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Predictability of the Madden–Julian Oscillation Estimated using Observational Data

Jianping Li (1), Ruiqiang Ding (1), and Kyong-Hwan Seo (2)

(1) LASG, Institute of Atmospheric Physics, Chinese Academy of Sciences, LASG, Beijing, China (ljp@lasg.iap.ac.cn, 86 10 82995172), (2) Division of Earth Environmental System, Department of Atmospheric Sciences, Pusan National University, Busan, South Korea

Existing numerical models produce large error in simulating the Madden-Julian Oscillation (MJO), thereby underestimating its predictability. In this paper, the predictability limit of the MJO is determined by the nonlinear local Lyapunov exponent (NLLE) approach, which provides an estimate of atmospheric predictability based on the observational data. The results show that the predictability limit of the MJO obtained from the bandpass-filtered (30–80 days) outgoing longwave radiation (OLR) and wind fields, which serves as an empirical estimate of the theoretical potential predictability of the MJO, can exceed 5 weeks, which is well above the 1 week predictability of background noise due to bandpass filtering. In contrast, a real-time analysis of MJO predictability using the real-time multivariate MJO (RMM) index, as introduced by Wheeler and Hendon (2004), reveals a predictability limit of about 3 weeks. Our findings raise the possibility of obtaining a higher predictability limit in real-time prediction by improving the RMM index or by introducing a better method of extracting intraseasonal signals.