



Development of an integrated Arctic Ocean Observing System (iAOOS) for the IPY

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Recent extreme tendencies in climate forcing at high latitudes appear to be reflected in the observed behaviour of our northern seas. Over the past several decades, our direct and proxy observations have described:- an irregular warming along both the Barents Sea and West Spitzbergen Current branches of Atlantic Water inflow to the Arctic Ocean; a 60-year increase in the discharge of Eurasian rivers to the Arctic, now seemingly confirmed and attributed through modelling; a reduction in Arctic sea-ice to a minimum concentration in 2002-3 'almost certainly unmatched in 50 years of charting Arctic sea-ice'; a large increase over 40 years in the freshwater loading of the Nordic Seas and Subpolar gyre, equivalent to the addition of around 19,000 km³ of freshwater since the 1960s; a 40 year freshening of the system of dense overflows that descend from spillways on the Greenland-Scotland Ridge to ventilate the deep Atlantic; a 40-year increase in the transport of the relatively-fresh waters passing south from subarctic seas around the Labrador shelf and slope.

As each of a succession of broad-scale observational arrays (EC-VEINS, ASOF etc) has delivered its unambiguous evidence of change, the emphasis has gradually shifted from its simple description to its climatic significance. Plainly, large-scale changes in the feed of warm saline water northward to the ice-covered Arctic Ocean, or in the southward flux of ice and fresh-water to the Atlantic are likely to have an impact on the Earth's climate system. The cold, dense overflows from Nordic Seas across the Greenland-Scotland Ridge drive the abyssal limb of the Atlantic Meridional Overturning Circulation (MOC); increases in the freshwater flows from the Arctic either side of Greenland are implicated in model experiments with slowing that circulation down.

Our best chance of mitigating climatic impacts at a time of global change lies

in developing a sufficient understanding of the ocean-hydrosphere-cryosphere system of our Northern seas *working as a complete system* to model and predict these changes. With the necessary new techniques just developed or in prospect, the upcoming International Polar Year (2007-9) should give us our first view of that complete system in operation, though to achieve that view it will be necessary to coordinate ships, equipment and PIs on a pan-Arctic scale. A proposal to establish an integrated Arctic Ocean Observing System (iAOOS) across Northern Seas for this purpose has been tentatively endorsed by the IPY Joint Cttee as one of 135 coordination or 'clustering' proposals by which the IPY will be carried through [see <http://www.ipy.org/development/eoi/proposals.php>]. The *actual* scope of iAOOS will depend on the outcome of funding decisions that are currently being made across three continents. Nonetheless, this talk will describe the rationale, domain, context and scope of a *potential* iAOOS programme, and suggest a structure by which this proposal might be carried a further step towards implementation.