



Extended-range prediction trials using the global cloud/cloud-system resolving model NICAM and its new ocean-coupled version NICOCO

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The global cloud/cloud-system resolving model NICAM and its new fully-coupled version NICOCO is run on one of the world's top-tier supercomputers, the K computer. NICOCO couples the full-3D ocean component COCO of the general circulation model MIROC using a general-purpose coupler Jcup. We carried out multiple MJO simulations using NICAM and the new ocean-coupled version NICOCO to examine their extended-range MJO prediction skills and the impact of ocean coupling. NICAM performs excellently in terms of MJO prediction, maintaining a valid skill up to 27 days after the model is initialized (Miyakawa et al 2014). As is the case in most global models, ocean coupling frees the model from being anchored by the observed SST and allows the model climate to drift away further from reality compared to the atmospheric version of the model. Thus, it is important to evaluate the model bias, and in an initial value problem such as the seasonal extended-range prediction, it is essential to be able to distinguish the actual signal from the early transition of the model from the observed state to its own climatology. Since NICAM is a highly resource-demanding model, evaluation and tuning of the model climatology (order of years) is challenging. Here we focus on the initial 100 days to estimate the early drift of the model, and subsequently evaluate MJO prediction skills of NICOCO. Results show that in the initial 100 days, NICOCO forms a La-Nina like SST bias compared to observation, with a warmer Maritime Continent warm pool and a cooler equatorial central Pacific. The enhanced convection over the Maritime Continent associated with this bias projects on to the real-time multi-variate MJO indices (RMM, Wheeler and Hendon 2004), and contaminates the MJO skill score. However, the bias does not appear to demolish the MJO signal severely. The model maintains a valid MJO prediction skill up to nearly 4 weeks when evaluated after linearly removing the early drift component estimated from the 54 simulations. Furthermore, NICOCO outperforms NICAM by far if we focus on events associated with large oceanic signals.