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Exploring the elevated water vapor signal associated with biomass burning aerosol over the southeast Atlantic Ocean

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The quantification of radiative forcing due to the cumulative effects of aerosols, both directly and on cloud properties, remains the biggest source of uncertainty in our understanding of the physical climate. How the magnitude of these effects may be modified by meteorological conditions is an important aspect of this question. The Southeast Atlantic Ocean (SEA), with seasonal biomass burning (BB) smoke plumes overlying a persistent stratocumulus cloud deck, offers a perfect natural observatory in which to study the complexities of aerosol-cloud interactions. The NASA ORACLES (ObseRvations of Aerosols above CLouds and their intEractionS) campaign consists of three field deployments over three years (2016-2018) with the goal of gaining a better understanding of the complex processes (direct and indirect) by which BB aerosols affect clouds.

We present results from the first ORACLES field deployment, which took place in September 2016 out of Walvis Bay, Namibia. Two NASA aircraft were flown with a suite of aerosol, cloud, radiation, and meteorological instruments for remote-sensing and in-situ observations. A strong correlation was observed between the aircraft-measured pollution indicators (carbon monoxide and aerosol properties) and atmospheric water vapor content, at all altitudes. Atmospheric reanalysis indicates that convective dynamics over the continent, near likely contribute to this elevated signal. Understanding the mechanisms by which water vapor covaries with plume strength is important to quantifying the magnitude of the aerosol direct and semi-direct effects in the region.