R. Houtz

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CRUISE REPORT

Ship Name: CONRAD Cruise No: 20-04

Departure: August 25, 1976 (Date) from GUAM (Port)

Arrival: Sept. 20, 1976 (Date) at YOKOSAKU (Port)

Days at Sea: ~~27~~ 26 Days Foreign Port: 4
No. of days in arrival port

Area of Operation: West Pacific, Shatsky Rise to Japan Trench

Program Description: 1. MCS/Sonobuoy Survey for 2-ship mantle Reflection Experiment

Participants: (All L-DGO unless otherwise specified)

NAME	SHIPBOARD TITLE
R. Houtz	Chief Scientist
D. Grab	Electronics Technician
D. Hill	Electronics Technician
B. Crowell	Electronics Technician
J. Sindt	Air Gun Technician
R. Crimmins	Core Bosun
P. Casagrande	Gravity Observer
J. Stennet	MCS Engineer
M. Gavin	MCS Technician
C. Gutierrez	Technician

All inquiries regarding cruise should be made to the chief scientist.

CRUISE REPORT C20-04

INTRODUCTION

This cruise was planned as a sonobuoy and MCS survey of the West Pacific which would provide reflection time to mantle at vertical incidence and the critical range for total reflection from mantle. This is required for the 2-ship experiment on the following leg. The work was also to be sufficiently detailed so that it could stand on its own as a study of the crustal structure of a subducting ancient Pacific plate.

RESULTS

The MCS data await processing and cannot yet be discussed, although the monitor records seemed to be of good quality. Mantle reflections and refractions were obtained on all the sonobuoys that were not faulty, and whose sound source was the large airguns. Mantle events were also obtained with the 2 RIX compressors driving a 120 in^3 gun, but the results were not always reliable. Many of the sonobuoy records were spoiled by unexpected topography. Mantle was reliably recorded at 30 sonobuoy stations, which were sufficiently dense to make contour maps of critical distance and reflection time to mantle. Typically the critical distance is 13 sec (D-time), but increases to 22 sec 200 km west of the trench, and the more than 20 sec on the western flank of Shatsky Rise. Reflection time to mantle is fairly constant throughout the area (9.8 to 10.5 sec). The contoured maps were left aboard for use on the next leg.

The strength of the refracted arrivals decreases regularly as the Japan trench is approached from seaward. At 165 km (SB 120) mantle is extremely weak or missing (SB 88); at 60 to 80 km (SB's 89 and 90) mantle is missing and the upper crustal refractions are very weak; at 55 km (SB 121) no refraction data are recorded, even though the quality of the recording is excellent. The transition from shallower mantle depths at SB's 79, 80 and 81 to the deeper mantle at SB 82, 85 etc. seems to correspond to the southern boundary of the gravity high.

Operations

Gun failures at the previous leg had resulted from towing them at high speeds. Consequently we did not use them enroute to the MCS survey area. This saved us some time, but was done mainly to save wear and tear on equipment. Since we had slipped one day in our schedule we took a rhumb line straight from Guam (adjusted to avoid an island chain), which was near previous Lamont tracks.

While the guns were being put in the water at the very beginning of the MCS work, an engineer informed us that No. 1 diesel was overheating. It was found to have a broken piston. The cause of overheating was thought to have resulted from a combination of back pressure in the exhaust, 83°F seawater, and the too small (1") piping to heat exchangers. Excellent sonobuoy data however, were obtained with just two guns firing at high pressure on one

compressor. Sonobuoy data were seriously degraded when the suppressors were used, so they were only tried once.

After one day of use, the valves in No. 2 compressor had to be ground. the 2 Rix compressors used as standbys could only provide 1300 PSI to a single large gun at 20 sec firing. Two days later the main bearing of No. 2 compressor burned out. The sonobuoy records were improved (but still marginal) by using the 2 Rix to drive a 120 in^3 gun at 1600 psi at 20 sec. The MCS eel was brought in since both compressor systems were down.

Bad weather resulting from a series of lows prevented any sonobuoy work for 2 days. We headed west for calm weather which gave Sindt an opportunity to break down No. 1 diesel. We abandoned working north of 38N and headed south. Sindt was able to use a spare piston from the coring winch and got No. 1 diesel back on the line 3 days after we got into calm weather. MCS put back in water. Heat exchanger plumbing on No. 1 was changed over to 1 1/2" piping throughout. During the period that the Price compressors were down (Sept. 2-8) I found that mantle sonobuoy data could be obtained with the 2 Rix and the 120 in^3 gun if the firing cycle were set at 30 sec and slow traverse recording is used.

