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Optimal error analysis of the intraseasonal convection due to uncertainties of the sea surface temperature in a coupled model

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The predictability of the convection related to the Madden-Julian Oscillation (MJO) is studied using a coupled model CESM (Community Earth System Model) and the climatically relevant singular vector (CSV) approach. The CSV approach is an ensemble-based strategy to calculate the optimal initial error on climate scale. In this study, we focus on the optimal initial error of the sea surface temperature in Indian Ocean, where is the location of the MJO onset. Six MJO events are chosen from the 10 years model simulation output. The results show that the large values of the SVs are mainly located in the bay of Bengal and the south central IO (around (25°S, 90°E)), which is a meridional dipole-like pattern. The fast error growth of the CSVs have important impacts on the prediction of the convection related to the MJO. The initial perturbations with the SV pattern result in the deep convection damping more quickly in the east Pacific Ocean. Moreover, the sensitivity studies of the CSVs show that different initial fields do not affect the CSVs obviously, while the perturbation domain is a more responsive factor to the CSVs. The rapid growth of the CSVs is found to be related to the west bay of Bengal, where the wind stress starts to be perturbed due to the CSV initial error. These results contribute to the establishment of an ensemble prediction system, as well as the optimal observation network. In addition, the analysis of the error growth can provide us some enlightment about the relationship between SST and the intraseasonal convection related to the MJO.