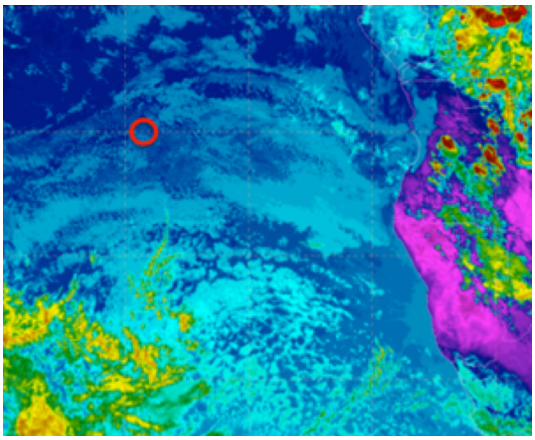
PTF04 September 27, Tuesday
Mission Report
flight scientist: Sebastian Schmidt
mission scientist: Paquita Zuidema

First leg of P-3 transfer flights back to WFF, from Walvis Bay to Ascension Island

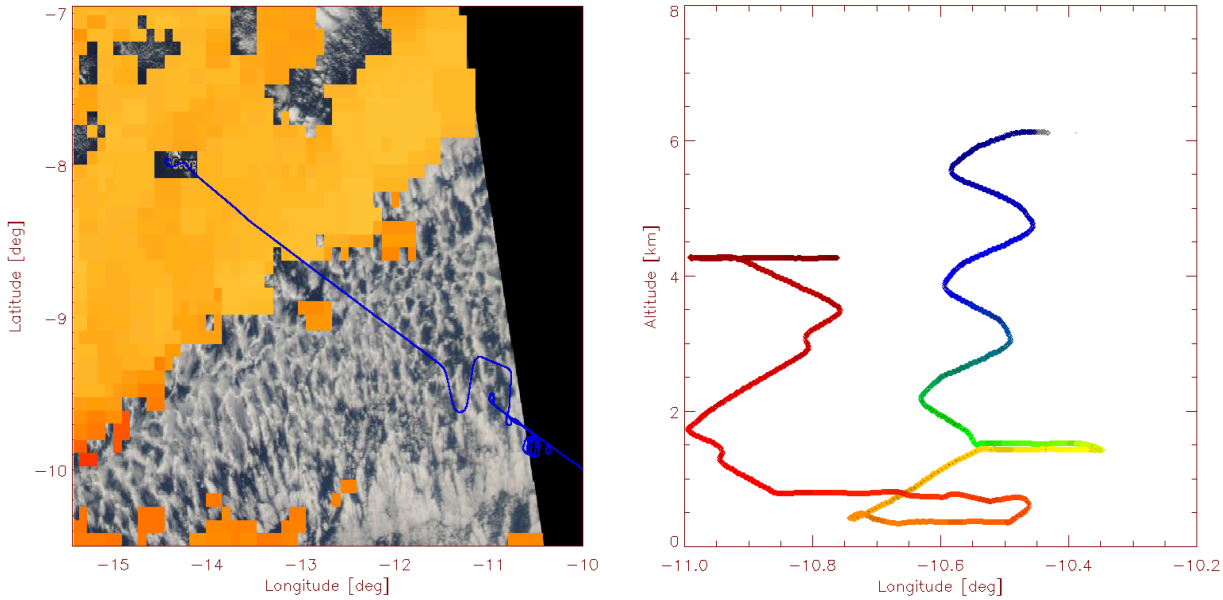
Flight objectives:
En route to Ascension Island, there are two remaining science objectives: (1) Calibration legs for vertical winds, in particular reverse-heading legs for interpreting Santa Helena data set from the beginning of the experiment; (2) Sample drizzling clouds between Santa Helena and Ascension Island (see satellite image); (3) Inter-comparison of aerosol measurements with Ascension DOE/LASIC site.

Flight Summary:
- Significant tail wind, which gave us more than one hour for maneuvers en route
- When this became clear, we planned the flight as follows:
    1. Wind maneuvers (square with sides aligned along/across the wind to provide reverse headings; also provide azimuthal asymmetry measurements for SSFR) (15 minutes)
    2. Microphysics/APR/radiation cloud leg in presence of drizzle (45 minutes)
    3. Potential comparison of P-3 aerosol in-situ measurements near DOE/LASIC site on Eastern tip of Ascension Island (extra time given the tail winds; 12 extra minutes would allow spiral close to the island)


IR image with target region highlighted (red circle).

- There was some confusion where the best spot for drizzling clouds (as required for APR work) would be; we used satellite imagery to set a location at ~10S,11E. When getting there (around 16:30), it turned out that cloud were burning off and had less drizzle than expected, so we decided to fly the cloud/radiation module first.
- During the cloud/radiation module (UTC~16.6…17.7h), we pursued the recommended sampling strategy (details below) but had to find the optimal area for sampling the drizzle (main objective of this module).
- After completing the radiation module, it turned out that we had burned more time than anticipated (65 instead of 45 minutes), and that the available time for work en route was less flexible than we had assumed; we persuaded the captain to fly the wind maneuvers, but had to cut out the radiation work, which would have added 10 more minutes. The work near the LASIC site also had to be cut, but the pilots were willing to fly the final descent to Ascension near the eastern tip of the Island.
- Overall, successful flight for cloud/radiation work, but in retrospect we should have done the wind maneuvers first, given the uncertainty in working with the pilots.

Cloud/radiation module:



The cloud/radiation module was flown from UTC=16.6-17.7 around 10S,11E. The image overlay shows Aqua imagery with AOD retrievals and the P-3 flight track. On this day, Ascension was in the plume, and the cloud/aerosol conditions would have been ideal for a local flight the next day. Sequence of the module:

1. Spiral down to the cloud deck
2. Above cloud (5 min, green leg in Figure above)
3. In cloud (patchy drizzle) (5 min, yellow leg)
4. Below-cloud leg (orange)
5. In cloud leg (red)
6. Aerosol in-situ leg (cut short to give time for wind maneuver)

Manifest Michael Singer, Mark Russell, Brian Yates, Todd Brophy, Mike Terrell, Brad Soeder, William Tapman, Scott Farley (crew), Simone Tanelli, Elin McIlhattan, Nikolai Smirnov, Steven Howell, Mary Kacarab, Art Sedlacek (off at Ascension), Jim Podolske, Joe O'Brian, Sebastian Schmidt, Eric Stith, Sabrina Cochrane, Connor Flynn

Metrics for achieved science objectives [green for full, red for partial]

Direct Forcing

SO1-1 evolution of BBA properties with transport:

1 full characterization of aerosol optical and radiative properties far away from the African coast, but we were still relatively far away from the maximum of the plume over Ascension

SO1-2 aerosol radiative effect as function of cloud/aerosol properties:

1 case for looking at aerosol radiative effect in presence of *scattered* clouds, but without imagery and with low aerosol loading

Semi-Direct Effect

SO2-1 relative aerosol-cloud vertical distribution:

1 complete profile far away from source region

SO2-2 constrain aerosol heating rates:

1 heating rate profile from spiral, but with low aerosol loading

Indirect Effects

Cloud/radiation module was flown in a regime that had until then not been flown: open cell convection with significant drizzle and low cloud fraction. Aerosol loading was low in this case; we did not sample any contrasts in the aerosol conditions.