# The Arctic Observing Network: Sustained Observations at the Davis Strait Gateway

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The Davis Strait observing program (Figure 1) has supported 22 published papers, with three more currently under review, three doctoral dissertations and several reports. Highlights from some of these results serve to illustrate the scientific role of long-term observations at the Davis Strait gateway.

Six-year (2004-2010) monthly-mean sections of cross-strait velocity, temperature, and salinity from moorings and gliders (Curry et al. 2014) illustrate persistent features and a seasonal cycle (Figure 2). A sharp, persistent front separates the south-going Baffin Island Current from north-flowing waters composed of the upper-ocean West Greenland Current and the deeper West Greenland Slope Current. The cross-strait position of this important front varies seasonally and interannually, which strongly impacts flux calculations (Curry et al. 2011; Curry et al. 2014). Glider-based sections provide a well-resolved measure of frontal position and structure, and quantify seasonal changes in the upper ocean, addressing two large sources of uncertainty and resolving seasonal to interannual changes in important flow structures that were previously impractical to sample.

The 2004-2013 monthly-mean net volume and freshwater flux through Davis Strait (Curry et al. 2014) has significant interannual variability, with only weak seasonality (due to phase cancellations in the water mass components that make up the mean) and no statistically significant trends. The 2004-2013 mean net volume and freshwater fluxes are -1.6±0.2 Sv and -94±7 mSv, respectively, with sea ice contributing -10±1 mSv of freshwater flux. When analyzed by water mass class, volume and freshwater fluxes show seasonality in south-flowing Arctic waters consistent with previously observed seasonality in Lancaster Sound (Peterson et al. 2012) and Nares Strait (Munchow and Melling 2008). Vage et al. (2009) assessed the impact on Labrador Sea deep convection, while Gladish et al. (2014) investigated the impact of north-going warm inflow into the Ilulissat Icefjord.
The steady accretion of long, concurrent time series at the three major Arctic Ocean gateways (Fram Strait, CAA/Davis Strait and Bering Strait) and the distributed measurements within the Arctic Ocean enable investigations of pan-Arctic freshwater exchanges and budgets. A freshwater budget that spans the period of concurrent gateway measurements (Haine et al. 2014) finds net inflow, consistent with observed and modeled increased freshwater storage in the Arctic Ocean. The study notes that shifting wind patterns could accelerate discharge through Davis and Fram straits, and emphasizes the need for continued measurements of Arctic freshwater fluxes and storage. Tsubouchi et al. (2012) and Haine et al. (2014) provide examples of high-priority science enabled by a network of sustained, concurrent observations at key locations within the Arctic system.

Torres-Valdes et al. (2013) combined velocity fields generated by an inverse model with a quasi-synoptic assemblage of hydrographic and hydrochemical data to estimate nutrient transports across all the Arctic gateways, finding Davis Strait to be the dominant pathway for nutrient exports. Baseline estimates for dissolved inorganic carbon (DIC) transport were derived using the same approach, revealing Arctic Ocean