EGU24-7455, updated on 20 May 2024
https://doi.org/10.5194/egusphere-egu24-7455
EGU General Assembly 2024

Assessment of ARPEGE-Climat using a neural network convection parameterization based upon data from SPCAM 5

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Interfacing challenges continue to impede the implementation of neural network-based parameterizations into numerical models of the atmosphere, particularly those written in Fortran. In this study, we leverage a specialized interfacing tool to successfully implement a neural network-based parameterization for both deep and shallow convection within the General Circulation Model, ARPEGE-Climat. Our primary objective is to not only evaluate the performance of this data-driven parameterization but also assess the numerical stability of ARPEGE-Climat when coupled with a convection parameterization trained on data from a different high-resolution model, namely SPCAM 5.

The performance evaluation encompasses both offline and online assessments of the data-driven parameterization within this framework. The data-driven parameterization for convection is designed using a multi-fidelity approach and is adaptable for use in a stochastic configuration. Challenges associated with this approach include ensuring consistency between variables in ARPEGE-Climat and the parameterization based on data from SPCAM 5, as well as managing disparities in geometry (e.g., horizontal and vertical resolutions), which are crucial factors affecting the intermodel parameterization transferability.