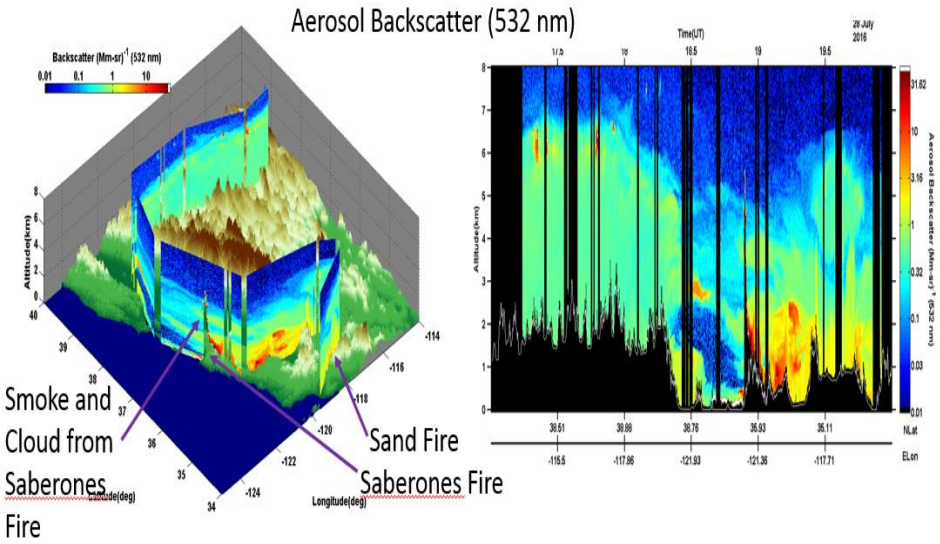
ER-2 Test Flight 1 July 28

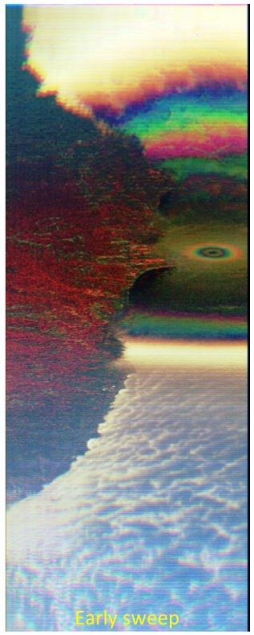
Test flight

- Takeoff ~16:18 UT, Landing~20:26 UT (Palmdale)
- Two passes of Ivanpah Playa (Railroad Valley) in Nevada
- Legs over:
  - Lake Tahoe buoy
  - Coast from San Francisco over Monterey AERONET
  - Soberanes and Sand Fires and smoke plumes
  - Bakersfield AERONET site
- RSP, SSFR, AirMSPI, HSRL-2 worked well
- eMAS collected no data

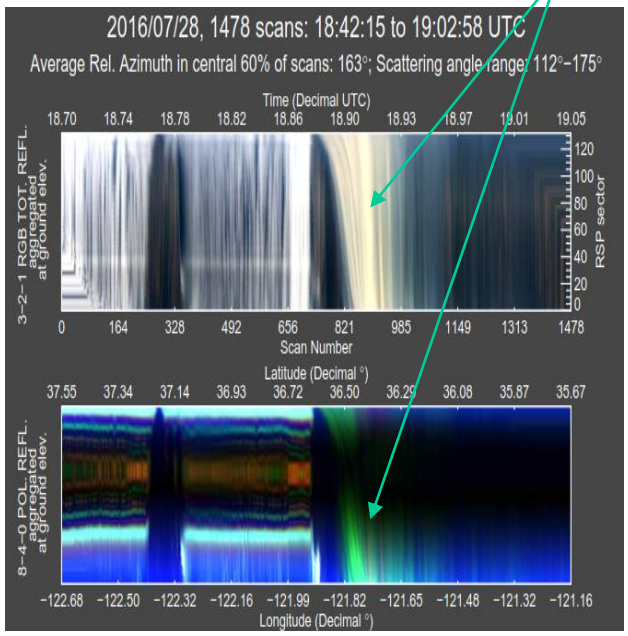
HSRL-2



AirMSPI Sweep off Monterey Coast



RSP data showing thick, polarizing smoke



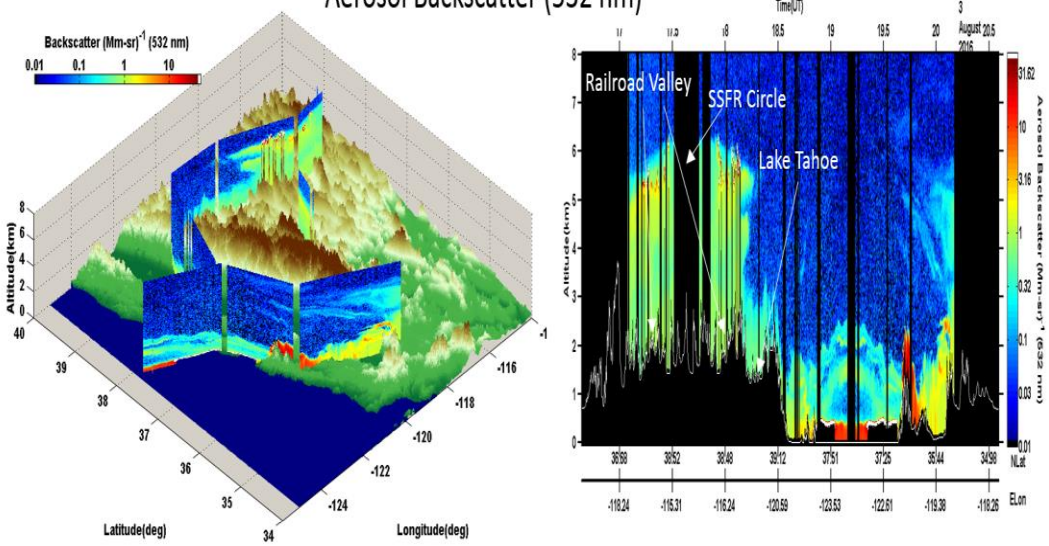
ER-2 Test Flight 2 August 3

<u>Test flight</u>

- Takeoff ~16:34 UT, Landing~20:41 UT (Palmdale)
- Legs over:
  - Ivanpah Playa (Railroad Valley) in Nevada including SSFR circle
  - Lake Tahoe buoy
  - Clouds and open ocean along principal plane
  - Soberanes smoke plume
  - Monterey and Bakersfield AERONET sites
- RSP, SSFR, AirMSPI, eMAS, HSRL-2 worked well

HSRL-2

Aerosol Backscatter (532 nm)



