

Distinguishing climatological and transient intraseasonal oscillation in East Asia-Western North Pacific summer precipitation

Jing Yang, Bin Wang, Yoshiyuki Kajikawa

Department of Meteorology and International Pacific Research Center, University of Hawaii, Honolulu, Hawaii, USA.

Abstract

Primarily based on six sets of long-term daily/pentad data beginning from 1979, including three observations and three reanalyses, we investigate the behavior of both the climatological intraseasonal oscillation (CISO) and transient intraseasonal oscillation (TISO) in boreal summer precipitation over the East-Asia (EA) and western North Pacific (WNP) regions. CISO is a portion of ISO that is phase locked to the slow annual cycle. TISO is defined as the ISO after removing CISO, which is the year-by-year varying portion of the ISO.

During boreal summer, the CISO exhibits the largest percentage variance near WNP subtropical high ridge and its associated subtropical EA front regions. A sharp change of the CISO patterns occurs in the mid-August across the latitude from 10°N to 40°N. A climatological quasi-biweekly rhythm (C-BW) is found in the CISO of subtropical EA monsoon rainfall. Before late-July C-BW is mainly related to Meiyu (Baiu/Changma) front migration, while after late-July it is associated with climatological tropical cyclonic activity.

For TISO we found three major modes in the subtropical EA summer rainfall: quasi-10 day, quasi-16 day and quasi-30 day. Quasi-16 day is the most distinguishable. The quasi-10 day is characterized with southeastward propagation from mid-latitude and has less linkage with tropical TISO. The other two modes have highly out-of-phase relationship with those in the northern SCS-PS region but exhibit different meridional propagating tendencies. On the other hand, in tropical WNP (South China Sea-Philippine Sea/SCS-PS) region, the previously identified 12-25 day and 30-60 day modes are confirmed respectively with westward and northeastward propagation. Additionally, the favorite seasons for each mode of TISO occurrence are different in the EA and WNP regions.

The basic behavior of CISO and TISO in EA-WNP region is further investigated in three reanalysis precipitation data. In general, the reanalyses are able to capture the major features in CISO and the dominant periodicities in TISO, although they still have several deficiencies. The ERA40 bears closer similarity with observations particularly in subtropical EA region than the other two.