between sea-surface temperature anomalies over the Gulf Stream extension region and the leading mode of Northern Hemispheric atmospheric variability are investigated.

OC-138

Freshwater Transports for the Global Ocean

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Meridional freshwater transports in the ocean are calculated from geostrophic velocities based on Reid (1994, 1997, 2003) and Ekman transports from near-surface climatologies. The overall freshwater transports and convergences agree reasonably well with previous estimates and with net evaporation/precipitation/runoff. The global total freshwater transports show an input of about 0.7 Sv from the Southern Ocean and 0.5 Sv from the Arctic Ocean into the lower latitudes, which thus have net evaporation. The freshwater transports are separated into contributions from the shallow, nearly horizontal ventilated circulation of the subtropical gyre thermoclines, and from intermediate and deepwater overturn. Because the major evaporation cells are centered in the subtropical gyres, the freshwater transports across the commonly-used 24°N and 30°S sections are neither robustly poleward nor equatorward, but depend on the location of the sections relative to the basin evaporation maximum. The order of magnitude of freshwater transport carried by each shallow gyre overturn is 0.1 Sv. North Pacific Intermediate Water formation carries about the same freshwater transport even though the net mass transport involved is much smaller. Formation of Labrador Sea Water and North Atlantic Deep Water carry 0.2 and 0.3 Sv equatorward in the North Atlantic due to northward flow of saline surface waters feeding the overturns, returned by somewhat fresher waters southward. Bering Strait freshwater transport from the Pacific is only a small fraction of the freshwater transport from the Arctic into the Atlantic.

Most of the equatorward southern ocean freshwater transport is carried by shallow overturn, with a large contribution from northward-subducting fresher Subantarctic Mode Water in the Pacific and Indian Oceans and southward saline flow in the Agulhas, with an important connection through the Indonesian Throughflow. The large deep overturning mass transport in the southern ocean due to formation of bottom waters from deepwaters carries only a small amount of freshwater poleward. Pacific and Indian deepwater freshwater transports are equatorward, associated with low latitude downward diffusion of higher salinity into the upwelled, southward-flowing deepwaters. In the South Atlantic, freshwater transport associated with conversion of low salinity Antarctic Intermediate Water into North Atlantic Deep Water (NADW) is counterbalanced by conversion of higher salinity Benguela Current water also into NADW.

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The Upper Branch of the North Atlantic Overturning Circulation

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The upper waters of the Gulf Stream must connect to the North Atlantic's subpolar gyre to feed the deeper portions of the North Atlantic Deep Water formed in the Nordic Seas and Labrador Sea. Two aspects of this connection are presented.

(1) Almost none of the subtropical surface drifters, drogued at 15 m, cross into the subpolar gyre, even though one would expect 15 to 20% to cross, based on the relative strengths of the Gulf Stream and the NADW overturning cell. We show, using the surface drifter's mean flow, with random noise to simulate the eddy field, and wind stresses from NCEP reanalysis, that this observational disconnect between the gyres is most likely due to small but important southward Ekman velocity. Thus an adequate representation of the cross-gyre flow in the upper layers requires floats below the Ekman layer.

(2) The surface circulation of the subpolar gyre, based on Lagrangian drifters, is composed of three strong branches of the North Atlantic Current, strongly associated with the complex topography. We show that the subpolar surface waters feeding the Nordic Seas and the Labrador Sea originate from well-separated types of Subpolar Mode Waters, which are the surface waters of the subpolar gyre. That is, the Subpolar Mode Water (SPMW) of the eastern North Atlantic that feeds the Norwegian Current is distinct from the SPMW that is found in the Irminger gyre. Throughout the subpolar gyre, the thickest SPMW layers are associated with topography and/or strong fronts. A particularly homogeneous pool of western SPMW is found along the Reykjanes Ridge.

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OC-140

An Array to Monitor the North Atlantic Meridional Overturning Circulation at 26N

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During February-March 2004 we are deploying an array of moored instruments that will measure temperature, salinity and velocity profiles at about 20 locations across the Atlantic Ocean at 26°N. This is the beginning of a 4-year pilot monitoring effort to measure the strength of the Atlantic meridional overturning circulation and heat flux across 26°N under the "Rapid Climate Change" programme. Deployment of the array in two ocean circulation models (OCCAM and FLAME) has demonstrated that the planned array measurements accurately reproduce the variability in overturning circulation within the models. Moorings are concentrated on the western side of the 26°N section to measure the deep western boundary currents, on the eastern side of the section to measure eastern boundary currents, and on either side of the Mid Atlantic Ridge to