2. SITE 314

The Shipboard Scientific Party[1]

SITE DATA

Date Occupied: 6 November 1973 (0630Z)

Date Departed: 8 November 1973 (0100Z)

Time on Site: 42.5 hours

Position:
Latitude: 15°54.76′N
Longitude: 168°28.07′W

Water Depth (sea level): 5213.8 corrected meters, echo sounding

Water Depth (rig floor): 5223.8 corrected meters, echo sounding

Bottom Felt at: 5225.5 meters, drill pipe

Penetration: 45 meters

Number of Holes: 1

Number of Cores: 3

Total Length of Cored Section: 17.5 meters

Total Core Recovered: <0.1 meter

Percentage Core Recovery: <1.0%

Oldest Sediment Cored:
Depth below sea floor: 45 meters
Nature: Brown clay above chert of unknown thickness
Age: Eocene
Measured velocity: 3.1-3.4 km/sec

Basement: Not reached

Principal Results: The section consists of approximately 7 meters of soft brown zeolitic clay containing poorly preserved radiolarians of Eocene age, redeposited during Quaternary time. These 7 meters overlie 28 meters of uncored section, probably brown zeolitic clay. From 35 to 45 meters the section is brown porcellanite and brown clay of middle and late Eocene age. Calcium carbonate is present only in the form of a few coccoliths and poorly preserved foraminifers. The section penetrated is similar to the upper 43 meters drilled at DSDP Site 164, 110 miles to the southeast, and the upper 15 meters drilled at Site 68, approximately 270 miles to the east of Site 314. A pinger, jetted out in a core barrel, was successfully tested as a tool to measure the distance from the drill bit to the mudline.

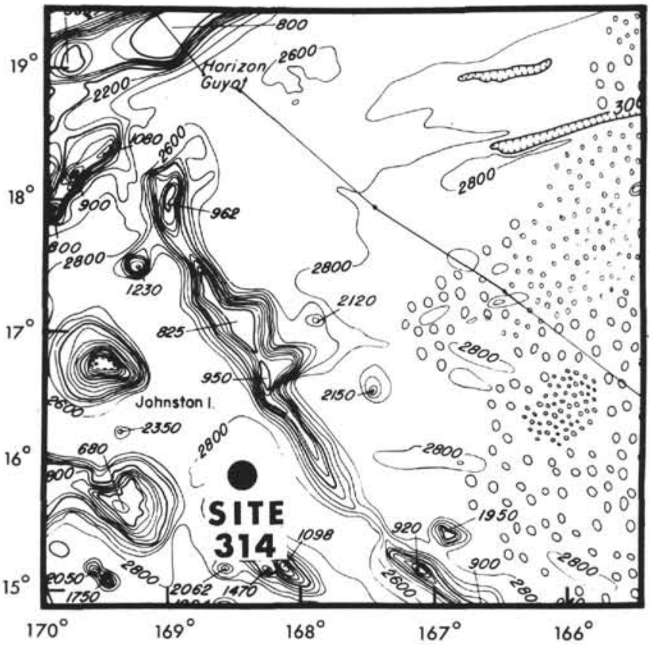

Figure 1. *Location map showing Site 314. Bathymetry by Chase, et al., 1970.*

BACKGROUND AND OBJECTIVES

The Johnston Island Trough site (Figure 1) was originally chosen to realize the following principal objectives: (1) to determine the date of cessation of volcanism at the approximate northern end of the Line Islands chain, and (2) to decipher the geological history of Johnston Island through study of the composition of its turbidite debris.

The two previously available seismic reflection profiles near the proposed site (*Argo, Scan,* Leg 5, 2000 hr 23 July 1969; *Vema*-24, 2200 hr 30 March 1967 [Figures 2, 3]) showed 0.08-0.1 sec of an apparently transparent layer above a strong reflector at 0.1-0.2 sec. A total sedimentary section of approximately 0.65-0.70 sec appeared to be present above a probable basement reflector.

Six days were originally allocated to this site to allow for continuous coring to basement. Due to the loss of 5 days of leg time during heave compensator installation delays, the objectives were revised in Honolulu. We decided to spot core Site 314, allowing only 2.5 days drilling time, with the following objectives: (1) to learn as much as possible about the geological history of the northern Line Islands, and (2) to determine, if possible, the age of the basement reflector in this area.

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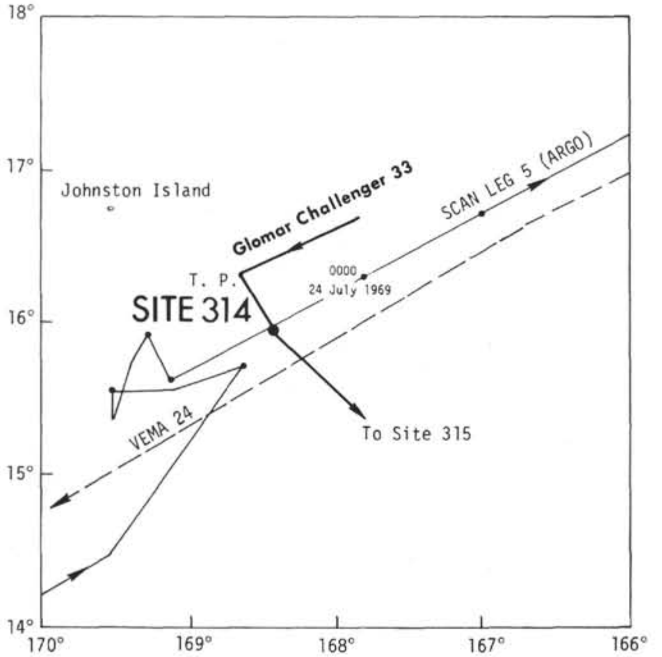

Figure 2. *Location of Site 314 and tracks of relevant surveys.*

OPERATIONS

Glomar Challenger Site Survey

In order to take advantage of the preexisting surveys in the area (*Scan* Leg 5 and *Vema*-24 tracks ([Figure 2]), the site was approached by steaming to a point (T.P.; Figure 2) at 16°18.0'N, 168°42.0'W and turning to a course of 148° true approximately 27 n. mi. northeast of the *Scan* Leg 5 line. We were thus steaming perpendicular to both the *Scan* and *Vema*-24 lines. The *Scan* Leg 5 line was crossed between 1900 and 1926, 5 November 1973 (0500 to 0526Z, 6 November 1973) (Figure 4), and the existence of an upper transparent layer of a thickness of approximately 0.070 sec was confirmed. A very poorly defined reflector at 0.4 appeared to correlate with a similar reflector on both the *Scan* Leg 5 and *Vema*-24 records. A deep reflector at approximately 0.65-0.70 sec, obvious on the *Scan* and *Vema* records was not picked up on the *Glomar Challenger* Leg 33 seismic profile. Because of the high quality of the *Scan* Leg 5 line and our proximity to it, it was decided to not proceed to the *Vema*-24 line; course was reversed (Figure 4) to 317° and the beacon was dropped at 2016, 5 November 1973. *Glomar Challenger* approach and departure seismic profiles are shown in Figure 5.

