Instantaneous aerosol and surface retrieval using satellites in geostationary orbit (iAERUS-GEO) – Estimation of 15-min AOD from MSG/SEVIRI and evaluation with reference data

Review of Ceamanos et al., 2023

General

Ceamanos *et al.* have developed and extended the iAERUS-GEO retrieval algorithm to retrieve Aerosol Optical Depth (AOD) at a very high temporal frequency (every 15 minutes). The sensor candidate is here SEVRI from METEOSAT. This method has very strong assets, 1 among many being the estimate of surface BRDF from previous day(s) and being re-injected into D-Day. Evaluation with satellite AOD inter-comparisons and validation with reference ground-based AERONET are achieved showing very convincing results.

This paper is overall excellent with very high quality results. Especially, I found it very well written, and therefore pleasant to read. I also very much appreciated the big efforts made by the authors to confront the results with the actual information content (variability) from SEVIRI, especially with respect (w.r.t.) geometry (via the scattering angle). This is little done nowadays while we all very well know this eventually plays a major role, especially with geostationary sensors.

I overall recommend this paper for publications. I only have the 4 following requests below (medium importance) and a few detailed questions in the next sub-section. I thank in advance Ceamanos *et al.* for addressing them:

1) Generally, we always expect different performance over water and land surfaces due to the different surface signal magnitude and how retrievals can be affected. Here, validations results are merged for all surfaces, but I believe it would be much more relevant to discriminate per surface type (AOD Land retrieval vs. AOD Ocean retrievals). I do anticipate that the number of AERONET station over waters is very low, and mostly coastal or islands. However, it is important to analyse in-depth whether iAERUS does better than MODIS over ocean (it is known nowadays MODIS AOD ocean is a little bit too high).

2) Could you please clarify how valid is the daily retrieval of surface BRDF over Ocean? I understand you assume the surface does not vary much over 1 day. I can largely see this assumption is true over Lands. Over oceans, I have some difficulties due to the potential high wind variabilities that might then lead to slope / wave changes (and hence glint). In addition, do you think we really need a daily Ocean BRDF from past day while I would assume we can easily calculate it instantaneously with the Cox & Munk model, Monahan + Koepke for foam / white caps, and wind forecast from meteo centres?

3) Could you give more details on the configuration for the BRDF surface retrieval over the past days? Notably, how do you select / filter out L1 pixels, what is the BRDF spatial resolution, and how aerosol effects are corrected for?

4) I miss references about the considered PODLER Aerosol versioning and its traceability. Could you please clarify it, given there have been several version I believe in the last versions.

Details

Abstract – Page 1: “of interest for research topics” => This is also for high importance for all operational and climate services, not only in research mode.

Sect 2.2.1 Page 6 “All aerosol terms depend on the aerosol optical depth (τ56,)” => They in fact depend on all aerosol properties (notably aerosol model and related scattering vs. absorption effects), not only AOD. Would you agree?

Sect 2.2.3 – Page 8: From this and Appendix A2.2., I slightly miss details on i) the foam fraction / white caps, and ii) the underlight scattering. My guess is for ii) you have followed the traditional Monahan & O’Muircheartaigh (1980) approach, and for ii) a typical standard Chrlorophy value (and perhaps even a fixed water leaving radiance). Could you please clarify these assumptions?