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# Skillful subseasonal forecasts beyond two weeks over East Asia in the extended summer

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The tropical intraseasonal oscillation (ISO) is a planetary-scale mode consisting of mesoscale convective systems coupled with large-scale circulation disturbance. It has a period of 30-70 days and propagates eastward along the equator with additional northward propagation in summer when interfered by the monsoon system in Asia. To distinguish the marked seasonality, the ISO with predominant eastward propagation is referred to as the Madden-Julian oscillation (MJO), whereas the summer ISO with northward propagation is called boreal summer intraseasonal oscillation (BSISO).

Tropical convection anomalies associated with the ISO can influence weather and climate outside the tropics by forcing large-scale teleconnection patterns, such as the PNA. Northward propagation of BSISO also impacts East Asia summer climate, including active and break spells in monsoon rainfall. Both climate research and forecasting communities have been trying to incorporate this mode of variability to fill the forecast gap between the numerical weather prediction (NWP) models and coupled dynamical models.

This study attempts to evaluate the subseasonal impacts of MJO and BSISO in East Asia during summer and quantify how well the MJO/BSISO index serves as guidance for subseasonal forecasts. We examine the lagged impacts of three MJO/BSISO indices that have been used for real-time forecasts, including the MJO (Wheeler and Hendon, 2004), bimodal ISO (Kikuchi et al., 2012), and BSISO (Lee et al., 2012) indices, on extended summer (May – October) climate over East Asia for lags of one to six weeks. Through the construction of a probabilistic forecast model determined through multiple linear regression (MLR), the study evaluates the forecast skills of temperature over the East Asian domain for each phase of the three MJO/BSISO indices.

Our results show that in East Asia, the MJO/BSISO predictors provide forecast skill over southern Tibetan Plateau and area between northern parts of the South China Sea and Philippine Sea, including Taiwan and north Luzon Island. Most indices show high skill for the first week after the initial state of MJO/BSISO in these regions. Surprisingly, for some initial phases of the MJO/BSISO, skill reemerges for lead times of 3-5 weeks. Some of the elevated skill beyond week 2 appears to be associated with the excitation of a pattern resembling the Pacific-Japan (PJ) pattern. We also discuss the dynamical mechanisms associated with these "forecasts of opportunity". These results have the potential to provide forecast guidance related to the expected impacts of the MJO/BSISO over lead times of up to five weeks.