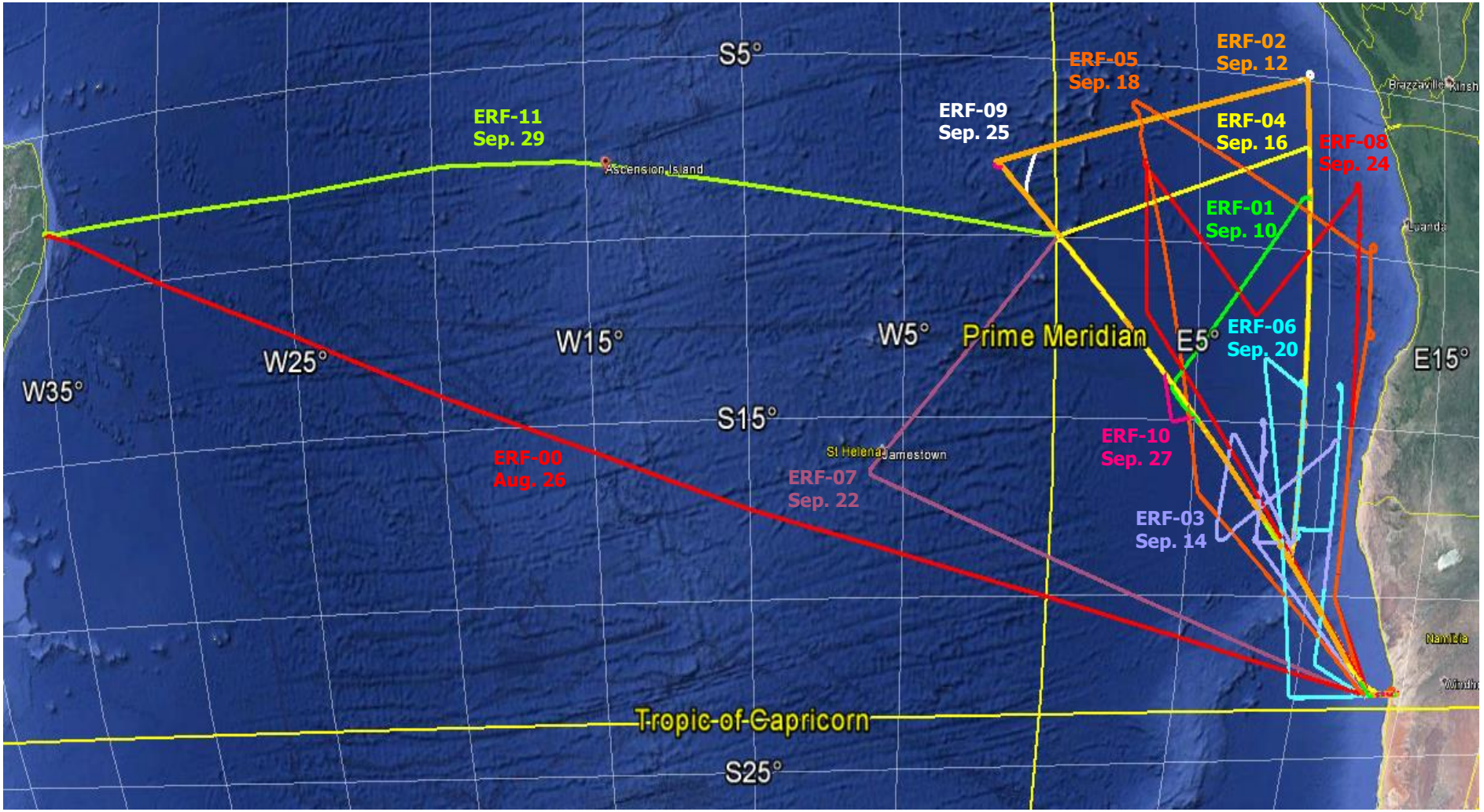
AirMSPI sweep over cloud and smoke from Soberanes fire

South

North

eMAS data over cloud and smoke from Soberanes fire

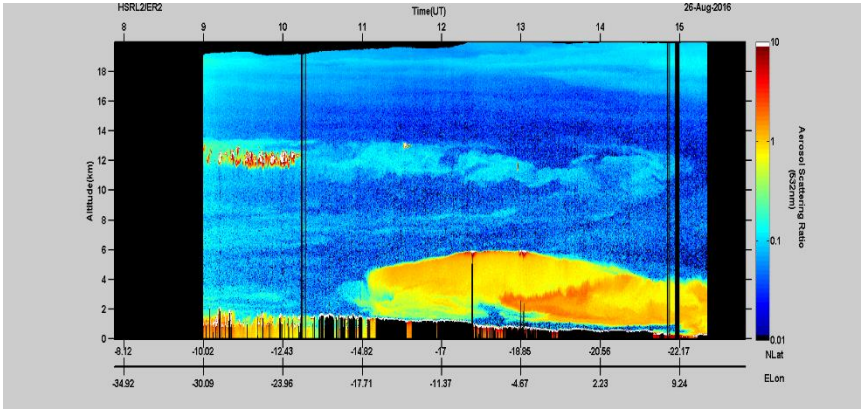
ER-2 Science Flights for ORACLES (Aug-Sep 2016)

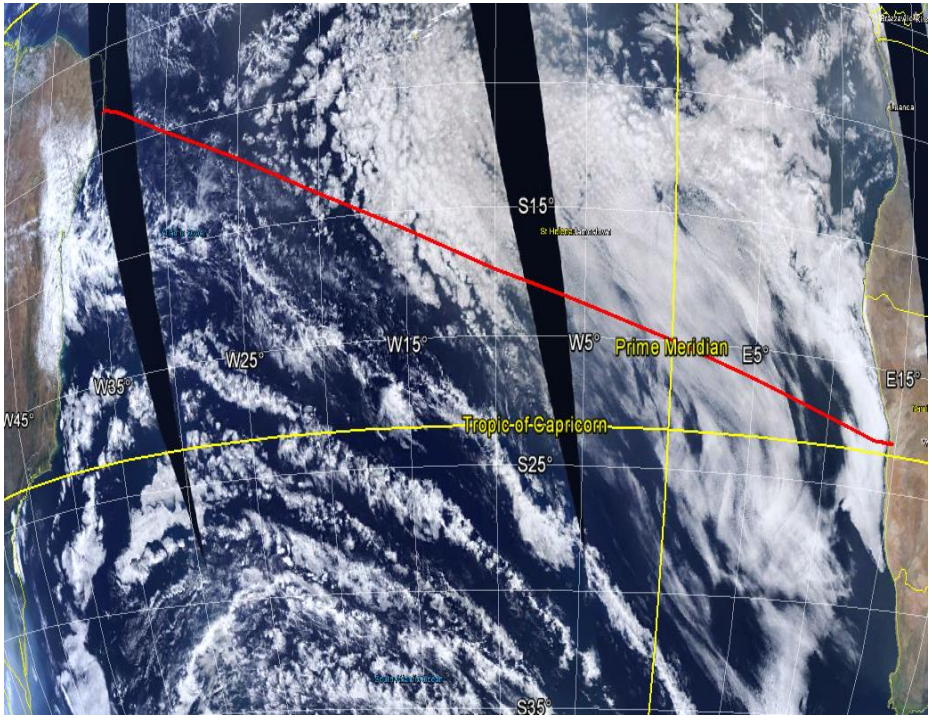


ER-2 ERF-00 Friday Aug. 26

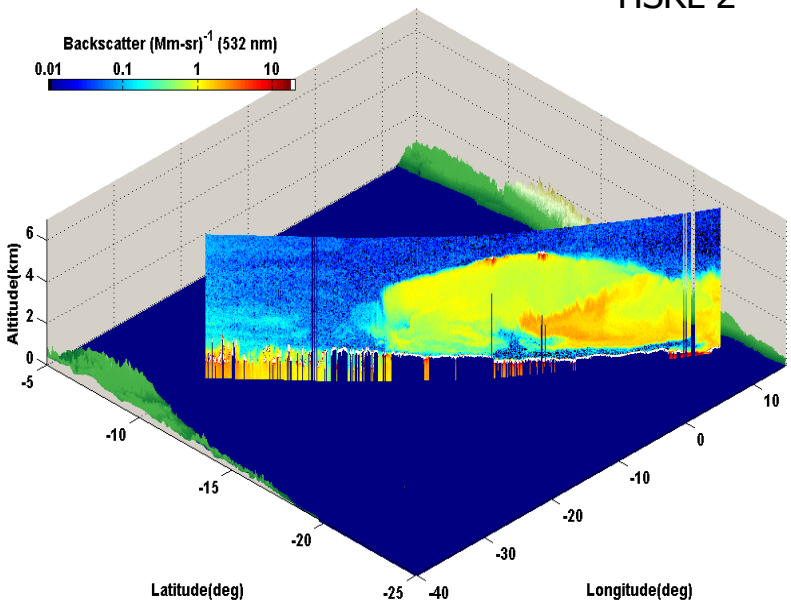
Transit Flight from Recife directly to Walvis Bay

