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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Comparison of the diurnal variations of warm-season precipitation for East Asia vs. North America downstream of the Tibetan Plateau vs. the Rocky Mountains" *by* Y. Zhang et al.

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Title: Comparison of the diurnal variations of warm-season precipitation for East Asia vs. North America downstream of the Tibetan Plateau vs. the Rocky Mountains

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Recommendation: Accept after minor revision

General comments:

In this study, the diurnal variation and propagation of precipitation downstream of the Tibetan Plateau in East Asia and the Rockies in North America are analyzed and compared using the CMORPH data. Overall, I think that the authors did a nice work through the use of the wavenumber-frequency spectral analysis and provide additional insight into the phenomena in both continents through a quantitative approach. The manuscript is well written, clear, and easy to read. After minor revisions to address the few comments listed below, I think that this paper can be accepted for publication.

Major comments:

1. P.13776: In this paper, diagrams of normalized hourly rainfall are shown to demonstrate the eastward propagation of organized convection within the diurnal cycle (such as Fig. 2). It would be nice if the averaged rainfall (without normalization) in the Hovmoller plots can also be shown to accompany Fig. 2 before going into more details and the spectral analysis. Sometimes, maximum and minimum in the original and normalized plots do not exhibit the same degree of significance, and the readers should be aware of this.

2. P.13778, L9-24 (and possibly other places, including p.13788, L8-9): The averaged westerly wind speed (u-component) is shown to be higher in the North America (mid-latitudes, 30-48N) than East Asia (mostly subtropics, 27-35N) over the focus domains in Fig. 5 here, and consistent with the difference in propagation speed of rainfall signals. However, the authors also say that the signals propagate faster than the mean steering-level wind speed (400-500 hPa) in both continents, and I am not very comfortable with this statement. In the Hovmoller plots, the propagating signals are dominated by organized convection and the phase speed can be estimated without much problem. On the contrary, the MCSs in individual cases may correspond to the steering flow in particular region and height, which are different among the cases, and thus the steering speed would be smoothed out (and under-estimated) significantly by averaging. At

least, caveats are needed here for clarification. The sentence in p.13788 (8-9) for a cause-and-effect relationship may be too strong.

Minor comments:

1. P.13774, L6-15: It should be pointed out that the latitudinal range used for North America (30-48N) to the lee of the Rockies is considerably wider than that used for East Asia (27-35N) to the lee of the TP. Also, in p.13794, the two study domains (fixed latitude/longitude boxes) should be fan-shaped in Figs. 1a and 1c, instead of rectangular, to avoid possible confusion.

2. P.13775, L5: While the study domain for North America is 30-48N, 78-110W, the authors state that the (power spectral) analysis of CMORPH data is from 35N to 48N here. Is the statement correct? Please check and clarify.

3. P.13780, L1-9 and Figs. 7b and 7d: To me, there also appears to be a second solenoid between about 84W and 88W at 0600 and 1800 UTC (between the Great Plains and the Appalachians) in the North America, with a direction opposite to S0. A similar pattern is also noted in Carbone and Tuttle (2008, their Fig. 9). Perhaps, the mean circulation at low levels in NCEP FNL is not strong enough, and the authors can decide whether they want to mention it or not.

4. P.13803-804, P.13815-816 (Figs. 10 and 18): In these two figures, rainfall distributions are plotted in color (same in each continent) and their perturbations in contours, which are not very easily seen partly because the font size of contour labels is too small. Maybe the authors can consider switch them (using color for perturbation and contours for rainfall), or at least use more appropriate contour intervals and specify them (the intervals) explicitly in the figure captions.

Other comments:

1. P.13773, L21-22: I suggest to use "... was used recently by... to study the diurnal evolution...".

2. P.13777, L9: I am not sure if the word "inversion" is a good choice here. Please consider other wording possibilities.

3. P.13780, L23-25: It should be noted that the positive (negative) wave-number correspond to eastward (westward) propagating signals in Fig. 8 (and other similar figures), either in the text or in figure caption.

4. P.13782, L24: It should be "... over both continents...". Also, this sentence is a bit too long and can be broken into two sentences for better readability.

5. P.13797, Fig. 4: The plots (and the labels) are too small to read clearly, and perhaps the readability can be improved by adjusting the layout (for example, put just 4 panels in one page).

6. P.13801, Fig. 8: It would be helpful if the axes of power maxima can be marked in the panels.

Technical points:

1. P.13774, L6: The two analysis domains...

2. P.13783, L20: Figures 10b-c and e-f show the time-longitude diagrams...

3. P.13793, Table 1 (and Figs. 8, 9, and 14): The acronym "CPD" (cycles per day) is not defined anywhere in the text before its use.

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