

## ***Interactive comment on “Retrieval of aerosol properties from Airborne Hyper Angular Rainbow Polarimeter (AirHARP) observations during ACEPOL 2017” by Anin Puthukkudy et al.***

**Otto Hasekamp (Referee)**

o.hasekamp@sron.nl

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This manuscript describes the first aerosol retrieval results from the airHARP instrument. The retrieval approach is being discussed and the algorithm is applied to a number of selected scenes from the ACEPOL campaign, where the fit quality between forward model and measurements is discussed as well as the comparison to independent measurements (HSRL-2 and AERONET). The paper is very relevant for the upcoming NASA PACE mission where similar (or improved) measurements and retrievals are to be expected. Overall, the comparison to the independent measurements looks good and some of the discrepancies (with HSRL2) can be explained. I would like

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to congratulate the authors with these nice results.

My comments are included in the attached pdf. Most of them are minor, with the exception of one comment that I copy below:

It seems that 3 different GRASP setups are used for 3 different cases: - GRASP for fixed aerosol models, together with the RPV surface model for the AERONET comparison. - Retrievals for 5 aerosol modes with fixed refractive index, together with the Ross-Li surface model for the Rosamond Dry lake. - 'Full' retrievals for 5 aerosol modes where also microphysical properties are retrieved for the smoke case. Here also the Ross-Li surface model has been used.

These 3 setups should be clearly described in the Theory section and not in the Result sections where they are being used. Also, the choice for a given setup should be better motivated, and perhaps also some numbers for retrievals in other setups should be quoted.

If possible, I would even suggest to restrict to 2 setups: the ones corresponding to 'full' and models', and using the same surface model for all over land cases.

Also, I would like to encourage the authors to also quote the mean aerosol properties for the smoke plume on 9 November so that they can be compared with those retrieved by Fu et al. (AMT, 2020) for SPEX airborne and RSP. Further, for this day, the sphericity retrievals can be checked with the depolarization ratio from HSRL2.

Please also note the supplement to this comment:

<https://www.atmos-meas-tech-discuss.net/amt-2020-64/amt-2020-64-RC1-supplement.pdf>

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