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Cold Pools and the Organization of Tropical Convection in Global Cloud-System Resolving Simulations

Wednesday 5 May 2021 16:00 (1h 45m)

The DYAMOND (DYnamics of the Atmospheric general circulation Modeled On Non-hydrostatic Domains) project produced simulations of forty days, beginning 1 August 2016, using global models with a cloud-system resolving grid spacing of 5 km or less. How might we use this set of simulations to learn more about the effects of cold pools on convection?

We have developed a global (tropical ocean) cold-pool climatology from one of the simulations. We found that a simple cold pool detection algorithm seems to perform quite well for the tropical oceans. In the oceanic ITCZs, simulated cold pool occurrence ranges from 0.1 to 0.25. Simulated gust front (or discrete cold pool) frequency ranges from 1 to 2 per day. The western Atlantic, eastern Pacific, and the western Indian ITCZs are the most active by this measure. The average cold pool duration ranges from 3 to 5 hours. There is little large-scale geographical variability within the oceanic ITCZ. We did not find an obvious correlation between cold pool activity and shear of the mean zonal wind. Convective downdraft and cold pool fractions vary with convective updraft fraction. Convective updraft speed increases with convective fraction, which suggests that updraft "demographics"(updraft sizes, environmental RH) change with convective fraction.

Our next steps will include calculating a measure of clustering or organization, such sa the radial distribution (or pair correlation) function, for the simulated convective updrafts to determine if there is a relationship between cold pools and convection organization in these simulations.

Primary authors: KRUEGER, Steven (University of Utah); KHAIROUTDINOV, Marat (Stony Brook University, School of Marine & Atmospheric Sciences, Stony Brook, NY, United States)

Presenter: KRUEGER, Steven (University of Utah)

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