

BLACK SEA SEISMIC EXPERIMENT: LAND PROGRAM REPORT

Line 1:

Station 1.0



Basement of hotel in Cayeli. Very noisy site with main roads at front and back.
About 400 m from sea. Good record of Iran earthquake.

Station 1.1 (CMG-6TD-6145, G3744 damaged and changed to G3896)



‘Priest’s House’ (prepared 30/1/05, deployed 2/2/05, serviced 17/2/05)

Location: 41 6.965 N, 40 50.927 E, 37 T 655226, 4553293

Altitude: barometric = 430 m, Max-gps = 441 m, Ali-gps = 442 m.

Driving: From Pazar take road to Haskoy. At turn for Yavuzkoy keep left.

Nearest village is Haskoy.

Site: At back of small steep tea farm. Farmer = Mustapha Cokokumus. Access up steep path to wooded clearing.

Geology: Eocene hornblende andesite with lots of fractures and alteration. Concrete plinth built onto solid rock. Magnetic susceptibility = 2000-2500. Rocky bank has trees along top which meant that gps lock difficult to obtain. First gps deployment crossed path and wire was pulled from receiver socket. Second deployment directly above site in tree.

Seismic quality: one of the less noisy sites.

Station 1.2 (CMG-6TD-6146, G3828)



`Village Tea' (prepared 30/1/05, deployed 1/2/05, serviced 14/2/05, 18/2/05)

Location: 41 5.381 N, 40 53.342 E (Ali = 41 5.367 N, 40 53.278 E), 37 T 658608, 4550377 (Ali = 658570, 4550404) *double check*

Altitude: barometric = 250 m, Ali-gps = 247 m.

Driving: From Pazar take road to Hemsin. Turn R across bridge to Baskoy. Through village to R up dirt track. R at fork, site on RH bend up gully.

Site: Access negotiated with village headman (Mahmut Bakoglu 0532-5674700). Owner = Ismail Basegnez (6283444). Access up steep gully in trees.

Geology: Highly fractured Upper Cretaceous volcanic rocks. Hole dug into outcrop and concrete plinth built. Gps difficult due to tree cover. No other problems.

Seismic quality: good.

Station 1.3 (CMG-6TD-6111, G3896 original; replaced with CMG-6TD-6128, G---)



`High Up' (prepared 31/1/05, deployed 1/2/05, serviced and removed 15/2/05, reprepared 15/2/05, redeployed 17/2/05). Original site had gps lock problems but did get offset and drift when we checked text file. Recorded earthquake activity before experiment. New site called `Not So High Up' and all following details refer to this new location.



Location: 41 3.549 N, 40 54.535 E, 37 T 660403, 4547079

Altitude: Ali-gps = 661 m.

Driving: Continue from previous site along Pazar-Hemsin road. Several km before Hemsin, road veers R over new bridge. Turn L up steep dirt track. Continue up track for several km until site which is located straight off a RH bend about 30 m from track.

Site: Access negotiated with Hemsin Jandarma (Senior Officer Taner Erkmen, 641-2500). Closest village = Yenikoy. Nearest dwelling is unoccupied in winter. Access up steep slope through brambles and trees.

Geology: Fractured Upper Cretaceous volcanic rocks. Site located on flat rock surface. Concrete plinth added.

Station 1.4 (original CMG-6TD-6128, G4219; replaced with CMG-6TD-6092, G4226)



`Kick the Bucket' (prepared 1/2/05, deployed 2/2/05, serviced 13/2/05, reprepared 15/2/05, redeployed 18/2/05). Original site never achieved offset and drift despite having a 3D lock. Earthquake recordings are therefore of little value. New site called KFB and all following details refer to this new site.



Location: 41 1.554 N, 41 0.335 E, 37 T 668619, 4543574

Altitude: Max-gps = 470 m, barometric = 450 m, Ali-gps = 425 m *double check*

Driving: From Camlihemsin turn R at fork on way out of town. Pass Jandarma station and continue to bridge and take L turn. Continue up steep dirt track to hamlet.

Site: Hamlet is called Konaklar. Headman = ? Site is located at back of tea garden up steep slope just at edge of forest.

Geology: Dark coloured andesitic basalt of Upper Cretaceous age. Dug down into sub-crop which rapidly became more rock-like. Not quite bedrock but close (altered). Concrete plinth added.

Station 1.5 (CMG-6TD-6048, G3804 and CMG-6TD-6111, G4233)

`Honey Man' (prepared 29/1/05, deployed 1/2/05, serviced 13/2/05, reserviced 18/2/05, additional site added on 18/2/05.



