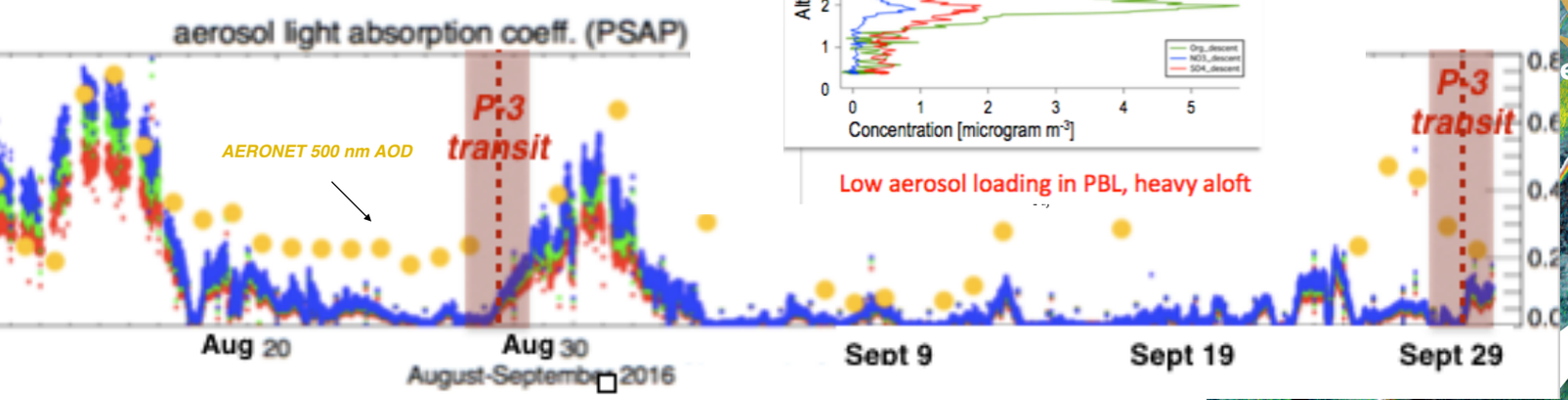
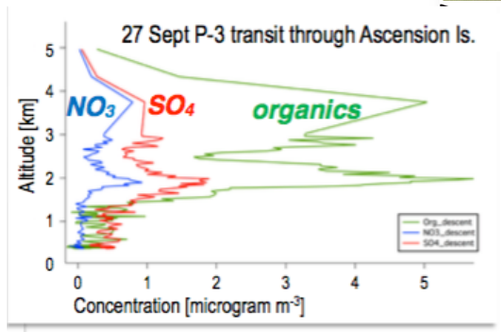
complementary aircraft measurements