- Takeoff ~08:06 UT (Recife), Landing~15:59 UT (Walvis Bay) (~7.9 hours)
- RSP operated without SWIR
- eMAS collected no data as plate installed over aperture
- RSP, SSFR, AirMSPI, HSRL-2 worked well





HSRL-2

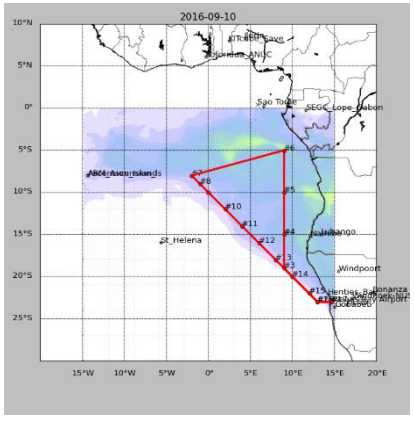


ER-2 ERF-01 Saturday Sept. 10

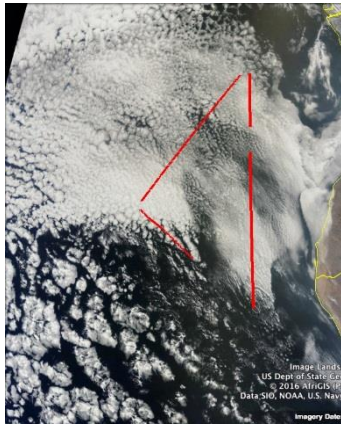
Mapping Routine Flight

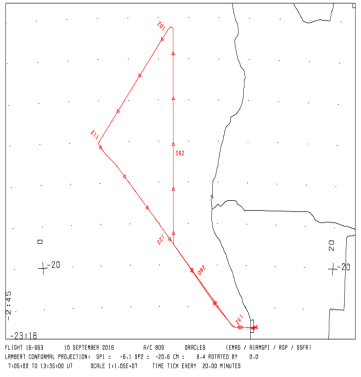
- Takeoff ~07:06 UT, Landing~13:30 UT (~6.3 hours)
- Planned 9 hour flight to survey smoke transport ("big triangle")
- High level clouds in target area prevented original plan to work with P-3
- RSP, AirMSPI, eMAS, SSFR worked well
- HSRL-2 did not operate due to tripped ER-2 circuit breaker/faulty ER-2 coolenol pump
- Flight shortened to attempt coordination with P3 and allow problem troubleshooting
- RSP, AirMSPI, eMAS (including SWIR) obtained data for cloud retrievals

Planned

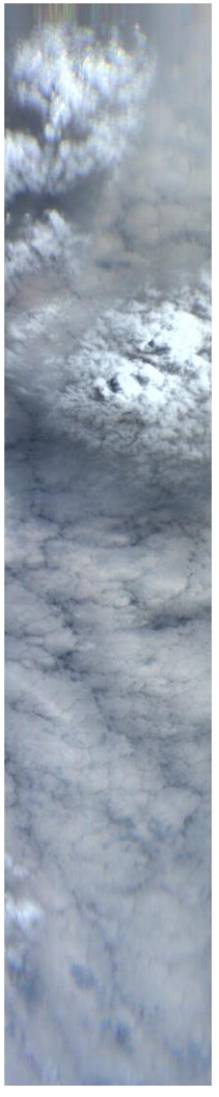


Actual





AirMSPI
~0824-0900 UT

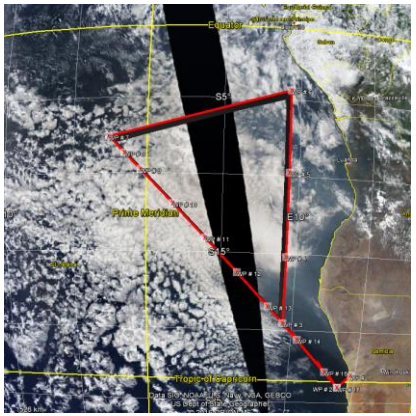


eMAS
~ 0820-0854 UT

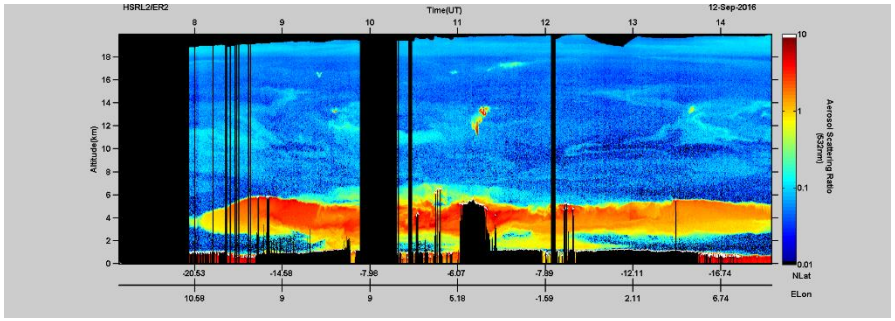
ER-2 ERF-02 Monday Sept. 12

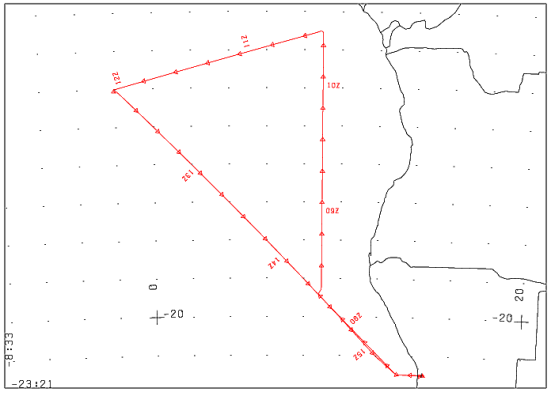
Full Mapping routine Flight

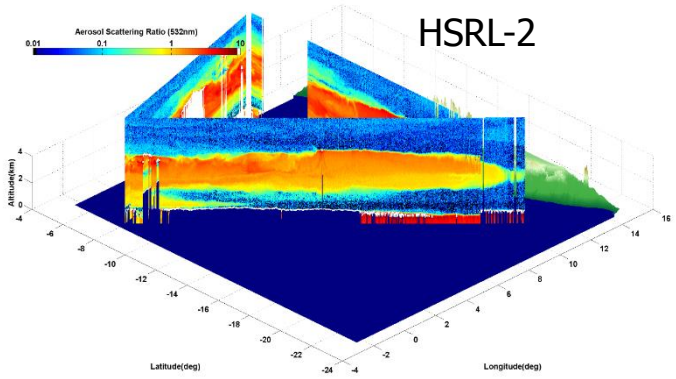
- Takeoff ~07:07 UT, Landing~15:46 UT (~8.7 hours)
- Planned 9 hour flight to survey smoke transport ("big triangle")
- Mid level clouds in target area prevented original plan to work with P-3
- HSRL-2, RSP, AirMSPI, eMAS, SSFR worked well