The PDR depth of 2765 fathoms at Site 314 is equivalent to a corrected depth of 5208 meters from transducer (5.8 m below water line) to bottom. (Matthews tables show 5205 corrected m for Area 42 and 5211 meters for Area 41; 5208 is an interpolation since Site 314 is near the boundary between the two areas). Thus, distance to bottom from the rig floor (sea level + 10 m) at Site 314 was calculated to be 5223.8 meters; the length of drill pipe from rig floor to bottom, and officially adopted depth was 5225.5 meters.

Sonobuoy Survey

A sonobuoy run (33-1) was made on 6 November 1973 (Figure 6), before and at the start of drilling. The records are not particularly good due to the lack of suitable currents and winds. Also the airgun tended to drift towards the ship and had to be stopped several times.

Drilling Program

Shortly after the beacon was dropped (5 Nov, 2030 hr local), the vessel was stabilized. The drill string was made up with a standard bottom-hole assembly 126.46 meters long and a pinger core barrel. The bit made contact with the sea floor at a depth of 5225.5 meters at 1205, 6 November (2205Z).

The pinger core barrel (Core 1) was punched into bottom with little resistance; however, core recovery was low (see Pinger Assembly, below). After recovery of the pinger core barrel, a 10.0-meter punch barrel (Core 2) was inserted and pushed directly into the sea floor, this time encountering considerable resistance. Because of the resistance, the last part of the barrel was flushed in to a depth of 17 meters. On withdrawal, the core barrel was clean and empty, its nose was flanged, and in one place, broken off (see engineering report). A regular extended punch core barrel was then inserted in the string, and the driller was instructed to wash as far as possible into the bottom and then, if possible, drill a core. We estimated the first sub-bottom reflector to be at a depth of about 0.07 sec. The driller flushed from 17.5 to about 45 meters, encountering rather strong resistance. At that depth he turned the bit slowly and found very high torque.

At that point we attempted to withdraw Core 3 without success. Inasmuch as we were advised by the driller that we were in badly caving, sandy ground, the string was withdrawn with the intention of moving to an offset site during retrieval of Core 3. Two overshot pins were broken in attempting to retrieve the core barrel, and at 0337 hr, 7 November (1337Z), it was decided to pull the string and abandon the hole. On recovery of the drill hole assembly on deck, fragments of brown chert were found in the core catcher (see Table 1 for summary).

Site Offset

The offset mentioned above commenced at 1854, 6 November (local) and was completed by 1950. The new location was approximately ½ mile northeast of Site 314 at latitude 15°55.18'N, longitude 168°28.31'W. Because of the difficulties in recovering the core barrel, the string was pulled approximately 70 meters above bottom, leaving open the option to spud in should we free Core 3. During the move the PDR was operating and showed a very smooth bottom; the offset site was only 2 meters shallower than the original site.

Because of our inability to penetrate the porcellanites at 45 meters and recover much core at this site, and because the jammed core barrel would have necessitated another round trip of 24 hr in order to occupy an offset site, we decided to abandon Site 314. This site would have provided an excellent locality to test the heave

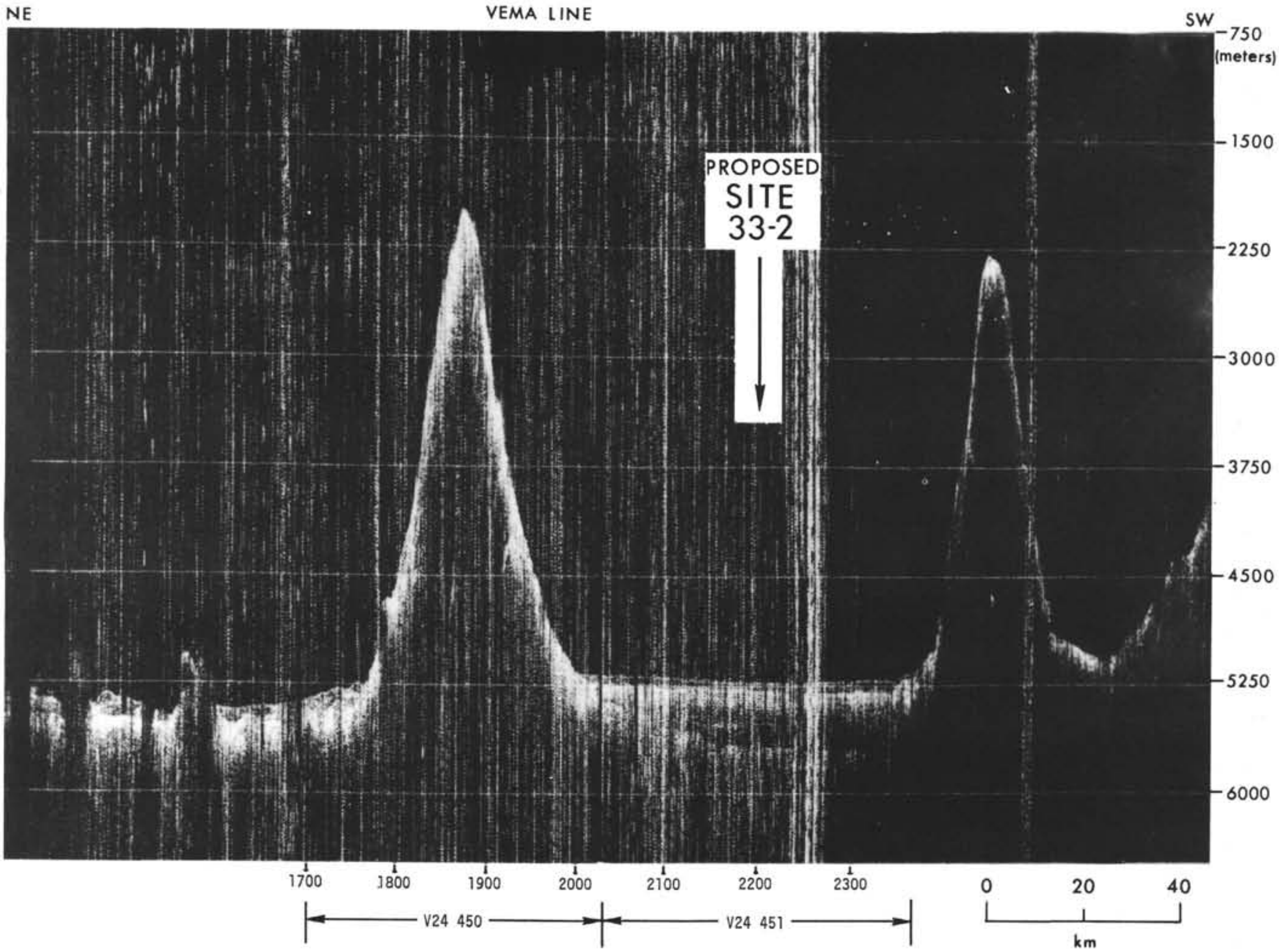

Figure 3a. *Lamont-Doherty* Vema-*24 profile across Johnston Island Trough (30 March 1967) showing Site 314 (proposed Site 33-2).*

