

How semi-automatic tuning tools can help parameterization improvement : Application to the sub-grid water distribution of a statistical cloud scheme

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The semi-automatic tuning or calibration tools developed in the High-Tune project led to a proposal for an adjustment of global models with a pre-calibration performed on 1D cases in comparison with LES (Couvreur et al., 2020, Hourdin et al., 2020). Applied to the LMDZ model, using the ARM-cumulus, RICO and SANDU transition test cases, the procedure confirmed the relevance of the thermal plume model coupled with a bi-gaussian cloud scheme to represent shallow cumulus.

However, in trying to extend the parametric exploration to the cases of deep convection (CINDYNAMO and TOGA), a systematic flaw was identified with an excess of cloud cover and relative humidity (both close to 100\%), attributed to an "all-or-nothing" behaviour of the statistical scheme indicating a missing source of variability from deep convection. We show how the tuning tools helped us to propose and adjust a new parameterization to solve this particular problem, without degrading the results for shallow cumulus cases.