ABSTRACT
Title: Midlatitude–MJO Teleconnection over East Asia in the Northern Winter

The midlatitude–MJO teleconnection in the Northern Hemisphere wintertime is extensively investigated using twenty years of OLR and various sources from reanalyses and station data over East Asia. Among the features found in this study, we note that the tropical upper–level divergence (convergence) anomaly of enhanced (reduced) tropical convection has a subtropical counterpart of upper–level convergence (divergence). As the convective region of MJO moves eastward from the Indian Ocean to the western Pacific, the divergent circulation connecting the tropics and subtropics moves eastward. From an analysis of vertical motion diagnosed by the generalized omega equation, it was revealed that the position of the subtropical Rossby gyres of the MJO with respect to the Asian–Pacific jet was the most important factor affecting the existence of the localized divergence (convergence) and associated lower–level vertical motion in the subtropics. As the subtropical Rossby gyres pass by the longitudinal position of the Asian–Pacific jet, vertical motion occurs to meet the balance required by quasi–geostrophic theory. As a result of the vertical motion near the jet entrance region in subtropics, the vorticity advection by vertical wind and the tilting of vorticity may become important. This conjecture is tested using the linear barotropic model forced by vertical vorticity advection and tilting. The model captured clearly the main feature of the midlatitude–MJO teleconnection.

Observational features of MJO–teleconnection are further investigated using surface air temperature and precipitation over Inland China and Korean peninsula. The spatial pattern and magnitude of both anomalies over east Asia change with MJO phases significantly. According to the modulation of surface air temperature by MJO, the number of extreme cold surge event changed consonant with MJO phases. Also, MJO modulates the distribution of precipitation over broad area over East Asian region; the precipitation rate difference between wet and dry periods over East Asia, when the centers of MJO convective activities are located over the Indian Ocean and western Pacific, respectively, reaches 3–4 mm day 1, which corresponds to the climatological winter–mean value. We show these observational facts are consistent with the proposed MJO–teleconnection mechanism.