



## How is the Fram Strait Freshwater Outflow Responding to Changes in the Arctic Climate System?

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The composition of the Fram Strait freshwater outflow is investigated by comparing 10 sections of concurrent salinity,  $\delta^{18}\text{O}$ , nitrate and phosphate measurements collected between 1997 and 2012. The largest inventories of net sea ice meltwater are found in 2009, 2010, 2011 and 2012. The 2009–2012 sections are also the first to show positive fractions of sea ice meltwater at the surface near the core of the EGC. Sections from September 2009–2012 show an increased input of sea ice meltwater at the surface relative to older September sections. This suggests that more sea ice now melts back into the surface in late summer than previously. Comparison of April, July and September sections reveals seasonal variations in the inventory of positive sea ice meltwater, with maximum inventories in September sections. The time series of sections reveals a strong anti-correlation between meteoric water and net sea ice meltwater inventories, suggesting that meteoric water and brine may be delivered to Fram Strait together from a common source. We find that the freshwater outflow at Fram Strait exhibits a similar meteoric water to net sea ice meltwater ratio as the central Arctic Ocean and Siberian shelves, suggesting that much of the sea ice meltwater and meteoric water at Fram Strait may originate from these regions. However, we also find that the ratio of meteoric water to sea ice meltwater inventories at Fram Strait is decreasing with time, due to an increased surface input of sea ice meltwater in recent sections. From 2010 to 2013, automatic water samplers have provided high frequency year round tracer observations required to resolve seasonal and short-term variations in the freshwater composition at Fram Strait. Measurements from these instruments reveal significant short-term variations in the freshwater composition over the East Greenland Shelf.