- Varying displacement of elevated smoke layer above low clouds







HSRL-2

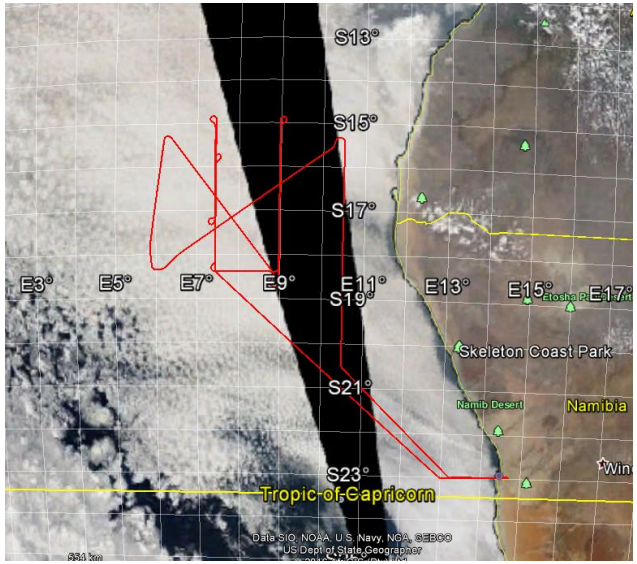
eMAS
08:57-09:30 UT

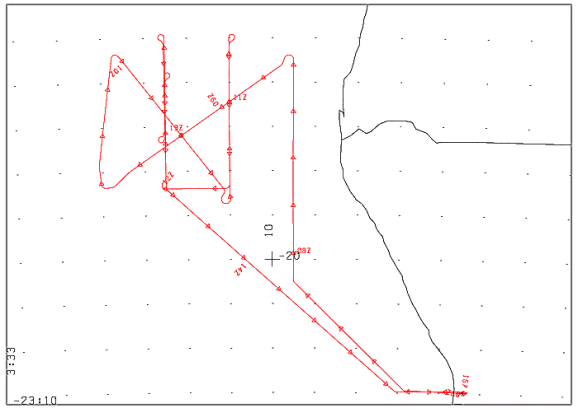
ER-2 ERF-03 Wednesday Sept. 14

Target of Opportunity Flight

- Takeoff ~07:00 UT, Landing~15:05 UT (~8.1 hours)
- Planned 8 hour flight with P-3 coordination along two N-S legs
- RSP, AirMSPI, SSFR worked well
- eMAS - VIS/NIR/SWIR worked well; Sterling cooler's active balancer failed during flight. LWIR 6.7, 13.3, and 13.9 µm bands noisy, and 7.3 µm band nonfunctional
- HSRL-2 did not operate due to tripped aircraft circuit breaker. Subsequent troubleshooting found faulty aircraft coolenol pump which was subsequently replaced
- Very good Terra overpass
- Good flight for polarimeter cloud retrievals and intercomparison with P-3 RSP and in situ

eMAS

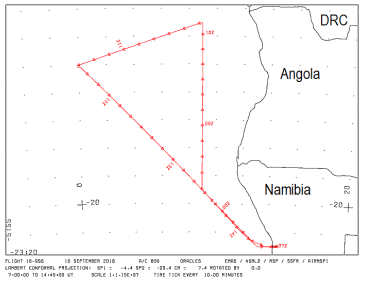


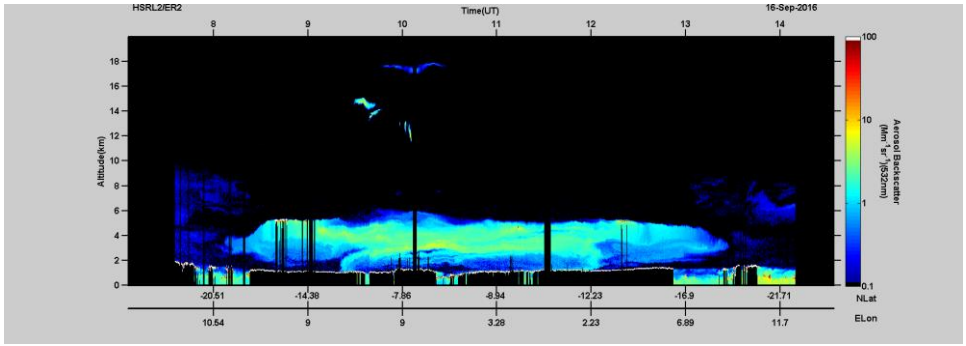


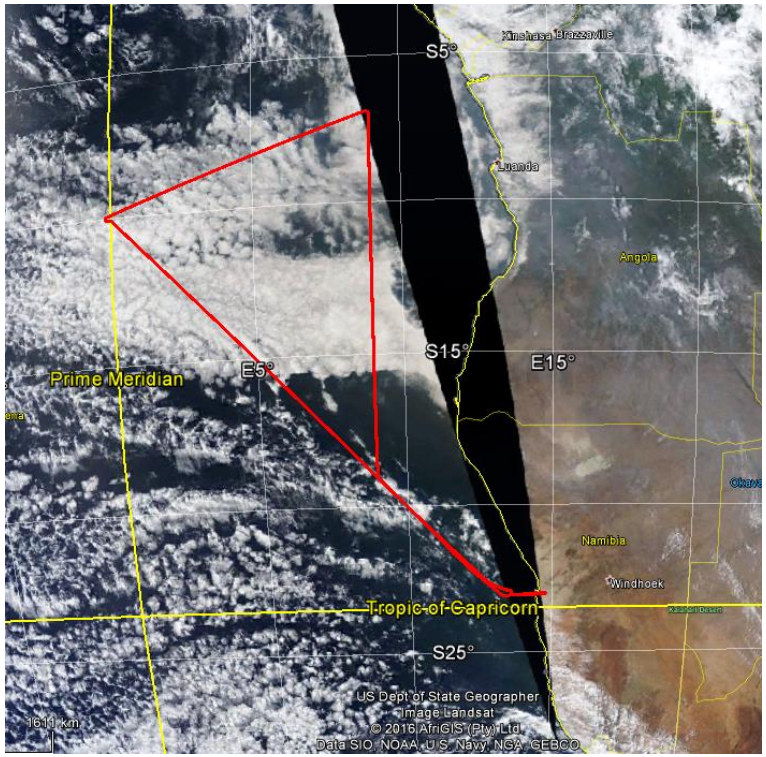
ER-2 ERF-04 Friday Sept. 16

Mapping Routine Flight

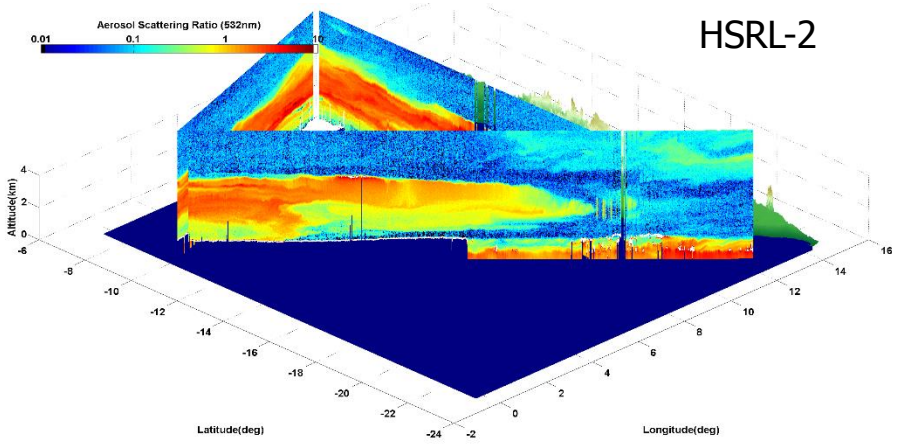
- Takeoff ~07:02 UT, Landing~14:46 UT (~7.7 hours)
- Mapping/survey flight "little triangle"
- HSRL-2 operational again after ER-2 coolenol pump replaced
- HSRL-2, RSP, AirMSPI, SSFR worked well
- eMAS - Good data in Vis-SWIR. No LWIR data available. Active balancer replaced after flight.