No. 1 compressor and diesel operated for three days then the high pressure piston parted from the shaft that joins it to the low pressure piston. Went back to using the 2 Rix, but this time we left the MCS in the water. Sindt, Crimmins

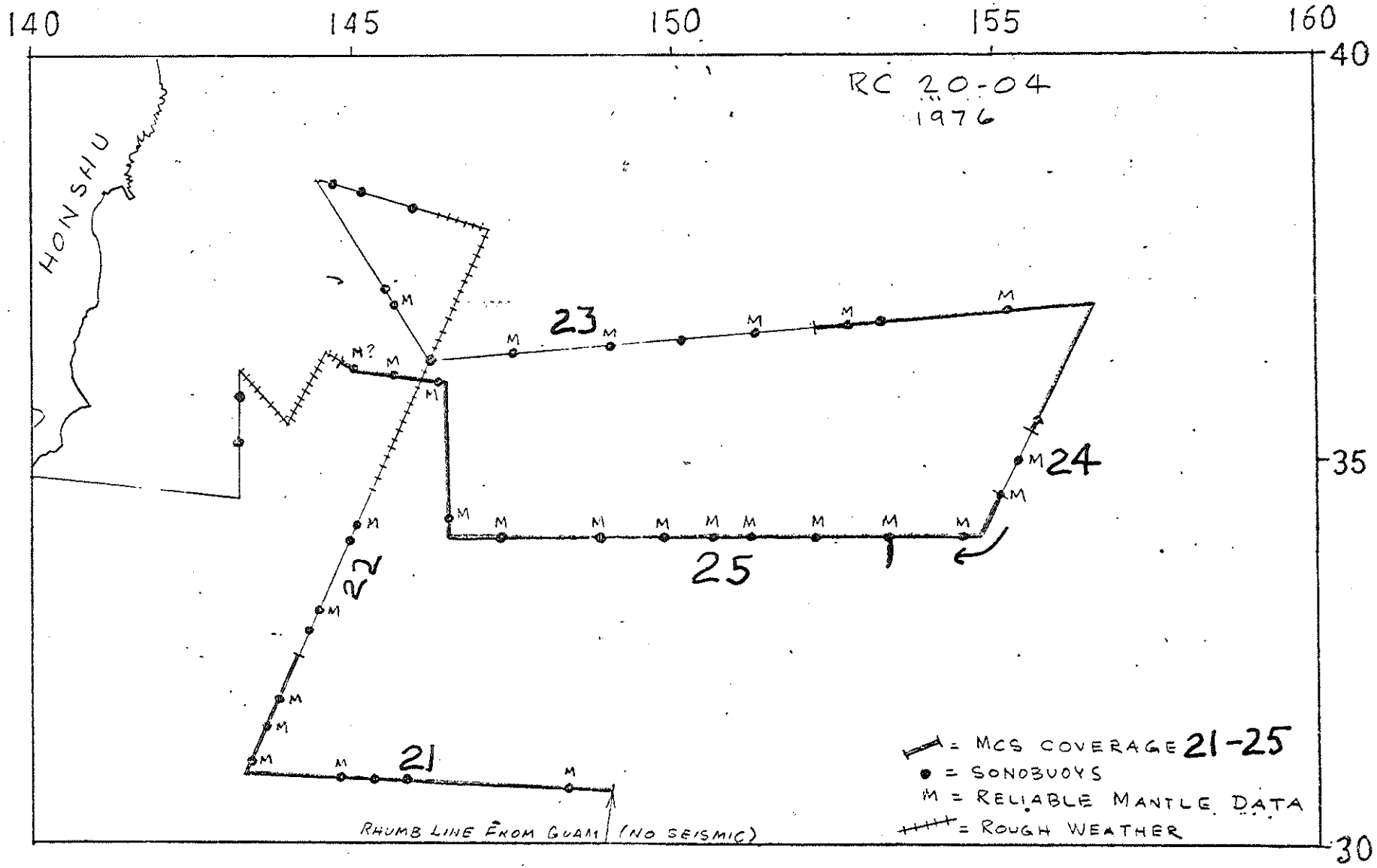
and Casagrande cannibalized the piston from No. 2, and had No. 1 back on the line the same day. This same team had worked very hard to get No. 1 diesel back on the line after we got in calm weather.

Typhoon Hope headed towards us bringing bad sea and wind conditions. The MCS was brought in Sept. 17. Too rough for sonobuoys, gravity off, maggie towing cable shorts out. Guns brought aboard and underway program reduced to PDR. Seismic operations resumed without the MCS when the weather cleared one day out of port, but then had to be shut down when compressor oil pressure dropped to less than 1/2 its normal pressure.

The gravity meter behaved erratically for significant periods of time, then would unaccountably settle down. The technician will try the new gyro when it arrives as a possible source of our troubles. The maggie cable developed a salt-water leak that got into the coil of the magnetometer. The coil was flushed out and the cable was re-potted into the towing head.

Recommendations

1. Randomizer needed for non-MCS legs.
2. Tail buoy on MCS would be larger and more visible.
3. As long as the large airguns are aboard, Chief Scientists should always strive for mantle data when sonobuoys are deployed.
4. Mobile license for SSB refraction transmitters. Unlicensed transmitters always worry radioman, and we run risk of getting fined.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RHUMB LINE FROM GUAM (NO SEISMIC)