Comparer la mémoire de la convection dans différents schémas en fixant l'état de grande échelle

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Convective parameterizations necessarily have to reduce the number of degrees of freedom of the convecting atmosphere, which can lead to errors. Recent studies advocate for introducing an additional degree of freedom as a new prognostic variables for unresolved atmospheric structures ("microstate memory"), adding on the more traditional large-scale influences on convection.

To test the ability of different convective schemes to capture such convective memory, we systematically analyse various convective schemes in a single-column situation, with LMDZ and WRF as convective playgrounds. We compare the scheme responses in a setup similar to radiative-convective equilibrium but with an imposed fixed large-scale state, such that only the unresolved state can vary. Using analogous cloud-resolving simulations (which showed exponential convective evolution) as a reference, we hope to find out which schemes contain memory, and to detect clues on which prognostic variables bring the most accurate form of convective memory. This method could be an additional 1D test to guide convective parameterisation development.

More fundamentally, this fixed large-scale state setup aims to identify to what extent the behaviour of convection is determined by the thermodynamic state variables, by fixing them to see how convection varies. Results indicate that one must use some other predictor (which in principle could be vertical velocity, or a new prognostic variable) to help predict convective activity.