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Atmospheric Measurement Techniques Discussions

Interactive comment on "Accounting for the effects of Sastrugi in the CERES Clear-Sky Antarctic shortwave ADMs" *by* J. Corbett and W. Su

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The manuscript describes 1) improved next-generation angular distribution models (ADM) developed for accounting for the effects of sastrugi and 2) testing them applied to the top-of-atmosphere (TOA) fluxes from CERES radiance measurements over clear Antarctic scenes. The presented results are certainly very interesting. I recommend publishing with minor revision; my comments are as follows.

1.About abstract: "In this paper we created a set of ADMs that account for the sastrugi. . ."

An approach to constructing of the CERES ADMs was described in Su et al., 2014. In

this paper the authors focused on details of the ADM development for a specific region of the world - Antarctica taking into account its specificity - the presence of sastrugi. I think that this should be noted in the abstract

2.The effects of sastrugi are wavelength dependent. According observation and simulation results in the solar SW spectrum snow has a much higher absorptance in the near infrared (NIR) wavelengths then in the visible wavelengths. Therefore, the most significant impact of the snow roughness manifests on the 0.86 μm reflectances from MISR cameras. As I understood, exactly these data were used for deriving statistical relationships between radiance from different viewing angles. At the same time, contribution of visible range in SW flux is large. The question arises: how exactly the obtained joint distributions of the standard scores of 0.86 μm reflectances from any two pairs of MISR cameras allow us to estimate the impact of sastrugi on the broadband fluxes (albedo)? Could the authors comment this result in more details (may be on the basis of the simulation results?) Maybe this is the reason that the decrease in albedo due sastrugi in the papers of Carroll and Fitch, 1981; Leroux and Fily, 1998; Zhuravleva and Kokhanovsky, 2011; Warren et al., 1998 is estimated to be a few per cent, and in this paper, the influence of sastrugi estimated at 10% (over areas close to the South Pole)?

3. Page 384: "We also do not have any solar zenith angle dependence in the adjustment factors. The standard-scores themselves are calculated in solar zenith angle bins, however we found that the joint-PDFs were largely insensitive to the solar zenith angle, so the decision was made to not include the solar zenith angle dependence in the adjustment factors."

It is desirable to see the confirmation of this statement - for example, in a figure

4. Page 378: "where $\theta 0$ is the solar zenith angle, θ is the CERES viewing zenith angle. . .".

Correct index θ - for CERES viewing zenith angle.

5. Page 385: “We first calculate the mean and standard deviation of the CERES clear-sky reflectances over Antarctica, using measurements from both the Terra and Aqua satellites.”

Sastrugi characteristics vary from month to month. It is taken into account when constructing the models?

6.Page 388. Formula (3)…. where A is the estimated instantaneous albedo determined using Eq. (3)

A(zi,zj) was used previously (page 384) to denote of adjustment factor. The use of similar symbol (A) can be confusing for readers

Please also note the supplement to this comment:
http://www.atmos-meas-tech-discuss.net/8/C106/2015/amtd-8-C106-2015-supplement.pdf

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Interactive comment on Atmos. Meas. Tech. Discuss., 8, 375, 2015.