(a)

Location: 40 59.930 N, 41 3.518 E, 37 T 673141, 4540671

Altitude: Max-gps = 830 m, Ali-gps = 803 m.

Driving: Drive from Camlihemsin towards Ayder. After ~8 km stop at bridge where road veers R. Several rivers converge at this point.

Site: Walk up steep path to farm on LHS of road (at dog sign `Kopek Bozuk Olabilir'). Beware of savage dog which owner will tie up on demand. Owner = Emin Sari (his son is the headman of Casmlihemsin/Ayder). Site right at back of tea plantation located on ridge to right of cistern.

Geology: Mafic-rich granitoid rock (Eocene?). Fractured. Hole dug down to solid outcrop.

Seismic quality: Despite careful choice of site away from two large rivers, this site is compromised by high frequency noise emanating from two rivers. Little obvious alternative in the region. Signal processing required.

(b)



Location: 40 59.969 N, 41 3.589 E, 37 T 673240, 4540743
Altitude: Ali-gps = 834 m.

Driving as for (a)

Site: Continue up ridge to back of farm past disused stables. Site located on flat bedrock just beneath cliff around to R. Same geology but less fractured.

Station 1.6 (CMG-6TD-6203, G---)

`Ayder-Down' (prepared 28/1/05, deployed 2/2/05, serviced 16/2/05 and 18/02/05).



Location: 40 57.172 N, 41 7.114 E, 37 T 678308, 4535686

Altitude: Ali-gps 1393 m (previously 1403 m).

Driving: Through Ayder village along paved road until road stops (during winter) at last bridge. Walk around to R along summer road.

Site: located at base of large granite roadcut. Instrument on solid rock with some degree of weathering. Concrete plinth. Relatively close to river (50 m). Public access negotiated with Camlihemsin Jandarma (Kadir Cimen Senior Officer).

Geology: Hornblende-rich granite (Eocene). Minor fractures.

Seismic quality: Surprisingly noisier than expected. Noise is lower frequency than expected from river flow. Cf `Honey Man'.

Station 1.7 (CMG-6TD-6045, G3873)

`Ayder-Up' (prepared 28/1/05, deployed 31/1/05, serviced 16/2/05 and 18/2/05).



Location: 40.95192 N, 41.11852 E (NOTE decimal; Ali = 40 57.119 N, 41 7.114 E),
37 T 678306, 4535589

Altitude: Max-gps = 1420 m, Ali-gps = 1409 m.

Driving: as for `Ayder-Down`.

Site: Continue walking along summer road around bend (~100 m). Site located within roadcut on LHS. Access as before.

Geology: Eocene granite but this time heavily weathered and altered. Pit dug into sub-crop down to level where starting to look more solid. Concrete plinth. Considerable evidence for small-scale landsliding of weathered material especially during thaw.

Seismic quality: Excellent site (probably the best). Occasional evidence for very high frequency, large amplitude events which are undoubtedly caused by landslides. Good records of regional earthquakes.

Line 2:

Station 2.1:

Location name: Hazel's Mound



Accessibility: After passing Harsit river bridge (Tirebolu) take Torul –Gümüşhane road and drive approximately 4 km towards Torul and take Balçıkbelen village exit and drive through village at the right side of the road there is a hill, at the northern slope of the hill St. L.2.1 located.

Land owner: was not at the village but Village governor Mustafa Kirman, his phone no: 0537 9358

Geology: pinkish colored rhyodacite-rhyo-dacitic welded tuff

Station 2.2:

Location name: Steep Bastard



Accessibility: After passing Harsit river bridge take Torul –Gümüşhane road and drive approximately 12 km towards Torul before Ketencukuru village there is a sharp left turn and steep hill left side of the road. There is a walking path towards the houses which are above the hill, take that path road . St. L.2.1 is located behind those houses.
Land owner: Ali Padar, his phone no: 427 82 80
Geology: pinkish colored rhyodacite-dacite

Station 2.3:

Location name: Mad Hag



Accessibility: Gelivera river is in Espiye, right side of Gelivera river there is a road which goes villages which are located within drainage area of the river. Take this road go through along this road until the bridge which is on the river and makes left exit, take this exit and take right road up to hills that goes to Güragac village. St. L.2.3 is located at the end of the village left side of the road and close to cistern of the village.

