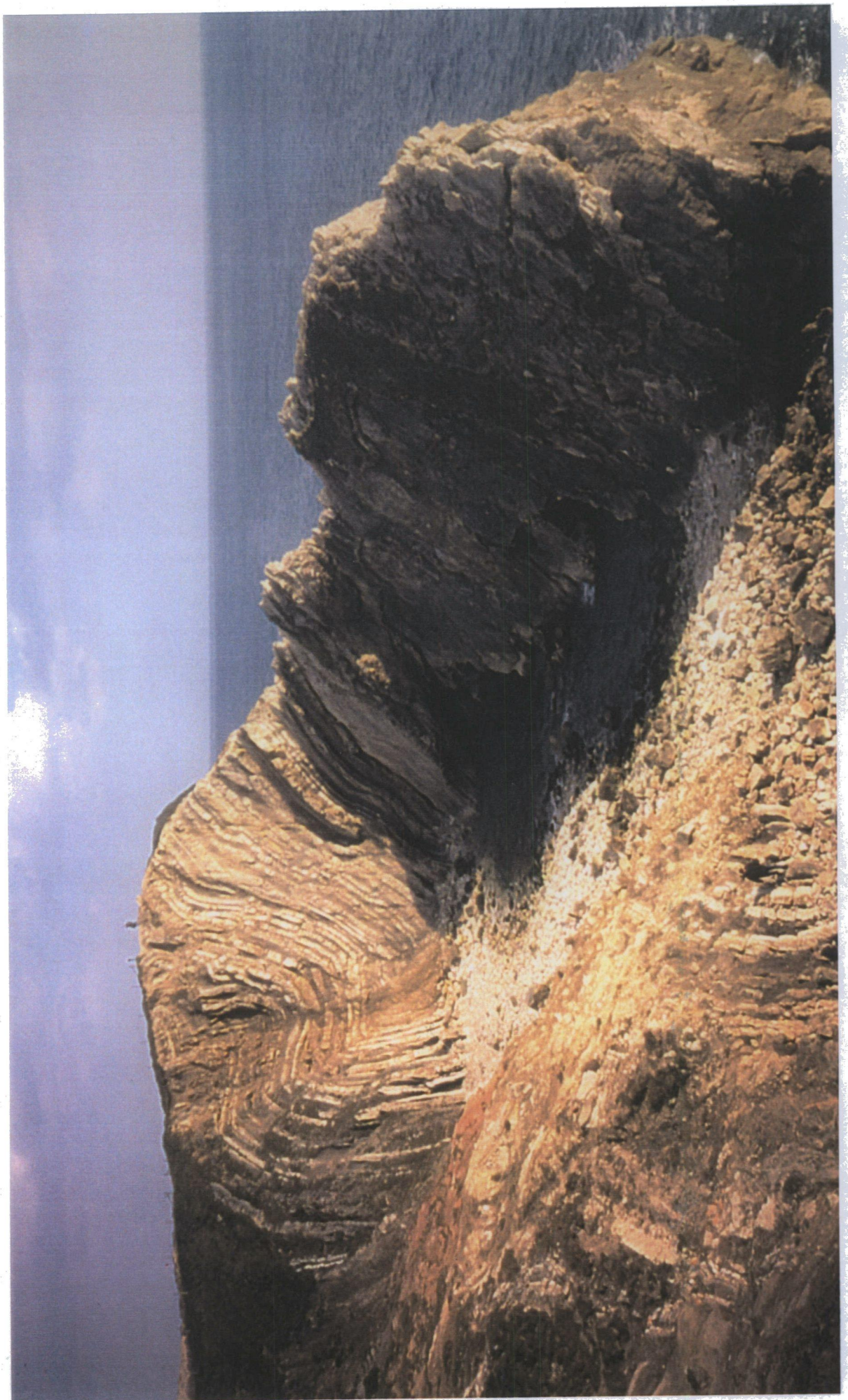


Plate 5.5: The field site on the eastern pincer at Lulworth Cove. Note the dip of the bedding in the Portland Limestone which is measured at 27°.

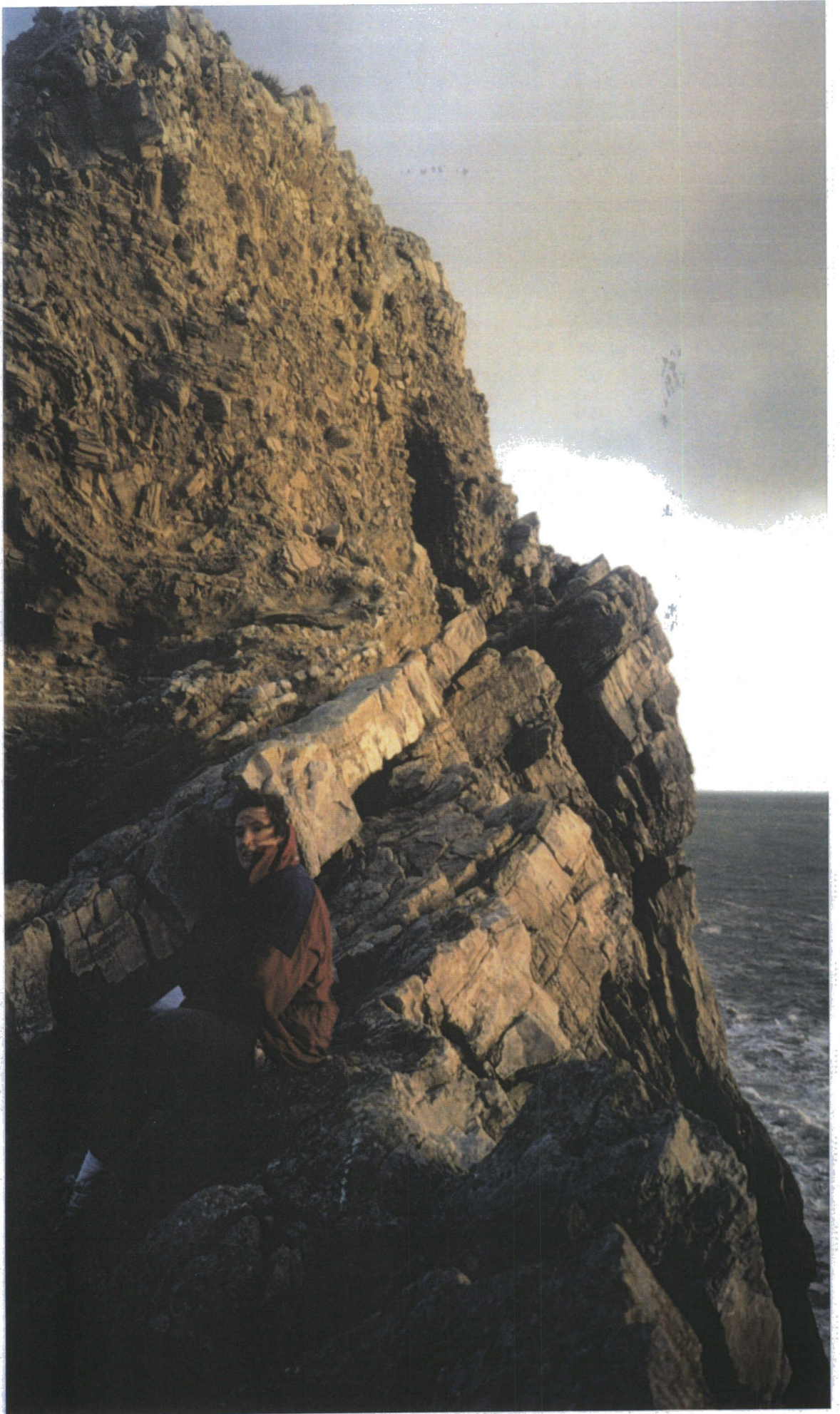


Plate 5.6: The Portland Limestone outcrop at Fossil Forest.

