The linkage of the East Asian climate to the Southern Hemisphere atmospheric circulation

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In the first part of this work, the linkage between the Antarctic Oscillation (AAO) to the dust weather frequency (DWF) in North China is addressed. Here DWF denotes the number of days of dust weather events including dust haze, blowing dust and dust storm in one year. It is found that the interannual variation of AAO during boreal winter or spring plays a significant role in the dustrelated atmospheric circulation. The correlation between AAO DJF and DWF is _0.35, whereas the correlation between AAO MAM and DWF is _0.45 (both for the period 1954 - 2001). Analysis shows that positive AAO anomaly tends to decrease the cold weather anomalies in Asia and AAO(MAM) restrains cyclogenesis. AAO has good correlation to the climatic factors related to DWF in North China.AAO may therefore modulate DWF in the region. One possible mechanism for the coupling between AAO and DWF is the meridional teleconnection from Antarctic to the Arctic. It turns out that positive AAO, with respect to negative AAO, is teleconnected with the pattern of changes from SH to the NH. Another possible mechanism is a regional circulation pattern in the Pacific Oceans involving the intensity of the Aleutian Low and the Siberian High. Further research may indicate why the AAO(DJF) is related to DWF in boreal spring. It is possibly due to role of the low frequency oscillation in both hemispheres.

The second part of this job consider the relationship of the East Asian summer monsoon to Mascarene High (MH) and Australian High (AM) in the interannual scale. Results show thatinterannual variability of MH is dominated by the Antarctic oscillation (AAO), and MH tends to be intensified with the development of the circumpolar lows in high southern latitudes. On the other hands, AH id correlated with AAO as well as ENSO, and tends to be intensified when an El Nino occurs. Since AH, especially MH, is positively correlated with AAO, composite analysis shows that, with the intensification of MH, the Somali jet, and Indian monsoon westerlies, tend to be strengthened. Accordingly, AH and the associated cross equatorial flow, become stronger whereas the trade wind over the tropical western and middle Pacific become weaker. In association with the above changes, convective

activities near the Philippines Sea and largely suppressed, as a consequence, exiting a negative convection anomaly, and a Rossby wave train from East Asia via the North Pacific to the western coast of North America (a negative Pacific Japan pattern). Corresponding to the negative Pacific Japan pattern, an anomalous rainfall pattern appears in East Asia. Correlation analysis between AAO and sea level pressure, 500 hPa geopotential height further indicates that AAO is a strong signal influencing the climate anomaly in both hemispheres, including East Asia. Due to the seasonal persistence, AAO and the related MH and AH in boreal spring, may provide some useful information for the East Asian summer monsoon prediction. With the intensification of MH during boreal spring through summer, the Meiyu/Baiu rainfall from the Yangtze River valley to Japan islands tends to increase, while less rainfall is found outside this region. In contrast with MH, the effect of AH on summer rainfall is confined to southern China.