

Interactive comment on “Mapping spatially-temporally continuous shortwave albedo for global land surface from MODIS data” by N. Liu et al.

Anonymous Referee #1

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The present paper presents a smooth interpolation method for albedo products. The method is based in an update of a historical albedo distribution with current and (temporally) nearby observations, weighted by their respective uncertainties. The method is visually compared with simple products that go into the interpolation algorithm, and is also compared with ground based albedo observations and the MODIS official albedo product.

Firstly, I note that the method is very similar to that used in ESA's GlobAlbedo product (see GlobAlbedo's Algorithm Theoretical Basis Document on

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http://www.globalbedo.org/docs/GlobAlbedo_Albedo_ATBD_V3.1.pdf, Sect 3.6.3, p. 61), in itself based on (Quaife and Lewis, 2010). In essence, the authors exploit temporal correlation in the signal. I think that the most critical assumption is that the conditional distribution of albedo at time k , α_k on $\alpha^{*}_{k+\Delta k}$ (albedo estimates at other times) is believable, but ought to be tested.

The use of the prior is an important and welcome addition. However, I envisage problems when the climatology is derived from e.g. snow free scenes and the observations have snow. If this is not carefully treated, we might miss the snow event.

The abstract is a bit unclear. However, the second paragraph of the conclusions does a good job of explaining what this paper is about: a Bayesian filter that updates a prior distribution based on an albedo climatology plus a weighted combination of temporally close observations and an idea of temporal correlation in albedo. The result is a smooth and complete time series of albedo plus uncertainties.

I don't really see the point of using 4 input products. Why not just group together the MOD09/MYD09 observations? Presumably all these products are very correlated (see point above)? And in most cases, the products are quite undistinguishable from MOD43!

There are only very limited comparisons with the official MODIS products. I guess the paper does not answer the question of why would anyone bother using the new product directly. Factors for this are: credible uncertainty, gap filled product, and similar or better performance to the MODIS algorithm over large areas.

Finally, given that snow has a very high albedo, its treatment should be high up in the list of priorities.

Minor points:

The abstract needs to improve. See suggestions above and note that (p 9044, l15) the suggested procedure can actually suffer from oversmoothing of important high-albedo

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events (snow fall, see Fig 3(c), DoY \sim 140).

p9044L24 "Spatial-temporal" replace by "Spatio-temporal"

p9045L6: "about" replace by "between"?

p9045L9: "enhance the completeness" replace by something like "interpolate missing observations", "fill observation gaps", etc.

p9045L10: Also mention Quaife and Lewis (2010), as well as the GlobAlbedo ATBD document.

p9046L1: "The Global [...]"

p9046L3: "high quality" is not defined and is ambiguous

P9046L6: "by the inversion of radiative transfer process" should maybe be "by the inversion of RT models"?

p9046L18: "and *A* quality[...]"

p9046L19: "The uncertainty[...]" presumably uncertainty is encoded as a continuous variable?

p9046L25: "there're" subs by "there are"

p9047L22: "consists OF two[...]"

p9048L2: "Moreover [...]": this few sentences should go at the beginning of the section, and introduced as the prior.

p9048L15: "the STF method updates the prior estimate of albedo by combining contemporary estimates weighted by their respective uncertainties, under the assumption of temporal correlation. The latter point enhances the smoothness of the resulting time series".

Up to p9049L6: This is just stating the previous comment. You can make it shorter and

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clearer

p9050L15: "The inputs [...]" (shorter)

p9050L16: "Systematic discrepancies" (shorter)

p9051L7: "[...]stability and *HAS* been widely validated."

p9051L12: Put the reference to Table 3 around here, not on bullet points

p9051L26: Is the product name spelt correctly?

p9052L7: "Tiber" ought to be "Tibet"?

p9053L5: "snow melt" rather than "smelt"

p9053L15: Can't you just check whether an actual snow event happened on those dates?

p9053L20: What do you mean by "It may be associated with the retrieval method[...]?"
Clarify this point

p9054paragraph2: Consider using part of this paragraph in the abstract

p9054L15: "[...]albedo products become available[...]"

p9054L17-20: The uncertainty in the prior is weighted against that of the observations, so the prior is always there (Eq. 4+5)

Fig. 2: Is this really needed? A more thorough comparison with MODIS MCD43 might be better.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 9, 9043, 2012.

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