

EDITORIAL

The Labrador Sea Deep Convection Experiment

One of the most poorly understood, observed, and modeled processes in the ocean is open ocean deep convection, in which large volumes of water have their properties changed by mixing driven by winter storms. In 1994 the Office of Naval Research began an Accelerated Research Initiative to study deep convection and improve its representation in ocean models. One of its goals was to foster a strong collaboration between modelers and experimentalists. Models would guide the observations and the observations would be used to test the models. Due to its great importance to the global ocean circulation, the Labrador Sea was chosen for the site of an intense observational program.

This special issue of the *Journal of Physical Oceanography* draws together the first results of the Labrador Sea Experiment, an attempt to comprehensively observe, model, and understand deep convection in the ocean in a region of great climatic importance, described in the *Bulletin of the American Meteorological Society*, Vol. 79, No. 10, pages 2033–2058. The overarching goal of the experiment was to improve our understanding of the convective process in the ocean, and hence the fidelity of its parametric representation in large-scale ocean models, through a combination of meteorological and oceanographic field observations, laboratory studies, theory, and modeling.

The field program began in the autumn of 1996 and had as its primary focus the oceanic convective process and its interaction with geostrophic and basin-scale eddies and circulation. But its other proximate goals grew to be major efforts in themselves: the investigation of the atmospheric synoptic and mesoscale dynamics that result in intense air–sea interaction in the region, the coupled dynamics of the deep convection process in the atmosphere and ocean, the communication of newly convected waters of the Labrador Sea with the World Ocean; and the relation between convection and decadal climate variability.

The experiment took place in the larger context of the Fronts and Atlantic Storm Track Experiment (FASTEX) and the World Ocean Circulation Experiment (WOCE). The context provided by these related experiments provided a much clearer and more complete picture of the synoptic meteorology in the region and the larger-scale circulation of the ocean.

Advanced and newly conceived technologies abounded in the experiment; beyond classical hydrographic sections and moorings measuring velocity, salinity, and temperature we deployed drifting and profiling floats, three-dimensional nearly Lagrangian drifters that can follow the convective process vertically as well as horizontally; acoustic tomography and vertical echo sounding aimed at long-baseline temperature, salinity, and currents; newly designed profiling CTD moorings and moored and lowered acoustic Doppler current profilers; shipboard air/sea flux instrumentation, wave radar systems, airborne and satellite passive microwave and scatterometer systems, and synthetic aperture radars. The datasets that were gathered exceed by far previous efforts to observe the convective process anywhere in the ocean, in both the scope and range of techniques deployed. They will provide an important resource for many years to come. Here then are some of the first results of the endeavor.

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