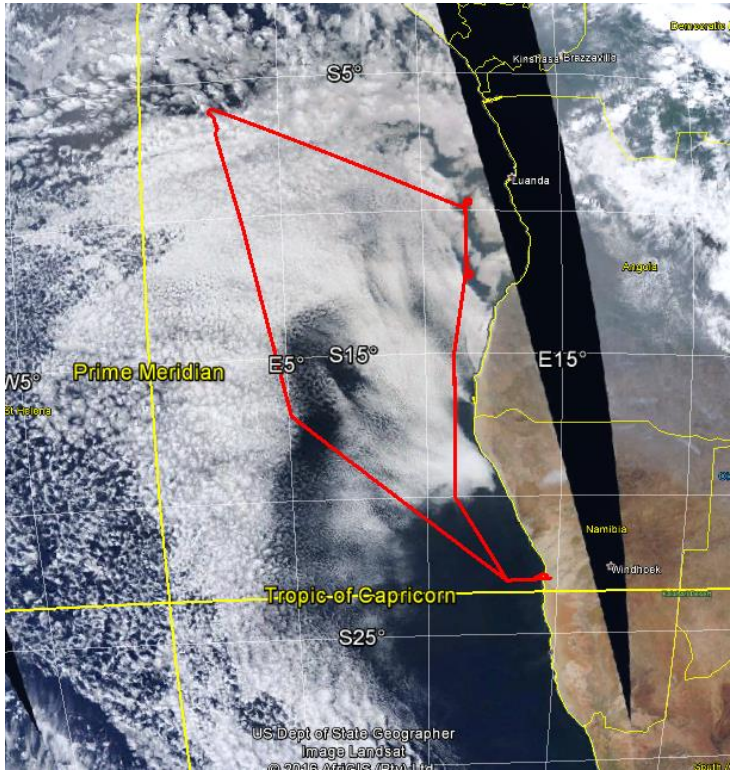
HSRL-2

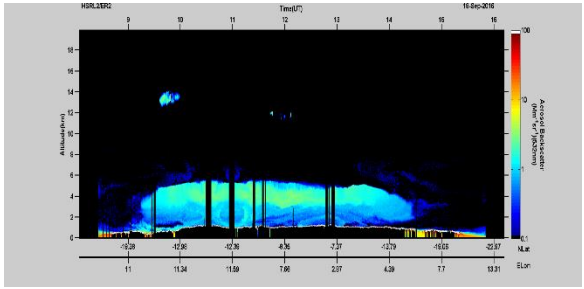


ER-2 ERF-05 Sunday Sept. 18

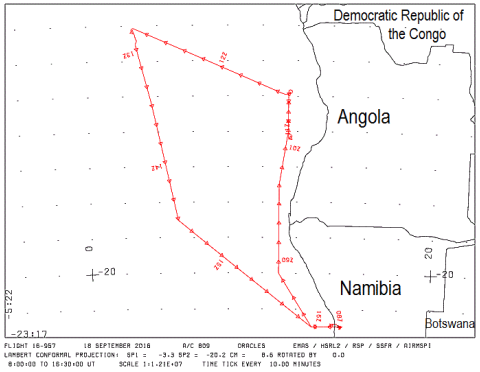
Target of Opportunity, Mapping, CALIPSO underflight

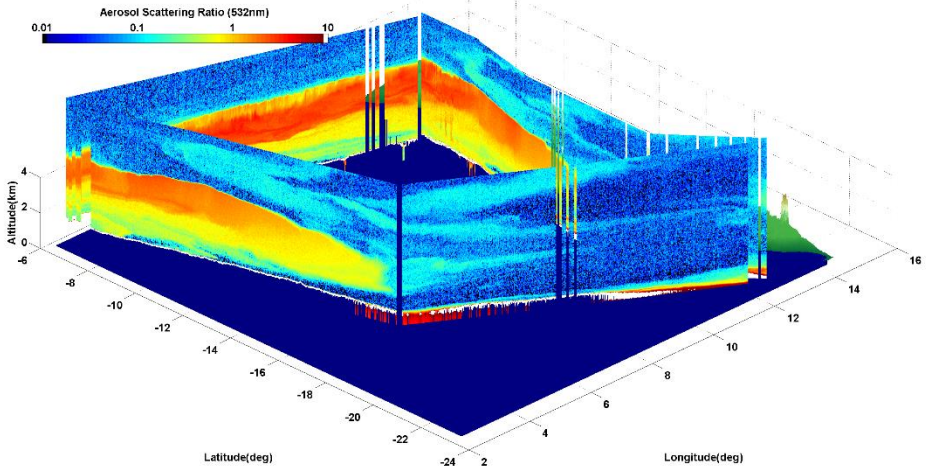
- Takeoff ~07:59 UT, Landing~16:27 UT (~8.5 hours)
- S-N leg near the coast (along 11 E) to look at smoke properties close to coast
- Northern part of S-N leg (between 10-12 South, 11.5 E) included portion that was coordinated with the P-3
- Western part of plan included CALIPSO leg (overpass ~13:35 UT)
- HSRL, RSP, AirMSPI, SSFR, eMAS worked well





