



5-mode and 2-mode polarimeter retrievals for aerosol micro-physical and optical properties: sensitivity studies based on synthetic and real experiments

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Polarimeter retrievals can provide detailed and accurate information on aerosol micro-physical and optical properties. The SRON-Aerosol algorithm is one of the few retrieval approaches worldwide that can extract this information efficiently. The algorithm combines a 2-mode (fine and coarse) Look-Up-Table approach (i.e. the LUT retrievals to obtain a reasonable 1st guess) and a 2-mode inversion retrieval based on regularized Levenberg-Marquardt methods.

In this contribution, we compare the performance of retrievals based on the 2-mode approach with those based on a multi-mode approach. Firstly, we found that, with loss of little accuracy, the LUT retrievals in the case of 5-modes can be significantly accelerated by fixing one model for each mode in the pre-generated look-up tables. Secondly, synthetic retrieval experiments show that 5-mode retrieval works very well for the case of 5-mode synthetic measurements. When retrievals on 2-mode-based measurements, the results of 5-mode retrievals are also acceptable, but worse than 2-mode retrievals. The synthetic experiments suggest that 5-mode retrievals (combining 5-mode LUT retrievals and 5-mode inversion retrievals) can be an efficient alternative to the commonly used 2-mode retrieval approaches.

Thirdly, 5-mode retrieval performances on real measurements are tested. The data are from POLDER instrument mounted on PARASOL satellite (retired 2013). To validate the retrieval results, AERONET data of v2.0 AOT and derived v1.5 SSA are used. The initial results show that 2-mode and 5-mode retrievals have similar performance on real measurements for the retrieval of optical properties. Further work is ongoing to investigate the performance for micro-physical properties.