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A methodology to evaluate parameterization schemes applied on west africa using enthalpy and water budgets

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The aim of this work is to analyze the behavior of turbulence and convection parameterization schemes included in the Météo-France ALADIN-Climat Limited Area Model in the frame of a 24 hour simulation of a HAPEX-Sahel case study (the 21 August 1992).
ALADIN-Climat simulations are performed with different horizontal resolutions ranging from 300 to 10 km. Parameterization schemes of convection and turbulence are compared to observations and to a CRM (Méso-NH French model with 5 km horizontal grid-mesh).
The explicit and the parametrized simulations are carried out using the same initial conditions and boundary forcings.
This framework provides an intermediate step of parameterization evaluation between SCM and GCM simulation studies.
Three physical packages have been evaluated, hereafter called Standard (STD), Prognostic 1 (PRO1) and Prognostic 2 (PRO_2). The term prognostic refers mainly to the turbulence and microphysics schemes which are diagnostic in the former case and prognostic in the latter.The main difference between PRO1 and PRO_2 lies in the convective scheme. For PRO1, the Bougeault (1985) mass-flux convective scheme with a Kuo-type closure (moisture convergence) is used. The most important specificity of the second Prognostic physical package (PRO_2) is its treatment of the deep and shallow convection. This convection scheme (Guérémy 2011) provides a continuous treatment of this atmospheric process with a CAPE relaxation closure condition.
Several sensitivity tests are made using those three physicals packages : vertical resolutions (31 and 91 levels), horizontal resolutions (from 300 to 10 km) and initial and lateral conditions (ERA40 vs ERAINTERIM). The behaviors of the three physical packages in terms of convection and wave propagation have been studied using two main methods.First, these parameterized simulations are compared with Méso-NH precipitation averaged on the different ALADIN-Climat grid meshes. Second, enthalpy and water budgets have been performed for each simulation wich leads to the computation of the apparent heat source Q1 and the apparent moisture sink Q2 and their different contributions. Those budgets have been done for explicit and parameterized simulations on similar horizontal domains in terms of the squall line life cycle phase.
Besides, Q1 and Q2 derived from the two ECMWF reanalysis datasets are compared to the Q1 and Q2 issued from the simulation.
The main result of this study is a better positioning of the convection system and a better time evolution of these associated elements with PRO_2 physics. Moreover, this physical package is closer to the CRM in terms of budget