Land owner: Mustafa Kır, was not at the village but his brother's wife is taking care of his garden

Geology: greenish colored vesicular andesite

Station 2.4:

Location name: Raven's Redoubt



Accessibility: Gelivera river is in Espiye, right side of Gelivera river there is a road which goes villages which are located within drainage area of the river. Take this road go through along this road until Yeniköy exit which takes almost 1.5 hour from Espiye. Take this right exit drive through up hill until Akkaya-Yeniköy junction , follow yeniköy road like 500 m right side of the road you will see first hous of village. Location just located 50 m close to that house left side of the road.

Land owner: Hatice Yıldırım

Geology:dark green colored Liassic basaltic volcanics

Station 2.5:

Location name: Katy's Gambit



Accessibility: Gelivera river is in Espiye, right side of Gelivera river there is a road which goes to villages which are located within the drainage area of the river. Take this road and go through along this road until Yeniköy exit which takes almost 1.5 hours from Espiye. Instead of taking Yeniköy exit, take the left walking track which goes to Avluca village. There is a limestone cliff on the left side. St. L.2.5 is located at the bottom of that cliff.
Land owner: Niyazi Bayrak, his phone 0454 626 23 52

Geology: Pinkish colored rhyo-dacite which could be dyke between Liassic volcanics and Upper Jurassic limestone.

Station 2.6a and b:



Location name: Reginald's Reach, Reginald's Reach Around.



Accessibility: Gelivera river is in Espiye, right side of Gelivera river there is a road which goes villages which are located within drainage area of the river. Take this road and follow until Ericcek village which takes at least 2 hours drive from Espiye. St. L.2.6A is located at the right side of the village road.

Land owner: Cafer Camcı

Geology: altered granite

Lines 3 and 4:

Station 3.0 (CMG-6TD-6045; G3873)



'Fruit of Ali' (prepared 26/2/05, deployed 27/2/05, serviced 1/3/05 and 4/3/05).

Location: 41 19.294 N, 36 13.863 E; 37 T 268251 4578155

Altitude: 165 m

Driving: Take main road from Samsun to Kavak. Turn to R at sign for Ahulu and Kamali villages. Drive through Kamali, take dirt track on RHS on edge of village. Continue for 2 km to crest of hill. Site is situated in orchard on RHS.

Site: Orchard predominated by apple and pear trees. Hole dug where trees are small and where outcrop is very close to surface. Site 3 km from sea well away from busy roads. Two quarries within kilometres. Private owner = Huseyin Altuntas, 435-8552. We paid him for damage to concrete post (YTL 160).

Geology: Bioclastic limestone with caliche. Very small dips. Hole dug into solid sub-crop. Concrete plinth.

Seismic quality: generally a good site but occasional noisy periods. Sometimes evidence for landslide activity.

Station 3.1a (CMG-6TD-6145; G3896)



`Futbol' (prepared 6/2/05, deployed 25/2/05; serviced 27/2/05, 1/3/05 and 4/3/05)

Location: 41 17.749 N, 36 12.490 E; 37 T 266244 4575357

Altitude: gps-max=293 m, barometric 247 m, nicky-gps=254 m, ali-gps=250 m.

Driving: Take main road from Samsun to Kavak. Turn R at sign for Ahulu and Kamali villages. Just before Ahulu take sharp L up dirt road which ends on football pitch.

Site: walk down to L towards main road and site is located in bushes. Hole dug into rock with concrete plinth. Site is within about 1 km of both main road and large quarry but quarry is inactive for long periods including at present as far as we know. Public land but great interest in our activities from local retiree with vicious dog and slightly odd wife (Serafettin Topcu).

Geology: Volcanoclastic conglomerate and sandstone. Hole dug into andesitic rock with fractures.

Seismic quality: intermittently noisy during the day peaking in early evening but quiet at night. Evidence for one large landslide possibly in nearby quarry.

Station 3.1b (CMG-6TD-6113, G4240)



`Extra time' (prepared 26/2/05, deployed 27/2/05, serviced on 1/3/05 and 4/3/05).

Location: 41 17.799 N, 36 12.397 E; 37 T 266125 4575457

Altitude: gps-Max=304 m, barometric = 273 m, gps-Ali-262 m.

Driving: as per Station 3.1a.

Site: walk past football pitch parallel to main road. Site is several hundred m in scrubby bush (160 m from 3.1a). Contact as above.

Geology: As per site 3.1a

Seismic quality: Surprisingly noisier than 3.1a but generally good. Noise does not correlate with 3.1a which is good.

Station 3.2 (CMG-6TD-6146, G3828)



`Cay-Alien' (prepared 5/2/05, deployed 25/2/05, serviced 27/2/05, 28/2/05 and 4/3/05).

