Mathematics of the Weather 2024



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Model uncertainty model intercomparison project an intercontinental comparison of physics suites in weather prediction and climate modelling

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In the Model Uncertainty-MIP (MUMIP) we run single column models from different modelling centres over the same period and domain with a series of 6hr simulations. By constructing the SCM initial and boundary conditions such that they are derived from a common 3D-simulation, a common prescription of dynamics is enforced. Consequently, combined dataset of the array of SCM-simulations will mimic a series of fully 3D NWP runs. Such a model intercomparison with objective procedures is highly important to understand and quantify uncertainty in physical parameterisations and parameterisation packages under the same largescale state. It can further help in constraining stochasticity when coarse simulations are compared to stormresolving simulations (Christensen, 2020). A dataset covering the Indian Ocean is currently under construction for the SCM of ECMWF, the UK Met Office, Météo France, and the NCAR/NOAA Developmental Testbed Centre.

Here, we present a first test case for MUMIP data. Recent work has demonstrated differences in (non-)stationarity across different reanalysis datasets (notably ERA5 and the Japanese reanalysis) in particular regarding the climatology of tropical explicit/convective precipitation and CAPE (Buschow 2024). A proposed hypothesis is that data assimilation and spin-up from non-native model states could be responsible for the non-stationary reanalysis climate.

We analyse MUMIP data to investigate similar transient behavior as a function of forecast time and the diurnal cycle. We further investigate the potential of a link between transience in short-term forecasts of (convective) precipitation and CAPE during the spin-up of the SCMs. Furthermore, MUMIP datasets allow us to intercompare different model physics packages as a function of lead time (0-6 hours), to quantify their divergence and to broadly illustrate model physics uncertainty.

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