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Atmospheric synoptic conditions of snow precipitation in East Antarctica using ice core and reanalysis data

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In the framework of the International Partnerships in Ice Core Sciences (IPCS) initiatives the GV7 site (70°41' S - 158°51' E) in East Antarctica was chosen as the new drilling site for the Italian contribution to the understanding of the climatic variability in the last 2000 years (IPICS 2k Array).
Water stable isotopes and snow accumulation (SMB) values from a shallow firn core, obtained at GV7 during the 2001-2002 International Trans-Antarctic Scientific Expedition (ITASE) traverse, are analyzed and compared with different meteorological model output in order to characterize the atmospheric synoptic conditions driving precipitation events at the site.
On annual basis, ECMWF +24h forecasted snowfalls (SF) seem to well reproduce GV7 SMB values trend for the period from 1980 to 2005. Calculated air mass back-trajectories show that Eastern Indian - Western Pacific oceans represent the main moisture path toward the site during autumn - winter season. Analysis of the ECMWF 500 hPa Geopotential height field (GP500) anomalies shows that atmospheric blocking events developing between 130° E and 150° W at high latitudes drive the GV7 SMB by blocking zonal flow and conveying warm and moist deep air masses from ocean into the continental interior.
On inter-annual basis, The SF variability over GV7 region follows the temporal oscillation of the third CEOF mode (CEOF3 10% of the total explained variance) of a combined complex empirical orthogonal function (CEOF) performed over GP500 and SF field. The CEOF3 highlights an oscillating feature, with wavenumber 2, in GP500 field over the Western Pacific-Eastern Indian Oceans and propagating westward. The pattern is deeply correlated with the Indian Dipole Oscillation and ENSO and their associated quasi-stationary Rossby waves propagating from the lower toward the higher latitudes.