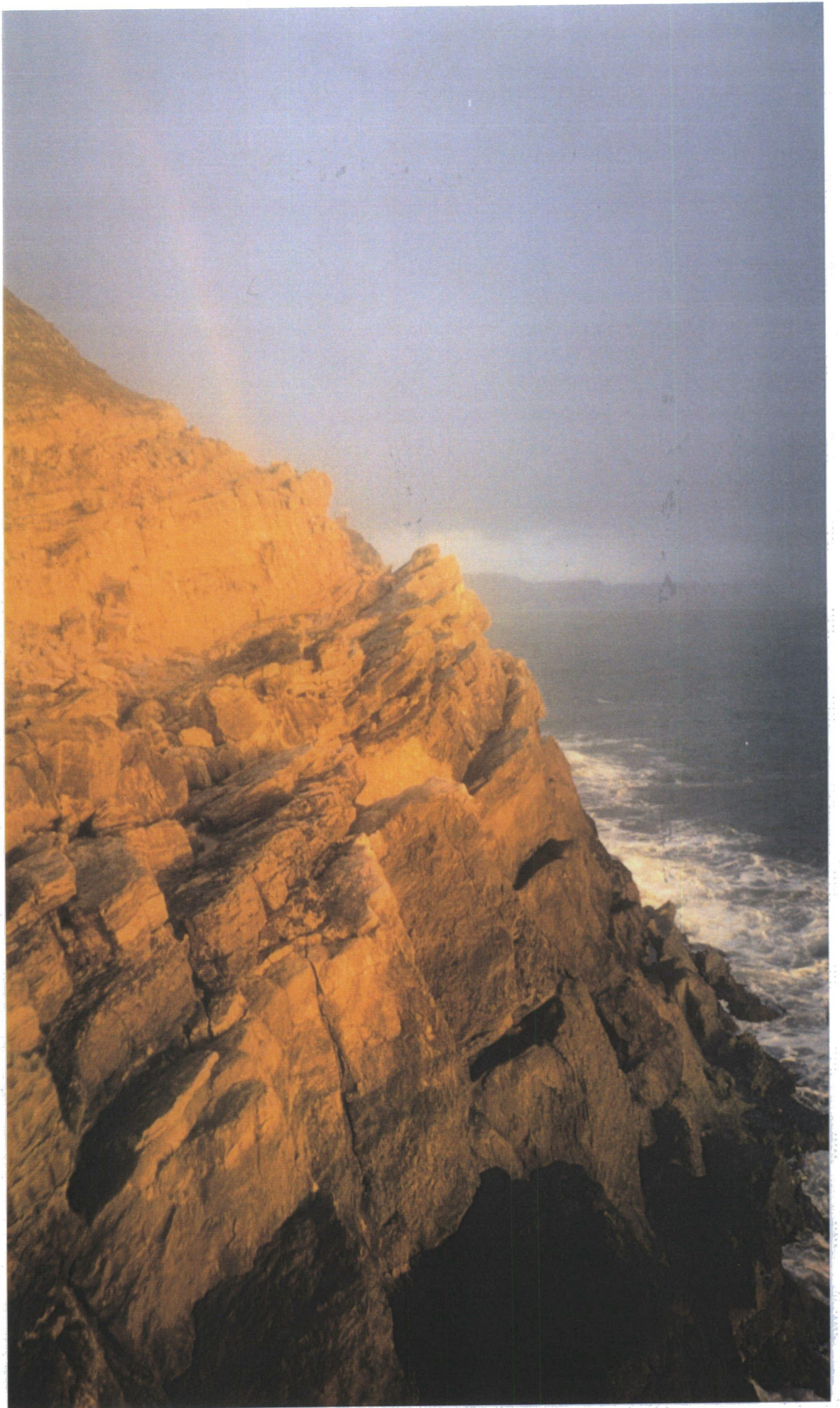


Plate 5.7: The Portland Limestone sea cliffs at the western entrance to Bacon Hole.



Plate 5.8: The field sites at Worbarrow Tout (left) and Pondfield (right). Note how the Portland Limestone outcrop rises above Kimmeridge Clay in Gad Cliff to the east of Pondfield.



Plate 5.9: The quarried Portland Limestone outcrop at Winspit.

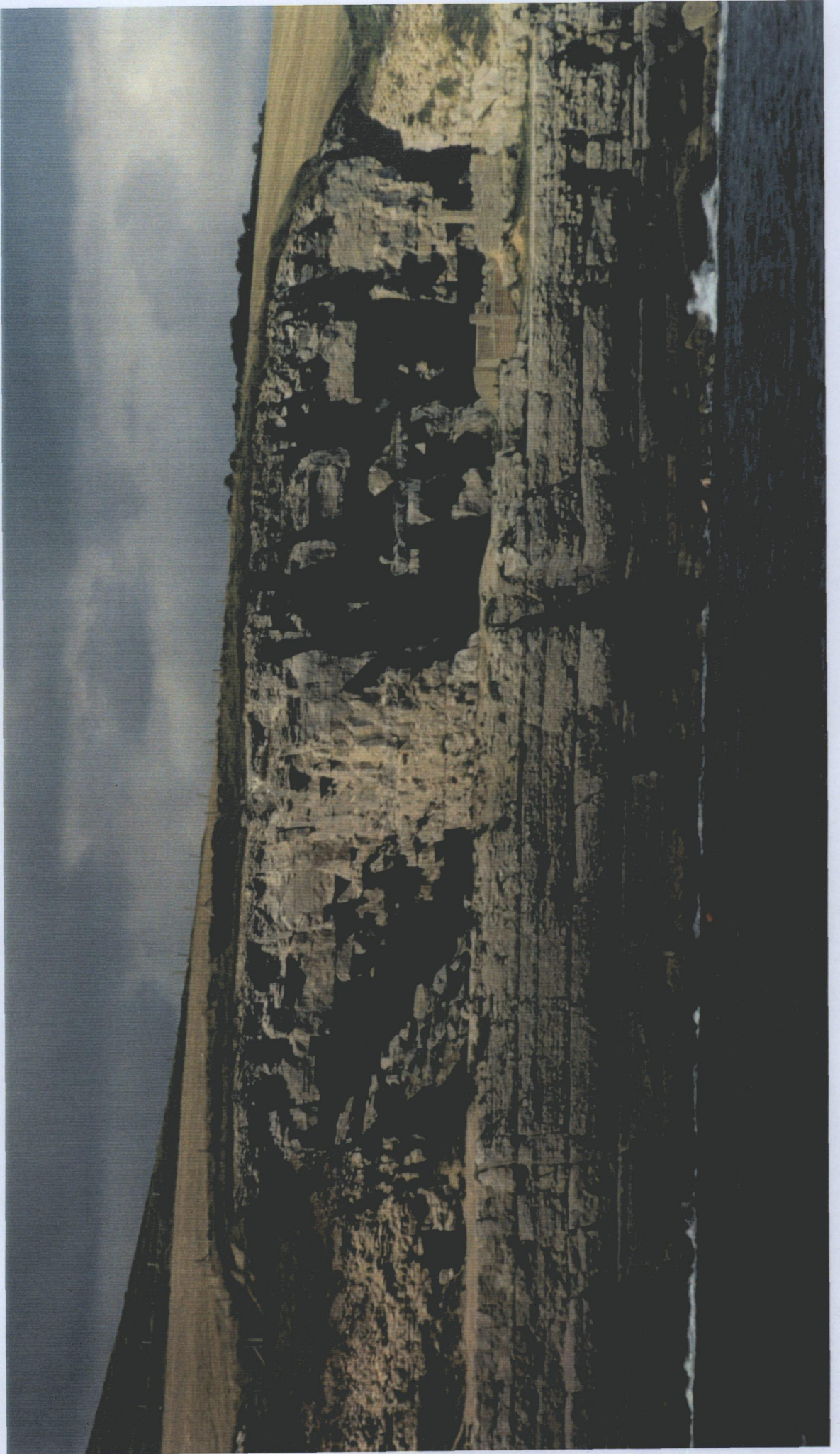


Plate 5.10: The Portland Limestone sea cliffs at Seacombe.



