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Comment on egusphere-2022-2

Anonymous Referee #2

Referee comment on "Improving the prediction of the Madden-Julian Oscillation of the ECMWF model by post-processing" by Riccardo Silini et al., EGU Sphere,
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Report on "Improving the prediction of the Madden-Julian Oscillation of the ECMWF model by post-processing" by Riccardo Silini et al

Silini et al show that post-processing of forecasts of an ECMWF MJO prediction can improve its prediction, both in amplitude and phase. Besides this practical application their work addresses the interesting question if it is advisable to use a simple forecast model in conjunction with a deep neural network (which is expensive to train) as done in Kim et al 2021, or the most advanced forecast model (i.e. ECMWF model in the context of MJO) in conjunction with a shallow single layer neural network. The authors suggest that their approach of combining the advanced forecast model with a single single layer network is preferable in the context of MJO prediction.

The authors train on (past and future) observations, in particular on two leading EOFs. The authors also compare simple multiple linear regression and a single neural network as post-processing methodologies.

The questions and results the authors consider are definitely of a wide interest and the comparison with KIM et al (2021) is illuminating. I would, however, like to see a few clarifications:

- the authors find that their ML post-processing improves MJO propagation mostly across the MC. Given the different performance across the different phases/sectors, would a stratification of the training data with respect to the initial conditions and their respective sectors be a good idea?
- the supplementary material Silini 2021b shows Wheeler-Hendon phase diagrams for all the data. I am not an expert on MJO but I was surprised how bad their forecasts perform. What is missing to get a better prediction? I imagine that RMM1 and RMM2

are not sufficient to predict the error between the forecast and the observations. Does one get better results if more EOFs are taken as input training data? Or can one include other variables as input training data?

- a minor comment: it may help the reader to begin the Discussion section with an introductory sentence which relates to their initial question of forecast model/postprocessing method complexity rather than starting without motivation "It is interesting to compare ...".