September, 2016: NASA

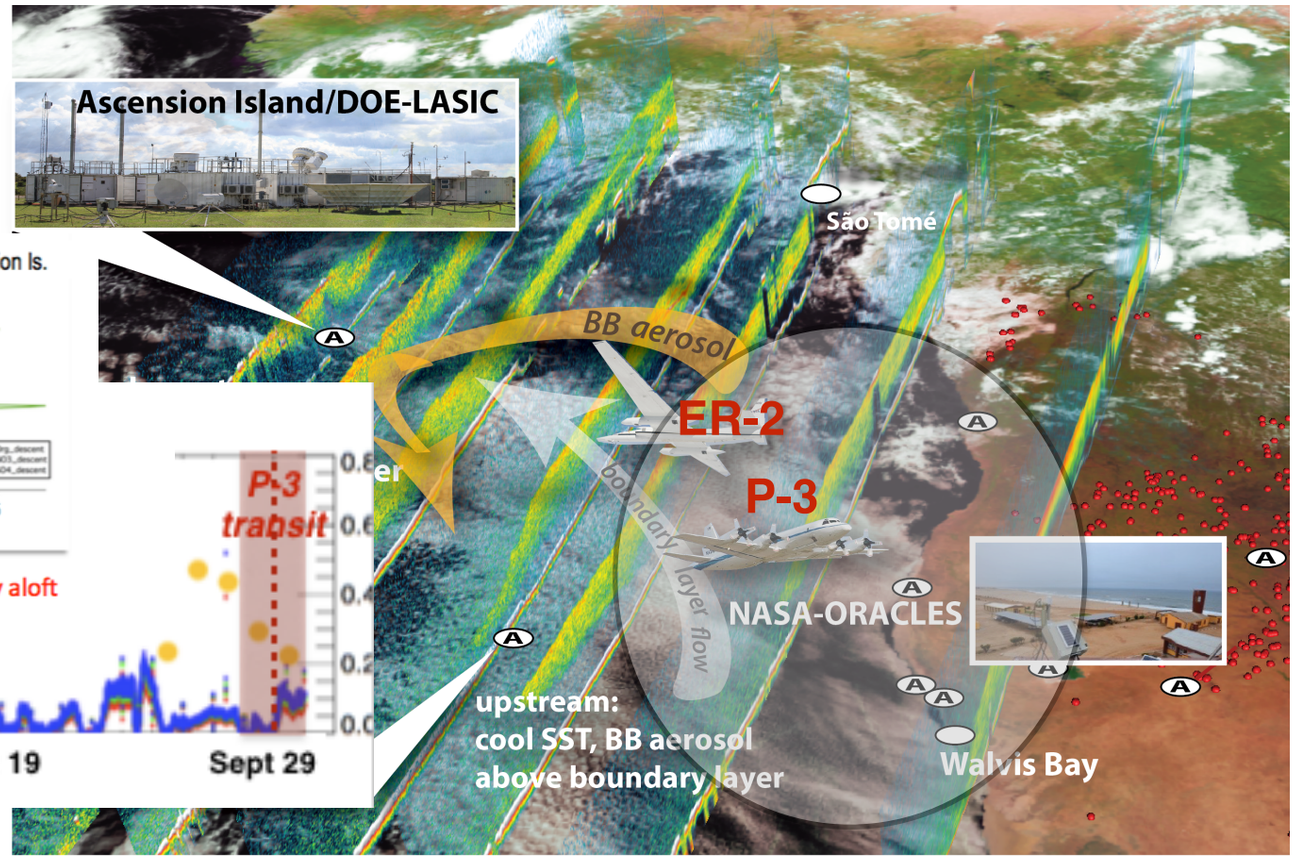
based at Walvis Bay, Namibia

1) 2 opportunistic profiles during NASA P3 transits

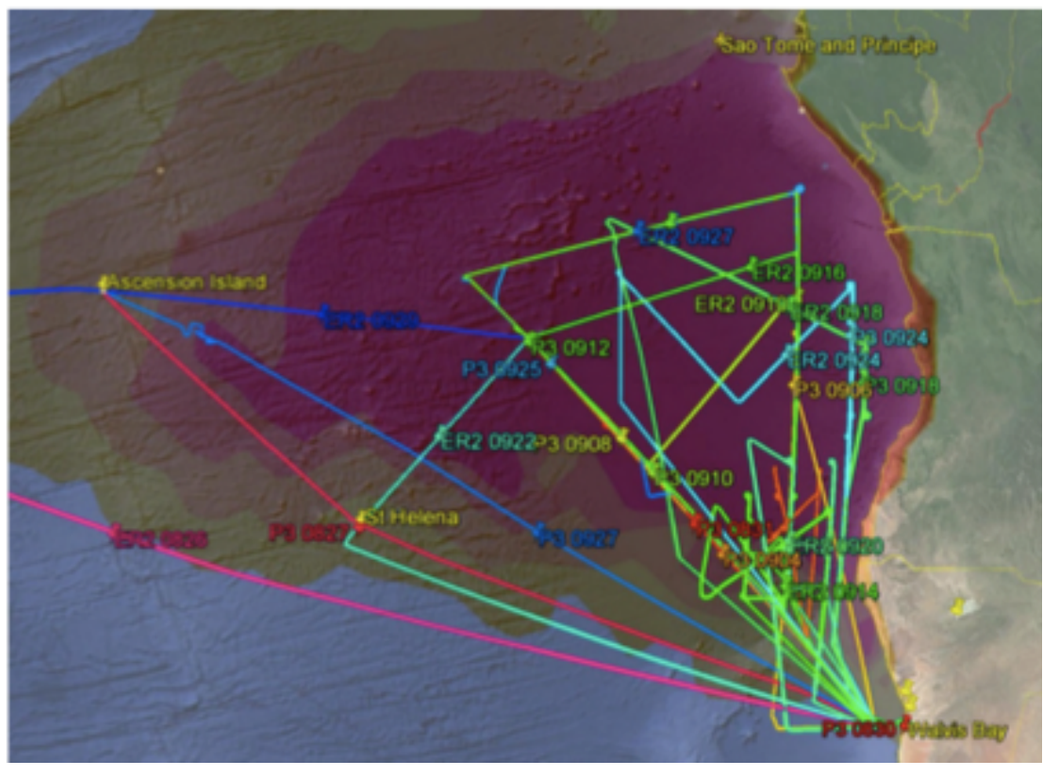




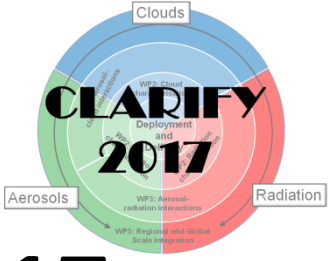
Low aerosol loading in PBL, heavy aloft



2) possible connection between air masses sampled at Ascension and the plane



NASA-2016 data becomes publicly available in June 2017



CLoud-Aerosol-Radiation Interactions and Forcing: Year 2017 (CLARIFY-2017)