Location: 41 13.891 N, 36 10.071 E; 37 T 262634 4568328

Altitude: barometric = 545 m, gps-Max = 586 m, gps-Ali = 543 m, gps-Nicky = 544 m.

Driving: Continue along Samsun-Kavak road. Negotiate LH turn across dual carriageway at sign for Akgol Koy. Drive along dirt track for several km. Continue through village and stop far sidewhere there is public land on RHS.

Site. Walk up hill through scrubby bushes for ~300 m. Site located in relatively bare area on outcrop. Public land but local farmer is contact (Dursunali Taninler). Village headman = Ilhan Icigen, 454-1022.

Geology: Intercalation of micrite, marl and shale. Upper Cretaceous-Paleocene age. Very low dips. Vertical jointing. Concrete plinth placed on bedding plane.

Seismic quality: One of the quietest sites on this line. Despite reasonable proximity to main road, no evidence of traffic noise (1500 m from main road).

Station 3.3 (CMG-6TD-6120, G4247)



'Pylon' (prepared 5/2/2005, deployed 25/2/05, serviced 27/2/05, 28/2/05 and 4/3/05).

Location: 41 10.051 N, 36 7.296 E; 37 T 258520 4561356

Altitude: barometric 713 m, gps-Max = 733 m, gps-Ali = 714 m

Driving: continue along Samsun-Kavak road. Just before Cakalli, negotiate turn across dual carriageway where a dilapidated blue metal bus stop is located on LHS. Signed for Kazanci Koyu village. Drive up road and after 1 km take LH turn down dirt track. Park just beyond disused water pump building.

Site: walk up to LHS up steep wooded slope about 500 m. Site located in corner of large field to E of pylons (100 m away). Public land but spoke to headman of village (Nuri Yilmaz, 0543-6816915).

Geology: Upper Cretaceous intercalated sandstone and shale. Vertical bedding. Hole dug down to bedrock with concrete plinth.

Seismic quality: variable. Many unusual high frequency events (animals? rain?). Possible road noise (600 m).

Station 3.4 (CMG-6TD-6078, G3804)



`Cistern' (original site prepared 5/2/05 and later destroyed by locals, reprepared 26/2/05, deployed 27/2/05, serviced 28/2/05 and 4/3/05).

Location: 41 05.759 N, 36 04.217 E; 37 T 253949 4553549

Altitude: gps-Ali = 778 m.

Driving: On way into Kavak, take RH turn to upper Kavak. Drive up hill past Jandarma station and continue towards Hacili Koyu (at fork take RH turn). In village continue to mosque and from there take L turn up hill towards a series of cisterns. Graveyard on RHS.

Site: Walk up hill for 300 m past upper cistern. Site located in small dip.

Public land but negotiated access with headman of village (Seydi Ulu, 0543-6464050).

Geology: Interbedded marly siltstone and shale. Dipping at 20 degrees to NW. Lower part of Upper Cretaceous. Outcrop is good quality but fractured. Concrete plinth.

Seismic quality: Generally good but sometimes high frequency noise (rain?). Site undisturbed.

Station 3.5 (CMG-6TD-6048, G4233)



`Grave Rubber' (prepared 4/2/05, deployed 25/2/05, serviced 27/2/05, 28/2/05 and 4/3/05).

Location: 41 2.875 N, 36 2.069 E; 37 T 250760 4548314

Altitude: gps-Ali = 617 m, gps-Nicky 615 m

Driving: On way into Kavak, pass a Fat Pilic sign on LHS. Continue for several hundred metres and negotiate crossing of dual carriageway. Continue back out of Kavak and turn R at cleared area (brick factory). Continue towards Yukaricirisli

Koyu along dirt track, crossing railroad. In village, leave mosque on LHS and go R to edge of village past old school. Take dirt track in LH corner of clearing. Drive around in a loop to access site which is walking distance from village.

Site: located on public grazing land. Walk across stream towards coniferous forest. Site located several hundred metres short of trees in a intermittently wet ditch. Site negotiated with village headman (Ruhi Yilmaz).

Geology: Lower Cretaceous arkosic sandstone with interbedded shales.

Seismic quality: occasional long period noise otherwise good.

Station Kavak (CMG-40TD telemetered to Bogazici University in Istanbul)



`KVTB' (continuous recording with 50 samples per second).

Location: 41 4.84 N, 36 2.78 E; 37 T 251737 4551655

Altitude: 639 m

Driving: In upper Kavak, drive past Jandarma station and then take RH turn towards big antenna. Site at base of slope to R.

Site: original installation in 1976. This is serious affair with a big isolated concrete plinth, insulated seismometer and hut. Unfortunately, what was an originally small hamlet of Kavak has grown and encroached upon site which is now probably fairly noisy.

