earth sciences

FLUID DYNAMICS

Joint ocean-atmosphere model

In the last few years general circulation models of the ocean and the atmosphere have been developed separately at the Environmental Science Services Administration's Geophysical Fluid Dynamics Laboratory at Princeton University. These processes use intricate mathematical equations to simulate air and water motions (SN: 9/6, p. 185).

Now scientists have constructed a joint model of the ocean-atmosphere system. With it they can study global air-sea interactions, which are crucial to weather and climate. The work, by Drs. Syukuro Manabe and Kirk Bryan, is described in a series of three articles comprising almost the entire November MONTHLY WEATHER REVIEW.

Many effects have been identified. For example:

- Oceanic heating of cold continental air stimulates cyclones off the east coast of continents in higher latitudes.
- Upwelling of cool water at the equator tends to lessen rainfall over the tropical oceans.
- About two-thirds of the poleward transport of heat is due to circulation of the atmosphere; about one-third, to circulation of the ocean.

"It is highly probable," Dr. Manabe says, "that the various effects of the circulation of the model ocean identified in this study are also influencing the actual climate."

METEOROLOGY

Hurricane energy study with tritium

An improved understanding of hurricane energy has come from the use of the hydrogen isotope tritium, released into the atmosphere by the H-bomb tests of 1961 and 1962.

Using the tritium in the atmosphere as a tracer, Dr. H. Gote Ostlund, a geochemist at the University of Miami's School of Marine and Atmospheric Sciences, has determined that 13 percent of the energy driving a hurricane is picked up from the surface of the ocean in the form of tritium-free evaporated water. In other words, that percentage of the rainfall, and thereby the latent heat—constituting the energy driving the storm—is water evaporated from the ocean beneath the storm.

"This relatively small percentage is a little astonishing," says Dr. Ostlund. The fact that hurricanes generally dissipate over land hinted that the figure for evaporation might have been larger. "Possibly the 13 percent figure for evaporation plays an important role out of proportion to its size," he says.

OCEANOGRAPHY

First major Canadian expedition

The Canadian scientific ship Hudson embarked Nov. 19 on the first oceanographic expedition to circumnavigate North and South America. It is Canada's first oceanographic expedition on a world-ocean scale.

From Halifax, the Hudson will proceed south in the Atlantic, around Cape Horn and through the Chilean fiords, then north in the Pacific and around Alaska. Next fall it will proceed through the Northwest Passage of Canada's Arctic Archipelago, returning to Halifax in October.

The work in the southern oceans is Canada's contribution to the International Decade of Ocean Exploration. The studies in the Chilean fiords will provide comparison with the British Columbia fiords and basic information about the fiords of the world.

The surveys off the west and north coasts of Canada are part of an extensive Government program of geological and geophysical exploration. The studies will be centered on the continental shelves and slopes around Canada. Scientists will study sediments in the channels of the Arctic islands and the crust beneath the sediments. The work is expected to test further the continental drift theory and to help understand the massive uplifting of the continental shelves in the Arctic.

OCEANOGRAPHY

Melville joins research fleet

The United States' newest oceanographic vessel, the 245-foot Melville, has now joined the fleet of the Scripps Institution of Oceanography. It is the largest ship in operation for Scripps. A sister ship, the Knorr, is to be delivered soon to the Woods Hole Oceanographic Institution.

The two ships were built under a single contract totaling $11.8 million, excluding equipment. When fully outfitted the Melville will have cost about $7 million. Each ship will carry up to 62 scientists and 21 crewmen.

Special features of the 2,075-ton Melville include an opening that makes it possible to conduct coring and drilling operations through the hull. It also has a bulb-like unit that extends from the bow containing viewing ports for scientists and housing sonar equipment for underwater mapping.

The vessel is being used initially in local Scripps operations until scientists are familiar with it.

GEOLOGY

Gas analysis for earthquake prediction

A German geologist believes that earthquakes can be predicted through the relatively simple method of monitoring the air at the earth's surface for traces of gases of subterranean origin.

On March 1 this year, three days after a quake in southern Germany, Werner Ernst of the Geological Institute of Tübingen predicted that there would be an aftershock. There was, less than five hours later.

Ernst had noted an abnormal concentration of methane gas in a research shaft. He surmised that earth movements of the kind that precede quakes were permitting a greater than usual amount of the gas to rise through a fault.

The air in the shaft normally measures between 0.3 and 0.6 percent methane, but it rose to 2.2 following the Feb. 26 earthquake. The gas content had returned to normal by Feb. 28. But then, on March 1, there was another big increase, signaling the second shock and confirming the technique.