IGPP to measure Antarctica tides for first time

December 11, 1969

Man's first attempt to measure tides in the deep oceans surrounding Antarctica is scheduled during January by scientists of the La Jolla laboratories of the University of California's Institute of Geophysics and Planetary Physics (IGPP), at Scripps Institution of Oceanography, it was announced here today.

Rounding out scheduled investigations will be scientists from Scripps, who will measure deep-sea currents; from Flinders University, Adelaide, South Australia, who will conduct hydrological studies; and from the Lamont-Doherty Geological Observatory, Columbia University, New York, who will take magnetic, seismic, and gravity readings. The ship's complement will report weather data by means of balloons flown in the upper atmosphere.

Main thrust of the 60-day effort conducted aboard the National Science Foundation research vessel Eltanin will be the launching of three IGPP free-falling deep-sea tide gauges, or capsules, along a 2,000-mile north-south track between Adelaide and Antarctica.

The gauges, to be placed 600 miles apart, will be installed in depths of 18,000, 12,000, and 15,000 feet, respectively, after the ship leaves the Australian mainland and will remain on the ocean floor for one lunar month.

Chief scientist aboard the Eltanin will be Frank E. Snodgrass, co-investigator with Walter H. Munk, IGPP director, of deep-sea tides. Snodgrass, designer of the deep-sea instrument capsule, is a research engineer with IGPP. Munk will join Snodgrass and his party in mid-January to participate in the recovery operations of the capsules from the sea floor.

Snodgrass left San Diego in late November for Adelaide to supervise preparatory work aboard the Eltanin, which sails from Adelaide December 15 on its two-months' cruise. The tide capsules were sent on ahead by freighter.

"Many scientists feel that because the oceans are continuous around Antarctica, the tides are unusually large and play an important role in exciting tides to the north in the Pacific, Atlantic, and Indian Oceans," Snodgrass said before he left for Adelaide.

"Now that we have successfully obtained deep-ocean data in the launching and recovery of our deep-sea tide capsules during some 40 operations in the Pacific, mainly off California, we feel justified in traveling a third of the way around the earth to examine the tides in this remote area never subjected to deep-water measurements.

"In addition, this expedition will continue a study of the deep-water circulation around Antarctica."

The latter reference is to the program set up by Joseph L. Reid, research oceanographer at Scripps, to install free-falling deep-sea current meters along the Eltanin's track to supplement current measurements made by the tide capsules.

This part of the expedition's work will be similar to that done by Reid in January of this year in the Drake Passage, between the tip of South America and Antarctica's Palmer Peninsula, during Scripps' Piquero Expedition. From data recorded by current meters placed at 21-2-mile depths, Reid and his associates estimated

that some 270 million gallons of water per second flow from the Pacific Ocean into the Atlantic through the Drake Passage.

The scientists from Flinders University's Horace Lamb Centre for Oceanographic Research will conduct extensive hydrological measurements of salinity and temperature versus depth to study the Flinders Current south of Australia.

They will also install the gauges across the 150-mile-wide Australian continental shelf near Adelaide to obtain additional tide data.

Prof. Rainer Radok, director of the Horace Lamb Centre, and Dr. John Bye, of the Centre, himself a Scripps graduate, head the Australian party.

Dr. Dennis Hays of Lamont-Doherty Geological Observatory will conduct measurements with the ship under way between stations in a continuing program of mapping the sea floor and the earth's magnetic and gravity fields.

The entire four-prong investigation is made possible under the continuing U. S. Antarctic Research Program. The Eltanin, recently equipped with computers and satellite navigation, has been participating in this work for nearly ten years.

The IGPP-Scripps investigations are being funded by the Office of Naval Research and the ship's operations by the National Science Foundation.

Working with Snodgrass and Munk will be James Irish, a Scripps graduate student, and Marion Singleton and Forrest Whitcomb.

Handling Reid's program will be Donald V. Rosendahl and Donald H. Palmer, both of Scripps.

Description of IGPP-Designed Deep-Sea Tide Gauge

The deep-sea tide gauge designed by Snodgrass measures tides in selected places in mid-ocean. Such measurements are normally taken from shore, where local land conditions, such as bays and rivers, distort the readings.

The gauge is a "free" vehicle; that is, it is not tethered to the vessel from which it is lowered. Its capsule, or hull, is made of aluminum spheres capable of withstanding the three-mile-deep pressures. The only communication between the capsule and the "mother" ship is through acoustic signals. Commands transmitted from the ship control the capsule and cause it to surface at the end of the experiment. The capsule transmits information to the ship describing its operation and condition.

Instruments attached to the capsule measure water temperature and currents, as well as pressure. Tidal information is obtained by measuring pressure with a sensitivity of 1/25th of an inch in three-mile depths. The gauges have been tested to depths of 15,000feet, but there is no doubt they will function at the greater depths planned in the Antarctic.

Data is recorded on magnetic tape within the capsule. After the capsule surfaces and is retrieved, the tape can be fed into a computer for analysis. A set of storage batteries anchors the capsule on the ocean bottom and also provides power for operating the instruments and the recording apparatus within the capsule. The combination battery pack-anchor remains on the ocean floor when the capsule is recalled to the surface.