Atmospheric Measurement Techniques Discussions

Atmos. Meas. Tech. Discuss., referee comment RC2
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Comment on amt-2021-351

Anonymous Referee #2

Referee comment on "Remote sensing of solar surface radiation – a reflection of concepts, applications and input data based on experience with the effective cloud albedo" by Richard Müller and Uwe Pfeifroth, Atmos. Meas. Tech. Discuss., https://doi.org/10.5194/amt-2021-351-RC2, 2022

General Comments:

Muller and Pfeifroth present a review paper summarizing the physics and techniques that go into satellite based retrievals of solar surface irradiance data (SSI). The authors give a nice overview of the subject with extensive references. With the ever increasing need for accurate SSI data this paper should serve as a useful reference in the field.

The authors also present a good argument for the well-established technique of using the observed effective cloud albedo (CAL) for the retrieval of the cloud transmission as opposed to the more indirect method of determining cloud transmission from the derived microphysical parameters of the cloud (cloud optical depth and effective radii) and RTM.

The English grammar could use some work, but my suggested edits below should help.

Overall, this paper addresses a relevant scientific topic within the scope of AMT. I recommend acceptance after minor revisions.

Specific Comments:

Abstract: The abstract is concise and provides a good summary of the paper.

Section 1, Introduction: The authors do a good job in the introduction of motivating the need for accurate SSI data, why satellite observations are the most useful for getting SSI, and in explaining the current satellite data sources.

Section 2: The authors give a good overview of the basics of the methods and physics that go into deriving SSI from satellite data.

Section 3 and 4: The authors do a good job of describing the indirect and direct path methods.

In Section 1, Lines 99-101: A reference, or web link, for GEWEX should be given

In Section 1, Lines 109-113: A reference, or web link, for CERES should be give.

In Section 2.1, Equation 4, dcor should be explicitly defined

Line 216: The wavelength dependence for Rayleigh scattering should be lambda to the negative 4

Section 7.1, Lines 450-459: These lines seem out of place in this paper. They are more of a philosophical lecture that comes across as condescending to the reader. I think these lines should be deleted. Just get right into the Heliosat project and the CALSAT method, why the cloud microphysical method was suggested, etc.

Section 7.1.1, Lines 487-488: The text reads as if the HRV channel is only available over Europe, and only applied over the European mountains, which I don't think is the case, is it? These 2 sentences should perhaps be more generalized to indicate the HRV channel improves things not only over the European mountains, but over all mountainous terrain.

Section 7.2, Lines 570-578: I don't think there's a need to actually list the C-code here. My opinion is that it is too much detail for this type of paper and could be taken out.

Technical Corrections:

Here are suggested grammatical corrections. They are minor corrections, but there are a lot of them:

Line 40: Change to "and 9.3% in Germany in 2020"

Line 51: Remove redundant phrase "flying in low orbit around Earth"

Line 60: Change 'primary' to 'primarily'. Change 'conversation' to 'conservation'

Line 65: Spell out acronym 'BSRN' the first time used

Line 80: Change 'provider' to 'providers'

Line 85: Change to "…based solar irradiance: the Climate…"

Line 88: Delete 'also'

Line 109: Suggest starting new paragraph at "The Clouds and the Earth's …"

Line 117: Change to " PVGIS allows one to visualize…" Change to "…selected sites. Different data…"

Line 118: Start new sentence…"…sources can be selected. In addition to …" and deleted 'also' at end of line.

Line 119: Change to "…(Hersbach et al., 2020) are available."

Line 119: Should 'servide' be 'service'?