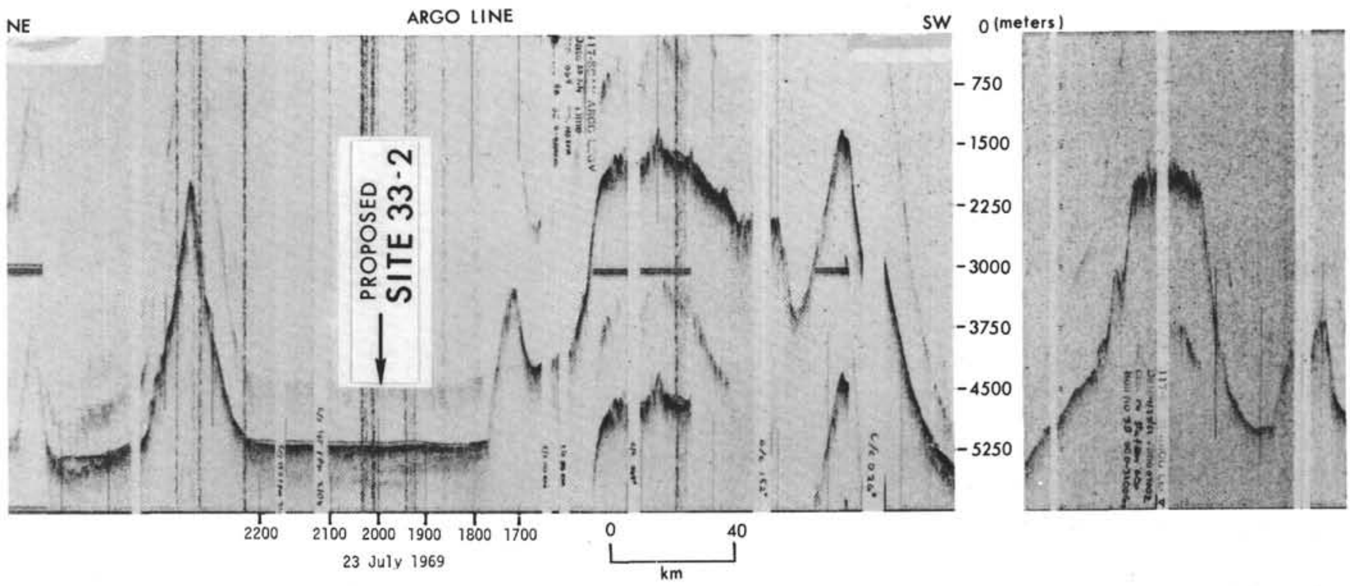

Figure 3b. *SCAN Leg 5* (Argo) *profile across Johnston Island Trough.*

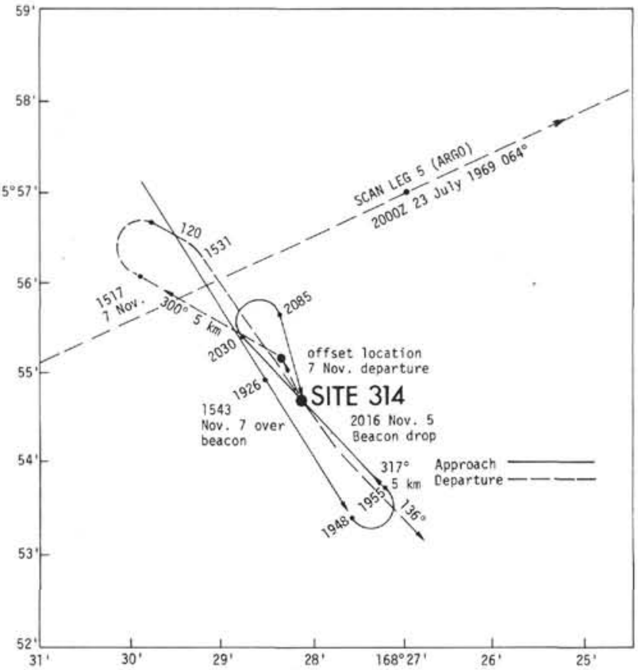

Figure 4. Glomar Challenger *approach and departure, Site 314 (local time).*

compensation apparatus, had it been in operating condition.

Departure from the offset location was at 1500, (local) 7 November. The ship steamed to the northwest, turned back over the beacon (Figure 4), and proceeded to Site 315 on a course of 136°.

Pinger Assembly

A specially designed core barrel consisting of a barrel with a 12-kHz pinger protruding from the nose was designed for testing on Leg 33. The purpose of this instrument was to emit a direct signal observable on the Precision Depth Recorder (PDR), and a reflection of that signal from the sea bottom. Closure of the two signals, and disappearance of the direct signal, would presumably indicate the approach rate of bit to bottom and, ultimately, actual immersion of the pinger tip in the sea floor. The instrument was proposed as being particularly useful in areas with very soft bottom sediments.

Inasmuch as our presite records and on-site high frequency EDO records indicated an 0.08-0.10 sec relatively transparent layer at Site 314, and since the heave compensation apparatus was not ready for testing at this site, we used the pinger assembly to follow the drill string from the drilling platform to the bottom (that is, as Core 1 of Site 314).

The pinger device was not synchronized with the sweep of the PDR, requiring rather frequent repositioning. Throughout the descent, the device gave excellent direct signals, and it was possible to follow from the Electronics Lab on the bridge the addition of stands of pipe to the string, and, indeed, every activity on the drilling deck. On early descent, bottom returns were fuzzy, but as the device neared the bottom, reflections became quite clear (see Figure 7). As presently designed, the device does not permit a direct reading to bottom, but

