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The planetary boundary layer dynamics in the Etosha Pan region and its interaction with dust and biomass burning aerosols: highlights from the AEROCLO-sA field campaign

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The Etosha pan in northeastern Namibia is known to be one of the main dust sources in Austral Africa. In addition, the pan area is characterized by a high surface albedo, yielding the deepest and most turbulent planetary boundary layer (PBL) over the elevated, arid Namibian plateau during the Austral summer.

In early September 2017, the Etosha pan region (and most of Namibia) was under the influence of a massive biomass burning aerosol plume originating from nearby Angola. The presence of large quantities of absorbing aerosols in and above the PBL disrupted the radiative balance over Etosha pan and impacted the PBL dynamics and thermodynamics diurnal cycle.

In this study, we use a combination of ground-based remote sensing observations acquired in Windpoort, airborne observations from 5 flights performed with the SAFIRE Falcon 20 during the AEROCLO-sA field campaign (August-September 2017) and high resolution numerical mesoscale simulations to investigate the evolution of the PBL dynamics and thermodynamics over the Etosha pan as a function of the aerosol direct radiative forcing. The features of the PBL in the Etosha pan are also compared to those of surrounding areas characterized by darker surfaces. The impact of the PBL dynamics on aerosol distribution (dust and biomass burning particles) is also investigated using ground-based and airborne lidars, together with dropsondes released from the Falcon 20. Complementary observations include the suite of advanced airborne radiometers, airborne optical sensors for cloud and aerosol microphysics and a ground-based sunphotometer.