EGU21-3342
https://doi.org/10.5194/egusphere-egu21-3342
EGU General Assembly 2021

Machine Learning Emulation of 3D Cloud Radiative Effects

David Meyer[2,3], Robin J. Hogan[2,1], **Peter D. Dueben**[1], and Shannon L. Mason[2,1]
[1]ECMWF, Research, Reading, United Kingdom of Great Britain – England, Scotland, Wales (peter.dueben@ecmwf.int)
[2]Department of Meteorology, University of Reading, Reading, UK
[3]Department of Civil and Environmental Engineering, Imperial College London, London, UK.

The treatment of cloud structure in radiation schemes used in operational numerical weather prediction and climate models is often greatly simplified to make them computationally affordable. Here, we propose to correct the current operational scheme ecRad – as used for operational predictions at the European Centre for Medium-Range Weather Forecasts – for 3D cloud radiative effects using computationally cheap neural networks. The 3D cloud radiative effects are learned as the difference between ecRad's fast Tripleclouds solver that neglects 3D cloud radiative effects, and its SPeedy Algorithm for Radiative TrAnsfer through CloUd Sides (SPARTACUS) solver that includes them but increases the cost of the entire radiation scheme. We find that the emulator increases the overall accuracy for both longwave and shortwave with a negligible impact on the model's runtime performance.