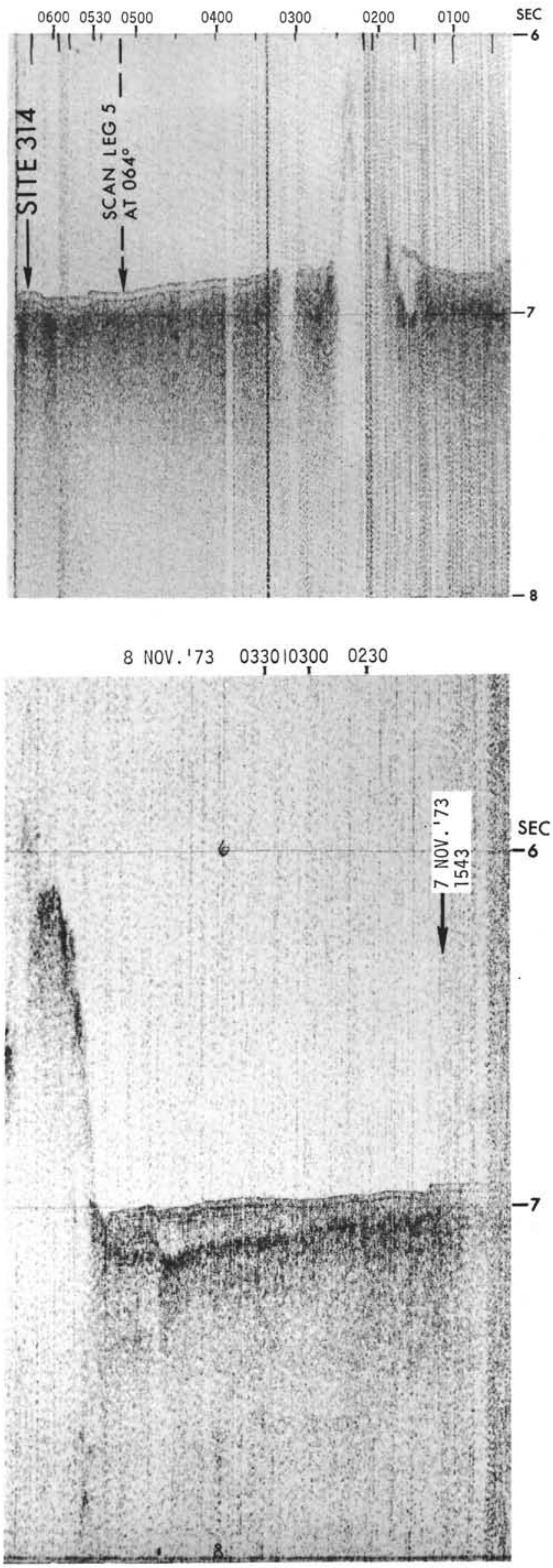

Figure 5. Glomar Challenger *seismic profiles* (a) *on approach and* (b) *departing from Site 314.*

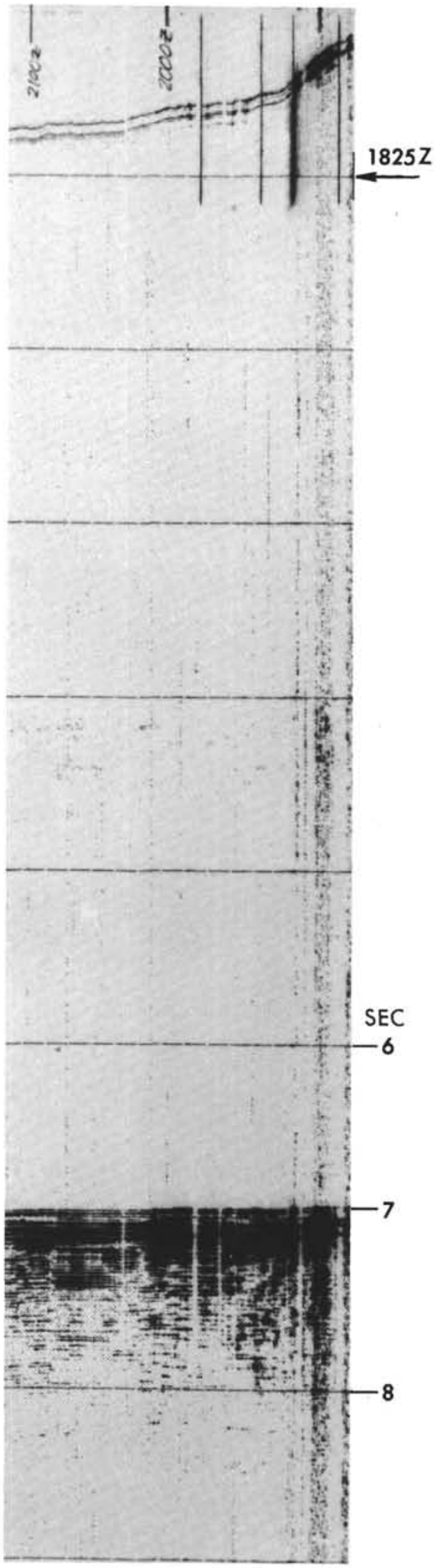

Figure 6a. Glomar Challenger *sonobuoy records at Site 314.*

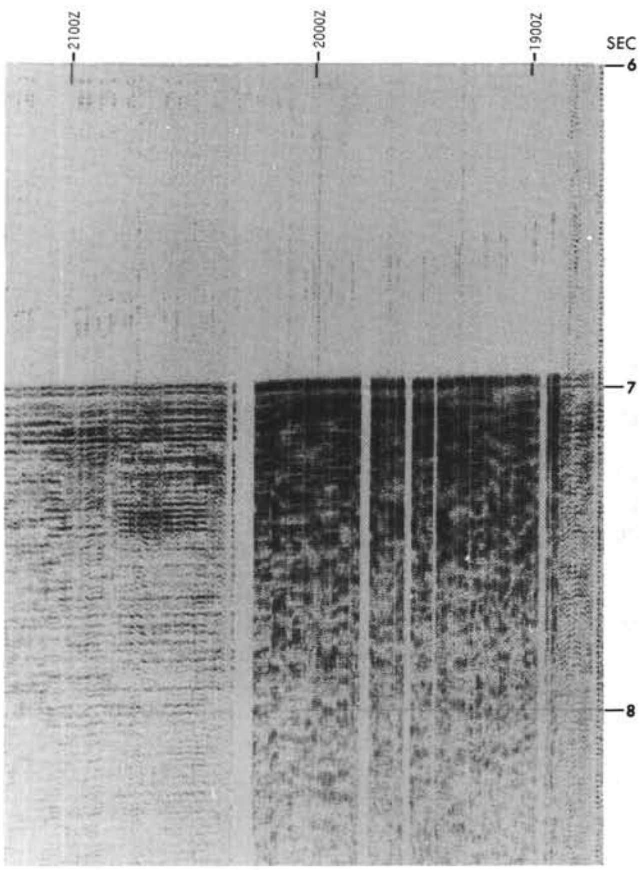

Figure 6b. Glomar Challenger *sonobuoy records at Site 314.*

by measuring the closure of stands it proved possible to empirically calibrate the distance between the bit and bottom. From the record shown in Figure 7, we were able to notify the driller of his progress, and finally, to predict bottom 3-5 meters beneath the bit. Upon insertion of one joint of pipe, bottom was felt after lowering 6 meters. We therefore give an accuracy of about ±3 meters to the device.

At that time the device was supposed to shear a pin, and to be retracted to the top of the core barrel, leaving 7.5 meters of empty core barrel for the collection of the first core. Upon retrieval of Core 1, we found that the pinger had indeed retracted and was still emitting signals. However, at some point it had ascended into the barrel and then extended; in the process it shredded the sock and broke most of the catcher teeth from the bottom of the barrel (see Figure 8). It also failed to shear the pin. As a result we had no core beyond a little watery sediment in the core catcher.

