

Impact of East Asian Winter Monsoon on MJO over the Equatorial Western Pacific

Jian LING¹, Xiong CHEN², Chongyin LI^{1,2}, and Yanke TAN²

¹ LASG, Institute of Atmospheric Physics, CAS, Beijing 100029, China

² Institute of Meteorology and Oceanography, PLA University of Science and Technology, Nanjing 211101, China

This paper investigates the processes and mechanisms by which the East Asian winter monsoon (EAWM) affects the Madden-Julian Oscillation (MJO) over the equatorial western Pacific in winter (November-April). The results show that both the EAWM and MJO over the equatorial western Pacific have prominent interannual and interdecadal variabilities and they are closely related, especially on the interannual timescales. The EAWM influences MJO via the feedback effect of convective heating, because that the strong northerlies of EAWM can enhance the ascending motion and lead the convection to be strengthened over the equatorial western Pacific by reinforcing the convergence in the lower troposphere. Daily composite analysis in the phase 4 of MJO (i.e., strong MJO convection over the Maritime Continent and western Pacific) shows that the kinetic energy, outgoing longwave radiation (OLR), moisture flux, vertical velocity, zonal wind, moist static energy and atmospheric stability differ greatly between strong and weak EAWM processes over the western Pacific. The strong EAWM causes the intensity of MJO to increase, and the eastward propagation of MJO to become more persistent. MJO activities over the equatorial western Pacific have different modes. Furthermore, these modes have differing relationships with the EAWM, and other factors can also affect the activities of MJO; consequently, the relationship between the MJO and EAWM shows both interannual and interdecadal variabilities.

Key words: MJO, EAWM, convection, moisture convergence