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Atmospheric Chemistry and Physics Discussions

Interactive comment on "The impact of channel effect on Asian dust transport dynamics: a case in southeastern Asia" *by* C.-Y. Lin et al.

Anonymous Referee #1

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Review of Lin et al., "The impact of channel effect on Asian dust transport dynamics: a case in southeastern Asia" submitted to ACPD, 2011.

The authors use PM10 measurements from ground monitors, CALIOP extinction and depolarization data, MODIS aerosol optical depth, the HYSPLIT single particle trajectory model, and the WRF-Chem model, to show how the Central Mountain topography of Taiwan can impact offshore flow and associated dust transport from the Asian continent, channeling the outflow through the Taiwan Strait, and blocking east-west transport, for a case of strong continental dust outflow in March 2010.

I think this is an interesting case study, which successfully illustrates the impact of the mountain topography in Taiwan on the meteorological flow and the dust transport. I particularly liked the sensitivity study showing the impact of artificially reducing the

height of the topography. The use of ground-based, and satellite data to illustrate the paper is good.

The paper suffers somewhat from being overly wordy, and I would encourage the authors to really focus on the core message here; that the Central Mountain Region of Taiwan can strongly impact offshore flow, and dust transport, from the continent, channeling (funneling) the flow through the Taiwan Strait, and blocking east-west transport. That topographic impact dictates the marked non-uniform geographic distribution of observed dust observed in this case. It seems to me there is there is much unnecessary detail, and repetition in the paper (see specific comments below). I would encourage the authors to select a few key figures to illustrate these points, and eliminate the rest. I think once the paper is streamlined in this way, it will be suitable for publication. My comments below are mostly minor points of clarification, or simplification.

Specific points:

Is this "super dust event" an extreme case, or is it characteristic of Asian dust outflow events that impact Taiwan?

How does the WRF dust simulation compare with the ground-based monitor PM10 data? You show the ground-based observations in Figs. 2 and 3. Can you show corresponding results from the model?

There is much repeated discussion of detailed meteorology, specifically the changing wind fields, pressure field, and the blocking effect of the CMR, in discussing Figs. 4, 5, and 8, e.g. on p. 26449 - 26453. I would encourage the authors to simplify, focus on the message, and avoid unnecessary repetition.

p.26443, Line 25: "documented from theoretical postulation" – a bit awkward. How about simply "proposed"?

p.26443, Line 28: "the air mass could be channeled". How about more simply "the flow could be channeled"?

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p.26446, lines 13-15, Are you saying that the GOCART dust module used to represent dust emission in the WRF model? It's not clear what you mean by "study" here.

Ref: Fig.4: In addition to the red "dollar" signs, I see small, yellow "infinity" symbols, unevenly distributed on the maps. What do these represent? I don't think the synoptic maps in Fig.4 are very useful. You are focused on the coastal region. I see no reason to show regions west of 110oE or north of 40oN, except for panel (e), where you discuss the origin of the dust. I think the maps in Fig.5 are much more helpful for the reader to visualize the frontal passage and the associated wind field. I suggest eliminating the weather charts in Fig.4 and relying instead on those in Fig.5 to make your points. Can you superimpose the dust event symbols on to Fig.5, for example?

p.26449, lines 13-15: "They indicated that the cold air mass mixed with the warm sea surface temperature (SST) in the low boundary, typically migrated westward, and regenerated the semi-permanent subtropical high of the eastern Pacific." This seems a bit unclear to me, and I'm not sure it adds much; suggest you leave this out.

p.26449, lines 27-29: "The depth of the northeasterly continental outflow usually shrinks to below 1500m when the northeasterly continental outflow travel southward in the low altitudes (Lin et al., 2010)." I think the authors are describing subsidence in the wake a of a cold front passage; the language is a little awkward.

p. 26450, ref. Fig.6b: the "model" winds you show those of the NCEP GFS or from the WRF simulation?

p.26452, section 4, Figure 8: This would be the WRF-Chem dust simulation, right? For Fig. 8, I suggest you choose an alternative color palette for Figs 8, 10, 11, 12, and 13. The grey color used for highest values doesn't work for me. The purple tends to obscure the underlying map in Fig.8.

As for my comments on Fig.4, I would strongly suggest that you show a more limited domain in Fig.8, such as is used in Figs. 5 and 9, focusing on the Taiwan Strait.

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Figures 10,11,12,13: I don't think it's necessary to show multiple panels (multiple times) for each cross-section to illustrate your point. Try picking a single time, say 21 March 06:00 UTC, and create a single 4-panel figure for all cross-sections. This would help the reader better compare and contrast the structures between locations.

Figure 14: This is a nice way to demonstrate the channeling and blocking effects of the topography. You show the meridional wind speed as a function of time and latitude for the 2 sections. It is not clear, however, if these are surface wind speeds, or averaged over a particular altitude range. The figure legend is an example of unnecessary wordiness. You only need to say "Temporal variation of N-S component of wind speed during 20–23 May 2010" and "The contour is shown in 3ms−1 interval" once.

With great respect to the authors, the paper would benefit by being proof-read by a native English speaker. There are some phrases, such as "The differences in concentration can be reached to 5 times in less than 100 km in the west-east bound distance," where this would help.

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 26441, 2011.