Geophysical Research Abstracts
Vol. 16, EGU2014-3154, 2014
EGU General Assembly 2014

Arctic Outflow West of Greenland: Mass and Freshwater Fluxes at Davis Strait

Craig Lee (1), Beth Curry (1), Brian Petrie (2), Kumiko Azetsu-Scott (2), and Jason Gobat (1)

(1) University of Washington, Applied Physics Laboratory, Seattle, United States (craig@apl.washington.edu), (2) Bedford Institute of Oceanography, Dartmouth, Nova Scotia, Canada

Eberhard Fahrbach worked to understand the communication between the Arctic and subpolar oceans and its role in modulating Arctic change. This included long-standing leadership in the Arctic-Subarctic Ocean Flux program and the long-term quantification of fluxes east of Greenland, through Fram Strait, the primary pathway for Atlantic water passing into the Arctic and one of two gateways for freshwater flowing out.

Freshwater also exits the Arctic west of Greenland, though the Canadian Arctic Archipelago and, to the south, Davis Strait. The strait provides a convenient choke point for monitoring temporal and spatial variability of Arctic outflow while also characterizing a critical upstream boundary condition for Labrador Sea convection. Fluxes through the Strait represent the net integrated Canadian Archipelago throughflow, over 50% of the Arctic's liquid freshwater discharge, modified by terrestrial inputs and oceanic processes during its southward transit through Baffin Bay. By the time they reach Davis Strait, Arctic waters already embody most of the transformations they undergo prior to exerting their influence on the deepwater formation sites in the Labrador Sea.

An ongoing program has characterized Davis Strait volume, freshwater and heat flux since September 2004. Measurements include continuous velocity, temperature and salinity time series collected by a moored array, autumn ship-based hydrographic sections and high-resolution sections occupied by autonomous gliders. Moored instrumentation includes novel new instruments that provide temperature and salinity measurements in the critical region neat the ice-ocean interface and measurements over the shallow Baffin and West Greenland shelves, while gliders have captured the first high-resolution wintertime sections across the Strait. These data show large interannual variability in volume and freshwater transport, with no clear trends observed between 2004-2010. Average volume, liquid freshwater and sea ice transports are -1.6 +- 0.2 Sv, -93 +- 6 mSv and -10 +- 1 mSv, respectively (negative indicates southward transport). However, changes in circulation have occurred, as freshwater outflow from Baffin Bay has decreased and warm, salty North Atlantic inflow has increased since 1987-90. Local atmospheric variability within Baffin Bay and the Labrador Sea influence the observed variability in Davis Strait volume transport either directly or indirectly. Large-scale atmospheric teleconnections, such as the AO and NAO, correlate poorly with Davis Strait volume transport and are likely only an indicator of transport variability when the indices are strong.