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Geoscientific Model Development Discussions

Interactive comment on "ASoP (v1.0): A set of methods for analyzing scales of precipitation in general circulation models" *by* Nicholas P. Klingaman et al.

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General Comments

This is an excellent paper that introduces a number of interesting and useful diagnostics to study the behaviour of precipitation in weather and climate models at various space and time-scales all the way to single grid points and time steps. The paper is very well written and the analyses and arguments are sound. It adds several new ideas for model analysis and evaluation, all of which will add to the arsenal available to the community. I have a few minor comments, which I list below.

Specific Comments

1) The new diagnostics introduce are very nice and worth looking at in the present form. However, as there are many of them, it would be nice if the authors could consider producing a few summary measures that could be presented more easily when comparing many models and/or evaluating them against observations. This would contribute to the growing interest in having "performance metrics", so that changes in models can be more easily assessed and their effects quantified. I am aware that there is no single metric that identifies good or bad models, but by having a collection of them - well beyond this study - I believe the community will be able to better communicate model improvement in the future. For one-dimensional histograms, there are simple statistical techniques one could use, such as the Kolmogorov-Smirnov two sample test, which allows an assessment of the likelihood that two samples are drawn from the same population. This would be especially useful where models are compared to observations. It would be nice to also have a summary measure of the two-dimensional histograms presented here, but that might be more difficult.

2) Page 12, Line 6-7: This is a very strange argument. It's likely you did look at the lagged time correlations for 3-hourly rainfall and found something. Why not just state what you found - no need to show a figure if you can say it in words. Saying that there could be a problem, rather than that there is one, sounds like you have something to hide.

3) Page 13, Line 28-29: The atmosphere is not in radiative convective equilibrium at the scale of 600 km over 3 hours. If the models were, that would be completely wrong. To provide evidence, I attach an unpublished figure from my own work, which plots daily averages of atmospheric cooling derived from CERES observations against daily averages of rainfall from GPCP for increasing areas centered on a 1x1 degree gridpoint in the Tropical Western Pacific. If we consider the 90x90 degree area as close to RCE, it is evident that the averaging scale one could argue starts to approach it is about 30-40 degrees (i.e., (3000-4000 km)^2), far from the 600 km scale speculated about here. In fact, not surprisingly, at those scales, the atmosphere is a far from

RCE as it can be, as the heavy rainfall is associated with large cloud fields that reduce the atmospheric radiative cooling substantially. More likely, at the 600 km scale the convection is in balance with dynamical systems at the synoptic scale, which do exist in the tropics, and are perhaps relatively well captured by the models.

Technical Comments

4) Page 6, Line 7-8 and Figures 2 and 5: The bin below 0.5 * Delta x appears pointless and makes for an awkward plot. I suggest changing the txt to acknowledge the theoretical possibility of the existence of such a bin but then states that in practice it does not exist for this study. Then you can remove the unnecessary and distracting XXX columns from the figures.

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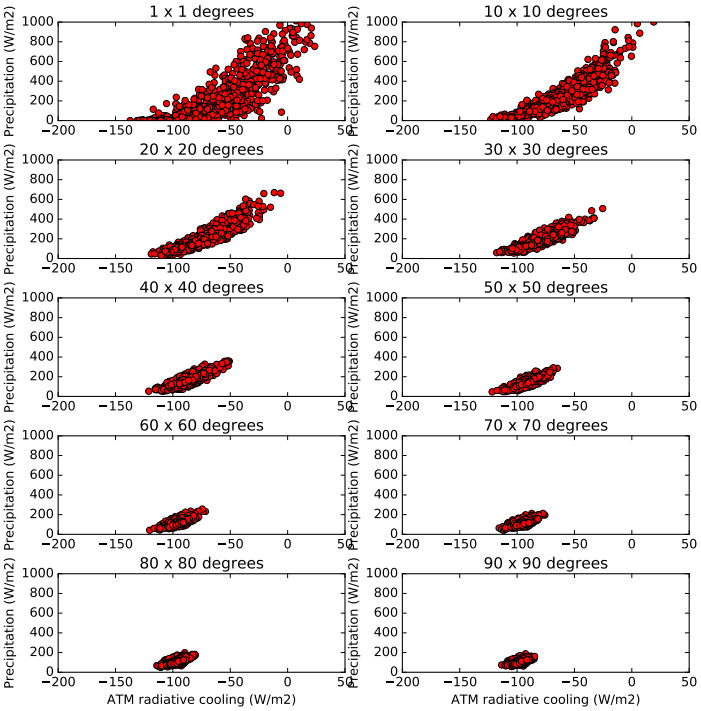

Fig. 1.