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Atmospheric Chemistry and Physics Discussions

# *Interactive comment on* "Disk and circumsolar radiances in the presence of ice clouds" *by* Päivi Haapanala et al.

**Anonymous Referee #2**

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The paper deals with the sensitivity analysis of how ice crystals, their shape and roughness, affect direct solar measurements, including the assessment of the diffused and circumsolar radiance.

This is topic of great interest, both to the cloud and aerosol retrieval community, especially from direct sun measurements. In addition, this is of interest to applications that are related to energy harvesting from the sun, as it lays the ground for simulations of the direct solar energy under various atmospheric conditions.

In general, the paper is well written and is well describing of the various methods and sensitivity analysis conducted. However, the connection between the sensitivity studies and observations and to the goal of the study is largely missing from the text. Please try to add more content reminding the reader in each of the sections of why and how



the results of the sensitivity studies would be important for solar measurements and for the aerosol/ice cloud retrieval community.

There are some areas where additional physical explanation or delineation might have been useful. For example, in Fig. 5 and Fig. 9 is it not entirely clear from the text why does the MR crystals result in a much larger bias from CS when compared to the SR particles. One might think that it should result in discrepancies that lie between CS and SR (in magnitude). This might be due to the contradicting effects of the direct and diffuse components, which might create this deflection point, but this is not entirely clear from the text.

In Fig. 11 and 12 it is unclear why some of the SAM measurements (dashed grey lines-hp) are discontinued and showing a drop in radiance intensity around 0.27, while the hn are not. Also, please add the acronym of hp and hn to the figures captions (in Fig.11 and 12), to help the reader.

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