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Validation of convective and turbulence parameterizations in tropical areas. The case of Neutral and convective Planetary Boundary Layer.

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In meteorological models, physical processes smaller than the model grid mesh are treated through different sets of equations corresponding to various physical parameterization schemes. The goal of this study is to compare the behaviour of different parameterization schemes dealing with turbulence, convection and micro-physics in the west-African area concerned by the AMMA experiment.

A prognostic TKE scheme (Cuxart-Bougeault-Redelsperger 2000), a prognostic micro-physics (Lopez, 2002) and a set of turbulence-convection scheme based on the concept of buoyancy (Guérémy 2005), are tested.

The parameterization schemes are evaluated along the AMMA-CROSS section.

The most recent parameterization schemes take into account top-PBL entrainment. The impact of this parameterization is positive: low stratiform clouds on the Guinea Gulf are better described while the simulated vertical velocity field fits the analyzed one pretty well. Besides, deficiencies in the simulation of the Saharan heat-low have been identified and suggest to improve the representation of turbulent processes in this area.

To achieve this goal and get a better understanding of the concerned physical mechanisms, neutral and convective PBL are simulated in a 1D framework as in Ayotte et al (BLM, 1996).

Using the results of a large eddy simulation (LES) model as the standard of comparison, a column version of the French model ARPEGE-Climat with a high vertical

resolution (about 20 meters) is evaluated over a range of stratification from free convective to neutral and a range of surface shear stresses. Capping inversion strengths for the convective cases range from weakly to strongly capped.

The vertical profile of temperature in the boundary layer is smoothed and improved by taking into account top-PBL entrainment and a representation of the dry thermals in the PBL.

Column-simulations performed with a coarse vertical resolution (that of the 3D model: about 200 meters in the boundary-layer) in order to evaluate the impact of parameterizations of thermals and entrainment at this resolution, are also presented.