Institutes and Investigators

Haywood, Collins

Blyth,Carslaw, Field

Coe, Gallagher, Choularton, Allan, Connolly, Dorsey

Stier, Washington

Bellouin, Highwood

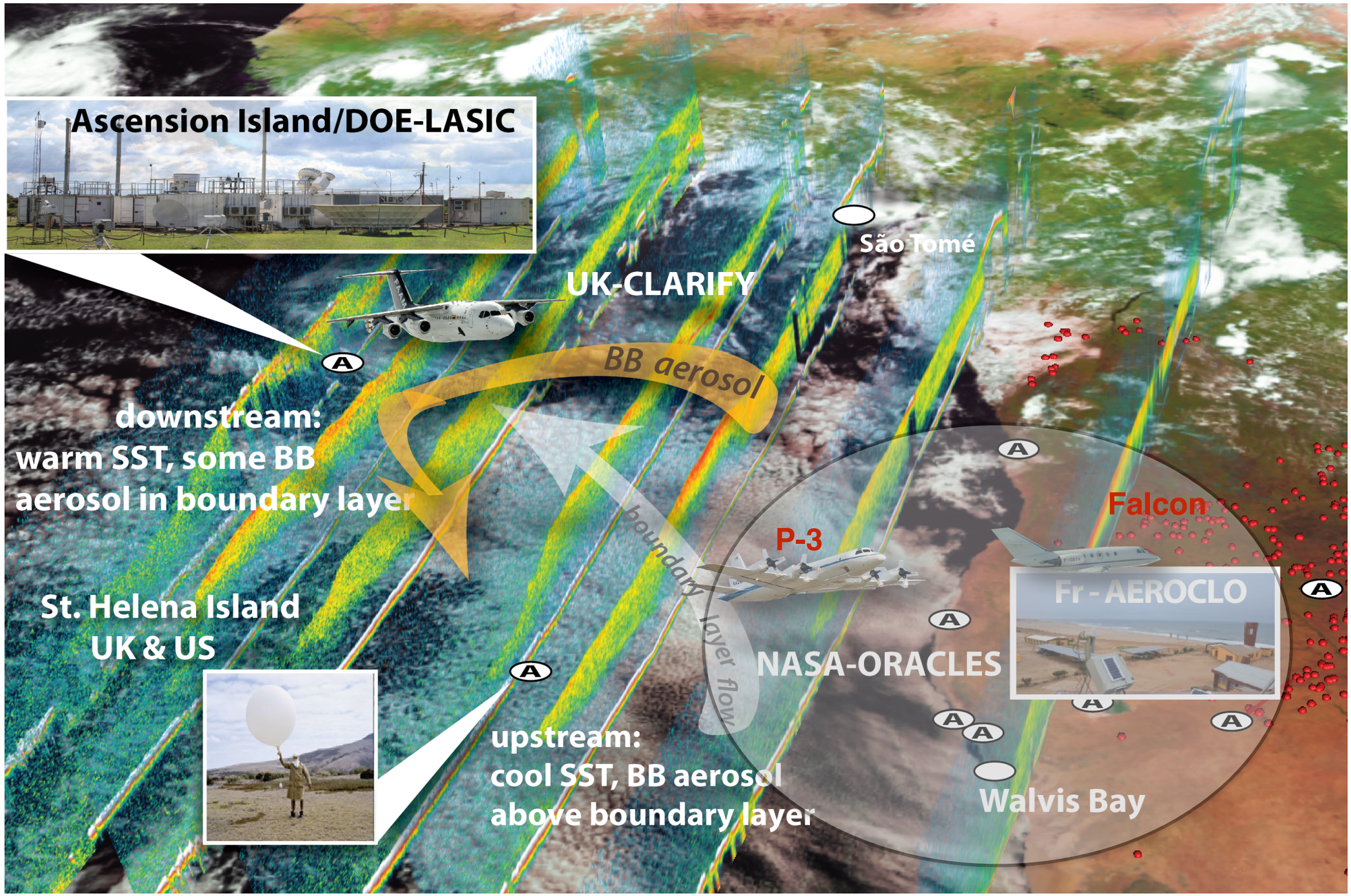
Abel, Taylor, Lock, Jones, Milton

Partners (£1.2m matched support secured): Met Office

complementary aircraft measurements

August-September, 2017: UK
based at Ascension

August-Sept 2017: NASA-P3, French
plan to base at Walvis Bay, Namibia



Science flights: Aug 15th – Sept 8th
Science flight hours: 90 hrs
Duration of each flight: 3.5 hr
Single flights possible Mon, Thu, Sat
Double flights possible Tue, Wed, Fri

Instrumentation: significant overlap with AMF1

Aerosol microphysics		
DMT-SPP200 PCASP	FAAM	Size resolved number 0.1 < D < 3 µm
TSI 3786 water filled CPC	FAAM	Total number D > 2.5 nm
GRIMM	FAAM	Size resolved number 0.25 < D < 32 µm
SMPS	UoM	Size resolved number 10 < D < 500 nm
DMT CCN-200	FAAM	Continuous flow CCN at 2 supersaturations
CVI TSI 3010 butanol CPC	UoM	Total number D > 10 nm
CVI APS	UoM	Size resolved number 0.37 < D < 20 µm
CVI UHSAS	UoM	Size resolved number 0.055 < D < 1 µm
EXSCALABAR PCASP	Met Office	Size resolved number 0.1 < D < 3 µm
Aerosol composition and optical properties		
Compact Time of flight AMS	UoM	Size resolved non-refractory composition 4 < D_{aero} < 700 nm
SP2	UoM	Single particle soot detection
PSAP	FAAM	Absorption coefficient at 565 nm
2 x TSI 3563 nephelometers	FAAM	Scattering coefficient at 450, 550, 700 nm
EXSCALABAR Brechtel TAP	Met Office	Absorption coefficient at 467, 528, 652 nm
EXSCALABAR PAS	Met Office	Dry and thermally denuded absorption coefficient at 405, 532, 662 nm
EXSCALABAR CRDS	Met Office	Extinction coefficient at 405, 662 nm dry. 405 nm also at RH = 75, 90%
Filters	UoM	Sub and super-micron nucleopore
Cloud physics		
DMT CDP	FAAM	Size resolved number 3 < D < 50 µm
DMT CIP-15	FAAM	Size resolved number 15 < D < 960 µm
DMT CIP-100	FAAM	Size resolved number 100 < D < 6400 µm
SPEC Fast FSSP	UoM	Size resolved number 3 < D < 50 µm, 50Hz
SPEC 2D-S	UoM	Size resolved number 10 < D < 1280 µm
DMT CAPS (CAS + CIP-15)	UoM	Size resolved number 0.5 < D < 960 µm
Nevzorov LWC/TWC	FAAM	Bulk LWC and TWC
SEA WCM-2000	FAAM	Bulk LWC and TWC
Brechtel CVI	MO-NCAS	Aerosol residual physio-chemical analysis

