Geophysical Research Abstracts, Vol. 6, 06649, 2004
SRef-ID: 1607-7962/gra/EGU04-A-06649

GLOBAL FRESHWATER TRANSPORTS FROM OBSERVATIONS

L. D. Talley (1), J. L. Reid (1), P. E. Robbins (1)

(1) Scripps Institution of Oceanography, University of California San Diego (ltalley@ucsd.edu/Fax: 1-858-534-9820)

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 deep water 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. Labrador Sea Water and North Atlantic Deep Water formation 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.