Geophysical Research Abstracts,
Vol. 11, EGU2009-1928, 2009
EGU General Assembly 2009

Determining Mixing and Circulation in the Southern Ocean

J. D. Zika (1,2), T. J. McDougall (1), and B. M. Sloyan (1)

(1) Centre for Australian Weather and Climate Research, CSIRO, Castray Esplanade, Hobart, TAS 7004, Australia (jan.zika@csiro.au), (2) Climate Change Research Centre, University of New South Wales, NSW 2052, Australia

The strength and structure of the Southern Hemisphere Meridional Overturning Circulation (SMOC) is related to the along-isopycnal and vertical mixing coefficients (K and D respectively) by analysing tracer and density fields from hydrographic data. The total transports across temperature contours on isopycnals, inferred from both tracer and density distributions suggest a ratio of K to D of order 10^6 particularly on deeper layers of Upper Circumpolar Deep Water. Analysis of the overturning circulation for such a balance reveals a view of the SMOC where deep water is transferred to lighter and denser layers in the Southern Ocean not only at the surface but also in the ocean interior with vertical mixing playing an important role. We relate the cross contour transport to a geostrophic streamfunction on ispoycnal surfaces. A new inverse method is then developed. In this method points sharing the same temperature and salinity, such as along the Antarctic Circumpolar Current, are connected by Tracer Tubes. Here vertical and along isopycnal mixing processes as well as the mean and residual circulations may be inferred directly from the observed hydrography.