

This manuscript developed new aerosol and surface products from the first 18 months multi-spectral and polarized measurements of POSP/GF-5(02) based on the Generalized Retrieval of Atmosphere and Surface Properties (GRASP)/Models approach. These products are validated and intercompared with ground-based aerosol inversion dataset and other independent satellite aerosol and surface products. The results show generally good consistency of POSP products including not only total Aerosol Optical Depth (AOD), but also detailed aerosol properties such as aerosol size, absorption, layer height, type, etc., as well as full surface Bidirectional Reflectance Distribution Function (BRDF), Bidirectional Polarization Distribution Function (BPDF), black-sky, white-sky albedos and Normalized Difference Vegetation Index (NDVI). This research deserves to be published given the new valuable satellite products development, but there are still some descriptions and statements unclear and need to be improved. The detailed comments can be found below.

1. Introduction: I think most parts of the first paragraph needs to be re-written. POSP is a single-viewing multi-spectral polarimetric sensor aimed at aerosol detection, so I suppose this paragraph should introduce the research background about using multi-spectral or polarized measurements to retrieve aerosol properties. However, the authors mainly discuss aerosol retrievals from multi-angle polarimetric measurements, while multi-angle is not one of the characteristics of POSP. I suggest to focus on the characteristics of POSP and introduce the underlying fundamental physics here.
2. Section 2.1: It is mentioned that "POSP is the first space-borne multi-spectral cross-track scanning polarimeter". Why does POSP use cross-track scanning method instead of along-track scanning? What are the advantages and disadvantages of cross-track scanning? Some background can be added here.
3. Table 1: What is POSP/GF5 overpass time? I suggest to add it in this table and compare it with NOAA-20 since the difference of their overpass time can cause inconsistency in aerosol retrievals as mentioned in the analysis later.
4. Line 203-221: Although these land/ocean surface models including BRDF and BPDF have been discussed in many previous studies, I think some statements are still needed to clarify the meaning of related parameters involved in the state vector, such as a_{iso} , a_{vol} and a_{geom} (I assume they are the linear coefficients of three kernels in Ross-Li BRDF model), as well as r_0 , δ_{Fr} and σ^2 . Is BPDF only considered for land surface but not ocean?
5. Figure 4: It seems the AE and scale height retrieval are less than other parameters, shown as many blank pixels over ocean in (e) and (f). What are the reasons for this situation? Are there any different criteria applied for different parameters retrieval availability or quality?
6. In the scatter plots, such as Figure 6-10, what does the color of each dot mean? This should be added in the caption.