Plate 5.11: The horizontally bedded Portland Limestone outcrop at Tillywhim.

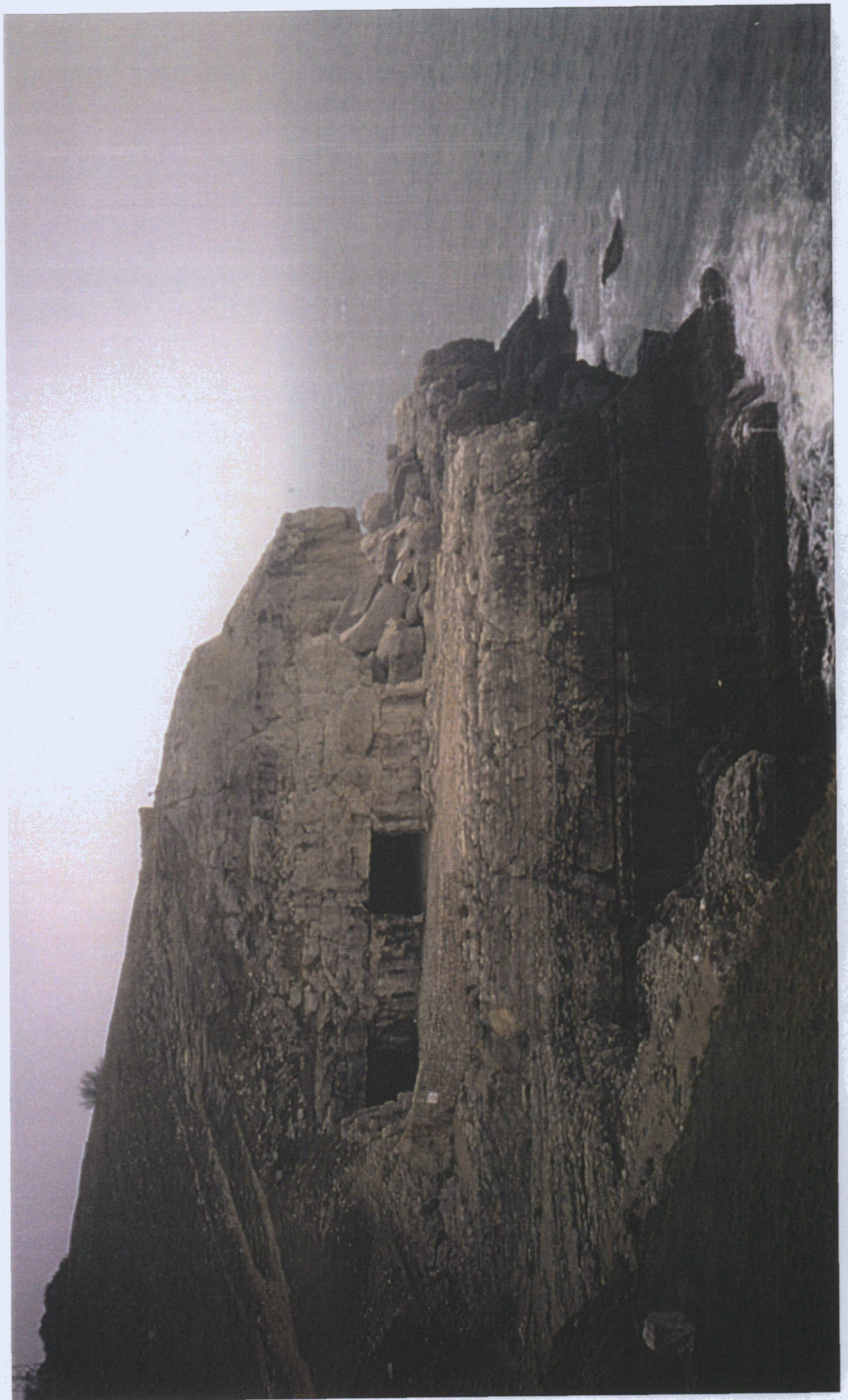


Plate 5.12: A toppling block of Portland Limestone embedded within the Kimmeridge Clay at St. Alban's Head.

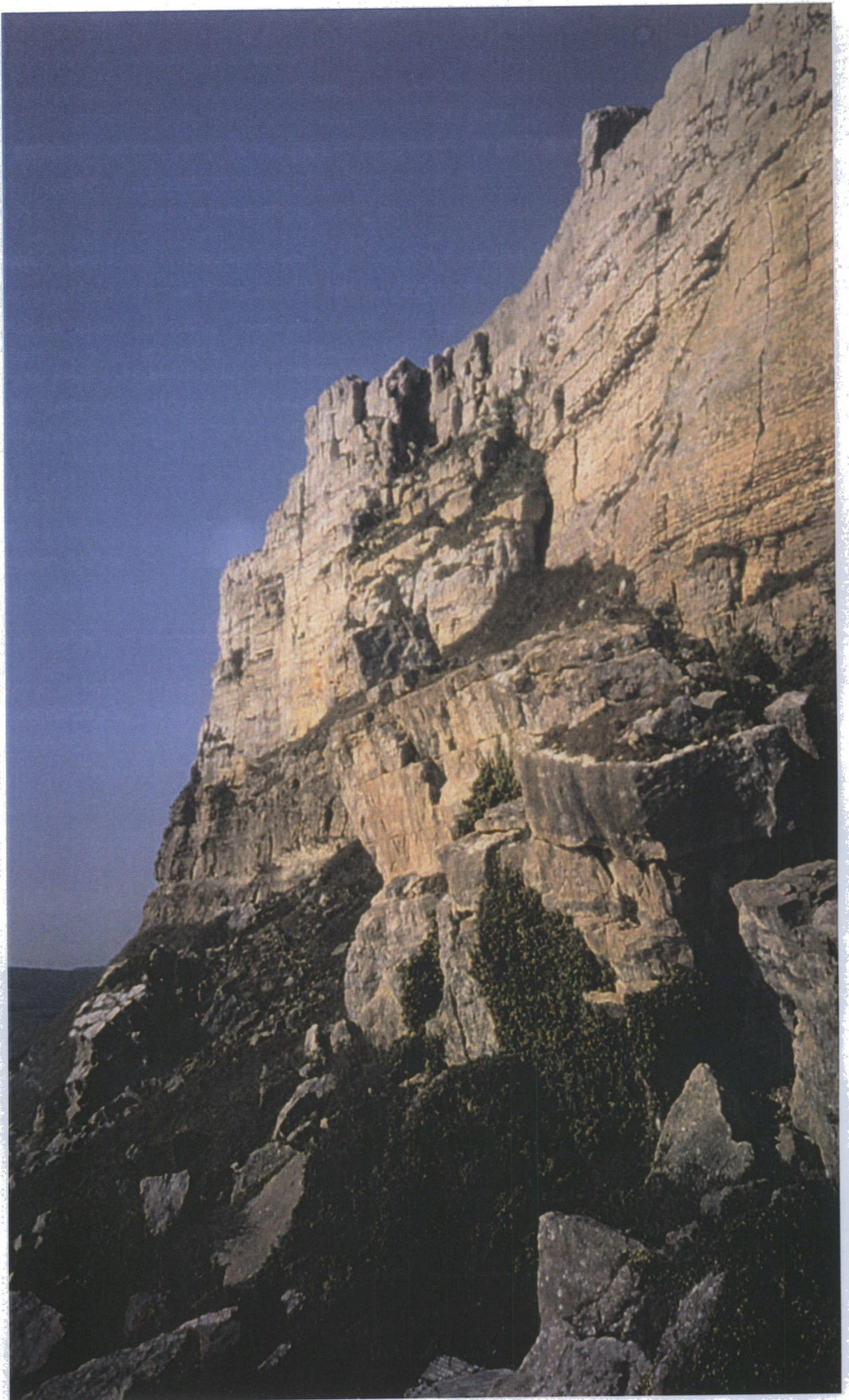


Plate 5.13: Typical view of the Colorado Plateau in the Canyonlands region.

