Radiation, Smoke and Clouds Observed in the Southeastern Atlantic with the Research Scanning Polarimeter during ORACLES

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\textbf{Background}

- Data for this analysis was collected during the NASA ORACLES (ObseRvations of Aerosols above CLouds and their intEractionS) in September 2016 and August 2017.
- The RSP was aboard the P-3 aircraft flying at a range of altitudes during ORACLES in 2016 and 2017 and also on the high-altitude ER-2 aircraft during ORACLES in 2016.
- Here we focus on observations close to 8S from Ascension Island along tracks heading to the East. This allows us to contrast the cloud conditions from 20160929 during the ER-2 transit from Walvis Bay to Recife, (9S) that passed over Ascension Island, with the transits from Ascension to Sao Tome on 20170809 and 20170821 (8S).

\textbf{Research Objective}

- The key determinant as to whether smoke above clouds will make them brighter, or darker is the single scattering albedo (SSA), which is the fraction of light that is scattered at each collision with a smoke particle.
- Here we show the retrievals of SSA for a sample of locations above the smoke plumes that were shown in Fig. 1, together with their uncertainties. The optical depths of these samples vary from 0.12 (black) to 0.95 (blue).
- As part of retrievals process the column absorption is computed and the radiative effect is evaluated by calculating the radiation field without aerosols, once the retrieval has converged. The albedo with aerosols is then subtracted from that with aerosols.

\textbf{Conclusions}

- The critical albedo can alternatively be regarded as a critical cloud optical depth above which the TOA reflectance is decreased by aerosols (left figure above).
- The critical optical depth in this case is 6.6. In the right figure we show this critical optical depth on the cloud optical thickness (AOT) diagram for the different cloud conditions obtained in 2017.

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