Impact of the South Asian monsoon on the Mediterranean Climate

Toru Tamura¹,²; T. Koike¹,²

¹. EDITORIA, University of Tokyo, Tokyo, Japan. ². Department of Civil Engineering, University of Tokyo, Tokyo, Japan.
E-mail : tamura@hydra.t.u-tokyo.ac.jp

Close relationship between the South Asian monsoon and the Mediterranean climate

In early summer, there is active convection associated with the South Asia summer monsoon (SASM) and the African monsoon (AFM) (Figure 1). As noted by Raicich (2003), the SASM is closely related with the Mediterranean climate as shown by correlation between the OLR over the SASM domain and the OLR in June (Figure 2), while there is no significant correlation between the AFM and the Mediterranean climate (Figure 3). Most significant anti-correlation between the SASM and Mediterranean climate is found in June (Figure 4).

Adiabatic warming in the upper troposphere over the Mediterranean domain by the SASM

Rodwell and Hoskins (2001) suggested that the Rossby wave response to the west of subtropical monsoon heating produces a region of adiabatic descent interacting with the mid-latitude westerlies. Moreover, Tamura et al. (2010) and Tamura and Koike (in press) demonstrated that the upper-level warming around the Tibetan Plateau in early summer is induced by adiabatic warming in compensation of active convections over the Maritime Continent or the Bay of Bengal (Figure 5). Anti-correlation between the SASM and Mediterranean climate can be investigated in conjunction with the monsoon convection, modulation of Walker and Hadley-type circulation and upper-level warming (Figures 6 and 7).

Decadal modulation of the Mediterranean climate- Impact of the ENSO, PDO

From monthly mean in June, we can find there are trends of more active SASM and drier condition over the Mediterranean (Figure 8 and 9). We conducted composite analysis, by producing dryer (2000, 2001, 2003, 2008) and wetter years (1983, 1988, 1992) based on the OLR data over the Mediterranean (Figure 8). Composite analysis clearly indicates the drier condition of the Mediterranean in June can be traced back to March when anomalous convection over the Maritime Continent and upper-level warming to the east of the Tibetan Plateau commence (Figure 10).

Composite of the SST in March shows the La Nina type SST distribution over the negative phase of the PDO (Figure 11). The phase change of the PDO in late 20th century is suggested to have contributed to the recent drier condition over the Mediterranean domain in early summer (Figure 12).