The Cryosphere Discuss., 6, C1199–C1200, 2012
www.the-cryosphere-discuss.net/6/C1199/2012/

The Cryosphere Discussions

Interactive comment on "Linking glacier annual mass balance and glacier albedo retrieved from MODIS data" *by* M. Dumont et al.

J. Dozier (Referee)

dozier@bren.ucsb.edu

Received and published: 19 August 2012

The paper's quality is high and contributes significantly to our understand of cryospheric remote sensing. But you need to reconcile the text and Table 4, or at least clarify what your evidence shows. Referring to the text on P 12 L16, unless I misunderstand Table 4, the data in the table do not really show the improvement by including the anisotropy. My first reading (I looked at the table before I read the text) was that including anisotropy provides hardly any improvement, and in some cases is less accurate than the isotropic method. Can you please clarify the sentences on P 12? I just find them hard to reconcile with Table 4, so perhaps revising both would improve the communication.

Perhaps the reason that the anisotropic correction is of marginal value lies in Section

4.3.4. There you discuss the anisotropy correction used and note the effects of surface roughness. Perhaps the reason that Table 4 does not show that much improvement is that roughness generally produces the opposite anisotropic effect compared to smooth ice or snow. Generally smooth surfaces scatter in the forward direction (because the ice grains themselves have a forward scattering peak) whereas roughness produces shadows in the forward direction, thereby causing a measurement that integrates over a larger scale to be lower for a rough surface. That is, the grain scale BRDF is different than the scale of the surface geometry.

An interesting side note here is that Li & Strahler (IEEE Trans Geosci Remote Sens, doi: 10.1109/TGRS.1985.289389) showed the similar effect for forests. Their realistic BRDF model is based only on the geometry of the trees, where every element in the model (leaves, grass, soil) scatters isotropically.

Some minor comments:

End of Section 2.1 (P 6, L3) - I think you mean 30 m resolution.

P8 (section 3.2) says 7 bands are used to retrieve broadband albedo, but equations 2 and 3 use just 4 bands. Please clarify.

Given that the analysis is restricted to pixels with more than 50% snow, how does the variability in reflectance of the rest of the pixel affect the analysis?

P 9 L13 - There is a word missing in this sentence but I cannot infer with certainty what it is.

Interactive comment on The Cryosphere Discuss., 6, 2363, 2012.