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Three years of velocity, temperature and salinity time series in the Yaghan Basin, Northern Drake Passage

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The complex bathymetry of the Drake Passage (DP) and the meridional extent of the Shackleton Fracture Zone in particular force the Subantarctic Front (SAF) and the Polar Front (PF) to veer to the north when passing through the Drake Passage. The flow of the Antarctic Circumpolar Current is concentrated in the Yaghan Basin, northern Drake Passage. Currents in the Yaghan Basin are studied using three years of data from five moorings deployed under Jason track 104 (January 2006-April 2008 and April 2008- March 2009) and equipped with a total of 14 punctual current-meters, 2 upward looking ADCPs and 6 Microcats. In addition to these time-series, full-depth CTD-LADCP sections were performed in April 2005, January 2006 (twice), April 2008 and March 2009, following the same track.

Statistical analysis of the mooring data is presented. Maximum velocity up to 80 cm/s is observed at 100 m depth at the northernmost mooring. Mean velocities vary from 32 cm/s to 6 cm/s at 500 m depth and from 13 cm/s to 3 cm/s at 2500 m depth and are the same order of magnitude as the main axis of the variance ellipses. Rotation of the mean velocity vectors is consistent through the water column with an upwelling or downwelling depending on the location. The first 3 Empirical Orthogonal Fonctions (EOF) explain more than 96% of the variability. The 1rst and 2nd EOFs suggest a barotropic equivalent vertical structure and one of them shows the same rotation pattern as the mean velocity vector rotation. The 3rd EOF corresponds to a baroclinic component and explains always less than 5% of the variance, except for the northernmost mooring, where it reaches 7% (coastal trapped waves). Temporal scales of variability observed from the mooring data are analysed and aliasing issues associated with altimetric sampling are discussed. The mooring data are also used to estimate eddy heat fluxes and eddy salt fluxes, after correction for the vertical mooring motion.

The in situ data, hydrographic cruises, mooring data and floats, suggest a recurrent (quasi-permanent) cyclonic circulation in the Yaghan basin, which is underestimated in all existing mean sea estimates.