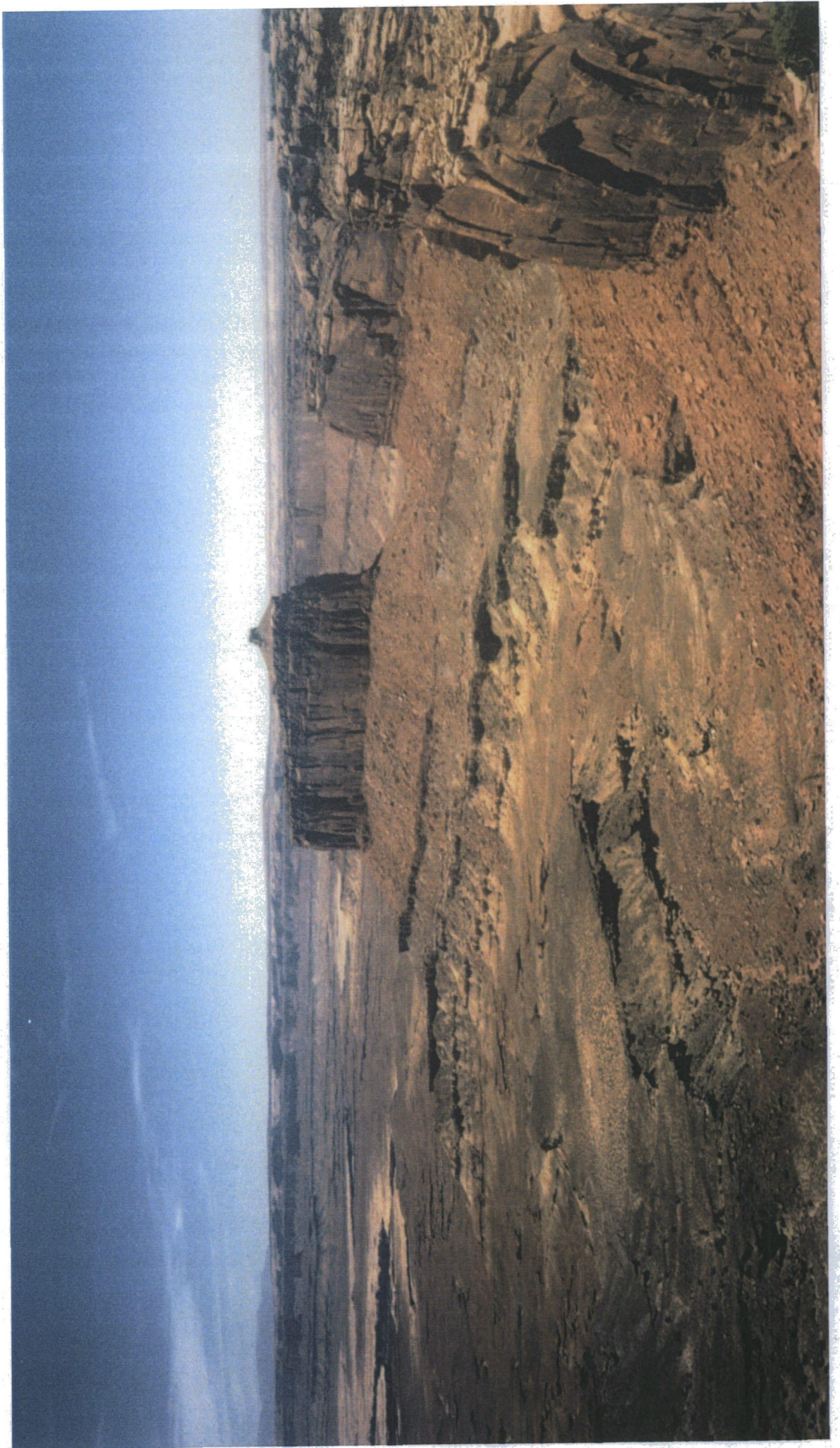


Plate 5.14: White Rim Sandstone scarp plan form in the Canyonlands region.

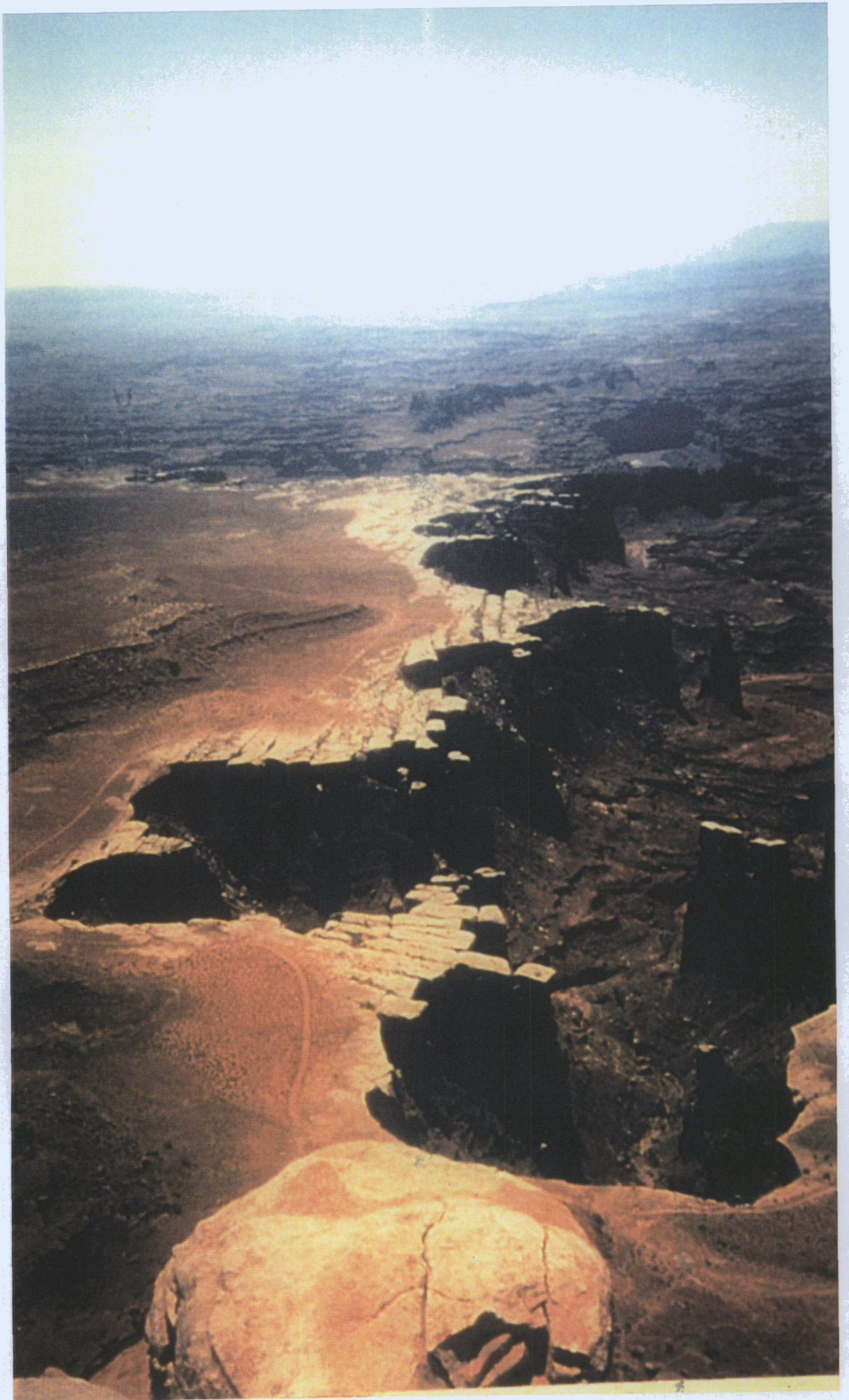


Plate 5.15: The Chinle Formation / Wingate Sandstone / Kayenta Formation cliffs at Dead Horse Point State Park.

