

Variable solar forcing of the Icosahedral Non-hydrostatic -ICON) model: implementations and tests in the upper atmosphere extension to apply varying CMIP7 forcing

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The Icosahedral Non-hydrostatic model framework is the open-source numerical weather prediction model and climate model developed by the German Weather Service DWD and the Max-Planck Institute of Meteorology. A consolidated climate setup with interactive ocean, land surface and atmosphere is currently being developed and tested. However, while ICON in its base setup includes varying solar TSI and SSI forcing, this implementation is rudimentary at the moment, and the ability of UV irradiances and energetic particle precipitation (EPP) to change atmospheric composition has not been considered so far.

The upper atmosphere extension of ICON (UA-ICON) currently is a modelling framework allowing the analysis of dynamic phenomena from the ground to the lower thermosphere (150 km). Implementing varying solar forcing and interactive chemistry is expected to hugely influence the thermal structure and composition in the mesosphere/lower thermosphere (MLT).

Updated solar forcing datasets for the 7th phase of the Coupled Model Intercomparison Project (CMIP7) are now prepared. These include daily varying SSI, TSI and ion pair production rates for solar protons, cosmic rays, and medium-energy electrons to model EPP. Implementing these solar forcing data and the interactive chemistry is still ongoing work, and we present the first results of this effort where we focus on the MLT and UA-ICON.

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