

Interactive comment on “Determination of circumsolar radiation from Meteosat Second Generation” by B. Reinhardt et al.

Anonymous Referee #1

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General Comments

This paper presents research on the application of data from SEVIRI (Spinning Enhanced Visible and Infra-Red Imager) on board MSG (Meteosat Second Generation) satellites of concern to the concentrating solar energy research community. The authors' use of radiance measurements in the visible and shortwave infrared bands to retrieve the angular distribution of sunlight reaching the ground within a few degrees of the solar disk (circumsolar radiation) represents a novel and substantive extension of the use of such measurements for retrieving the microphysical properties of cirrus clouds and is well within the scope of AMT. The authors are to be commended for their candor concerning the problems they encountered, e.g., the uncertainties introduced by lack of knowledge of ice crystal habit, and their thoroughness in investigating and

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documenting them. Despite these difficulties they make a good case for the usefulness of their approach.

The authors begin with a brief discussion of circumsolar radiation, a short history of ground-based measurements, and the reasons for seeking a satellite-based approach. They motivate their decision to focus on the role of cirrus clouds (as opposed to that of aerosols) and note where their work departs from or extends previous research. They provide a good discussion of the methods they used and references useful for filling in details. The presentation is well structured and clear, although the English shows signs of being written by non-native speakers. All in all, this is an excellent paper and I recommend publication.

Specific Comments

Although this is not critical to the argument of the paper, given the subsequent discussion of the importance of ice crystal habit, e.g., the differences between the two sets of Baum phase functions, I would have expected to see some more information on the phase functions used to prepare Fig. 1.

The authors introduce “effective radius” at the end of section 2.3. I understand that this is the measure commonly used to characterize cirrus cloud particle size distributions. I encourage the authors in the future to consider a different measure recently reported in JGRD (doi:10.1002/jgrd.50440). This measure, termed “area diameter”, relates directly to diffraction, which is the physical mechanism responsible for the strong forward scattering by ice crystals. The JGR authors noted that the diffraction phase functions for different ice crystals habits with the same area diameter are significantly more similar than those with the same effective radius or a couple of other measures they investigated.

Page 5848, Lines 10 and following: It seems that most researchers involved in radiative transfer calculations are familiar with cases involving small particles in which multiple scattering plays a significant role even at very small optical depths, e.g., as small as

0.05. So the authors' statement concerning the limited dependence of the corrective factor k on optical depths below 3 may come as a surprise. The authors might consider noting that multiple scattering is the issue and that indeed its effects are much reduced in the case of scattering by particles that are large compared with the wavelength of the light for scattering in the near forward direction.

I mention a few minor language issues below.

Page 5844, Line 3: "concerning" would be better than "considering"

Page 5846, Line 16: "this" should be "these"

Page 5846, Line 21: "assess" should be "assessed"

Page 5849, Line 10: "solar" seems redundant with "circumsolar"

Interactive comment on Atmos. Meas. Tech. Discuss., 6, 5835, 2013.