MEETINGS

Modern Perspectives on Measuring and Interpreting Seafloor Heat Flux

The Future of Marine Heat Flow: Defining Scientific Goals and Experimental Needs for the 21st Century; Salt Lake City, Utah, 6–7 September 2007

There has been a renaissance of interest in marine heat flow in the past 10–15 years, coinciding with fundamental achievements in understanding the Earth's thermal state and quantifying the dynamics and impacts of material and energy fluxes within and between the lithosphere and hydrosphere. At the same time, technical capabilities have dwindled to the point that no U.S. academic institution currently operates a seagoing heat flow capacity.

In September 2007, a workshop was convened in Salt Lake City with sponsorship from the U.S. National Science Foundation (NSF) and participation by scientists and engineers from the United States, Canada, Europe, South Korea, and Japan. The primary goals of the workshop were to (1) assess high-priority scientific and technical needs and (2) to evaluate options for developing and maintaining essential capabilities in marine heat flow for the U.S. scientific community.

Workshop participants emphasized how marine heat flow data are proving especially important for interdisciplinary initiatives that link physical, chemical, and biological processes in the deep marine environment, and are contributing in new and sometimes unforeseen ways to plate boundary, geodynamics, subseafloor hydrology, and deep biosphere studies. Such studies are important on their own and to the scientific goals of the Integrated Ocean Drilling Program, MARGINS and InterMargins, RIDGE2000 and InterRIDGE, and now the NSF's Ocean Observing Initiative. Specific discussions included (1) combining conductive marine heat flow data with new technologies for measuring the advective components of heat transfer as a means to assess the role of seeps and vents in regional and global thermal budgets; (2) the role of heat flow measurements in understanding the evolution of hydrothermal circulation; and (3) geodynamic insights from the thermal state of the lithosphere, transform faults, subduction zones, and hot spots.

Modern marine heat flow studies commonly include coincident seafloor and subseafloor mapping and imaging surveys and sediment coring programs that provide material for physical, chemical, and microbiological analyses. Navigational technologies that precisely locate marine heat flow probes on the seafloor, and new perspectives on survey design and nesting of widely and closely spaced heat flow measurements, have improved the quality, interpretability, and utility of the data for many scientific problems. These approaches have turned intermeasurement variability that was once considered to be experimental noise into signals that respond to shallow subseafloor processes related to fluid flow, gas hydrates, sedimentary processes, and oceanographic phenomena.

Although the scientific need for continued acquisition of seafloor heat flow data cuts across disciplines and programs, the future of U.S. capabilities remains uncertain. The U.S. community needs to move quickly to establish basic capabilities in the acquisition, processing, and interpretation of marine heat flow data, before critical expertise is lost. The workshop considered several relatively low cost (e.g., pay-as-you-go) models to provide the U.S. community with access to modern marine heat flow capabilities during surveys on UNOLS (University National Oceanographic Laboratory System) and other research vessels.

The full workshop report is available at http://www.coas.oregonstate.edu/Workshop/FutureofMarineHeatFlow.html. We thank the National Science Foundation (OCE06-48146) for financial support.

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