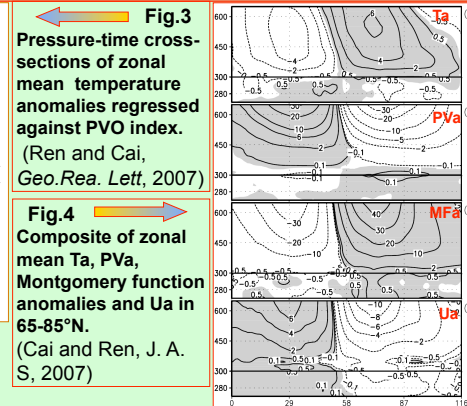
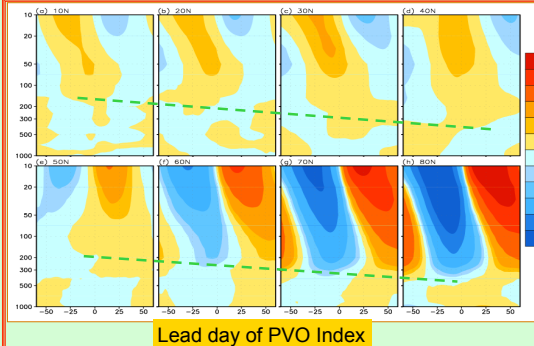
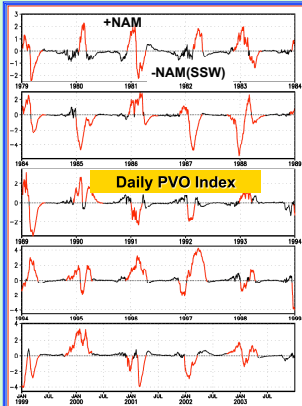
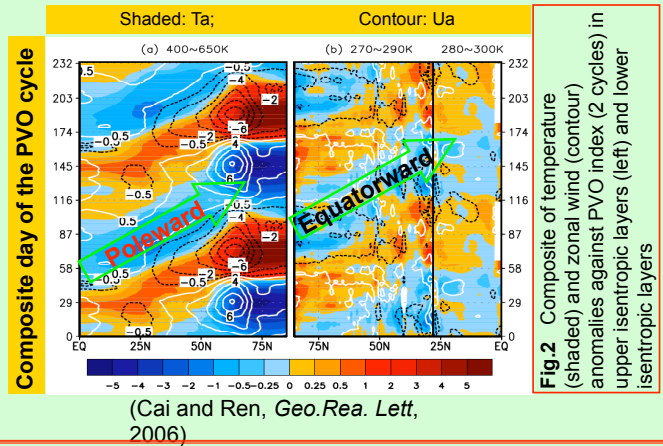
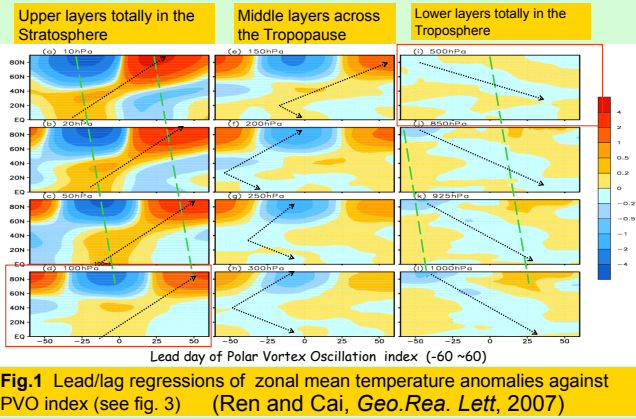


Downward propagation and the out-of-phase relationships of temperature anomalies between the stratosphere and troposphere

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Point 1:

■ The stratospheric circulation anomalies associated with the polar vortex oscillation appear originating from the deep tropics, the poleward propagating signals in the upper layers lead that in the lower layers (Fig. 1); In the troposphere, temperature anomalies are seen propagating equatorward (Fig. 1,2).



Point 2:

Downward propagating stratospheric circulation anomalies seem not directly reach the lower troposphere; temperature and potential vorticity anomalies between the stratosphere and the troposphere exhibit an out-of-phase relationship (Fig.3-4). The seemingly barotropic structure of zonal wind and geo-potential height anomalies is the result of their in-phase responses to the opposite heating anomalies from the stratosphere to the lower troposphere (Fig. 4).

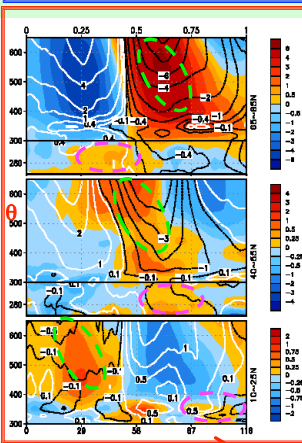


Fig.5 Composite of T_a (shading) and U_a (contour) against PVO index.

Fig.6 Composite of Mass anomalies against PVO index.

Point 3:

The stratosphere-troposphere coupling is intimately related with the vertical coupling of the poleward and equatorward propagations, which corresponds to the inter-seasonal variation of the global mass circulation.