6.1 Analysis of the MPAS convective-permitting physics suite in the tropics with different parameterizations of convection.

Fowler, Laura, Mary Barth, *National Center for Atmospheric Research*, Kiran Alapaty, *United States Environmental Protection Agency*, Mark Branson, and Don Dazlich, *Colorado State University*

As the Weather Research Forecast (WRF) model, the atmospheric component of the Model for Prediction Across Scales (MPAS) hosts several parameterizations of deep convection, including a few that adapt to horizontal resolutions varying between nonhydrostatic and hydrostatic scales.

Using uniform and variable-resolution meshes, we compare 30-day simulations run with the convective parameterization developed by Grell and Freitas (2014), the convective parameterization developed by Tiedtke (1989) and further modified by Wang et al. (2007), and the multi-scale version of the Kain-Fritsch convection parameterization (Alapaty et al. 2014). We also include the first results of our implementation of the scale-aware parameterization of convection developed by Chikira and Sugiyama (2010).

As we plan to transition MPAS to a near-global convection-permitting model for seasonal time-scale predictions, an improved understanding of the interactions between convective, grid-scale, and radiation processes at non-hydrostatic scales and at long time-scales is needed. Using the 30 km-6 km variable-resolution mesh centered over the Western Tropical Pacific Ocean, we compare outputs of our 30-day simulations against satellite data over the most refined region of the mesh. Our results focus on the distribution of precipitation, cloudiness, and the top-of-the-atmosphere radiation budget.

References:

Alapaty, K., J.S. Kain, J.A. Herwehe, O.R. Bullock, M.S. Mallard, T.L. Spero, and C.G. Nolte, 2014: Multi-scale Kain-Fritsch scheme: Formulations and tests. The 2014 Annual CMAS Conference, R.T.P., North Carolina: https://www.cmascenter.org/conference/2014/agenda.cfm#inline1503.

Chikira, M., and M. Sugiyama, 2010: A cumulus parameterization with state-dependent entrainment rate: Part I: Description and sensitivity to temperature and humidity profiles. J. Atmos. Sci., 67, 2171-2193.

Grell, G.A., and S.R. Freitas, 2014: A scale and aerosol aware stochastic convection parameterization for weather and air quality modeling. Atmos. Chem. Phys., 14, 5233-5250.

Tiedtke, M., 1989: A comprehensive mass flux scheme for cumulus parameterization in large-scale models. Mon. Wea. Rev., 117,1779-1800.

Wang, Y.L., L. Zhou, and K. Hamilton, 2007: Effect of convective entrainment/detrainment on the simulation of tropical precipitation diurnal cycle. Mon. Wea. Rev., 135, 567-585.