Geology: Upper Jurassic-Lower Cretaceous platform limestone.

We have negotiated access to these data with Professor Dogan Kalafat (00-90-216-4622426).

Station 3.6a (CMG-6TD-6111, G4254)



‘Valley of Doom, Sequel’ (prepared 6/2/05, deployed 25/2/05, serviced 26/2/05, 28/2/05 and 3/3/05).

Location: 40 58.736 N, 35 59.123 E; 36 T 751173 4540712

Altitude: gps-Ali = 1018 m

Driving: There are two methods of getting to this station. The preferred approach is a longer drive but much less traumatic. Drive through Kavak and take road towards Ladik. At approach to Ladik, take LH turn to Tatlicak village. Continue along dirt track and at fork take LH turn towards Hasirci village. Continue through village, cross 1943 fault break and drive to next village called Gunkoru. Drive to upper village by keeping L. Out of village, pass splendid outcrop of dacite volcanics and continue up dirt track which is inaccessible if wet. After 1.5 km continue straight up hill into forest (i.e. turn R off main track). At saddle, forest clears and continue down past concrete watering trough to top of valley. Second method involves driving from Kavak towards Kavalli and up dirt track. 2 km outside Kavalli, take RH turn down steep dirt track (easy to get stuck here). Walk to site (about 4 km over steep wooded terrain). Bring compass and gps. When exiting site, follow stream downhill if dark.

Site: Tucked in on LHS close to bushes. Public access but site negotiated with village headman (Necati Karanfil, 778-0010) who instructed Imaam to tell his flock that entering site would imperil their immortal souls.

Geology: Feldspar porphyry. Highly weathered but possible to dig down to firm sub-crop. Shortage of concrete resulted in very small plinth which was difficult to level.

Seismic quality: excellent.

Station 3.6b (CMG-6TD-6092, G4226)



`Valley of Doom, Prequel' (prepared 5/2/05, deployed 25/2/05, serviced 26/2/05, 28/2/05 and 3/3/05).

Location: same as 3.6a

Altitude: same as 3.6a

Driving: same as 3.6a

Site: same as 3.6a

Geology: same as 3.6a

Seismic quality: surprisingly noisy. High frequency noise which may be instrument related rather than a function of site.

General Comments

Line 1:

This line has steep topography and much tree cover so initial locations were often either inaccessible or compromised. Many stations are thus located offline. Our biggest difficulty was gps fix and in two cases sites were relocated. Much time was spend climbing trees to optimize gps lock and waiting for offset and drift. Gps difficulties caused by a combination of forest and steep slopes.

All sites were located on bedrock and considerable time and effort was expended in order to achieve this end. In all but two cases, a concrete plinth was made and a bin with hole was sunk into plinth. Thus sites were immune to hydrological ingress and landsliding.

Battery life was surprisingly variable (two sites lasted for 7 and 9 days but the rest lasted for over two weeks). Once 11-13 v was reached, the instrument usually switched off. We suspect that atmospheric and ground temperature played the biggest role in governing battery life.

Site location was best achieved by close liasing with the local Jardarma stations and village headmen as well as with landowners where possible.

Line 3 and 4:

Access close to a main road greatly speeded up preparation, deployment and servicing. However, some stations are affected by traffic noise. In general, all 9 sites are quieter than Line 1. One site was destroyed. It had been prepared without local consultation in bad weather early evening. This area is reputed to have buried treasure which led to site destruction. No difficulties with gps.

SEIS-UK Recommendations

- (a) Battery pelicasas. During battery insertion, individual batteries can sometimes fail to touch contacts. Best check is to measure voltages for each set of 4 batteries.
- (b) Gps. Source of major delays in field but difficult to see how this can be resolved. Need to check that you can get gps lock before expending a lot of effort in site preparation. This can only be done with instrument and not with other gps receivers. In some cases, longer cables would have greatly helped (or at least the ability to daisy chain two cables together). We had one cable breakage and perhaps design can be looked at to ensure that soldered contacts do not pull away so easily or pulled away from a plug on outside. Palm software not ideal for checking offset and drift as could not scroll LR or UD to check values.
- (c) Some levelling problems and three adjustable feet on base of seismometer would be much better.

- (d) The Shaw-Champion-White patented deployment scheme is best. Waterproof, landslide-proof and secure. Much better to strap battery pack on top of bin lid and then tie down whole lot with secure (non flapping!) plastic sheet. Elastic string worked best for tying.
- (e) Software a bit ropy especially Palm.