Biogeosciences Discuss., 5, S485–S488, 2008
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Biogeosciences Discussions

Interactive comment on "Reflectance properties of selected arctic-boreal land cover types: fieldmeasurements and their application in remote sensing" *by* J. I. Peltoniemi et al.

J. I. Peltoniemi et al.

Received and published: 7 May 2008

We thank the reviewers for extensive criticism and the rare opportunity for open scientific discussion.

Some answers to reviewers

by Tiit Nilson

We acknowledge the thorough and profound comments written by Tiit Nilson, and will clarify the mentioned points as well as extend references in our paper.

Nilson inquired about publishing our data base. Our aim is to get the database publicly available as soon as possible, but unfortunately many small technical, fiscal and legal

issues still need solving.

by G. Schaepman-Strub

Schaepman-Strub criticized the general scientific quality of our paper. However, since we consider our work well and carefully done (i.e. worth publishing), we have to disagree with Schaepman-Strub in this matter. We agree that many of the general conclusions presented in our paper probably apply to a larger region than only the boreal zone. However, we fail to see why this is considered a shortcoming in a paper. Unfortunately, our experience has been that papers which are not in the "main stream" or a part of the current trends in the remote sensing industry have more difficulties to be published in remote sensing journals.

1) Lack of aim and focus We will clarify the aims paragraph of our paper.

a) The aim of our paper is to present examples of BRDF's of important surface covers in boreal forests, and hence, to support both modeling and application studies in the RS of northern areas. The motivation for our study has been that the forest remote sensing community needs (desperately) information of BRDF's of the land surfaces in order to separate e.g. understory and forest tree layer effects. It is clear that a large part of reflectance signals from boreal forests come from the understory, and that the ground understory level signals can sometimes vary much more than the tree canopy signal. When BRDF's of the understory are not available, many RS models only assume black or homogeneous and Lambertian soil.

b) "omit the trees". Title mentions "selected land cover types", not all land cover types, not even most. We have measurements of over 200 samples and there are at least 2000 more to measure. We simply cannot cover them all in a single paper. Even presenting these samples required careful selection and compression. We will present more data and analysis in forthcoming papers, including detailed measurements and modelling of trees and parts of them. We can clarify the title more if needed.

BGD

5, S485–S488, 2008

c) "mix of description of the instrument, methodology and database.". The instrument and measurement methodology are already covered in few of our earlier papers (references are given in the description of the instrument) and a thorough technical paper of the Figifigo itself is under preparation. This is why we have not repeated all the details in this paper, but instead concentrated on the application results which should be interesting to a wider community.

2) a) ”missing something”. The aim of of this paper was not to provide a general review of all possible BRF measurements (for all possible samples), but instead, to describe a data set for a specific biome, the boreal zone. We had to exclude forests from our paper, but we will add more references to e.g. the BOREAS project (and others) as suggested by Schaepman-Strub.

b) The data processing and terminology are correct. The data processing really is as simple as Eqs 1 (and 2) and cleaning of obviously bad outlier points. We wish to point out that a model is not needed to get BRDF from HCRF, when all necessary parameters are measured in the field. Here is the methodology (we will add it to the paper also): One can separate the diffuse sky and environment radiation from the direct sunlight very simply by putting a small obstacle blocking direct sunlight illuminating the target and measuring the target brightness under the diffuse light only, and then subtracting the diffuse component from the combined (diffuse+sunlight) part. Takes only few minutes extra time in the field. That sunlight is neither exactly collimated and comes from 0.5 degree cone is insignificant for most applications of BRF (only positioning of halos and study of close range backscattering and diffraction effects need to care about that).

c) Solar angle is never assumed constant in our paper, whatever time measurements take! Only in lamp (i.e. laboratory) measurements it is constant. The presented results are interpolated to a fixed solar angle using expansion 2.

d) This is a good question by the reviewer, and we have discussed it a lot. We selected

BGD

5, S485–S488, 2008

this specific mathematical expansion, because we want a general tool that applies to all other data as well. Better BRDF models apply only to very few very ideal samples, which our samples unfortunately are not, even after careful selection. Using better-suited but specific models may also bring some modeling artefacts, and can (in the worst scenario) lead to an impression that the measurements fit perfectly to a model. A more detailed analysis of the validity of different models is beyond the scope of this publication, yet we do agree, that it is an important field of study.

e) Anyone with access to a goniospectrometer should easily be able to reproduce the main results to the accuracy sufficient for most applications. Exact reproduction of single data points is, of course, impossible, because every sample in nature is individual and conditions vary in large range.

f) We will clarify the wording here.

3) a) From the papers published in leading RS journals, it can be seen that empirical field measurements (and laboratory work) have not been as popular and as widely published as many other, more large-scale application studies.

b) We edited the figures. For easier comparison, we have now fixed the same scale for all the plots (except snow). On the other hand, I do not see any problems with the y-axis in any plots. I agree that the quality of images can be improved making them bigger, but that will increase the number of pages and make the layout more complicated. If you have some good suggestions for making them better, we are happy to improve anything we can.

Interactive comment on Biogeosciences Discuss., 5, 1069, 2008.