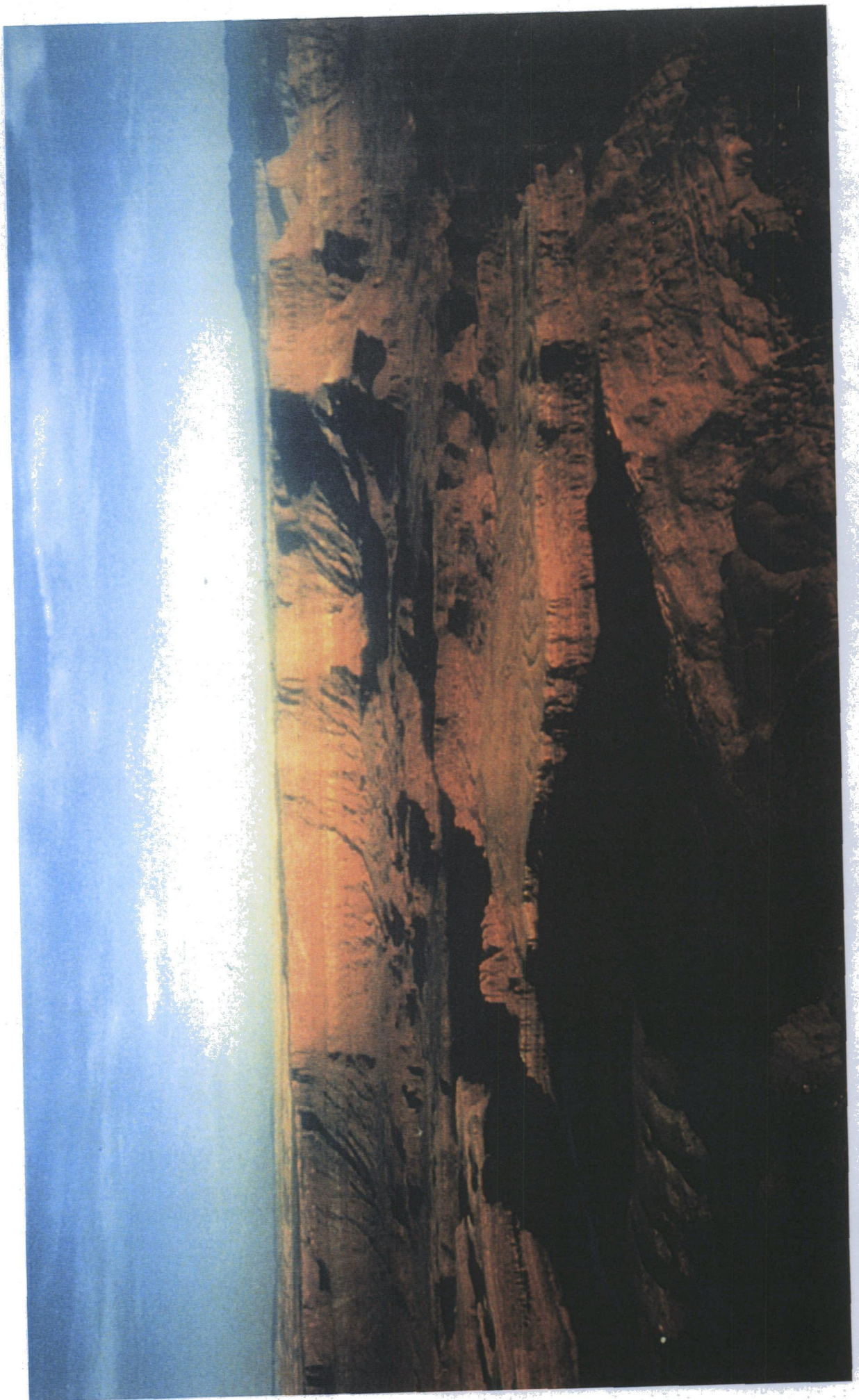


Plate 5.16: Headland site DH6H at Dead Horse Point State Park.

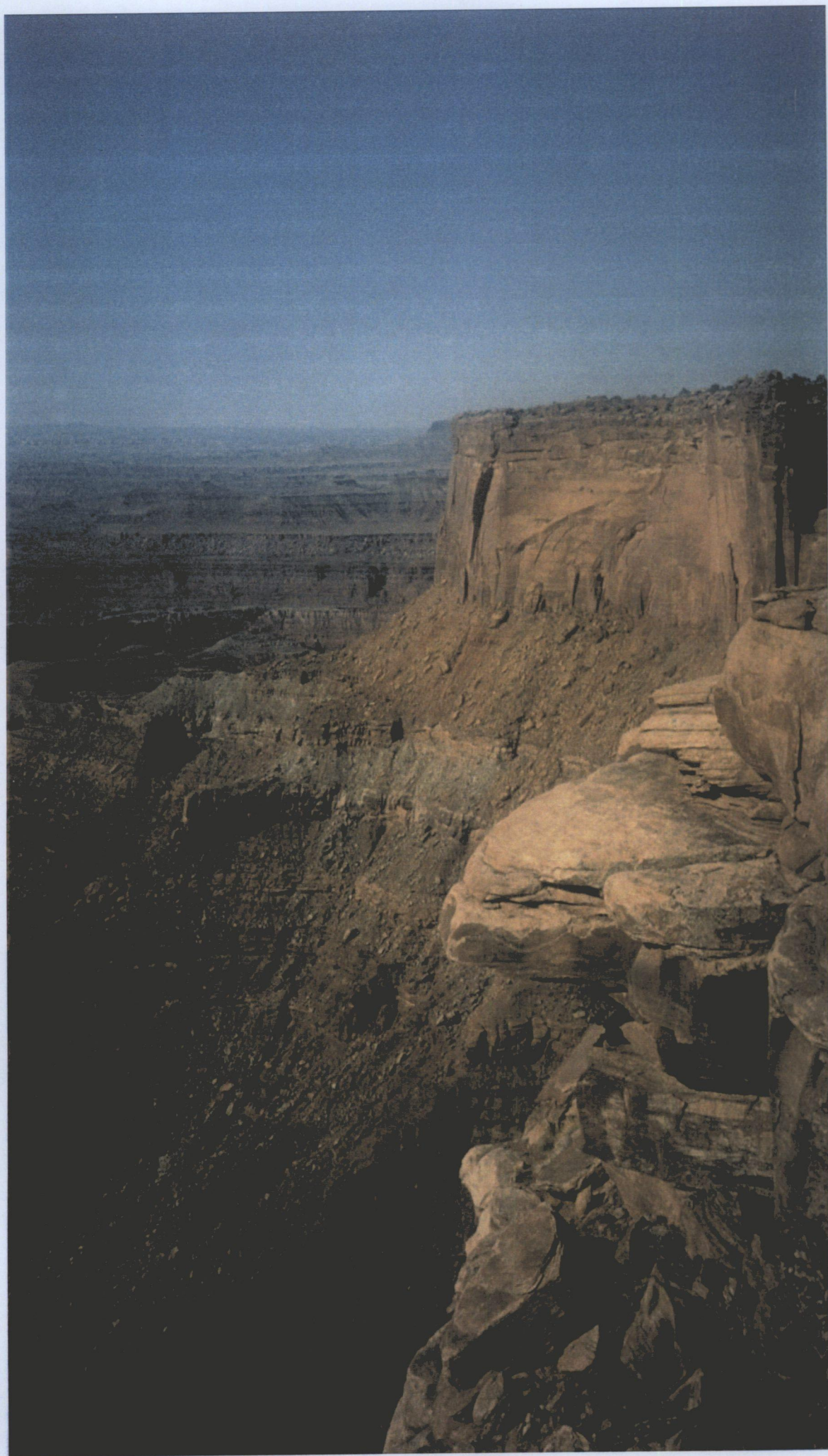


Plate 5.17: Embayment site DH2E at Dead Horse Point State Park.

