

# Review for Zhong et al., 2022, WRF-DL v1.0: A Bridge between WRF v4.3 and Deep Learning Parameterizations and its Application to Atmospheric Radiative Transfer

The manuscript presents the new WRF-DL coupler, which allows the integration of the machine learning models, written in Python, into the WRF weather forecasting model, written in Fortran. In general, a lot of modern software is written in Python, while the bulk of the models in geosciences is written in Fortran due to demands in computational efficiency. Integration of the Python written modules into the Fortran codes is often desired but hampered by the lack of the appropriate interfacing infrastructure. And, although the authors focus on deep learning only, the methodology presented in this manuscript is general and allows integration of any Python models (including physical, i.e. Mie calculation or cloud parametrizations, etc) into WRF. A further advantage of this work is that it presents a functional example of Python-Fortran coupling and can serve as a template in the future.

The topic of the manuscript aligns well with the focus of the journal and the work represents important progress in model development capabilities. The manuscript is very well written and I enjoyed reading it. I recommend publishing this work after some of the non-major comments are addressed.

## Minor comments:

The use of the term “Accuracy” in section 5.2 is inappropriate. Accuracy should refer to the comparison of the models output, which are driven by the same input. It is appropriate to use the term “accuracy” for the model comparison in the offline regime. The online regime, however, does not permit such comparison because the input parameters evolve in time and are not consistent between different runs. By propagating small differences in time, the model transitions into a different physical state, which is characterized by the individual temperature and velocity profile.

The fundamentals of this issue were studied by Lorenz and are known as the “weather predictability limit” (<https://doi.org/10.3402/tellusa.v34i6.10836>).

To summarize, It is OK to keep section 5.2, but the wording needs to be adjusted and the conclusion on the 220-222 is trivial.

Line 193. CPUs->GPUs

Line 200. rsl\_interal\_microclock -> rsl\_inteNral\_microclock

Line 229. More efficiently than what?

Finally, I encourage offers to prepare and document a minimal functional example of coupling the primitive python subroutine into the WRF code (in addition to what is already provided as a git repository). This request is beyond the scope of the manuscript and elective.