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Impacts of a change in deep convection scheme on the ARPEGE data assimilation system

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In the context of Numerical Weather Prediction (NWP), continuous improvement from one version to another is made possible by the improvement of individual parts of the models. Thus the evaluation of those parts is crucial. Within a time step, we see the sequence of the resolved dynamic part and physical parametrizations. Similarly, within a data assimilation cycle, we see the sequence of forecast and analysis. These cyclical behaviours are responsible for a high coupling between the different parts of a NWP system. This means that, when evaluating an individual physical parametrization, a forecast only approach is not enough and simulations of the whole system with data assimilation over a long period are required.

In this work, we focus on the evaluation of the physical parametrization of deep convection in the French model ARPEGE. We evaluate the direct impact of this parametrization in a forecast only study as well as the indirect impact with a 4D-Var and the study of the analysis. We have replaced the previous parametrization by the one used in the Integrated Forecast System (IFS) developed at the ECMWF. We seize the opportunity of using an other model parametrization to rearrange physical tendencies in the same way as in the IFS. This diagnostic is new for the ARPEGE environment and it leads to an intecomparison between the two model physics. To evaluate the coupling, we use several ARPEGE 4D-Var to compare the change in analysis with an estimate of the analysis error. Those studies show a significant impact of the new scheme both in the tendencies and in the analysis.