Dependence of the reproducibility of the MJO convection on differences in the surface flux conditions in NICAM

*Tamaki Suematsu[1], Chihiro Kodama[2], Hisashi Yashiro[3], Tomoro Yanase[4], Hiroaki Miura[5], Tomoki Miyakawa[1], Masaki Satoh[1]

1. Atmosphere and Ocean Research Institute, The University of Tokyo, 2. Japan Agency for Marine-Earth Science and Technology, 3. National Institute for Environmental Studies, 4. Graduate School of Science, Kyoto University, 5. Graduate School of Science, The University of Tokyo

Simulation of the Madden-Julian Oscillation has been notoriously difficult in atmospheric models. Although it has been over a decade since the first realistic simulation of the Madden-Julian Oscillation has succeeded using the non-icosahedral atmospheric model (NICAM; Miura et al. 2007), reproducibility of the MJO remains highly sensitive to parameters that are often difficult to fix from observation or theory, and require empirical tuning based on model behaviors. Moreover, model settings fine-tuned for MJO simulations are not necessarily compatible with longer simulations due to biases in the long-term mean. Therefore, the selection of parameters that adequately simulate the MJO without undermining the long-term mean remains a challenging problem.
To address this problem, we conducted parameter sweep experiments on NICAM on parameters that regulate the surface latent heat fluxes, which in turn influence the development of convection. From the parameter sweep experiments, we selected parameter sets that best simulate the MJO case from December to January 2019, and investigated how the changes in the parameters influenced the month-long mean states. We found that while the best performing parameter sets for MJO simulation displayed overly high surface latent heat flux over the equatorial Pacific, it also mitigated the double ITCZ bias in the month-mean precipitation patterns.

Keywords: NICAM, Cloud Resolving Model, Madden-Julian Oscillation