HSRL-2

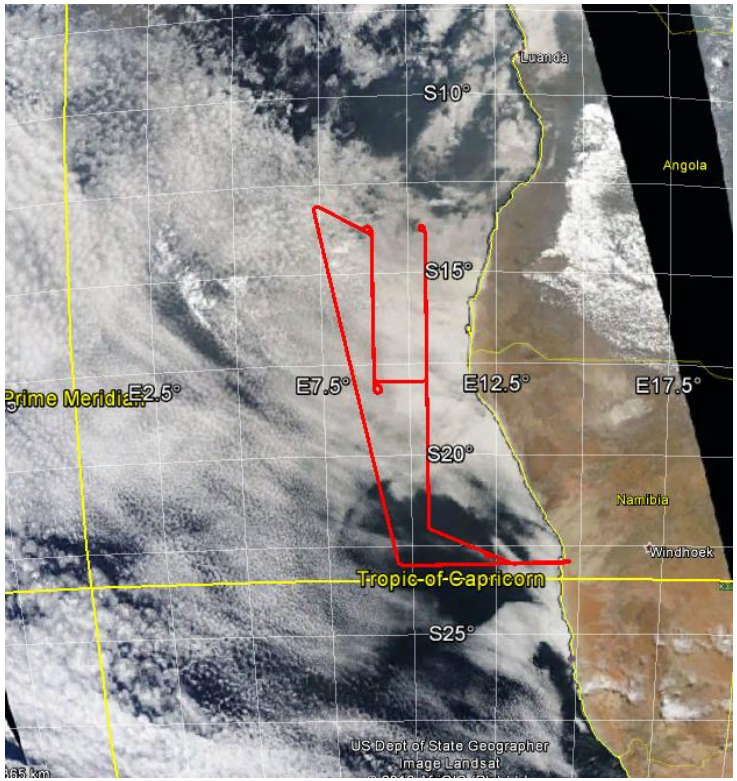


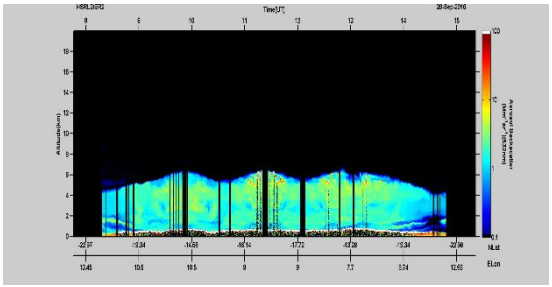


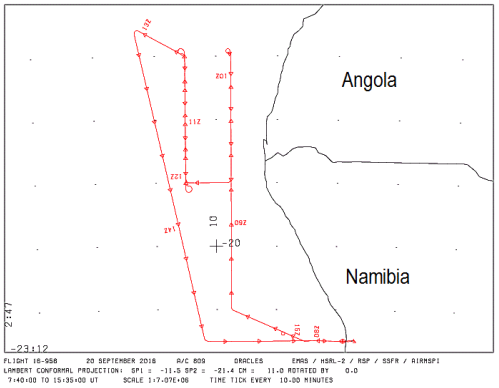
ER-2 ERF-06 Tuesday Sept. 20

Target of Opportunity, P-3 coordination, CALIPSO underflight

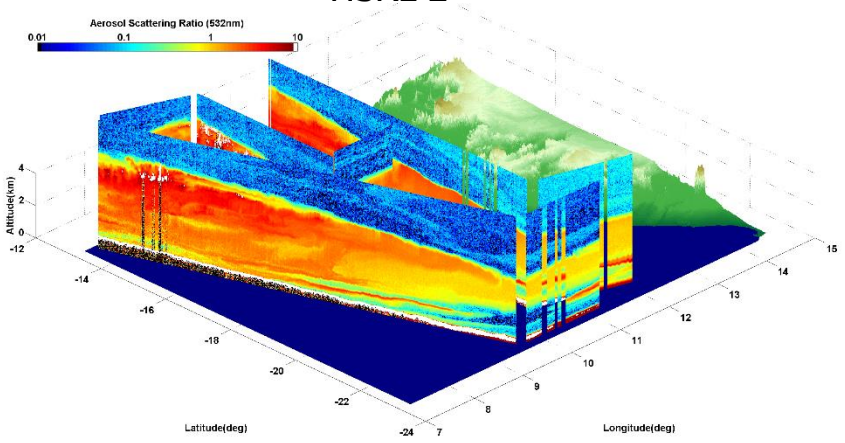
- Takeoff ~07:42 UT, Landing~15:27 UT (~7.7 hours)
- Coordinated S-N legs with P-3 along 10.5 E and 9 E between 14-18 South
- Western part of plan included CALIPSO leg
- HSRL, RSP, AirMSPI, SSFR, eMAS worked well (eMAS no 13.9 μm band data)







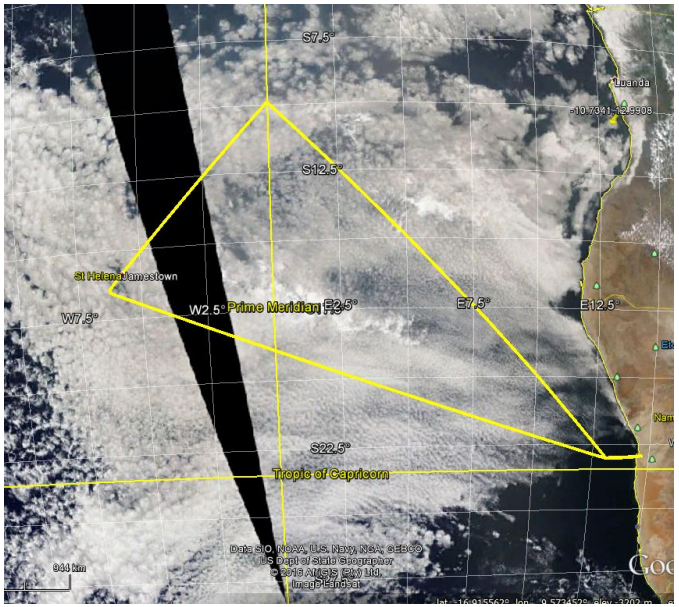
HSRL-2

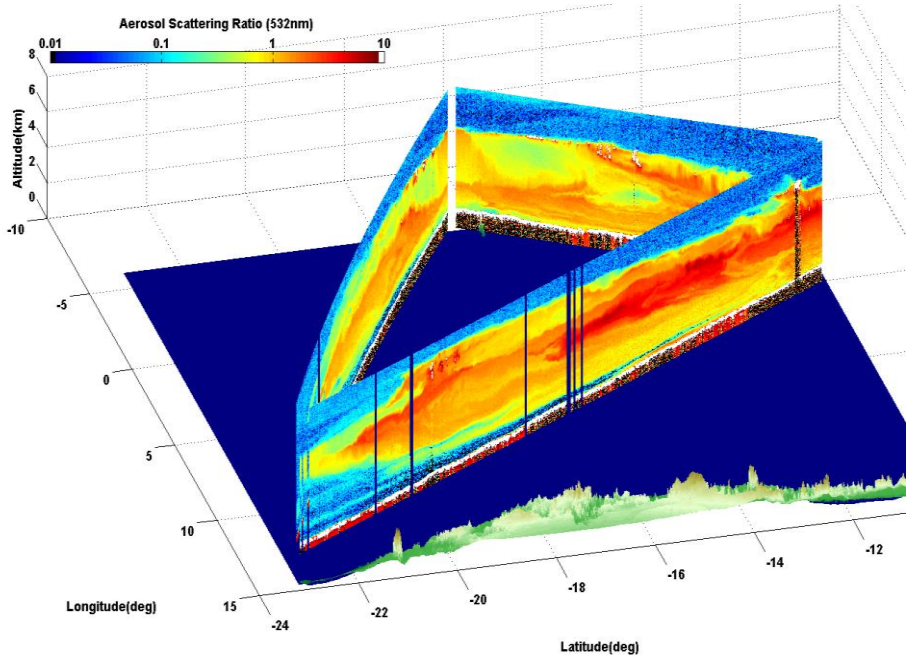


ER-2 ERF-07 Thursday Sept. 22

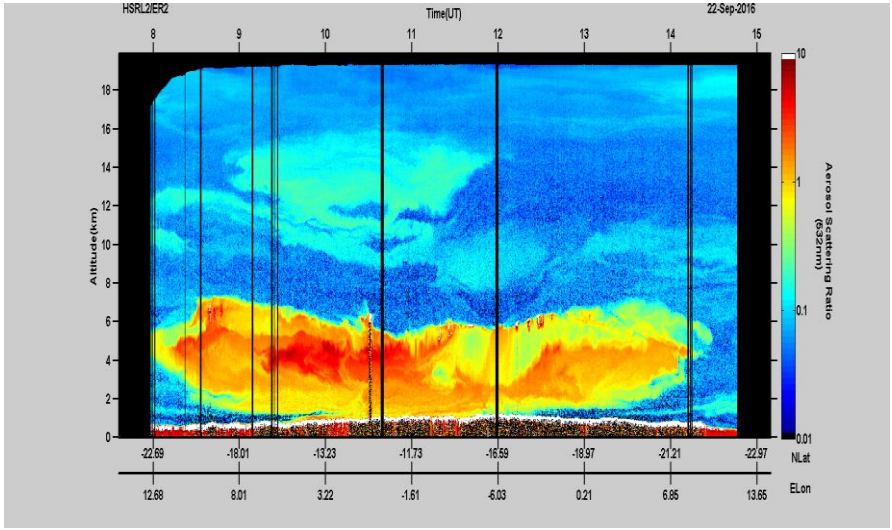
Mapping, Southern survey, St. Helena overflight