At its present stage of development, we recommend the separate retrieval of the pinger device after use to find bottom only in acoustically very transparent areas (the corrected PDR depth in meters and the drill pipe measurement differed only by 1 m at this site) and that it be retrieved and replaced by a fresh core barrel. This, of course, would necessitate an extra trip with the core barrel.

LITHOLOGIC SUMMARY

Poor recovery at this site, yielding sediment of uncertain stratigraphic position, imposed severe restrictions

TABLE 1
Coring Summary, Site 314

Core	Date (1973)	Time (local)	Depth From Drill Floor (m)	Depth Below Sea Floor (m)		Length Cored (m)	Length Recovered (m)	Recovery (%)
1	6 Nov	1345	5225.5-5233	0	7.5	7.5	CC	<1
2	6 Nov	1635	5233-5243	7.5	17.5	10	0	0
3	7 Nov	1430	5260-5270	35	45	10	CC	<1

on the description and interpretation of samples. Only a few grams of material could be scraped from the core-catcher teeth from Cores 1 and 3.

Samples available consisted of a few grams of brown clay from the core catcher of Core 1 and various fragments retained in the core catcher of Core 3. In an attempt to supplement these sparse samples, scrapings were taken from sediment left clinging to the outer drill collars. These scrapings may originate anywhere between the sea floor and 45 meters below.

The following lithological units were defined: Unit 1—Brown zeolitic clay (probably 0-35 m): 1, CC (scrapings); and Unit 2—Silicified claystone and porcellanite (probably from 35 to 45 m): 3, CC.

Unit 1—Brown Zeolitic Clay (0-35 m)

This unit is characterized by the association of X-ray-amorphous, ferruginous material with clay minerals and zeolites. There are considerable amounts of dark brown, equant (2-20 μm) specks which are likely to be the small amounts of goethite and magnetite revealed by X-ray diffraction. The principal zeolite is clinoptilolite, although stubby penetration twins of phillipsite were also observed. Rare fish debris and palagonite grains are present. Aggregates of altered palagonite with emergent zeolite clusters were observed. Siliceous components are rare, generally comprising broken fragments of radiolarian tests and scattered sponge spicules. Calcite is totally absent. X-ray diffraction (Cook and Zemmels, this volume) further revealed magnetite, montmorillonite as the dominant clay mineral, and a minor assemblage of quartz, feldspar, and mica. It is interesting to note the occurrence of palygorskite and sepiolite in the surface layers; in recent deep-sea sediments they are rarely encountered.

Bedding structures in the zeolitic clay are suggested by the presence of varied bands of light brown (5YR5/6) and dark yellowish-brown (10YR5/2) color.

Drill collar scrapings differ from the clay in the core catcher of Core 1 in that they contain scattered nannofossils, foraminifers, radiolarians, as well as numerous detrital minerals. The detrital fraction includes plagioclase feldspars, pyroxenes or amphiboles, other unidentified heavy minerals, and some volcanic glass fragments. Abundant tiny (less than 1 mm) pustulate Fe-Mn micronodules and some coarse fish debris also constitute part of the sand-sized fraction. The varied ages given by the fossils suggest that the coarser material may, in part, be redeposited.

Unit 2—Silicified Claystone and Porcellanite (35-45 m)

This unit is based solely on the various fragments recovered in the core-catcher sample from Core 3. These fragments represent several different lithologies, including brown, firm clay, brown zeolitic claystone, porcellanitic claystone, brownish porcellanite, and whitish foraminiferal porcellanite. The firm clay and zeolitic claystone fragments are similar in composition to the clay of Unit 1.

The stratigraphic relations of these lithologies are indeterminate. Several fragments exhibit bedding and laminations. Some pieces show faint mottling with sharp boundaries between different stages of silicification. Brownish porcellanites are cut by veins of whitish porcellanite.

Abundant molds of radiolarians and foraminifers were seen in thin sections of the porcellanite. The tests are locally replaced and filled, completely or partially, by opaline silica or chalcedony. Foraminiferal tests commonly remain calcitic although primary structures of the tests have often been lost due to recrystallization. Two-stage growth of the silica phase is indicated by the frequent presence of a thin, commonly clay-rich, opaline silica layer lining fossil or cracks, followed by infilling with fibrous chalcedony. Some enrichment of clay is observed along the periphery and/or the inner lining of microfossils. This may indicate clay expulsion during replacement of formerly clay-filled fossils. Fine-grained calcite (2-6 μm) occurs disseminated in the opaline matrix. X-ray results did not show the presence of cristobalite; however, optical examination suggests that there is abundant highly disordered cristobalite present. Other distinctive features from the X-ray results include the dominant association of phillipsite with the siliceous claystone, rare quartz and mica, and traces of dolomite.

GEOCHEMICAL MEASUREMENTS

Due to the small amount of sediment recovered, no samples were squeezed for interstitial water analysis. Two samples of zeolitic clay scraped from the drill collar were measured for water content using the syringe technique. The results of 48.3% and 51.6% are probably of little significance due to the high degree of sample disturbance.

The rock-chunk technique was used to measure the water content of porcellanite and claystone found in the core catcher of Core 3. The water content of the porcellanite and claystone are 8.8% and 36.4%, respectively. A piece of foraminiferal porcellanite found in the core catcher of Core 3 was determined to be about 22% $CaCO_3$ by the shipboard "carbonate bomb" method (a rapid carbonate determination technique that measures the pressure of CO_2 evolved from a sediment sample of known weight after reaction with 1*N* HCl; see Chapter 1).

