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## Cloud life cycle investigated via high resolution and full microphysics simulations in the surroundings of Manaus, Central Amazonia

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**Abstract Text:**

In this study we evaluate the skill of WRF model to simulate the actual diurnal cycle of convection in the Amazon basin. Models tipically are not capable to simulate the well documented cycle of 1) shallow cumulus in the morning; 2) towering process around noon; 3) shallow-to-deep convection and rain around 14h (LT). The fail in models is explained by the typical size of shallow cumulus (~0.5 – 2.0 km) and the coarse resolution of models using convection parameterisation (> 20 km). In this study we employed high spatial resolution (Dx = 0.625 km) to reach the shallow cumulus scale. . The simulations corresponds to a dynamical downscaling of ERA-Interim from 25 to 28 February 2013 with 40 vertical levels, 30 minutes outputs,and three nested grids (10 km, 2.5 km, 0.625 km). Improved vegetation (USGS + PROVEG), albedo and greenfrac (computed from MODIS-NDVI + LEAF-2 land surface parameterization), as well as pseudo analysis of soil moisture were used as input data sets, resulting in more realistic precipitation fields when compared to observations in sensitivity tests. Convective parameterization was switched off for the 2.5/0.625 km grids, where cloud formation was solely resolved by the microphysics module (WSM6 scheme, which provided better results). Results showed a significant improved capability of the model to simulate diurnal cycle. Shallow cumulus begin to appear in the first hours in the morning. They were followed by a towering process that culminates with precipitation in the early afternoon, which is a behavior well described by observations but rarely obtained in models. Rain volumes were also realistic (~20 mm for single events) when compared to typical events during the period, which is in the core of the wet season. Cloud fields evolution also differed with respect to Amazonas River bank, which is a clear evidence of the interaction between river breeze and large scale circulation.

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**Title:** Cloud life cycle investigated via high resolution and full microphysics simulations in the surroundings of Manaus, Central Amazonia
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