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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Deriving polarization properties of desert-reflected solar spectra with PARASOL data" *by* W. Sun et al.

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This article provides what I consider an obvious first-order approach to modeling the effect of polarization of scattered sunlight over bare/desert regions. The advantages of the model are that it is simple and straightforward and physically intuitive. I consider this to be the first step in more complicated models. In addition, the model does not shy away from using advanced techniques. For instance, the authors select the agglomerated debris particles to represent their atmospheric aerosols. These particles have been demonstrated to be the most accurate at modeling the light-scattering properties of dust particles. In fact, they are the ONLY model particles that can accurately reproduce the light-scattering properties at multiple wavelengths (Zubko, 2013).

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Interactive Discussion

Discussion Paper

As an introductory paper to this complicated topic, the paper leaves open several lines for future research and discussion. Not only does it provide the foundation for future, more advanced modeling approaches, but leaves some research questions unanswered: 1. When more complicated surface models are incorporated, how will this effect the results? 2. As with any model that is composed of several distinct physical parts, what are the predominate sources of error and what observations are necessary to test these parts independently, so that we know where it is best to focus our efforts to make improvements? 3. Most significant in my mind are the surface parameters f and sigma and their lack of dependence. What happens, for instance, when we consider extreme incident angles? My only significant criticism is that I would prefer to see the figures discussed in more depth. The authors present several of these and make broad statements. In the text, they really should state what each figure shows and why it is being presented.

There are some minor typographical considerations that I have transmitted to the authors.

Interactive comment on Atmos. Chem. Phys. Discuss., 15, 8525, 2015.