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Discussions

Interactive comment on "Determination of land surface reflectance using the AATSR dual-view capability" *by* L. Sogacheva et al.

Anonymous Referee #2

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This paper presents a validation of a land surface reflectance product derived using the ADV AATSR aerosol retrieval algorithm. The ADV product is compared to both the ASRVN and MODIS surface BRDF products and the results described as a function of surface type. The paper is generally well written and the methodology sound. I am somewhat dubious of the usefulness of a product that amounts to a pseudo-directional surface reflectance (for the AATSR viewing geometry) at 550 and 660 nm, but if nothing else the work is further validation of the ADV aerosol retrieval scheme.

I recommend publication once the following comments and questions have been addressed.

General comments:

C3090

The authors need to be more specific in their definitions and use of terms such as albedo and surface reflectance. In the introduction the authors appear to be describing the bi-hemispheric spectral reflectance, or spectral white sky albedo (they mention that to determine albedo the surface reflectance needs to be integrated across all sun-view geometries). The unqualified term Albedo generally refers to the spectrally integrated (across the solar spectrum) white sky albedo - this appears to be what they are referring to as the "surface shortwave albedo" around line 10 on page 7454.

Furthermore, the term "surface reflectance" is also problematic. At the start of page 7454 the authors mention that instrumental methods measure surface reflectance for a given sun-view geometry, but fail to note the dependence on the ratio of direct to diffuse incoming radiance - i.e. the measured surface reflectance will not be purely bi-directional, but will include a diffuse to direction component which depends on the turbidity of the atmosphere.

These points may seem finicky, but they illustrate the mire of related but distinct values which tend to be used interchangeably. I strongly suggest the authors clearly define the terms and nomenclature they using and stick to it.

I was left wondering what the point of section 6 was. I understand the desire to show an application of the ADV surface reflectance product, but this seems rather forced. The authors provide no real motivation for this work, nor do they provide any real conclusions.

Specific points:
These points refer to the specific page and line number indicated.
pg.7456 ln.22: The ATSR-2/ERS-2 date range is incorrect. The ERS-2 satellite was operational until 2011 and I think ATSR-2 was producing data up until 2009. Currently Level 1 data from ATSR-2 is available to mid 2003 (when the on-board tape storage on ERS-2 failed).
pg.7457 ln.2: Please be specfic: The ADV algorithm uses the "555" "659" and "1610" nm channels, other algorithms use a different selection of channels.

pg.7458 ln.5: "Cloud reflectance dominates" rather than "Cloud reflectance overwhelms".

pg.7458 eq.1: This is a good example of where the authors need to be more precise about the assumptions made in the forward model. The define ρ_s as simply surface reflectance, without noting that this formulation assumes that the surface is a Lambertian reflector. It assumes the same surface reflectance for the direct+diffuse transmitted solar-radiation (top line) and the downwelling multiply reflected sky radiance (bottom line).

pg.7459 ln.15-21: The authors state that "The determined AOD is independent of assumption of surface properties". This is not true - the k-ratio is an explicit assumption of the spectral dependence of the surface BRDF (which the authors acknowledge on ln 21), in addition to the assumption described in my previous comment. Thus the retrieved AOD is dependent on at least two assumptions of the surface properties.

pg.7460 ln.8-9: The description of ASRVN is to brief to be informative. What is AERONET data used for and what is meant by "MODIS TOA measurements are used for atmospheric correction"?

pg.7460 ln.14-15: Contradictory statements: Is the resolution of ASRVN 500 m or 1 km? pg.7460 ln.27 - pg.7461 ln.5 (last paragraph of section 3.1): Is this classification of the surroundings of ASRVN sites something that was done as part of this work? If so, more detail should be provided as to how this classification was done; otherwise provide a reference.

pg.7461 ln.10-13: The description of the RTLS weighting parameters/kernels given in the brackets is very difficult to follow. Please reword.

pg.7463 ln.5: Where does 675 nm come from? Is this a typo (i.e. should it be 659)?

pg.7463 ln.7-10: The sentence starting "Spatial coverage varies..." is poorly worded and doesn't scan well. Please reword.

pg.7464 ln.3-4: Are the references given for the surface albedo accuracy requirements (which are 21 and 31 years old) valid for current climate modelling surface reflectance modelling? Furthermore, are these values referring to broadband albedo or spectral

albedo (and if so, at what spectral resolution)? How do these values relate to the validation of the pseudo-directional surface reflectance retrieved by ADV? pg.7464 ln.22: The fact that brighter surfaces have a higher correlation is more related to the fact that they provide a wider range of reflectance values than any improvement in the agreement between the ASRVN and ADV results (as is evidenced by the RMS and absolute error values provided in tables 1-3).

pg.7465 ln.6: When the authors say "typical average cases", are they referring to some average aerosol loading?

pg.7465 ln.25: How are the uncertainties in the averaged values derived? Do the authors mean that the average ADV-ASRVN discrepancy is given in table 3? If so, this is not an uncertainty in the average value!

pg.7466 ln.21: The observed differences could also be partly due to the limitations of the RHLS BRDF model.

pg.7467 ln.16-20: I'm not sure what point the authors are making with the sentence starting "For this transect...". Please clarify.

pg.7468 ln.1-4: This sentence is not very clear and should be reworded.

pg.7469 ln.26: Would the ADV surface reflectance at 555 and 659 nm really be sufficient for calculating a broadband albedo which would be a improvement over current estimates? Given that the ADV algorithm neglects the 870 nm channel, which has the strongest sensitivity to vegetation, I am sceptical.

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