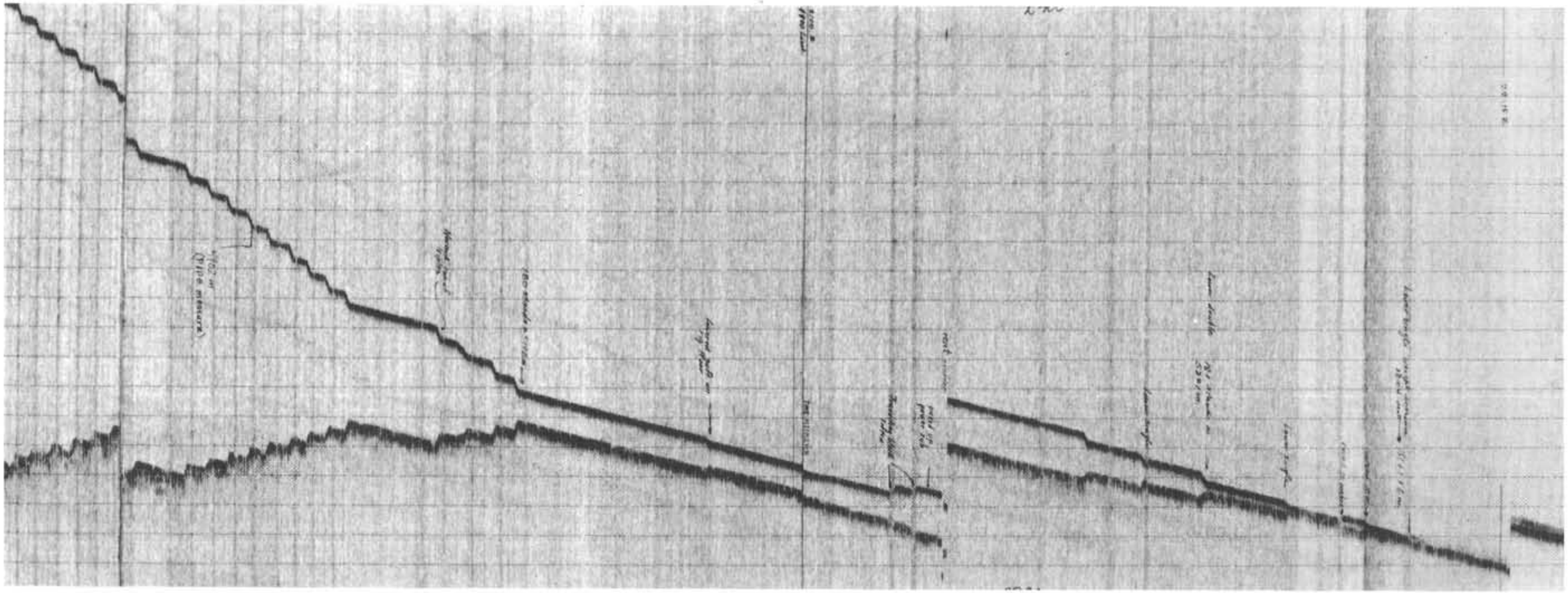

Figure 7. *Precision Depth Recorder* (PDR) *record obtained on* Glomar Challenger *during test of core barrel pinger (see text).*

Figure 8. *Core catcher retrieved from core barrel after pinger test.*

PHYSICAL PROPERTIES

Sound Velocity

Compressional wave sound velocities at 400 kHz were measured through two small irregular fragments by means of the Hamilton frame velocimeter. The accuracy and precision of the Hamilton frame velocimeter on good samples is about ±1.5% and is fully described by Boyce (1973) is the use of correction factors applied to the velocities because the oscilloscope was out of calibration at the time. The correction factors used are discussed in Appendix I, this volume.

Because of disturbance, the soft clays recovered at site 314 were not measured. Their velocities, however, would be about that of the bottom water (1.47 to 1.50 km/sec).

Hard fragments of dark grayish-brown (5YR3/2) claystone and grayish-orange (10YR3/2) porcellanite were recovered in the core catcher of Core 3 from a depth of 45 meters. These fragments were too small for reliable velocity measurements; however, the values determined are as follows: the claystone yielded velocities from 3.118 to 3.438 km/sec.

Water Content, Wet-Bulk Density, Porosity

At Site 314 recovery was sparse and samples were not large enough to process the data through the GRAPE equipment (described in Boyce, 1973). However, discrete wet-water content samples were selected from the dark grayish-brown (5YR1/2) claystone (also sonic-velocity sample) and grayish-orange (10YR7/4) porcellanite (sonic-velocity sample).

Wet-water content is defined as the weight of seawater to the weight of the wet-saturated sediment expressed as a percentage. The gravimetric techniques, calculations, and salt corrections (after Hamilton, 1971) are discussed by Boyce (1973) and in Appendix I of the present volume. Wet-water contents of 36.4% and 8.80% were determined by the rock chunk technique (discussed in detail in Appendix I, this volume) for the claystone and porcellanite, respectively, without salt corrections. With salt corrections these values are 37.7% and 9.12%, respectively.

CORRELATION OF REFLECTION PROFILE WITH DRILLING RESULTS

Because only the uppermost part of the stratigraphic section was sampled at this site, the age and lithologic character of the deeper reflectors seen in the *Glomar Challenger* profiler records (Figure 5) and in the *Argo* and *Vema* records (Figure 3) cannot be determined. The first major reflector, seen in Figure 5 at a subbottom reflection time of about 0.10 sec, corresponds to the base of the "upper transparent" layer of Ewing et al. (1968), which has previously been sampled at several Leg 17 sites (164, 168, 170, Winterer, Ewing, et al., 1973) in this region. At these sites the layer consists of Cenozoic pelagic brown clay containing porcellanite chert blebs and knobs in the lower part of the layer.

At Site 314, a profiler record filtered to pass signals between 160 and 320 Hz (Figure 5b) shows the base of the "transparent layer" is a diffuse boundary at about 0.06 sec of reflection time below the sea floor, but there is a persistent reflector within the transparent layer at about 0.030 sec (Figure 9). The depth to this uppermost reflector diminishes gradually to about 0.015 sec as it is traced to the northwest. It seems likely that the porcellanite recovered in Core 3, in the depth interval 17.5-45 meters below the sea floor, came from this uppermost persistent reflector. The measured sound velocity in specimens of the porcellanite averages about 3.2 km/sec, whereas the associated zeolitic claystone has a measured velocity of only about 2.0 km/sec; the softer brown clay sampled in Core 1 probably has a considerably lower velocity. The porcellanite could thus give rise to a seismic reflector if it occurs in the form of a layer. The exact position of the porcellanite sample in the cored interval (17.5-45 m) is uncertain, but from the behavior of the drill rig weight indicator, it seems most

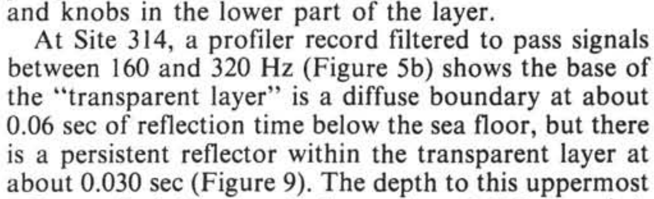

Figure 9. *Line drawing interpretation of part of seismic reflection profile taken from aboard* Glomar Challenger *while approaching Site 314. The persistent reflector about 0.03 sec below the sea floor at the drill site is correlated with the chert sampled in Core 3 at a depth of about 45 meters. The diffuse reflector at about 0.06 sec is the base of the "upper transparent" layer of Ewing et al. (1968).*

likely that the porcellanite comes from near the bottom of the interval (between 35 and 45 m). Using 45 meters as the depth to the porcellanite, and accepting the porcellanite as the uppermost seismic reflector at 0.030 sec yields an interval velocity of about 1.5 km/sec for the transparent layer. Similar velocities for the upper transparent acoustic layer are reported at Sites 164, 168, and 170 (Winterer, Ewing, et al., 1973).

Efforts to determine interval velocities at Site 314 using a sonobuoy were unsuccessful. The sonobuoy drifted only about 800 meters from the ship during the experiment, and thus no wide-angle data were obtained on which to base velocity estimates.

PALEONTOLOGY

Biostratigraphic Summary

Micropaleontological studies were carried out on the following sediment samples obtained at Site 314.

Sample 314-1, CC: A small volume (<10 cc) of zeolitic clay retrieved from the core catcher of Core 1 at a depth of approximately 7.5 meters below the sea floor.

