



The ASOF Study: long-term monitoring of the two-way exchanges of heat, mass and salt between the Arctic Ocean and the North Atlantic

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The Arctic Subarctic Ocean Fluxes Study (ASOF) aims to measure and model the variability of fluxes between the Arctic and the Atlantic Ocean with a view to implementing a longer-term system of critical measurements needed to understand the high-latitude ocean's steering role in decadal climate variability. ASOF is structured around six main regional tasks that identify the broad range of upstream influences that might impose change on the thermohaline circulation of the North Atlantic. These are supported by a 7th numerical experimentation group that provides modelling support at all stages from experiment design to interpretation. Further details of the ASOF program can be found at: <http://asof.npolar.no/>

Certain of the ASOF choke-point arrays represent the continuation of moorings begun during the EC VEINS programme (1997-2000) or earlier. From these long-sustained gateway arrays and from model output, it has been possible for the first time to recognise the system-wide nature of the long-term decadal changes passing through Arctic and Subarctic seas, and to formulate and test ideas on the complexity and systematic nature of these changes.

The questions on which ASOF is currently focused are these:

- How well can we now predict the flux of warm saline water west of Norway and through the Barents Sea? Remote versus local forcing is the key issue being resolved.
- What new perspectives do we have on the Denmark Strait Overflow? Among the emerging evidence of overflow variability, the key issues continue to be the

origin and pathways of watermasses recruiting to the overflows and the degree of common forcing between them.

- How well can we model hydrographic change in the Subpolar Gyre of the NW Atlantic? The Labrador Basin represents the receiving volume for many of the fluxes that we are measuring through subarctic seas, so that our ability to simulate the changes observed throughout the watercolumn of the Labrador Sea over 4 decades —among the largest changes in the modern oceanographic record, anywhere— offers a useful test of our ideas on how the ocean-atmosphere system of Arctic and Subarctic seas is changing ‘upstream’.
- How well do we know the freshwater fluxes through Arctic and Subarctic Seas? We are still at a relatively primitive stage in mapping these fluxes through northern seas and our evidence of their variability still relies on a mix of direct observations, modelling and hydrographic analysis. Based on these estimates, the question on which ASOF is currently focused is the fundamental one of whether the influence of freshwater fluxes on the MOC is likely to take effect through processes of local (overflow), regional (‘hosing’ the NW Atlantic) or global (worldwide salinity redistribution) scale, individually or in combination.