Review of paper:

Performance evaluation for retrieving aerosol optical depth from directional polarimetric camera (DPC) based on GRASP algorithm *by S. Jin et al.*

Highlights

- alternate aerosol retrieved by a new satellite sensor with the GRASP algorithm
- investigations of relative relevance of particular sensor data on retrieval accuracy
- comprehensive evaluation

Concerns

- still significant differences in spatial distributions
- with all the extra sensor information … no superiority compared to existing retrievals
- missing absorption and size evaluations, hinder meaningful AOD retrieval assessments

General comments

A GRASP-based retrieval algorithm is applies to a new Chinese satellite sensor operating since 2018. The Directional Polarimetric Camera (DPC) is a multi-spectral, multi-angle and also polarization sensing instrument to offers a wealth of information about atmosphere and surface. All this information is processed in a statistically optimized GRASP retrieval for a consistent determination of surface and all aerosol properties at cloud free condtions.

Retrieval results for AOD are compared to AERONET local statistics and different MODIS versions and indicate general skill. However, AOD spatial distribution samples still leave many questions open. For a more comprehensive AOD comparison/evaluation – especially for comparisons to other satellite data complementary information on aerosol size (e.g. AOD fine-mode fraction) and absorption e.g. AAOD or even better AAOD attributed to fine and coarse mode) would go a long way.

Otherwise a nice contribution

Specific comments

251 are these effective radii (in um)? Since the size-modes are represented by log-normal distributions what are mode(-number) radius und std dev (width information)? For dust regions I would allow another super-large (e.g radius ca 6-9um) dust size, as large size mineral dust, if present, will add significant absorption, which otherwise may be incorrectly attributed to fine-mode aerosol

322 …which is common for aerosol retrieval with most sensors

439 yes as this is kind of a pre-cursur to ESA's upcoming 3MI space sensor

647 show, in addition, the same results side-by side in a log/log scale so info on behavior at low (or most coomon) AOD is better illustrated (the linear fit is less meaningful, as controlled by a few larger values)

651 nice … what about statistics at 1 or 2 (like SLSTR) viewing angles ?

658 the 4b figure is so much better to understand than figure 4a! If there would be similar 4b plots for regions this would be perfect.

668 the comparisons to other satellite data is an eye-opener. There ARE differences that need more attention. It is interesting that for E.Asia MODIS DT greater than MODIs DB, while it is the other way around for western Europe. I also would add MISR data (the are available) for the same region

I attach a seasonal subset of a general (year-independent) MAC reference, which addresses aerosol amount, size and absorption (not just AOD !) for testing satellite retrievals, to identify major retrieval biases (which can be quickly done, if monthly 1x1 averages are provided).

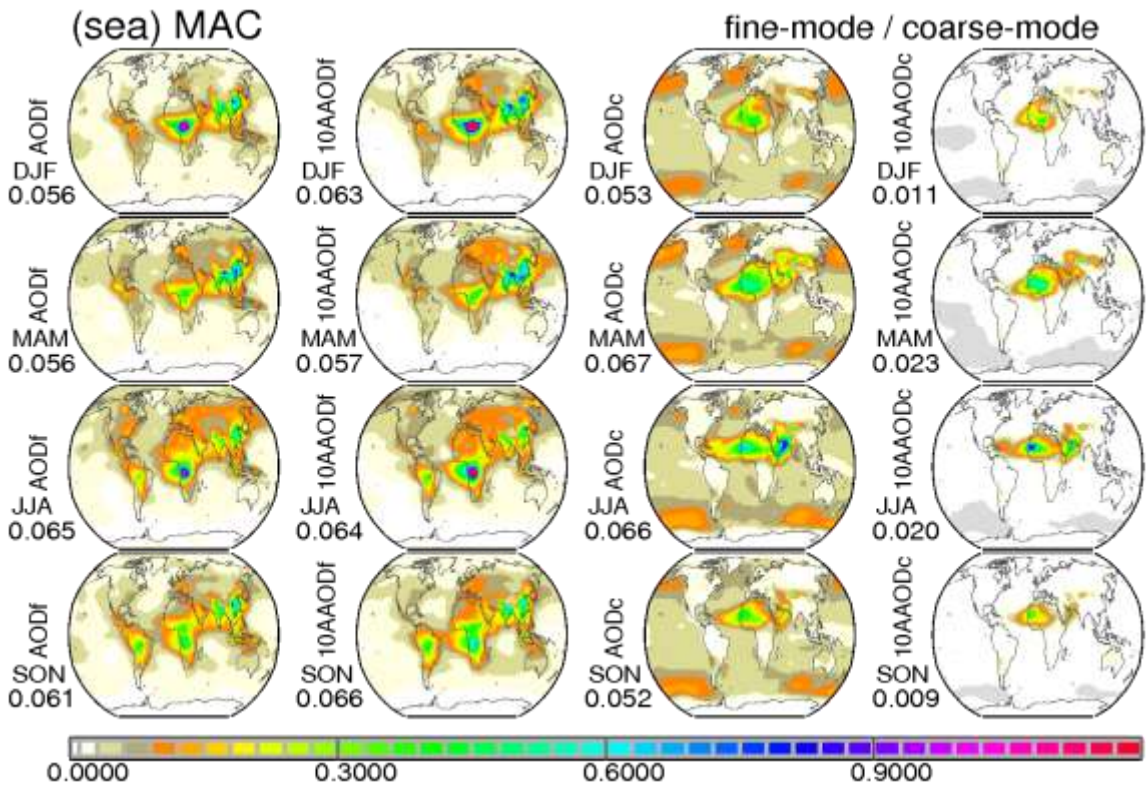

Figure *Seasonal distributions for mid-visible AODf, AAODf, AODc, AAODc of the MAC aerosol climatology. Values to the lower left indicated seasonal global averages.*