Effect of resolved convection on the Maritime Continent precipitation and related physical processes in a regional model.

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Climate simulations at convection-permitting scales are now becoming possible and they are expected to improve the representation of convective processes and thus in convective precipitation. This is of particular relevance in tropical regions where rainfall is mostly generated by convective systems. Here we analyse whether this potential is actually realized in the context of the Maritime Continent and explore the physical mechanisms that lead to differences between convection-permitting and parameterized-convection models. We use the Weather Research and Forecasting model operating at multiple resolutions (32, 16, 8, 4, and 2 km) over the Maritime Continent to determine the role of resolution and the convective scheme in better representing features of rainfall in the region.

The Maritime Continent is a complex archipelago characterized by steep topography, warm oceans and intense convective activity, which produce very particular land and ocean precipitation regimes that models struggle to reproduce. In this talk, we will discuss aspects that are more realistically represented when convection is explicitly resolved, such as the diurnal cycle of precipitation, the spatial propagation of convective cells, or the overall rainfall amounts. We will also show features that remain a challenge even at the kilometre scale. To better understand the reasons behind these differences across multiple-resolution models, we will analyse the vertical structure of the atmosphere, the low-level winds, and the moisture convergence in the islands.