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Times series of velocity, temperature and salinity in the Ona Basin, Southern Drake Passage

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Time series of velocity, temperature and salinity gathered in the Ona Basin, southern Drake Passage are presented and analysed. They were obtained at four mooring sites located under the Jason satellite groundtrack #104. They were measured by 12 current meters (3 instruments per mooring at 500, 1000 and 2500 m) and 2 microcats during 26 months (Feb 2006- April 2008). The time series at the southernmost site located on the continental slope of the Antarctic Peninsula are complemented by 13 months of data acquired in 2003-2004.
Velocities as high as 0.5 ms-1 at 500 m depth are observed during current pulses that severely pulled down the moorings over periods of several days. Satellite data provide background information to understand the situation during those extreme events. Mean velocity amplitudes at 500 m reach 0.22 ms-1 at 58.5°S and 0.15 ms-1 at 60°S and are smaller at 59°S and 60.5°S. Mean velocities at 2500 m vary between 0.05 and 0.10 ms-1 and are westward on two of the moorings, suggesting a recirculation pattern in the center of the basin and a deep mean westward flow on the slope. The southernmost mooring (continental slope) was under sea ice in winter, and velocity variations were reduced in amplitude during that period. Rotations of the mean velocity vector with depth indicate consistent downwelling or upwelling depending upon the mooring site. Axes of velocity variance ellipses are larger than means except at 58.5°S (signature of the Polar Front). Velocity variance ellipses are stretched in the direction of isobaths above the continental slope (60.5°S), and close to circular elsewhere in the Ona Basin. The first three empirical orthogonal functions (EOF) together explain between 92 and 98% of the total velocity variance at each mooring. The first two EOFs suggest a barotropic equivalent vertical structure while the third EOF (always less than 4%) corresponds to a baroclinic mode. Dominant time scales are presented and discussed. The data were corrected for vertical mooring motion and eddy temperature and salinity fluxes are computed in the 2-90 day bandwidth.