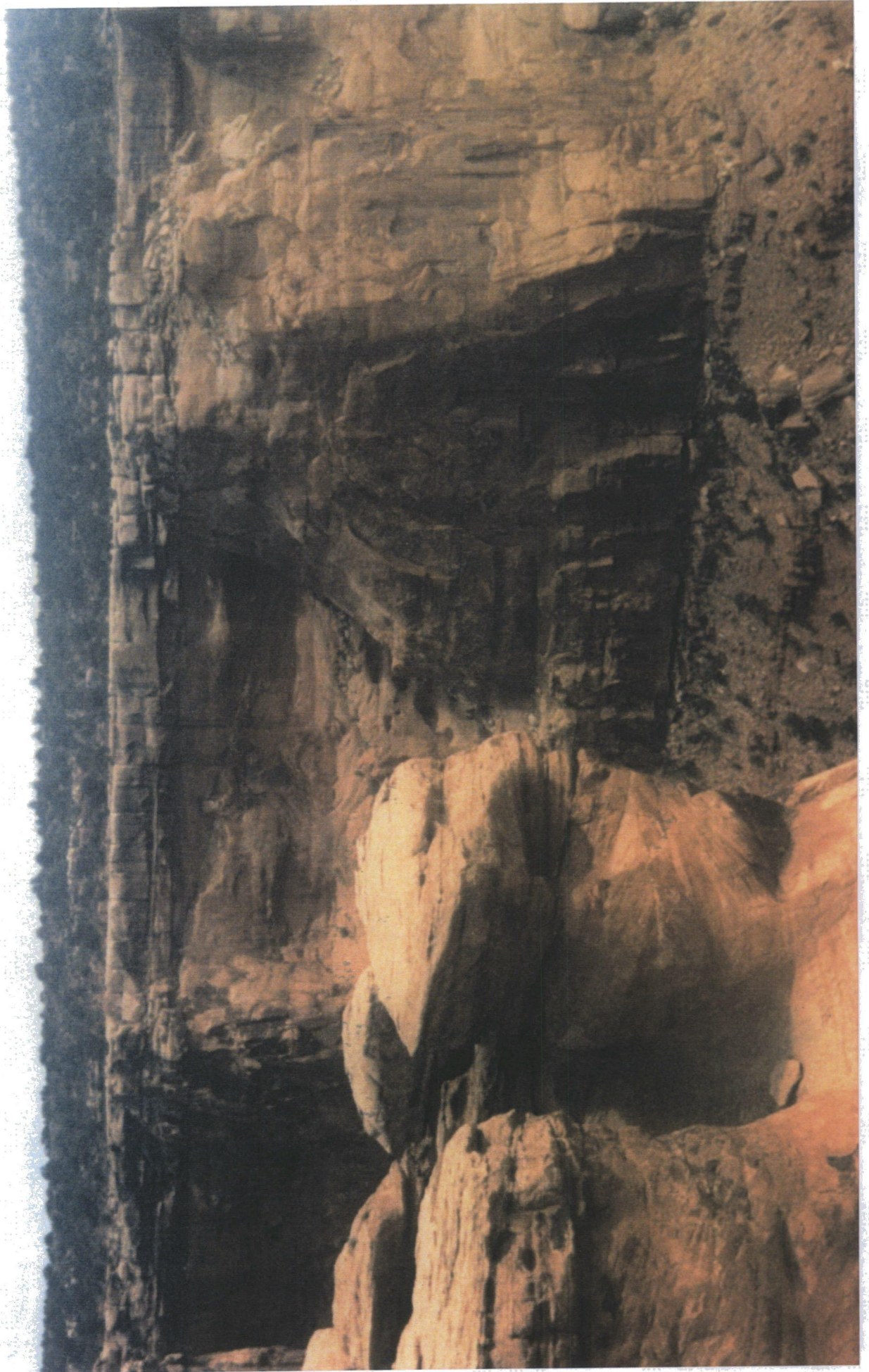


Plate 5.18: Butte and site DH11H at Dead Horse Point State Park.



Plate 5.19: The Chinle Formation / Wingate Sandstone / Kayenta Formation cliffs at Fruita Canyon, Colorado National Monument.

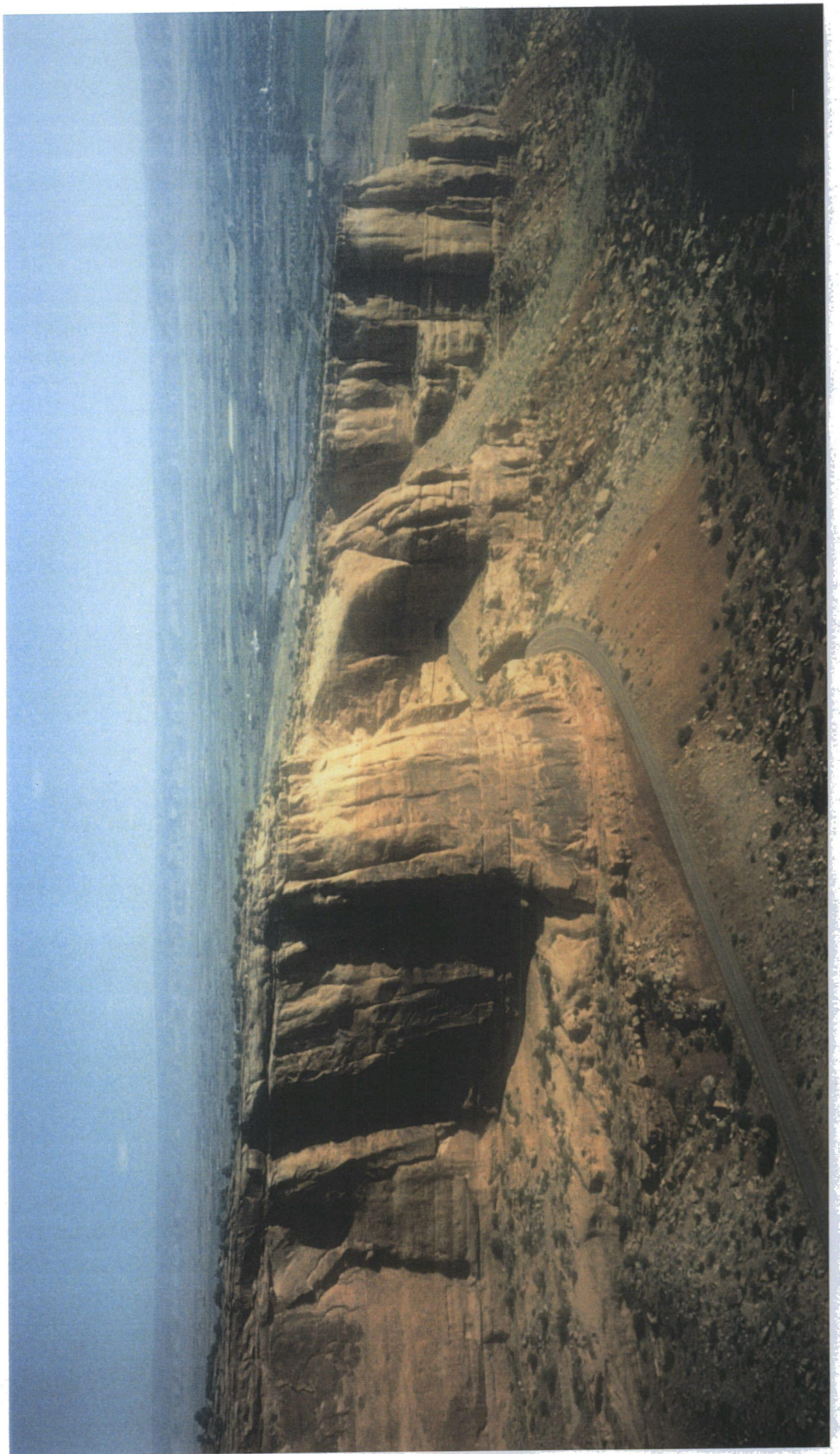


Plate 5.20: Weathering of unprotected Wingate Sandstone at the Coke Ovens,
Colorado National Monument.



Plate 5.21: Monument Canyon, Colorado National Monument. Note differences in cliff profile form across the valley. Embayment site CO15E is on the left (south) side of the canyon and CO13E is on the right.