Sample 314-3, CC: Approximately 50 cc of zeolitic clay, claystone, and porcellanite from the core catcher of Core 3. This material could have been recovered from any level between 17.5 and 45 meters. Based on considerations of on-site seismic reflection data and measured seismic velocities in the samples, however, it is most likely that the material in Sample 314-3, CC is from near the bottom of the hole (depth 35-45 m).

In addition to these two samples, approximately 50 cc of material was removed from the outer surface of the drill collars when the drill string was retrieved. Material was removed from levels of 11 and 13 meters above the drill bit. Since the total penetration of the drill string was 45 meters, the material in this sample must have come from between 0 and 34 meters below the sea floor.

Sample 314-1, CC was found to be devoid of calcareous microfossils, with only poorly preserved fragments of Eocene radiolarians present.

In the sediment removed from the drill collars, the nannofossil assemblage consists of species ranging in age from Upper Cretaceous to Quaternary, with upper Neogene forms dominating the assemblage (~80%). Included in the nannofossil assemblage is a form (*C. cristatus*) restricted to the upper Pliocene and Quaternary. The radiolarian assemblage in this sample is dominated (>.99%) by specimens of Eocene age. Included in the assemblage are species which have limited stratigraphic ranges (ca 3 m.y.), and which collectively represent the entire middle and upper Eocene. Trace amounts (<1%) of Neogene radiolarians are also present. Foraminifers in this sample include a partial test of *Sphaeroidinella dehiscens*, indicating an age of Pliocene or younger, and three specimens of the Paleogene form, *Chiloguembelina*. The above evidence indicates that much of the material in this sample may have been redeposited, probably during the Quaternary. Alternatively, the mixed assemblages may be an artifact of the drilling process.

Sample 314-3, CC consists of clays, claystone, and porcellanites. The clay and claystone contain radiolarians of middle and upper Eocene age. Foraminifers in smear slides (very rare) and in a thin section (common-abundant) of the porcellanite indicate a Paleogene age, possibly Eocene. No nannofossils were observed in the clays from this sample, but thin sections of the porcellanite yielded partically recrystallized nannofossils with age ranges from middle Eocene to Lower Oligocene. The microfossil evidence therefore is consistent with an Eocene age for this sample.

In summary, the biostratigraphic data suggest that an undetermined thickness (up to 45 m) of zeolitic clay containing redeposited Paleogene and Cretaceous material overlies claystone and porcellanite of Eocene age.

Foraminifers

Foraminifers are not of common occurrence in the zeolitic brown clays at Site 314. Because of the small volume of material obtained in Core 1 and its distinctly noncalcareous nature, a foraminiferal sample was not taken. Core 2 was empty, and Core 3 brought up fragments of zeolitic claystone, porcellanite, and brown clay. No foraminifers were found in the sieved fraction of Core 3, but rare, small specimens of a bolivinid, *Chiloguembelina* sp., and other unidentifiable trochoform foraminifers, were seen in thin sections of one of the silicified fragments, in which they are occasionally of quite common occurrence. The indication is that Core 3 is of Paleogene age—possibly Eocene on the basis of relative number and gradual enlargement of chambers of *Chiloguembelina.*

The additional sample of brown clay obtained from the outside of the lower drill collar at the termination of the site was found to contain a partial test of *Sphaeroidinella dehiscens*, indicating that Pliocene or younger material is present. Also found in this sample were additional specimens of *Chiloguembelina* sp.

Calcareous Nannoplankton

Sediment from the core catcher of Core 1 proved to be noncalcareous. Zeolitic clay removed from the outer surface of the bottom-hole assembly 11 and 13 meters above the core bit yielded rare nannoplankton of various ages (~80% upper Neogene to Quaternary including *Ceratolithus cristatus*, and a few specimens from the Eocene, Paleocene, and Upper Cretaceous), indicating that the nannoplankton assemblage may represent an upper Neogene or Quaternary turbidite. In thin sections of the porcellanite from the core catcher of Core 3, some partially recrystallized calcareous nannofossils ranging in age from middle Eocene to the lower Oligocene (e.g., *Reticulofenestra umbilica, Chiasmolithus grandis*) were identified, indicating that an upper Eocene ago for this sample is most likely.

Radiolarians

In Sample 314-1, CC, poorly preserved fragments of Eocene radiolarians were observed. Specimens present include *Thyrsocyrtis tetracantha, T. triacantha,* and *Theocorys* sp. cf. *T. anaclasta.*

In the sediment recovered from the outer surface of the bottom-hole assembly, several moderately to well-preserved radiolarian specimens were observed in coarse fraction separations (>62μ). Species of lower to upper

Eocene age dominate the assemblage, comprising >99% of the specimens observed. Species included are: *Stylosphaera coronata coronata, Calocyclas hispida, Podocyrtis chalara, Theocampe urceolus, Lithomitra docilis, Dictyospyris gigas, Lithochytris vespertilio, Theocampe amphora, Theocampe mongolfieri, Thyrsocyrtis triancantha, Thyrsocyrtis tetracantha,* and *Rhopalocanium ornatum.* The stratigraphic ranges of these species are nonoverlapping. In addition, scattered specimens of *Polysolenia* sp. and *Pterocanium* sp. aff. *P. trilobum* were observed, suggesting an upper Cenozoic age. The above evidence suggests that much of the material present in this sample may be reworked.

In the clays and claystones recovered in the core catcher of Core 3, moderately well preserved specimens of Eocene radiolarians were observed. The species include *Thyrsocyrtis triancantha, T. rhizodon, Theocampe mongolfieri,* and *Podocyrtis papalis.* The presence of these species is consistent with a middle to upper Eocene age for this sample.

ACCUMULATION

Depth of penetration was too shallow and stratigraphic control of samples too poor to attempt accumulation rate graphs for this site. It seems apparent that 35-45 meters of red clay has been added to the Johnston Island Trough since middle to upper Eocene time.

SUMMARY AND CONCLUSIONS

The original objectives at Site 314 were to determine the date of the cessation of volcanism in the northern part of the Line Islands, and to continuously core the sedimentary section in order to decipher geologic events relevant to the development of the Johnston Island Trough since that date. Due to the loss of time that resulted from delays in the heave compensator installation, site objectives were amended on leaving Honolulu to a spot coring program at this site, with the idea of penetrating the 650 meters of sediment that overlies acoustic basement, as interpreted on the *Scan*-5 and *Vema*-24 reflection profiles used in the precruise planning.

Actual penetration at the site was 45 meters; only core-catcher samples were recovered in Cores 1 and 3, and Core 2 was empty. Due to mechanical difficulties culminating in a bent bottom-hole assembly, the site was abandoned.

The stratigraphy of Site 314 is shown in Figure 10. The section from 0.0 to 17.5 meters, and most likely to a depth of 35 meters, consists of brown zeolitic clay rich in phillipsite, and containing abundant reworked upper Neogene, Paleogene, and Cretaceous faunal and floral elements. This clay overlies claystone and porcellanite, probably of middle to upper Eocene age, sampled between 35 and 45 meters below the sea floor. The porcellanite is a diagenetic product of an originally foraminifer- and nannofossil-bearing sediment.

