



EGUsphere, referee comment RC1  
<https://doi.org/10.5194/egusphere-2022-170-RC1>, 2022  
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## **Comment on egusphere-2022-170**

Anonymous Referee #1

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Referee comment on "Bayesian atmospheric correction over land: Sentinel-2/MSI and Landsat 8/OLI" by Feng Yin et al., EGU sphere,  
<https://doi.org/10.5194/egusphere-2022-170-RC1>, 2022

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### **General comments:**

Atmospheric correction is an essential part of satellite remote sensing of land surface. Yin et al. describe and evaluate the Sensor Invariant Atmospheric Correction (SIAC) algorithm for atmospheric correction. The existing atmospheric correction methods can be improved and therefore further development of the algorithms is welcome.

SIAC is capable of carrying out atmospheric correction both for Sentinel 2 and Landsat 8 satellite data. Furthermore, SIAC is a Bayesian (statistical) algorithm so it can take advantage of prior information and it produces uncertainty estimates for the surface reflectances produced. The algorithm is tested and validated with ground-based AERONET and RadCalNet data. There are no significant steps taken in new method development in this work, but SIAC combines well existing methods. The results shown in the manuscript show that SIAC is capable of carrying out good quality atmospheric correction.

The selections made in the development of SIAC are mostly well justified and based on previously published literature. It is very good that the authors have shared the codes for others to be used.

My main criticism is in the presentation. The quality of presentation in the manuscript varies. Time to time the text is well written and smooth but quite often the text is difficult to read. The manuscript is quite long and structured so that first SIAC and results are explained in general terms followed by the Discussion and Conclusions, and then all the technical details are mostly included in the Appendices. As this is a method development manuscript, I find this a bit difficult for the reader as it is needed to browse back and forth while reading. Furthermore, the manuscript heavily relies on use of acronyms and symbols. It is good that the main symbols are explained in a table but this also makes the manuscript very slow to read, especially for a person who is not that familiar with the

field. I would strongly recommend the authors to think the use of acronyms (even single letter acronyms) and symbols, and possibly shorten and re-organise the manuscript for improved readability. Also, there were some typos in the text so proofreading is recommended. Most of the font sizes in figures are too small and very difficult to read.

### **Specific comments:**

I.15 Abstract mentions efficient emulators. However, in the text this was a bit unclear how these were used. Could it be clarified?

I.53 AERONET is based on remote sensing, not in-situ measurements.

I.83 "..., we calculate:". "Calculate atmospheric parameter estimation"?

I.84 The list is difficult to follow.

I.129 In the abstract this was probably mentioned as "statistical emulation", neural networks are not really statistical emulation.

I.133 "This may cause errors". Can you estimate the significance of these errors

I.169 "Matrix D" was this defined?

I.183 "We assume that mean atmospheric parameters...are constant..." Can you estimate the significance of this assumption?

I.221 Can you give an example of "other artifacts"

I.223 Why the tolerance of 10% was selected? How this filtering affects the evaluation of the results?

I.300 "corrected to R", what is R?

I.333 Why different TCWV gamma values are used for S2 and L8?

p.23 Figure 13. What are the colors of the bars?

I.374 Is IQR defined?

I.375 Validation of surface reflectance uncertainty was a bit unclear. Should be clarified.

I.390 In many sentences (especially on page 25) you use "that" & "this" and it is unclear to which word these are referring to

p.26 Figure 15. What are the colors?