

Effect of Enhanced Diabatic Heating in Maritime Continent on Unusual Large-scale Circulation and Extreme Weather in East Asia–Western North Pacific in Early Summer

Huang An-Yi¹, Hong Chi-Cherng¹, Hsu Huang-Hsiung², Tseng Wan-Ling^{2,3}, Hsu Pei-Chun², Lo Min-Hui⁴

(1)Department of Earth and Life Science, University of Taipei, (2)Anthropogenic Climate Change Center, Research Center for Environmental Changes, Academia Sinica, (3)Department of International Degree Program in Climate Change and Sustainable Development, National Taiwan University, (4)Department of Atmospheric Sciences, National Taiwan University

During June to July of 2020, Yangtze–Huai River valley and Japan (YHRV–Japan) experienced excessive rainfall which was associated with the long-lasting Mei-Yu front system and led to severe flooding. Simultaneously, the western North Pacific subtropical high (WNPSH), which is the most important factor affecting the intensity and location of the Mei-Yu front, broke the record since 1979. Previous studies have revealed that tropical sea surface temperature (SST), especially in the North Indian Ocean (NIO), acts a vital role on influencing the WNPSH and Mei-Yu rainfall. However, our analysis results reveal that the SST in NIO contributes substantially to the anomalous large-scale circulation in the western North Pacific (WNP) only in June and is weaker in July. On the other hand, we found that the diabatic heating in the Maritime Continent (MC-heating) could affect the WNPSH and Mei-Yu rainfall both in June and July. In this study, we demonstrate the role of MC-heating, which is less investigated, on the anomalous large-scale circulation in the WNP and the Mei-Yu rainfall. We also discuss the possible physical process of how MC-heating affects the Mei-Yu front and its connection to the annual cycle.

Keywords: diabatic heating, western North Pacific subtropical high, extreme rainfall, sea surface temperature, annual cycle