Planning Layered Atlantic Smoke Interactions with Clouds’ (LASIC) AMF1 Deployment

Paquita Zuidema, Rodrigo Delgadillo, Lakshmi Chandra Yemi Adebiyi  U of Miami, pzuidema@rsmas.miami.edu

The LASIC Working Group, aircraft deployment collaborators Jim Haywood, Jens Redemann, Robert Wood, ARM Logistics Kim Nitsche, Amon Haruta, Heath Powers, ARM aerosol scientists Stephen Springer, Art Sedlacek, the Radar Working Group, Pavlos Kollas, instrument mentors and many more

Southern Africa is the world's largest emitter of biomass burning aerosols, seasonally transported westward over the least examined of the planetary subtropical stratocumulus decks. Model representations must consider not only the direct aerosol radiative effect, but also the cloud adjustments. Low cloud mixing with overlying air is also implicated in IPCC model climate sensitivity. LASIC aerosol and cloud measurements on Ascension Island spanning June 1, 2016-October 31, 2017, provide a first-ever characterization of the full annual cycle, spanning two biomass-burning aerosol seasons, with which to articulate effects and processes.

A focus on near-field micropulse lidar data
* amount of mixing between free-tropospheric smoke and underlying clouds unknown
*micropulse lidar critical for assessing relative locations of aerosol and cloud
* emphasis on lidar data quality includes assessment by both vendor and MPLNET
* current work at Miami developing familiarity. Example below of low cloud/aerosol characterization using MPL and a zenith radiometer confirms quantitative near-field use of MPL

Example of thin low cloud & aerosol optical depth retrieval using Miami MPL

Hypotheses
* smoke is present July-October with Sept max, and increasing single-scattering albedo
* smoke loading at Ascension closely tied to strength of zonal free-tropospheric winds emanating off of Africa (see top right)
* low clouds distributed over two levels, with the cloud at inversion most responsive to overlying thermodynamic changes (consistent with surface observations but unproven)

Motivation

Implementation
* AMF1/MAOS on remote windward SE site far from airfield
  * consistent SEerly winds allow detailed radar scanning along mean wind direction during all months
  * radiosondes launched at airfield sample full boundary layer, complemented by MWR and ceilometer
  * first ever documentation of diurnal cycle; Sept-Oct 2016 IOP
* complementary deployment to St. Helena in fall 2017
  * first report on installation Thursday 10:45-12:45

Complementary Deployments