

On the edge between water and ice

In a project involving 11 nations, seven ships, eight aircraft, four helicopters and more than 200 people, oceanographers have journeyed to the Fram Strait region of the Greenland Sea to study the marginal ice zone — the boundary between open and ice-covered ocean.

With the seasonal advance and retreat of polar ice, roughly 7 percent of the world ocean is at some time during the year part of this boundary zone. The Marginal Ice Zone Experiment, called MIZEX, is helping scientists develop a comprehensive picture of the physical and biological interactions between ice, ocean and atmosphere at this boundary.

The Fram Strait area is of particular interest because it is the "main [ice] outlet for the Arctic Sea," says Miles McPhee, who served as chief scientist on the research vessel *Polarqueen* for the 1984 leg of MIZEX. In the April 24 *SCIENCE*, five groups report on their findings from MIZEX-84.



Shuchman/ERIM

A SAR image from MIZEX-84 with a central eddy approximately 30 kilometers in diameter. Bright zones are ice; dark zones are ice-free water.

This area, the northernmost extension of the Gulf Stream, is the mixing ground of cold, low-salinity Arctic water and warmer Atlantic water. Knowledge gained from MIZEX will have applications in the study of global climate. "It's a fairly strong feeling," says McPhee, "that sea-ice is a very sensitive indicator of what the climate is doing." Even small changes in the global climate, such as a "greenhouse" warming trend, will noticeably affect the position of the marginal ice zone, says McPhee.

MIZEX scientists conducted the main research during the summers of 1983 and 1984 and followed that with a winter study this March. Led by Norwegian oceanographer Ola Johannessen of the University of Bergen, these three segments were centered on the prime meridian, 400 kilometers east of Greenland.

One of the important results of MIZEX was that it demonstrated the potential value of remote sensing, says Robert Shuchman of the Environmental Research Institute of Michigan, in Ann Arbor. Because marginal ice zones are located in polar areas that are dark for half the year and are often obscured by clouds, MIZEX relied on a microwave radar, called synthetic aperture radar (SAR), mounted on aircraft to provide images with up to 15-foot resolution.

"Without SAR to give us insight into the circulation patterns, I don't think one can study places like the Greenland Sea," says Shuchman, who has just returned from the Fram Strait.

Shuchman and his colleagues report that SAR helped them locate the position of transient eddies near the ice edge. By

analyzing sequential SAR images, the group was also able to locate an eddy *beneath* the unbroken interior ice. Eddies, which circulate water at the edge of and under the ice, play a key role in determining how quickly the interior ice melts and breaks into smaller pieces.

In a separate study, MIZEX biologists tested to determine how eddies affect the populations of phytoplanktons, one-celled ocean organisms that serve as the basis of the polar food web. Walker Smith from the University of Tennessee in Knoxville told *SCIENCE NEWS* that "eddies were acting as a pump in the circulation so that nitrate [an essential nutrient] was being injected into the surface, therefore stimulating biological productivity."

More detailed results of MIZEX will appear in an upcoming special issue of the *JOURNAL OF GEOPHYSICAL RESEARCH* dedicated to studies of marginal ice zones. — R. Monastersky

Soviet-ODP partnership on or off?

While scientists on the international Ocean Drilling Program (ODP) drill-ship the *JOIDES Resolution* may sometimes have to brave a turbulent ocean, the ODP itself is weathering stormy seas of a political sort. Early in February it looked as if the National Science Foundation (NSF), which administers the ODP, had navigated a course that would make the Soviet Union the eighth international partner in the program. The Soviet Union, which had been a member of the Deep Sea Drilling Program, ODP's predecessor, had accepted NSF's invitation last year.

But plans for NSF officials to go to Moscow to sign a memorandum of understanding were short-circuited (SN: 2/14/87, p.102) by the Department of Defense. The reason, NSF officials told *SCIENCE NEWS* last week, is the Defense Department's concern about giving Soviet scientists access to about half a dozen pieces of the *Resolution's* equipment that are on the Commerce Department's export control list.

A Defense Department spokesman says the agency is "not opposed to the scientific endeavor" but is concerned about "techniques and technologies used for deep-water [drilling] operations" and the ability to "hold a ship in position over deep water."

Scientists who have participated in ODP cruises are expressing displeasure at the action. According to one crew member, researchers aboard the *Resolution* during ODP's recent Leg 113 (see story on p. 278) joked that if the Soviets obtained access to the ship's antiquated computer system it would set the Soviets back 10 years.

More seriously, NSF's Alexander Sutherland says that while scientists in

general may occasionally observe the ship operations and drilling gear of concern to the Defense Department, they don't have hands-on access to the equipment. What's more, he says, "the Soviet Union already has the world's newest fleet of drillships" and he doubts that the equipment on the *Resolution* would be much more advanced than that on Soviet ships.

NSF and ODP scientists would also welcome the Soviets' scientific expertise and their annual \$2.5 million membership fee. Moreover, with the Soviets as members, ODP scientists might be more likely to get permission from the Soviet Union to drill in the Soviet Arctic, a longtime goal that has been out of ODP reach. (Sutherland says that if permission is granted, one possible approach for such a project would be to permanently freeze an old drillship into an ice floe for Arctic drilling.)

According to a Defense Department spokesman, the National Security Council will "coordinate an interagency decision" within a month or so. NSF officials hope the decision is made before this July, when a few hundred scientists will meet in Strasbourg, France, for the Conference on Scientific Ocean Drilling II to plan the next five to 10 years of drilling projects. "You'd like to have all your partners in before you make those kinds of decisions," says Sutherland.

Ocean sciences, he continues, are generally benign and should be kept fully and openly international. "It's not as though we were doing laser physics," he says. "If the ODP can't cooperate with the Soviet Union in an international science program, I'm not sure what kind of science program can." — S. Weisburd