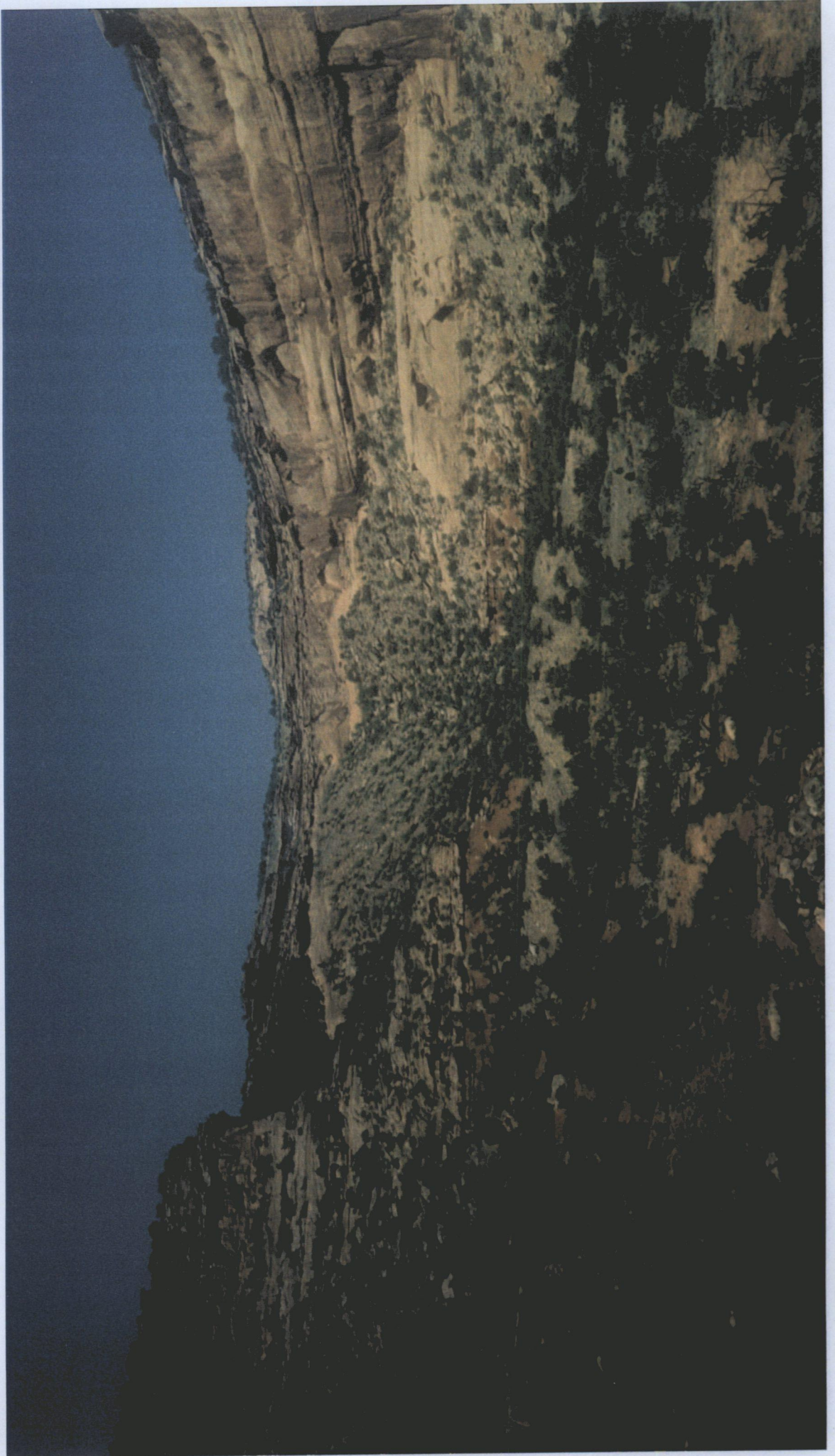


Plate 5.22: Headland site CO11H at the Colorado National Monument.



Plate 5.23: Independence Monument, Colorado National Monument.

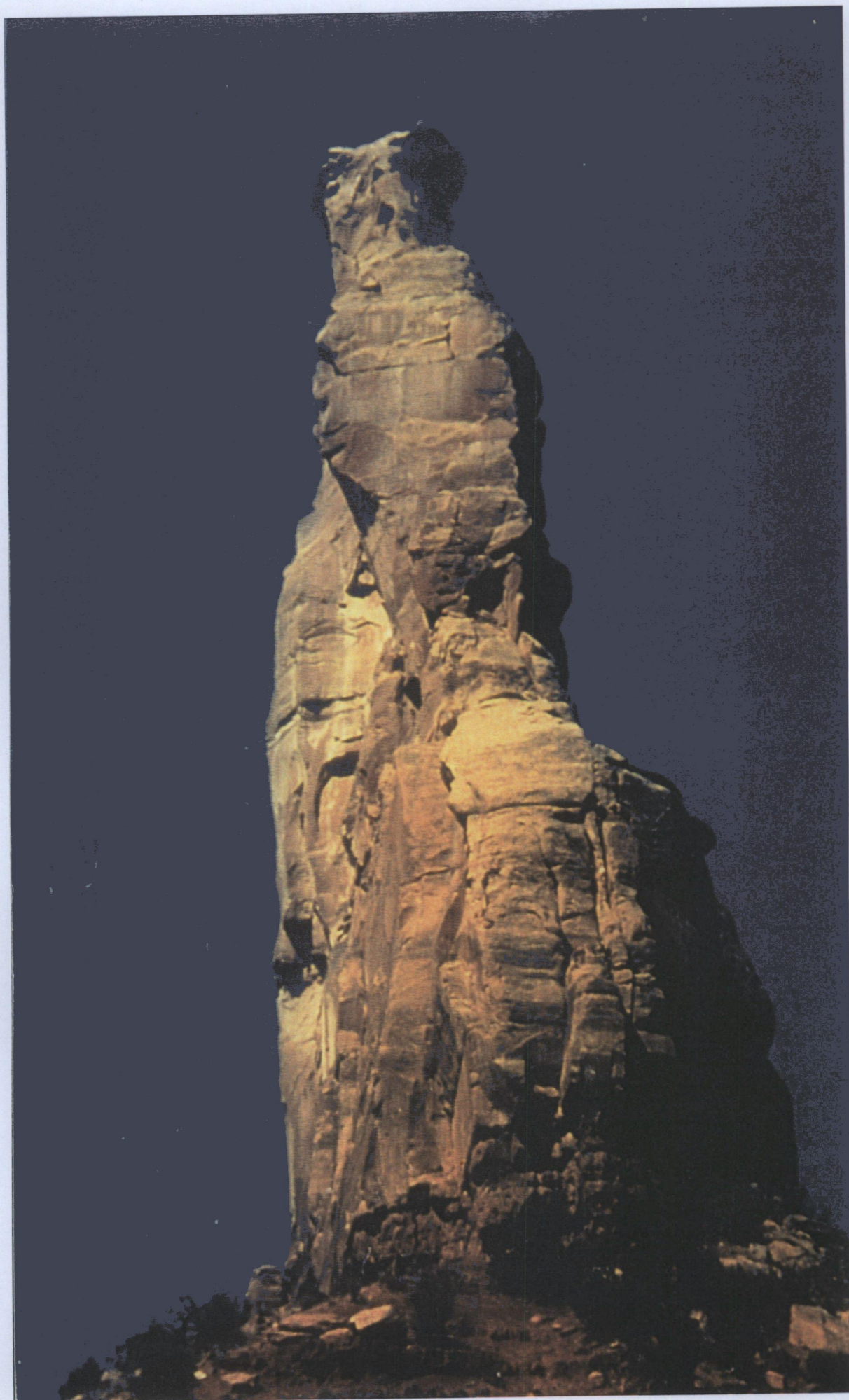


Plate 5.24: Discontinuities in the Winspit Member of the Portland Limestone at Winspit.



Plate 5.25: Discontinuities in the Kayenta Formation at Dead Horse Point State Park.