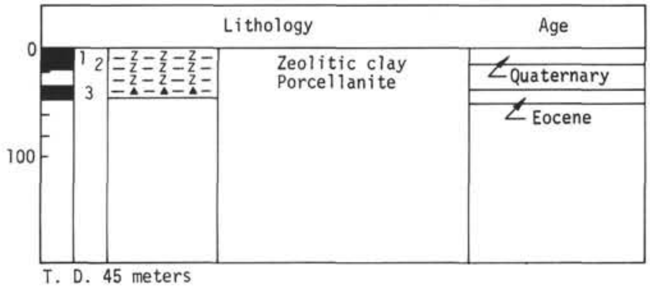

Figure 10. *Graphic log showing lithology and age of the section drilled at Site 314.*

The porcellanite may correspond to the 0.03-sec reflector seen on Leg 33 profiles approaching the site. This reflector was not seen on *Scan*-5 or *Vema*-24 profiles.

The relict nannofossil and foraminifer carbonate in the porcellanite, 22% by shipboard determination, indicates that the Johnston Island Trough may have been shallower than the calcite compensation depth during middle to late Eocene time (the present depth being 5225 m), unless one ascribes a turbidite origin to the carbonate in the porcellanite. By way of contrast, at Site 164 (present depth 5499 m) the stratigraphically equivalent section was probably below the calcite compensation depth as a result of its location beneath a region of extremely low fertility (Winterer, Ewing, et al., 1973; p. 22). At Site 68 (present depth 5467 m, see Tracey, Sutton, et al., 1971) the situation was similar to that at Site 164. It might therefore be reasonable to suppose that the bottom of the Johnston Island Trough was, by middle-late Eocene time, already shallower than the basin to the east in which Sites 164 and 68 are located (see Figure 1). Even then, the trough must have been ridge-bounded, with a topographic configuration capable of producing and containing turbidite flows.

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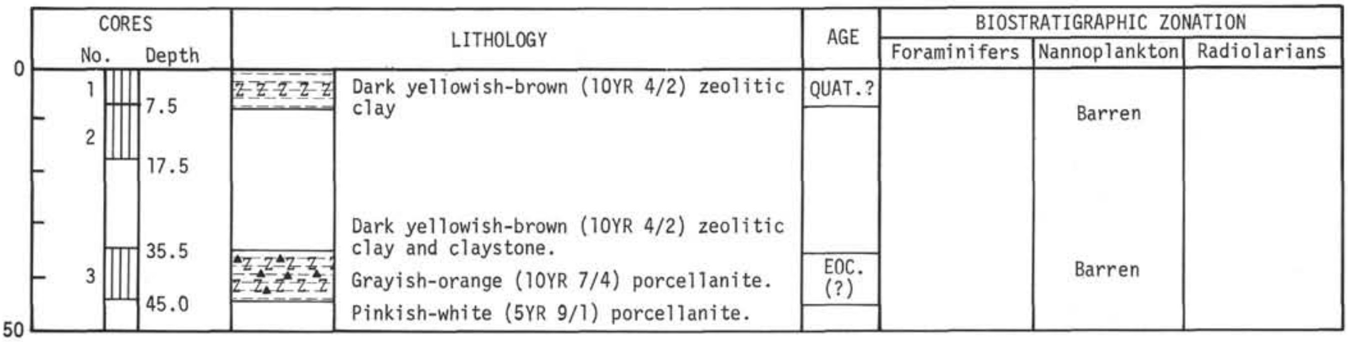


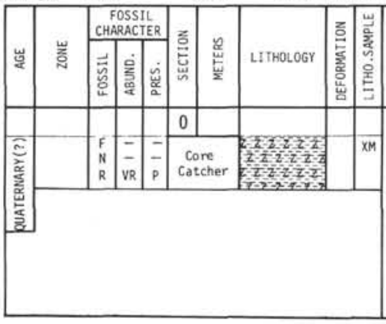
Dark yellowish-brown (10YR 4/2) zeolitic clay

Dark yellowish-brown (10YR 4/2) zeolitic clay and claystone.

Grayish-orange (10YR 7/4) porcellanite.

Pinkish-white (5YR 9/1) porcellanite.

Site 314 Hole Core 1 Cored Interval: 0.0-7.5 m



LITHOLOGIC DESCRIPTION

Dark yellowish-brown (10YR 4/2)
ZEOLITIC CLAY.

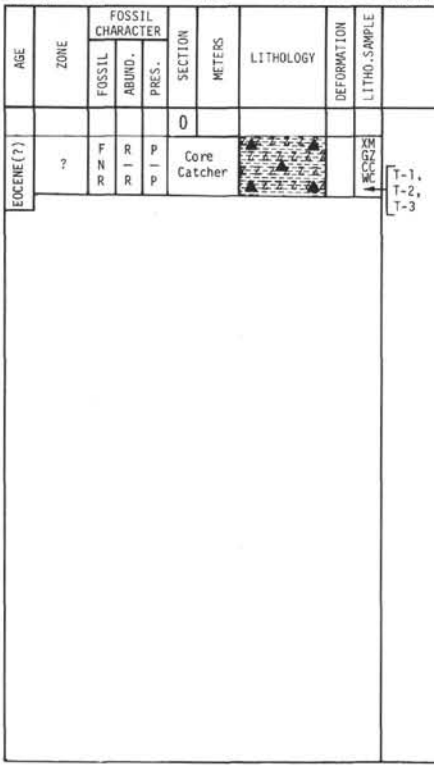
Smear Slide: CC

Clay	D
Zeolites	C
Sp. Spic.	R
Rads	R
Fish Debris	R
Fe-Mn Specks	R

Traces of heavy minerals.

Site 314, Core 2, 7.5-17.5 m: NO RECOVERY

Site 314 Hole Core 3 Cored Interval: 35.5-45.0 m



LITHOLOGIC DESCRIPTION

Fragments of several lithologies:

1) Grayish-brown (5YR 5/6)
FIRM CLAY

Smear Slide:

Clay	D
Fe-Mn Specks	R
Zeolites	R
Rads	R
Fish Remains	R
Volcanic Glass	R

2) Grayish-orange (10YR 7/4)
PORCELLANITIC CLAYSTONE

Smear Slide: Thin section T-1

Clay	D
Chert	C

3) Dark yellowish-brown (10YR 4/2)
PORCELLANITE

Smear Slide:

Opaline Chert	D

4) Dark yellowish-brown (10YR 4/2)
ZEOLITIC CLAYSTONE

Smear Slide:

Clay	D
Fe-Mn Specks	C
Zeolites	C
Volcanic Glass	R
Fish Remains	R

5) Pinkish-white (5YR 9/1)
PORCELLANITE

Smear Slide:

Opaline Chert	R
Fish Remains	R

Explanatory notes in Chapter 1