- Takeoff ~07:34 UT, Landing~15:20 UT (~7.9 hours)
- RSP, AirMSPI, SSFR, HSRL-2 worked well
- eMAS – not operational (data system failure)
- Southern mapping triangle
- Flyover of St. Helena
  - Clouds prevented AERONET aerosol measurements
  - ER-2 overflight nearly coincident with St. Helena radiosonde launch





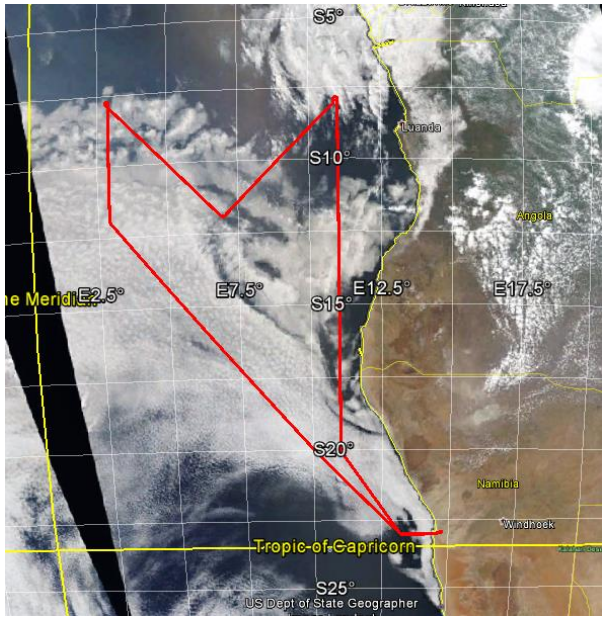
HSRL-2

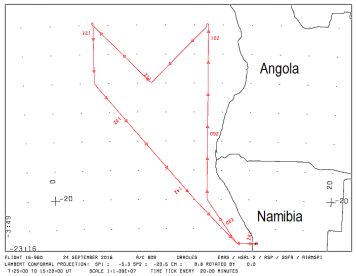


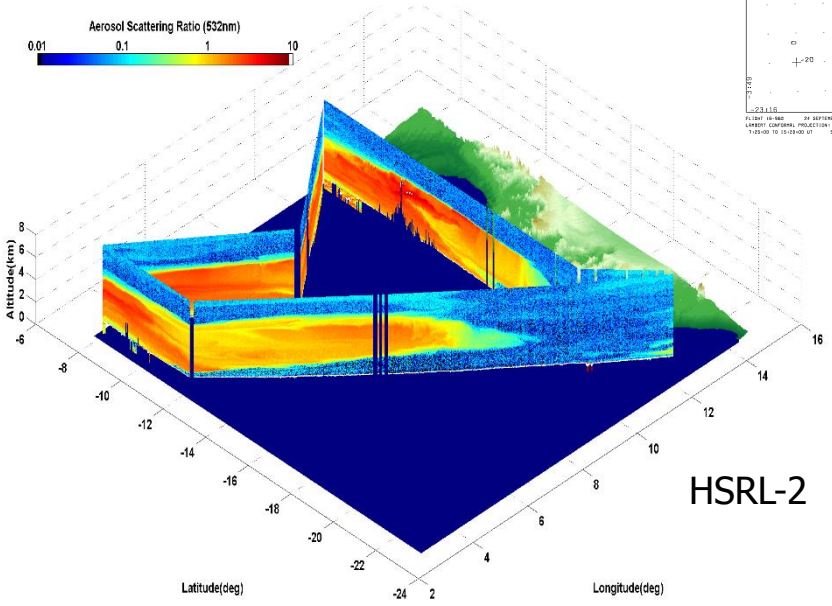
ER-2 ERF-08 Saturday Sept. 24

Target of Opportunity, Mapping

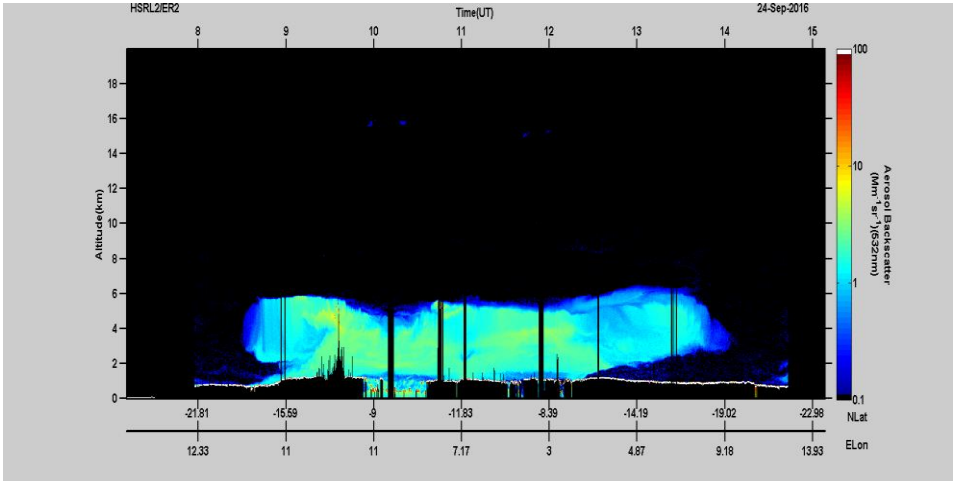
- Takeoff ~07:27 UT, Landing~15:18 UT (~8 hours)
- RSP, AirMSPI, SSFR, HSRL-2 worked well
- eMAS – Good data in Vis-SWIR. No LWIR data (bands 26-38) Aircraft pod heater failure toward end of flight.
- ER-2 leg along 11E between 8-20 South along P-3 leg
- ER-2 legs between 8-12 South used to study smoke evolution between 11 E and 3 E







