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Atmospheric Measurement Techniques Discussions

Interactive comment on "Combined neural network/Phillips-Tikhonov approach to aerosol retrievals over land from the NASA Research Scanning Polarimeter" *by* Antonio Di Noia et al.

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This is a well-designed and well-written study. The neural network (NN) is trained based on the radiative transfer simulations first, and then used to arrive at first guess solution for the following Phillips-Tikhonov minimization when processing RSP data. The NN-accuracy is demonstrated based on synthetic data, and the algorithm is applied to process PODEX and SEAC4RS flight campaign data. The paper is a good contribution to the field, and should be published after authors make a couple of corrections below. I have just one question which should be outlined, perhaps, in the Abstract or summary, and was not really clear to me after reading the paper. Of all

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Discussion paper

field campaign data, what % of experiments did you process in the end? Paper says ∼10% based on convergence to chi2<2. From chi2>2, what % is due to failure from the surface retrievals? You can evaluate chi2 from the surface alone based on simulated experiments. My feeling is that adding surface spectral covariance as a constraint may not serve you well. Also, the retrieval accuracy of ∼0.01 surface reflectance (perhaps larger since 0.01 is rmse) in the visible bands is not good enough for the land applications, e.g. vegetation studies, and it creates a considerable uncertainty for the aerosol retrieval, although of course, aerosol-surface parts are not separated in the described algorithm.

1. P.5, Ln. 12: The backscattering azimuth is 180-phi (you have 180+phi). 2. P.5, Ln.27: "This term is equivalent to the classically defined surface albedo." This is incorrect – please remove here and correct everywhere in the paper. Surface albedo is "classically" defined as a ratio of reflected and incident surface fluxes. This ratio will equal f_iso ONLY if hemispheric integrals of terms containing K_vol and K_geo in the boundary condition of RT are zero, and they are not. For the same reason, surface albedo is a function of SZA (e.g., see Lyapustin, 1999, JGR).

Sincerely, Alexei.

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