Atmos. Chem. Phys. Discuss., 15, C6801–C6805, 2015
www.atmos-chem-phys-discuss.net/15/C6801/2015/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Toward enhanced capability for detecting and predicting dust events in the Western United States: the Arizona Case Study" *by* M. Huang et al.

W. Sprigg (Referee)

wsprigg@email.arizona.edu

Received and published: 13 September 2015

General Comments: This paper does report on some significant findings over the past decade regarding elevated dust detection and modeling. A partial list is provided in specific, following remarks.

While the approach is novel, and introduces use of new tools, the authors' case could be made stronger for, "This study develops dust records in Arizona in 2005–2013. . ." In particular, their study report is vague about agriculture sources and their variability, not very specific about the influence of extant sources, and the frequency by which

sources should be identified and monitored in order to make a reliable dust record using consistent methods.

The authors include a nice example of how models (HYSPLIT and CMAQ) may apply in understanding the observed "dust record" for Arizona, but this reviewer felt the connection between modeling a dust event (with CMAQ) and creating a dust record needed more explanation. If the authors cannot explain why the CMAQ run adds significantly to new, important findings shown in this paper, the CMAQ component should be extracted.

The paper should be published only after addressing the main points of this review.

Scientific quality: Are the scientific approach and applied methods valid? Are the results discussed in an appropriate and balanced way (consideration of related work, including appropriate references)? Relevant work by others is missed, lowering readers' confidence in the thoroughness of the study being reported upon. E.g. Mahler, Yin, Vukovic, Sprigg, Morain, the USGS (e.g. Reynolds et al.) and NASA JPL (e.g. Painter) _____

1 Does the paper address relevant scientific questions within the scope of ACP? Yes

2 Does the paper present novel concepts, ideas, tools, or data? Yes, combining a variety of satellite-based (MODIS) and surface-in-situ (AirNow & IMPROVE), models (HYSPLIT, CMAQ, NAM) to assess potential relationships of interannual drought and airborne dust.

3 Are substantial conclusions reached? Stratospheric ozone intrusion and other synoptic weather patterns combine to generate dust, hence a forecast system should account for both. This is an important conclusion, for this phenomenon may not be important for much of the rest of the world. Identifying its importance in Arizona and the SW US is useful.

Substantial conclusions are not reached in the sections describing CMAQ. One storm, one example, at 17 km spatial resolution, does not appear to add much to extending the dust record. Nor does this one model test tell us much about how to use dust sources to improve model simulations of dust concentrations. Too, the paper's Abstract concludes that the, "... 12km CMAQ model during a recent strong dust event in the western US 20 accompanied by stratospheric ozone intrusion ... (shows) that the current modeling system well captures the temporal variability and the magnitude of aerosol concentrations during this event ..." This statement needs a definition of "well captured." There is at least one other modeling system (e.g. Vukovich, et al., 2014; Sprigg, et al., 2014) that if compared, arguably would affect this wording.

4 Are the scientific methods and assumptions valid and clearly outlined? They are clearly outlined, but an unwritten assumption by the authors is that their methods of monthly satellite measures of soil moisture and NDVI are adequate in covering the highly variable contributions of agriculture (e.g. irrigation, crop cycles) to dust sources and emissions. This assumption is doubtful. See, e.g., papers by:

a) Vukovic A., Vujadinovic M., Pejanovic G., Andric J., Kumjian M.J., Djurdjevic V., Dacic M., Prasad A.K., El-Askary H.M., Paris B.C., Petkovic S., Nickovic S., and W.A. Sprigg (2014) "Numerical Simulation of 'An American Haboob'", Atmos. Chem. Phys., 14, 3211-3230, 2014, doi:10.5194/acp-14-3211-2014 b) Sprigg W., Nickovic S., Galgiani J.N., Pejanovic G., Petkovic S., Vujadinovic M., Vukovic A., Dacic M., DiBiase S., Prasad A. and H. El-Askary (2014) Regional dust storm modeling for health services: the case for valley fever, J. Aeolian Res. http://dx.doi.org/10.1016/j.aeolia.2014.03.001; Elsevier, AEOLIA-D-13-00085R1 c) Yin, D. and W. A. Sprigg (2010) Modeling Airbourne Mineral Dust: A Mexico - United States Trans-boundary Perspective. Pp. 303-317 in W. Halvorson, C. Schwalbe, and C. van Riper, III (eds), Southwestern Desert Resources. University of Arizona Press, Tucson, AZ, 359 pp. d) Yin, D., S. Nickovic and W.A. Sprigg (2007) The impact of using different land cover data on wind-blown desert dust modeling results in the southwestern United States. Atmospheric Environ-

ment, DOI.10.1016/j.atmosenv.2006.10.061. e) Yin, D., S. Nickovic and W.A. Sprigg (2007) Effect of wind speed and relative humidity on atmospheric dust concentrations in semi-arid climates; J. Atmos. Env. 41(10):2214-2224; Science of the Total Environment 04/2014: 487C:82-90. DOI.10.1016/j.scitotenv.014.03.138 f) Mahler, A-B., K. Thome, D. Yin, W. A. Sprigg (2006) Dust transport model validation using satellite- and ground-based methods in the southwestern United States; SPIE, Vol. 6299;ISBN: 9780819463784

A search of the literature by the authors would have revealed modeling, forecasting and simulating dust concentrations in the exact area (and time) of their study. References are first noticed missing on pages 20746 - 7.

5 Are the results sufficient to support the interpretations and conclusions? 6 Is the description of experiments and calculations sufficiently complete and precise to allow their reproduction by fellow scientists (traceability of results)? Yes 7 Do the authors give proper credit to related work and clearly indicate their own new/original contribution? Note author oversight of literature and work on dust source identification and monitoring, and dust modeling, simulation and forecasting in the region of their study, Arizona. 8 Does the title clearly reflect the contents of the paper? Yes 9 Does the abstract provide a concise and complete summary? I think it risky to state, as in the abstract, "Studies have revealed intensified dust activity in the western US during the past decades ..." An intention of the authors' research is to determine this. I am unaware of solid evidence of such, which makes the authors' research timely and important. 10 Is the overall presentation well structured and clear? Yes 11 Is the language fluent and precise? Yes 12 Are mathematical formulae, symbols, abbreviations, and units correctly defined and used? Yes 13 Should any parts of the paper (text, formulae, figures, tables) be clarified, reduced, combined, or eliminated? Yes, the section on CMAQ modeling should either be eliminated or elaborated upon significantly. 14 Are the number and quality of references appropriate? No. See previous remarks. 15 Is the amount and quality of supplementary material appropriate? Yes