



## **A 20-year long volume transport time series of the Antarctic Circumpolar Current obtained from in situ and satellite observations. Part I : production and validation**

Zoé Koenig (1), Christine Provost (1), Ramiro Ferrari (1), Nathalie Sennéchaël (1), and Marie-Hélène Rio (2)

(1) Locean, UPMC, Paris, France, (2) CLS Argos, Toulouse, France

A 20-year long volume transport time series of the Antarctic Circumpolar Current (ACC) across the Drake Passage has been produced combining information from in situ mooring data (3 years, 2006-2009, current meter and ADCP) and satellite altimetry data (20 years, 1992-2012). A new method is designed to account for the dependence of the vertical structure on surface velocity and latitude. This method is based on the elaboration of a look-up table of velocity profiles. Yet unpublished velocity profile time series from Acoustic Doppler Current Profilers are analysed and used to provide accurate vertical structure estimates in the upper 500m. The cross-track mean surface geostrophic velocities are estimated using an error/correction scheme in a sensitivity study to the mean velocities deduced from two recent Mean Dynamic Topographies (MDT) : the CNES-CLS09 MDT and the CNES-CLS13 MDT. The look-up table is carefully checked with independent velocity data, and the robustness of the new method established.

The volume transport is  $140 \pm 2,2$  Sv (standard error of the mean) in the upper 3000m and  $141 \pm 2,2$  Sv from the bottom to the surface. Both transports show a slightly significant decreasing trend with 95% confidence (between -0,15 and -0,35 Sv per year). The small 1 Sv difference between the 0-3000M and 0-bottom transports results from the deep recirculation cells. Partition between baroclinic/ barotropic transport over 3000m is  $112 \pm 1,6$  /  $28 \pm 1,6$  Sv and from the surface to the bottom  $136 \pm 1,6$  Sv /  $5 \pm 1,6$  Sv. The barotropic time series present a decreasing trend (-0,35 Sv over 3000m and -0,6 Sv from 0 to the bottom) while the baroclinic time series show an increasing trend (0,1 Sv over 3000 m, 0,3 Sv from 0 to the bottom). The total and baroclinic transport time series exhibit 5-year period variations that are significant at the beginning of the series.