Geophysical Research Abstracts
Vol. 14, EGU2012-1748, 2012
EGU General Assembly 2012

Impact of Preceding Boreal Autumn Antarctic Ozone on Spring Precipitation over South China

F. Zheng (1,2) and J. Li (1)

(1) State Key Laboratory of Numerical Modeling for Atmospheric Sciences and Geophysical Fluid Dynamics (LASG), Institute of Atmospheric Physics (IAP), Chinese Academy of Sciences (CAS), (2) Graduate University of Chinese Academy of Sciences

Boreal spring precipitation over South China (SC) decreased during the last three decades of the 20th century. Simultaneously, Antarctic stratosphere total column ozone undergone a significant depletion, known as the Antarctic ozone hole (AOH), causing prominent changes in atmospheric circulation and surface climate in Southern Hemisphere (SH) as other researchers had pointed out. The aim of this paper is to figure out the possibility for the AOH to affect Northern Hemisphere (NH) climate changes. Specifically, try to investigate the possible impact of preceding boreal autumn AOH on decreased boreal spring rainfall over SC.

An ozone Index (OzI) is defined as the regional mean of total column ozone over the south of 75°S to represent the variability of AOH. The results show the contribution of autumn AOH to changes in spring precipitation and wind over SC takes up about 50% of the total changes. Decreasing trend in SC spring precipitation was related closely to autumn AOH.

Both modeling and observation studies have suggested that austral spring (boreal autumn) AOH contributes to an increasing trend in the austral summer (boreal winter) Southern Hemisphere Annular Mode (SAM, also referred to as the Antarctic Oscillation), leading to changes in Antarctic surface climate. However, the variability of SAM can impact circulation and climate not only in SH, but also in NH. The results show there is a significant negative correlation between boreal winter SAM and the following boreal spring SC precipitation. In boreal winters with strong SAM, latent heat fluxes change because of the changes in sea surface wind speed, resulting in sea surface temperature (SST) abnormally high (low) in 30°-45°S (45°-70°S). This SSTA persists to the following spring due to the large heat capacity of ocean, and causes circulation anomalies and reduced rainfall over SC. The SST anomalies and rainfall anomalies over SC reverse in boreal winters with weak SAM.

Consequently, we can get the preliminary conclusion that boreal autumn AOH leads to decreased SC precipitation through favoring an increasing trend in winter SAM. The strengthened SAM causes decreased spring SC precipitation through the role of SST anomalies over 30°-70°S.