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Tropical Pacific - high latitude South Atlantic teleconnections as seen in d18O variability in an Antarctic Coastal Ice Core

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d18O record from a coastal ice core is used for examining the teleconnections between the Tropical Pacific and the Atlantic sector of the Southern Ocean. For analysis we use a 100 m deep and dated annually back to 1737 ice core, drilled on Fimbulisen Ice Shelf in Dronning Maud Land (DML) during NARE 2000/01. We use gridded monthly mean anomalies of Hadley Centre's sea level pressure (SLP) and NOAA Extended Reconstructed Sea Surface Temperature (SST) maps for the period 1854-1999 to detect atmospheric and oceanic patterns causing variability in d18O, which is believed to be a proxy for the surface air temperature at the core location. We correlate annual mean d18O, and seasonal (austral winter and spring) SLP and SST data to identify spatial teleconnections on the annual scale. The analysis, focused on the latest 30 overlapping years of data from the 1969 to 1999, suggests that positive anomalies in d18O are associated with positive SST and SLP anomalies in the high latitude South Atlantic, which is a potential source region for air masses reaching the core cite. This is accompanied by negative SLP anomaly in the south west Pacific and negative SST anomalies in the tropical Pacific that show pattern resembling cold ENSO events (La Nina). The principal mechanism of the south- and south eastward propagation of the ENSO signal is through the weakening (strengthening) of the regional Ferrel Cell to the west (east) of the Antarctic Peninsula/ southern South America as a response to cold ENSO events. Intensified southward transport of heat in the southern Atlantic, in turn, creates and sustains positive SST anomalies in the source area for the air

masses controlling moisture transport to the core site. During warm ENSO events the opposite picture emerges. Empirical orthogonal function (EOF) analysis reveals a significant link between the tropical Pacific and southern polar Atlantic that appears as pronounced bidecadal variations in d18O, coherent with the first principal component of the EOF decomposition of SSTs for the austral summer (ENSO SST signature). The lag in nearly 4 years roughly corresponds to a time required for the SST anomaly formed in south-eastern Pacific to reach a south western Atlantic. A potential source of the bidecadal variability can be as in long-term variations of ENSO itself as in strength of ENSO - high latitude South Pacific teleconnection that modulates the southerly heat flux. This question is still to be resolved.