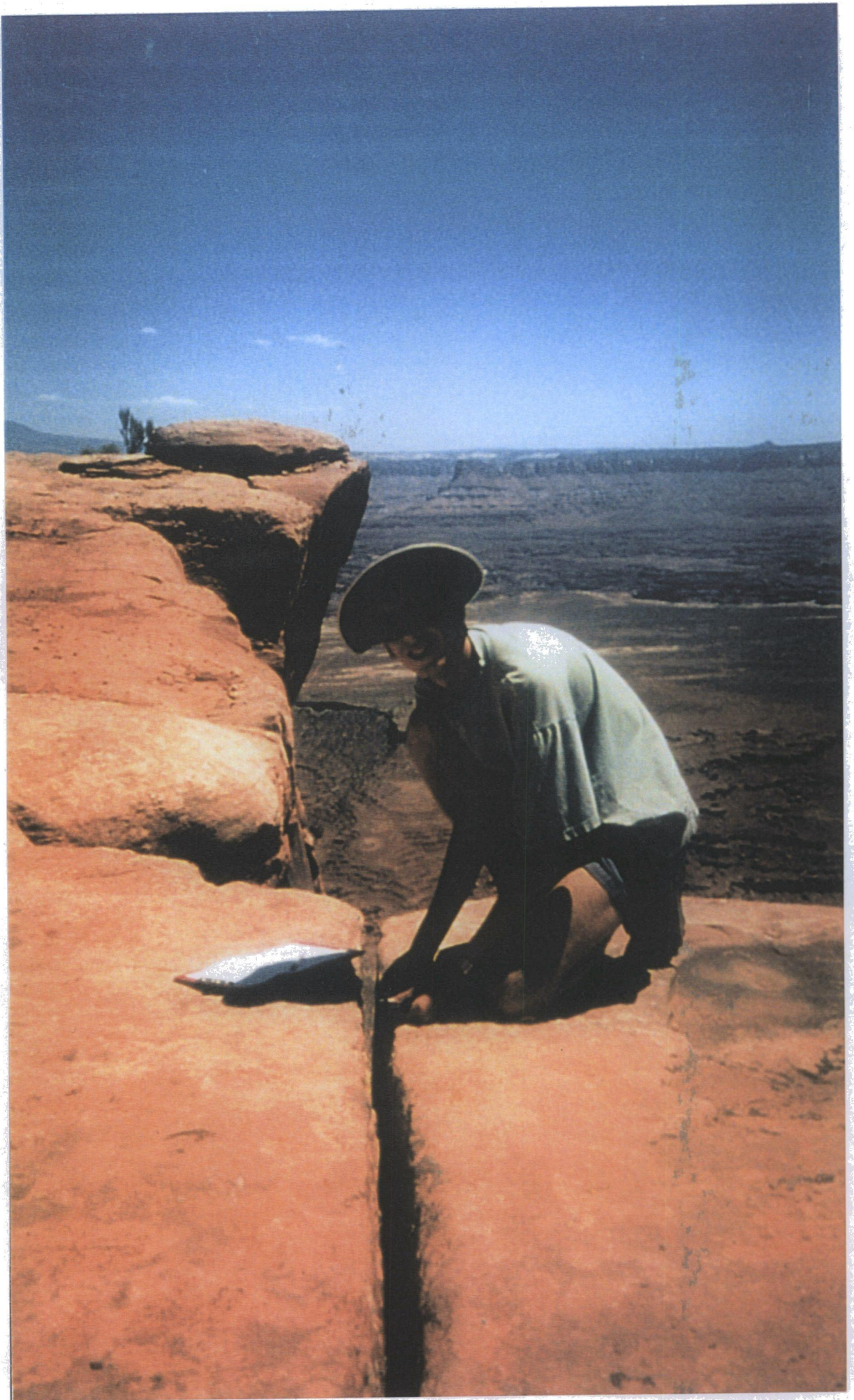


Plate 6.1: A toppling block of Portland Limestone at Winspit.



Plate 6.2: The top of the Durdle Door sea arch. Note the almost vertical bedding of the rock.

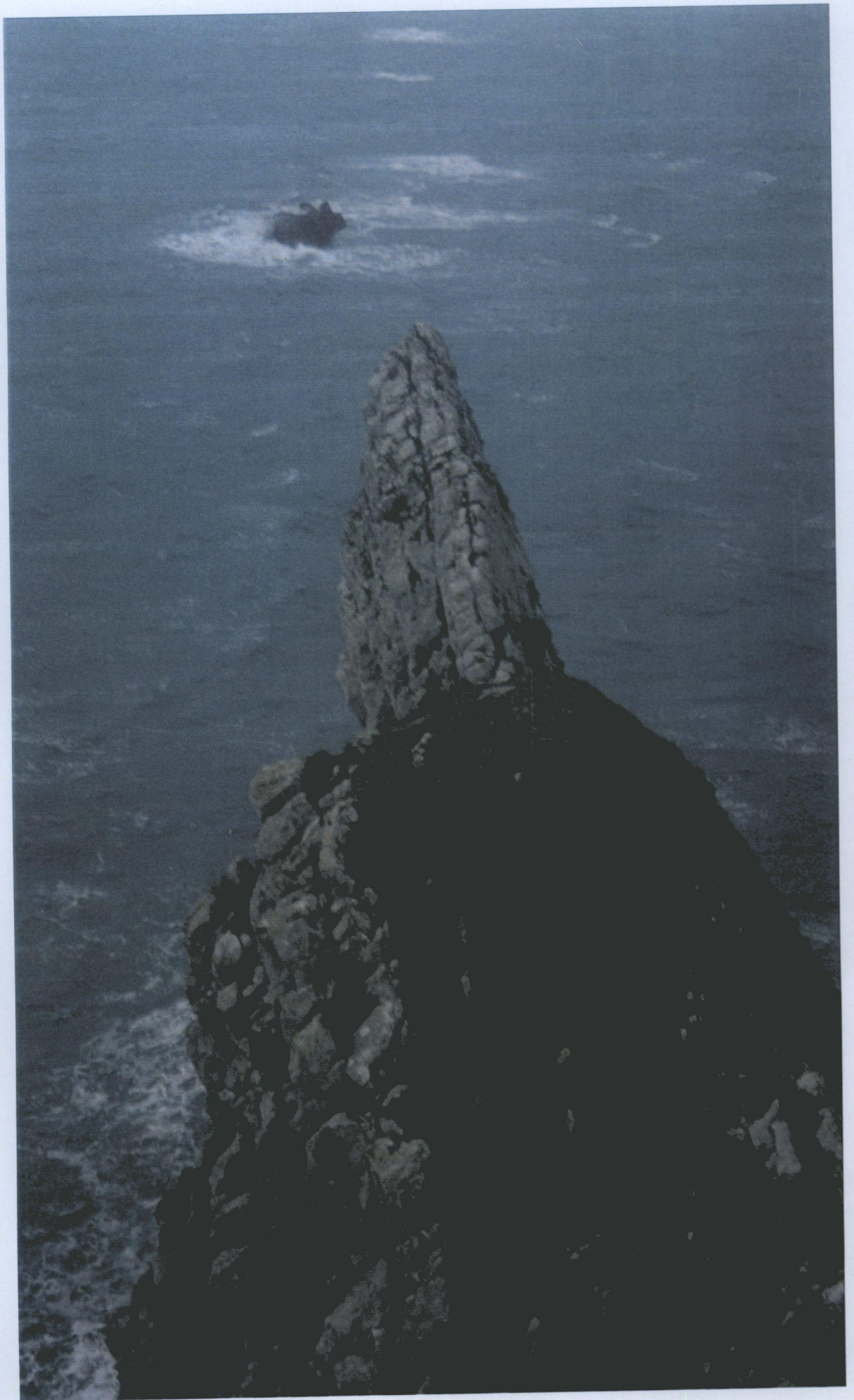


Plate 7.1: The east-west profile of the modelled butte from site DH11H at Dead Horse Point State Park.

