21 September 1992

To: DUMAND Collaboration

From: John Learned

Subject: **Preliminary Report of DUMAND Site Coring from the R/V Yuzhmorgeologiya**

Compliments of Craig Smith, UH Prof. of Oceanology, we had the opportunity to accompany him and his team on the first several days of an extended cruise aboard the Russian Vessel the Yuzhmorgeologiya, operated by the Russian Ministry of Geology out of Gelendzhik on the Black Sea. Craig has chartered this heavy 100m vessel for use in manganese nodule mining resedimentation studies, and got it for the amazing price of $50K for 72 days of ship time. The ship is very stable and has excellent cable handling capability, so I was interested in it as a possibility for DUMAND deployments. It turns out that the Yuzhmorgeologiya has only a single screw and rudder and no bow thruster, so would not work for our cable laying or string deployment, but there are sister ships which do have station keeping ability and more modern cranes. After my experiences on board I think we might want to pursue this further.

Outline of Cruise:

Sailed from Snug Harbor at 1030 on Sunday, 13 Sept 1992, sailing directly for the DUMAND site at 156 deg 19.5' W and 19 deg 42.5' N, arriving on station about 2030.

We made 5 lowerings with Smith's multi-core sample unit. This device consists of an eight legged octapod about 3 m tall, which carries an eight (10 cm by 50 cm) core holder which is pressed into the bottom by several hundred pounds of lead. The mechanism drops with damping for slow insertion, after device touchdown. Upon pullout, covers snap over both top and bottom of cores sealing them quite effectively.

The first two drops had little result, with the cores mostly empty upon return to the ship. The third and fifth were 8 for eight, and the fourth drop was a partial success. Details will be published later but here I only want to summarize the broad conclusions. The locations of the ship were 720 m NE, 200 m S, 1620 m NE 270 m NE and 180 m NE for the drops. The ship moved only about 200 m during the 5th drop so we can be sure it was very near the nominal DUMAND site. There was no consensus on what might have been the cause of the failures of the first two coring attempts.

The successful cores had roughly 30 cm of penetration (23–36.5 cm). The top 8–12 cm consists of a high water content soft clay/fine sand, with little mechanical integrity or bearing strength. It is probably the normal near island sediment in that area, and similar to that we have seen in earlier tests.

The next layer consists of more coarse sand, said to be turbidites because of the obvious layering and gradation in the sediments. It is darker in color, and the dark bands can be seen to be continuous across the group of cores (sampled in an area about 1 meter square). It consists of sand and ash, and under the microscope one can see Pele's hair and limu o Pele broken up,

evidence of volcanic activity. There is also some bioturbation in this layer: worm holes later sedimented shut. The layer has very little tensile strength, and easily falls out of the core. On the other hand it is quite hard to push through, probably explaining our failures in piston coring the site last year.

Below the turbidity flow region there seems to be more of the same as the top payer, but much more consolidated, and with the consistency of modeling clay.

We finished the 5th coring at 1840 un Monday, 14 Sept, and set sail for Hilo, 12 NM offshore (as they had no permit to land in Hilo). With some considerable difficulty, due to heavy weather in the area the shpping agent (Theo. Davies) located a small fishing boat that brought suplies and took me off the ship at about noon on Tuesday, the 15th. I returned to UH around 1600.

Follow up will be done by Craig and his team, by the Russian geologists on board who promised a geological analysis, and by tests now underway at UH (Alex in charge).

Summary: While awaiting the quantitative analysis we can still make two general conclusions:

1) The site does seem to have a good bottom for supporting our array. We can be sure that the cable and any tools dropped by the submarine, will however sink into the top layer. The lack of integrity of the turbidite layer will perhaps mean that the cores to be taken in two weeks by the Sea Cliff may have problems with dropping out the bottom unless there is a core catcher, yet the core catcher may cause problems with properly admitting the soft top layer.

2) The presence of the region that shows evidence of significant material transport is not terribly surprising. We know these events take place all around the islands, the question is how often (geologists now believe that even major pieces of the islands slump into the ocean launching tidal waves of sizes never recorded in history). We do not yet know the sedimentation rate at this site, but if the deep ocean rate of 1 mm/year obtains, then the turbidite layer may be 10,000 years old. As an example of what we might have seen and did not, was a bare bottom with ripples. Clearly this soft bottom does not often see high currents.