

Comment on **essd-2022-166**

Anonymous Referee #3

Referee comment on "AnisoVeg: anisotropy and nadir-normalized MODIS multi-angle implementation atmospheric correction (MAIAC) datasets for satellite vegetation studies in South America" by Ricardo Dalagnol et al., Earth Syst. Sci. Data Discuss., <https://doi.org/10.5194/essd-2022-166-RC3>, 2022

The manuscript "AnisoVeg: Anisotropy and Nadir-normalized MODIS MAIAC datasets for satellite vegetation studies in South America" by Dalagnol et al. describes the production of a data set on vegetation anisotropy derived from MODIS data for South America. There is considerable potential for such a data set to provide useful information about the state of the land surface, and one tantalising hint that the authors provide is the result that the ANI is able to explain $R^2=0.55$ of the variability in the GEDI canopy height signal (Fig 5., c.f. $R^2=0.16$ for the normalised reflectance). Overall, I think this is a well written paper which describes a potentially important data set. I do have a few grumbles, mostly minor, but I hope the authors take these in the spirit in which they are intended – I am only seeking to improve the manuscript, and I am not suggesting any complex changes.

Main comments:

I find it strange that MCD43 isn't mentioned anywhere. The implicit claim is, I assume, that the MODIS MAIAC data is far superior to the MOD09 and MY09 which is used to derive MCD43. I don't disagree with this, but one could also use the MCD43 data to produce similar data (not to mention that MCD43A4 contains an NBAR product which is similar in concept to the NAD in this paper). Some discussion of this in the introduction is necessary.

Fig 3 does not convince me that there is complimentary information in the NAD and ANI data. Some additional metric to show how much different information is in there would be useful. For example, if the authors calculated the principle components, how much variance would the second component explain? [note – I *am* convinced of this by some of the later results, but I it should ideally be demonstrated here too.]

L409: Table 3, captions says: "Examples of other multi-angular anisotropy indices that can be further calculated using layers of the AnisoVeg product." Initially I thought this wasn't possible as earlier the manuscript gives the impression that the layers are only ANI and NAD, however I see now this isn't the case. I suggest including a table explaining what the actual layers of the AnisoVeg product are. On a related note, although the authors call "H" the hotspot in this part of the paper, the algorithm apparently doesn't compute the value in the hotspot direction and instead use 35 degrees (see Line 217 - and I agree this is a sensible thing to do). The authors should only call this "back-scattering" so as not to give the wrong impression - it is not in the hotspot.

Minor comments:

L59 - I think this sentence could cause confusion between what the *definition* of anisotropy is, and what *causes* it. Anisotropy is defined as the departure from Lambertian scattering, it is caused by the physical structure of media through which photons pass. I am certainly not doubting that the authors know this, but I think it could be made clearer to the reader. I am also not sure about the use of the word "mechanical" in this sentence.

L73 - the Foody and Curran reference is a bit of an odd one to include to support this statement. Their paper doesn't really look at the influence of biophysical properties on the surface anisotropy, although it does include a correction for the influence of terrain on the observed radiance. With no disrespect to either Foody or Curran, there are many more relevant papers that could be included here. Suggest finding some different references.

L110 - Again, I do not think the Foody and Curran reference is the best choice of references here. The totality of what it says on this subject is: "Terrestrial land cover surfaces are typically non-Lambertian reflectors and may exhibit a class-specific angular reflectance response. Thus data acquired at different angular geometries may help to identify and characterize land cover classes in both optical (Barnsley, 1994) and microwave (Foody, 1988) wavelengths." Whereas the current manuscript attributes "the use of multi-angular information to obtain metrics of anisotropy and extract information on forest structure" to that paper. I think this is a bit of a stretch. Suggest finding some different/additional references.

L113 Whilst the Sandmeier et al., 1998 reference is appropriate here, it is most definitely not the "first" example of this type of work. It is an early example though, and perhaps that would be a better way of describing it.

L179 Another strange reference. The Lucht and Lewis paper referenced presents a really nice results around the so-called "weights of determination" of the kernel BRDF models, but as a general reference for the RTk-LSp model it is an odd choice. A more obvious paper would be, for example, Wanner et al. (1995).

L184: Eqn 1 – why are the labels for the kernel weights superscripted (e.g. k^y) and the kernel values subscripted (e.g. F_v)? Ultimately, it doesn't greatly matter, but it would be better if these were made consistent, unless there's a good reason for not doing this.

L184: Eqn 1 – I find it odd that the with kernel *values* are given the symbol "F" and the kernel *weights* are given the symbol "k". Traditionally in the literature it has been the other way around see, for example Wanner et al. (1995) or, indeed, Lucht and Lewis (2000). This tripped me up whilst reading the paper, and a later statement appeared wrong to me due to this, so it could cause confusion. I strongly suggest changing this so that it adheres to the convention.

L200: "0.009107388 degrees" – this is quoted too precisely - 0.000000001 of a degree is a fraction of a millimetre. The text goes on to say that it is "approximately equivalent to 1 km" so really only needed to quote to that precision (say 4 or 5 d.p. in degrees).

Typos etc:

L98 product -> products

L205: Here an astrix has been used as a multiplication sign, whereas in Eqn 1. an actual multiplication sign was used. Suggest making consistent.

L315 "The EVI_{NAD} and EVI_{ANI} are seasonal variability and..." this doesn't scan. Should it say "The EVI_{NAD} and EVI_{ANI} are seasonally variable and..."?

References:

Wanner, W., Li, X. and Strahler, A.H., 1995. On the derivation of kernels for kernel-driven models of bidirectional reflectance. *Journal of Geophysical Research: Atmospheres*. 100(D10), pp.21077-21089.