HSRL-2

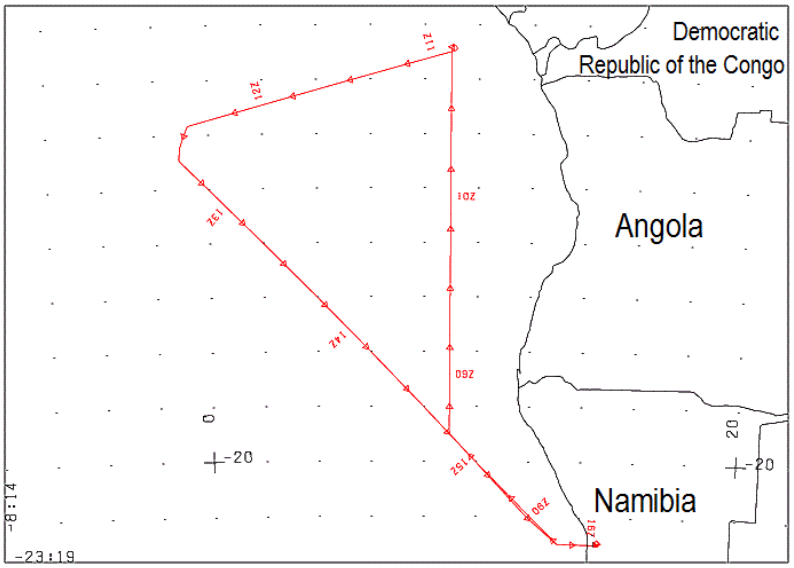


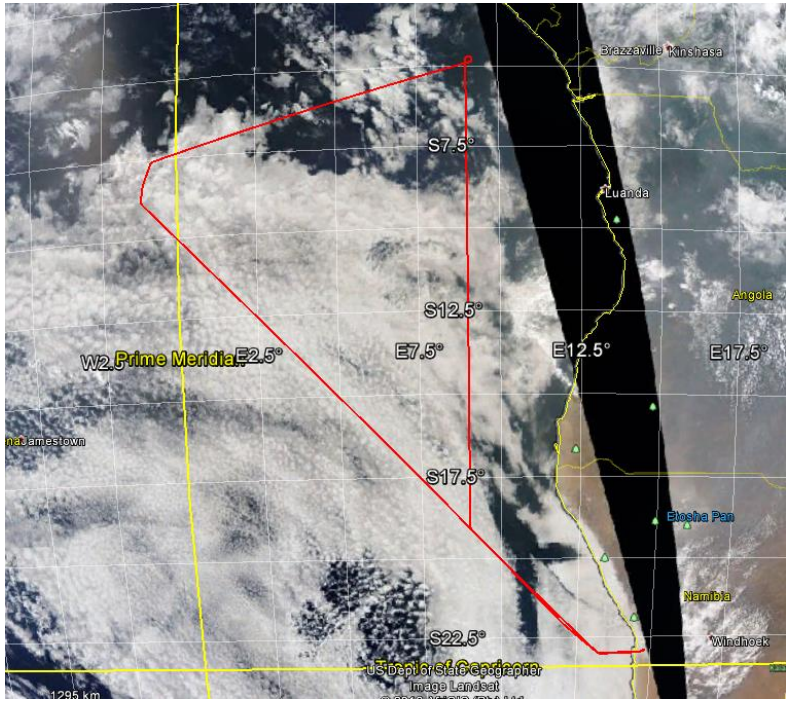
ER-2 ERF-09 Sunday Sept. 25

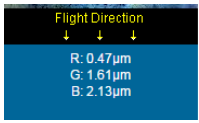
Mapping routine flight

- Takeoff ~07:30 UT, Landing~16:12 UT (~8.7 hours)
- RSP, AirMSPI, SSFR worked well
- HSRL-2 did not collect science data due to laser problem
- eMAS – Good data in Vis-SWIR. No LWIR data (bands 26-38) Aircraft pod heater failed.
- ER-2 flew "big triangle" and met P-3 on return leg

eMAS data along P-3 coordination leg



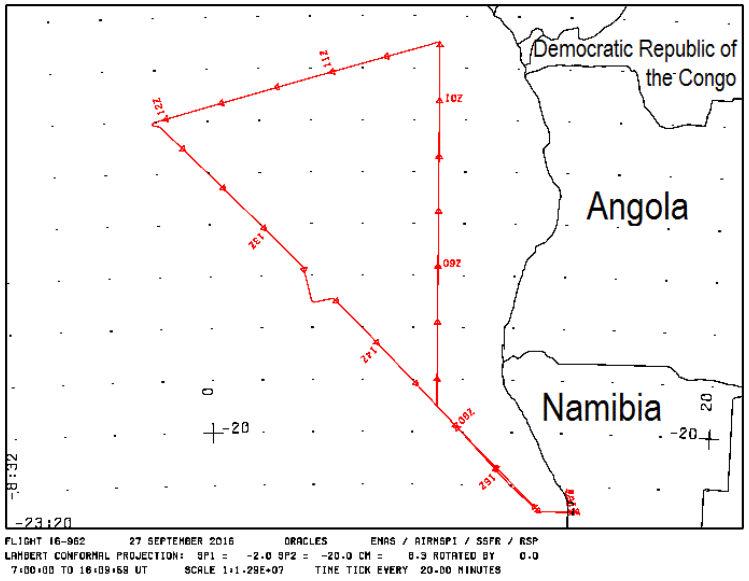


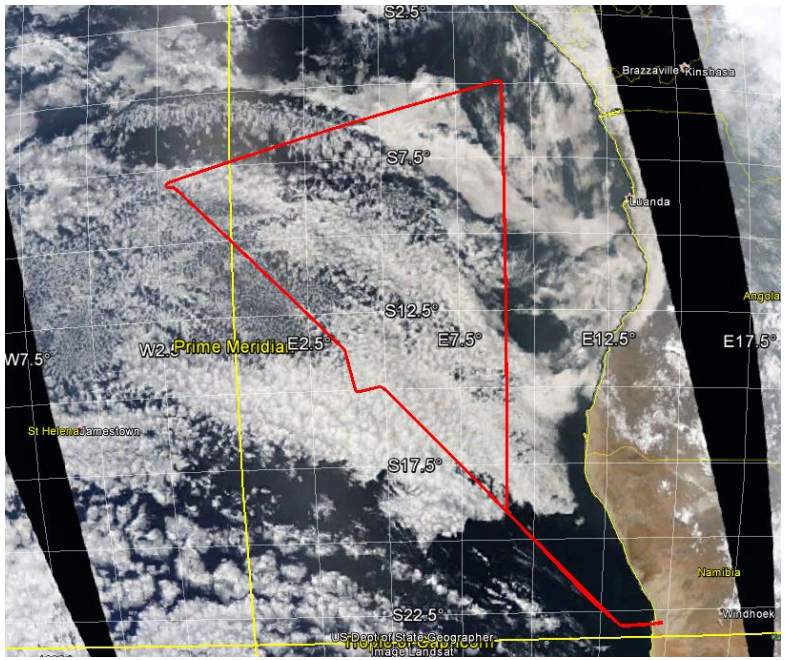


ER-2 ERF-10 Tuesday Sept. 27

Mapping routine flight

- Takeoff ~06:56 UT, Landing~16:07 UT (~9.2 hours)
- RSP, AirMSPI, SSFR worked well
- HSRL-2 did not collect science data due to laser problem
- eMAS – Good data in Vis-SWIR. No LWIR data (bands 26-38) Aircraft pod heater failed.
- Short (10-15 min leg) on return leg for Aqua overpass for eMAS
- ER-2 flew "big triangle"





eMAS data along Aqua overpass

ER-2 ERF-11 Thursday Sept. 29

Transit Flight from Walvis Bay to Recife

- Takeoff ~09:17 UT (Walvis Bay), Landing~17:55 UT (Recife) (~8.6 hours)
- Initial leg went NW over standard leg to 0 deg N, 10 S, then over Ascension Is. before continuing to Recife
- eMAS collected no data as plate installed over aperture
- HSRL-2 did not collect science data due to laser problem
- RSP, SSFR, AirMSPI worked well