Line 120: Change to "SoDa was commercilised…"

Line 153: Change to "…constant is somewhat misleading…"

Line 157: Change to "…the year on the order of …"

Line 158: Change to "…leading to a respective…"

Line 174: Change to "powerful"

Line 187: Delete 'also'

Line 187: I don't think it's correct to start a sentence with 'E.g.' I think you should spell it out at the beginning of a sentence, that is "For example, after 4 years of…" The use of 'E.g.' at the beginning of the sentence was done a few times throughout the paper, so all should be changed to 'For example,…"

Line 194: Change to 'calculations'

Line 205: Change 'nevertheless' to 'is somewhat'

Line 207: Change 'modify' to 'to modification of'

Line 210: Change 'E.g.' to 'For example,'

Line 212: Change to 'acting as a strong…"

Line 218: Change 'are leading to 'follow'

Line 238: Change 'hybrids' to 'hybrid'

Line 246: Change ‘neglected in’ to ‘neglected to’

Line 246: Change ‘trough’ to ‘through’

Line 247: Change ‘equals in’ to ‘equals to’

Line 263: Is there a reference for Skartveit and Olseth?

Line 263: Add a comma after ‘indirect path,’

Line 288: Add ‘to as the prototype’

Line 298: Change ‘induces’ to ‘induce’. Add ‘the use of the direct path’

Line 351: Change ‘has been retrieved’ to ‘have been retrieved’

Line 354 and 355: The reference ‘Kulesza, 2021’ is repeated

Line 367: Change ‘ist’ to ‘is’

Line 368: Delete ‘used and for’ to ‘used for’

Line 396: Change ‘a adaption’ to ‘an adaptation’

Line 407: Change ‘larger’ to ‘longer’

Line 424: Change ‘E.g.’ to ‘For example, ‘

Line 435: Change ‘met’ to ‘meet’

Line 438: Change ‘Further, a running’ to ‘Further, running’

Line 446-447: These lines seem out of place and redundant here at the end of this section. Seems like they should go at the beginning of the section where you are motivating the need to forecast SSI

Line 470: Change to ‘approach as not been replaced by’

Line 472: Change misspelling to ‘conservation’

Line 473: Change to ‘In these terms’

Line 482: Change to ‘possible improvements to these retrievals’

Lines 484-485: Change to ‘is relatively coarse, approximately 3-5 km over the European mountains.’

Line 488: Change to ‘which means about’, that is, remove ‘of’

Line 493: Change ‘digitally’ to ‘digital’

Line 503: Change ‘pixel’ to ‘pixels’

Line 509: Change ‘rho’ to the actual Greek letter

Line 539: Add ‘satellite information lines including…’

Line 540: Change to ‘However, melting periods of snow are still sometimes…’

Line 587: Change to ‘independent of cloud height’

Line 589: Change ‘E.g.’ to ‘For example, ‘

Line 610: Change to ‘Based on those results’

Line 622: Add acronym for neural networks here, that is ‘neural networks (NN)’ then you don’t have to keep redefining it throughout the first paragraph on pg. 24

Line 623: Change to ‘This also includes the estimation…’

Line 625: Change to ‘neural networks is their black box character’

Lines 652-653: Change to ‘However, climatologies can also be used in…’

Line 661: Remove ‘European Medium Range Weather Forecast’ since you already defined ECMWF earlier

Line 665: Remove ‘of’ at end of sentence, that is, ‘SAL is about’

Line 668: Change ‘E. g.’ to ‘For example,’

Line 670: Change to ‘This is of particular importance for regions…’

Line 671: Change to ‘as these are the main drivers for huge…’

Line 672: Change to ‘and its miss-classification’

Line 681: Change to ‘parameters’

Line 694: Change to ‘relatively dark’

Line 697: Change to ‘yet, for hygroscopic aerosols the AOD depends on the relative humidity…’

Line 699: Change to ‘with an accuracy higher than approximately’

Line 701: Change to ‘relatively’

Line 707: Change to ‘has great potential’

Line 718: Change misspelling to ‘Heliosat’

Line 727: Change to ‘concepts’

Line 734: Change to ‘enable’

Line 744: Change to ‘index or’

Line 752: Change to ‘plane-parallel’

Line 764: Change to ‘eventually into the development’

Line 769: Change to ‘and is therefore recommended’

Line 771: Change to ‘retrievals also have limitations’

Line 771: Change to ‘extensions have’

Line 774: Change ‘significantly’ to ‘significant’

Line 775: Change ‘works’ to ‘work’

Section ‘Meaning of eigenvector approach’. Shouldn’t this be labelled as an Appendix