MJO prediction skill of the subseasonal-to-seasonal prediction models

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The Madden-Julian Oscillation (MJO), the dominant mode of tropical intraseasonal variability, provides a major source of tropical and extratropical predictability on subseasonal timescale. To understand MJO prediction skill, this study conducts a quantitative evaluation in state-of-the-art operational models, participating in the subseasonal-to-seasonal (S2S) prediction project. The relationship of MJO prediction skill with model mean biases in the mean moisture fields and in the longwave cloud-radiation feedbacks is also investigated.

The S2S models exhibit MJO prediction skill out to a range of 12 to 36 days. The MJO prediction skills in the S2S models are affected by both the MJO amplitude and phase errors, with the latter becoming more important at longer forecast lead times. MJO events with stronger initial MJO amplitude are typically better predicted, consistent with previous studies. The sensitivity to initial MJO phase varies notably from model to model.

In most models, a notable dry bias in the deep tropics develops within a few days of forecast lead time, especially across the Maritime Continent. The dry bias weakens the horizontal moisture gradient over the Indian Ocean and western Pacific, likely dampening the organization and propagation of the MJO. Most S2S models also underestimate the longwave cloud-radiation feedback in the tropics, which may affect the maintenance of the MJO convective envelope. The models with smaller biases in the mean horizontal moisture gradient and the longwave cloud-radiation feedback show higher MJO prediction skills, suggesting that improving those biases would enhance MJO prediction skill of the operational models.

Key words: MJO prediction skill, subseasonal-to-seasonal model

Reference

Lim, Y., S.-W. Son, and D. Kim, 2018: *Journal of Climate*, in press.