Earth Science

Bonanza of Arctic Ocean data

The mere stroke of a pen last month dramatically boosted oceanographers' knowledge about the Arctic seafloor. The U.S. Navy declassified formerly secret data collected by submarines between 1957 and 1982.

Ever since naval submarines started prowling the Arctic Ocean, they have been making measurements of the seafloor depth. Because ordinary ships cannot plow through the ice-covered central Arctic, civilian oceanographers have lacked detailed information about this region—one of the least-known parts of Earth's surface.

The Navy, the State Department, and the U.S. Arctic Research Commission collaborated to pull together the secret data and arrange for their release. "This is at least a factor of two, and maybe three or four, times more data for the central Arctic than what was available before," says the commission's Garrett W. Brass.

The new information will aid researchers studying a broad array of questions, he says. Climate scientists, for instance, need to know the highs and lows of seafloor topography in order to chart the paths of deep currents of cold water that develop in the Arctic and then flow south into the Atlantic. —*R.M.*

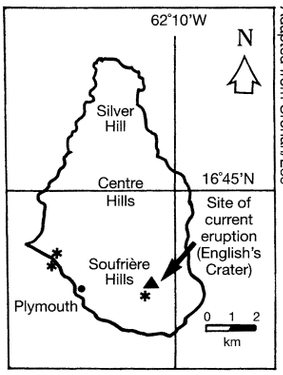
Hot springs provide hints of eruption

People living in the shadow of a dormant volcano may want to keep tabs on some of the hot springs in their region. On the Caribbean island of Montserrat, underwater thermal springs just off the coast gave off clues of mounting danger before the Soufrière Hills Volcano erupted there in 1995, according to British researchers.

While studying hot springs in the Caribbean, the team fortuitously surveyed three sets on Montserrat in January 1995. Six months later, on July 18, the volcano reawoke from more than 3 centuries of slumber, starting a cycle of eruptions that has devastated the southern two-thirds of the island over the last 2 years (SN: 8/16/97, p. 101). David S. Cronan of the Imperial College of Science, Technology, and Medicine in London and his colleagues returned to measure the springs immediately after the July eruption and again in December 1995.

The two sets of hot springs on land showed no systematic changes during the period, but the springs located only 50 meters from the beach displayed a dramatic increase in activity. In July, concentrations of iron averaged 300 times the value measured in January. Manganese concentrations had increased by 40 times and arsenic by 60 times, the researchers report in the Aug. 19 Eos.

Because Cronan and his team made their second set of measurements after the eruption, they cannot tell for certain whether the metals increased before or during the July blast. Some evidence, however, points to the changes occurring before the volcano blew. When the scientists made measurements during subsequent eruptions in December, they saw relatively stable metal concentrations, suggesting that the blasts themselves do not alter the fluids substantially.



Adapted from Cronan/Eos

Asterisks locate offshore and onshore hot springs on Montserrat.

Cronan suggests that molten rock rising up under the volcano in early 1995 helped heat seawater circulating through the seafloor. The hot fluids leached elements from the crust faster than normal, leading to greater concentrations of dissolved metals in the water spewing from the submerged hot springs. —*R.M.*

Science & Society

DOD's year 2000 vulnerabilities

Though year 2000 worries are grabbing headlines everywhere, few nightmare scenarios are as obvious as those confronting the Department of Defense. It faces critical threats to its military readiness, operations, and security, observes the General Accounting Office (GAO) in two reports issued last month.

For decades, software programmers have abbreviated years by using just the last two digits. As the next century dawns and the date counters cycle back to 00, computers relying on two-digit dates can no longer distinguish between 2000 and 1900.

The key to identifying what Defense needs to fix, GAO believes, is a departmentwide inventory of all its computer systems. Defense has pointed to a database known as DIST—which catalogs its automated information systems—as a pivotal tool in its correction efforts. Yet GAO found that DIST users generally consider the system cumbersome, technologically antiquated, and rife with erroneous data. If these problems are not corrected immediately, GAO charges, the Defense Department's efforts "will be at risk of failing."

The Defense Logistics Agency (DLA) offers a window on the department's vulnerability. Located within Defense, DLA is dependent upon computers not only for securing and managing military supplies of food, fuel, medicine, and clothing but also for supporting more than 1,400 weapons systems. Other agencies rely on DLA to manage almost $1 trillion worth of contracts.

The agency is at work fixing the 86 automated information systems on which it will rely after 2000—programs containing some 39 million lines of computer code. However, GAO notes, DLA "has not yet taken the fundamental steps [for] ensuring the proper date information is passed between systems," nor has it adequately set priorities for which systems should be attended to first.

Recently, the Defense Department got a taste of what headaches lie in store, when a faulty year 2000–related date calculation inappropriately removed from inventory 90,000 items in DLA's materiel management system. Correcting the problem took 400 hours.

So far, Defense has not explained in detail its planned year 2000 remedies to agencies and industrial contractors whose computers interface with DLA's, nor has it ensured that such interfacing programs will be fixed in time. If they aren't, GAO argues, "they can introduce and/or propagate errors into DLA systems."

Finally, GAO finds, DLA has not developed contingency plans "to establish the course of action that should be followed in the event that any of DLA's mission-critical systems are not corrected in time." Why not? "Officials told us that they expect all their systems to meet their year 2000 deadline and, for that reason, contingency plans are not needed," GAO reports. —*J.R.*

Want a job? Become a PhD

The unemployment rate among U.S. residents with a doctorate in science or engineering runs at about 1.5 percent—or approximately one-quarter the unemployment rate for the entire labor force, according to an Aug. 14 report by Carolyn F. Shettle of the National Science Foundation in Arlington, Va. Essentially unchanged since 1973, the doctoral unemployment rate has remained well below the norm. People with less advanced degrees in science fell midway between the two.

Among the 27,000 persons who received science or engineering doctorates in 1995 (the most recent year for which data are available), research proved the predominant activity only for engineers (67 percent) and physical scientists (54 percent), according to National Research Council data tabulated in the Aug. 29 Chronicle of Higher Education. Roughly one-third of all science PhDs entered teaching, more than twice the rate (12 percent) among the engineers. —*J.R.*