Radiation/Remote sensing		
Leosphere lidar	Met Office	355 nm UV backscatter lidar with depolarisation
Broad Band Radiometers	FAAM	Upper and lower pyranometer (0.3-3µm) and red dome (0.3-0.7µm)
Broad Band Radiometers	FAAM	Upper and lower pyrgeometer (4.5-42 µm)
SWS	Met Office	Spectrally resolved radiance (300-1700 nm), pointable
SHIMS	Met Office	Spectrally resolved radiance (300-1700 nm), broadband
MARSS	Met Office	89 and 157 GHz channels for LWP and WVP
Trace gas chemistry		
Ozone TE49C	FAAM	UV Photometric O3 analyzer
Aero-Laser AL-5002	FAAM	CO
Fast Greenhouse Gas Analyser	FAAM	CO2 and CH4
SO2 TE43C TL	FAAM	SO2
Thermodynamics		
Turbulence probe	FAAM	3D winds, 32 Hz
AIMMS-20	Met Office	3D winds, 20 Hz
Dropsonde system	FAAM	Profile temperature, wind, humidity
Total water probe	Met Office	Total water content, 64Hz
WVSS-II x 2	Met Office	Water vapour
Buck CR-2	FAAM	Water vapour
General Eastern	FAAM	Water vapour
De-iced and non-deiced temperature	FAAM	Temperature, 32 Hz

Example flight profiles

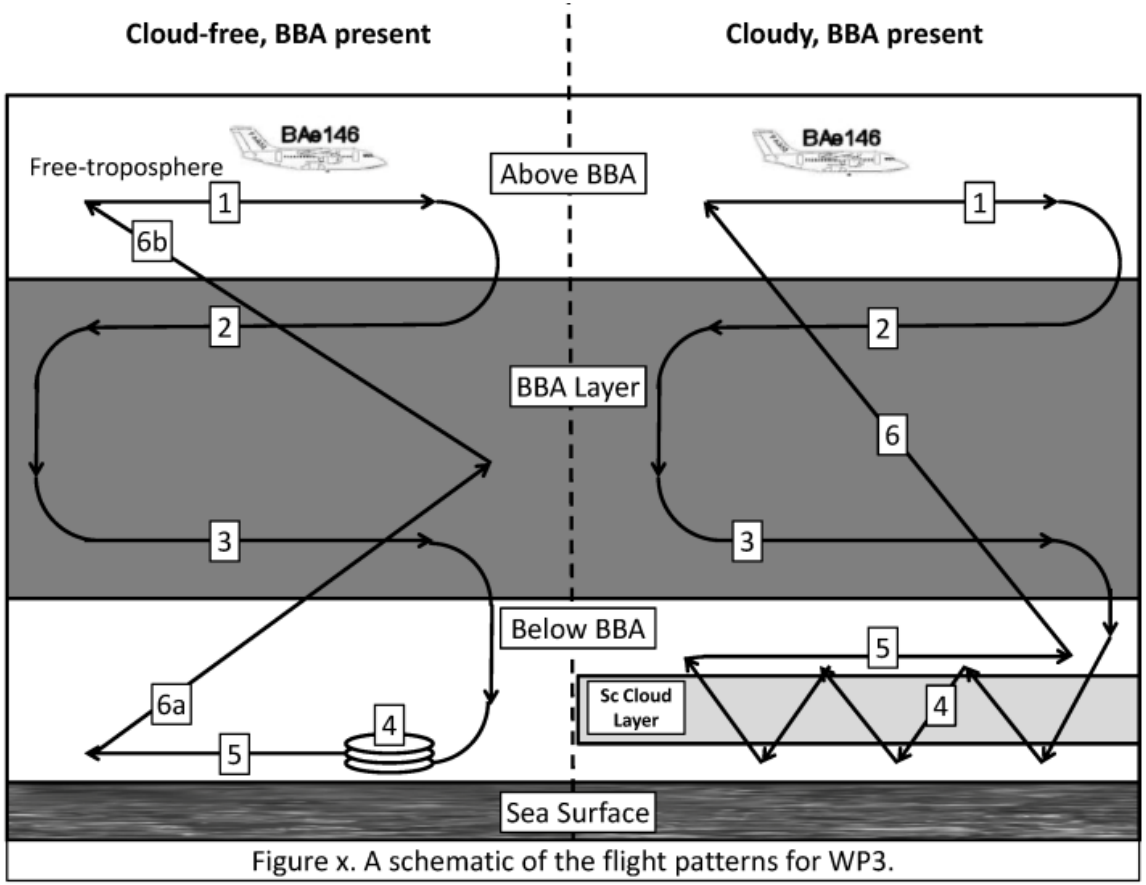
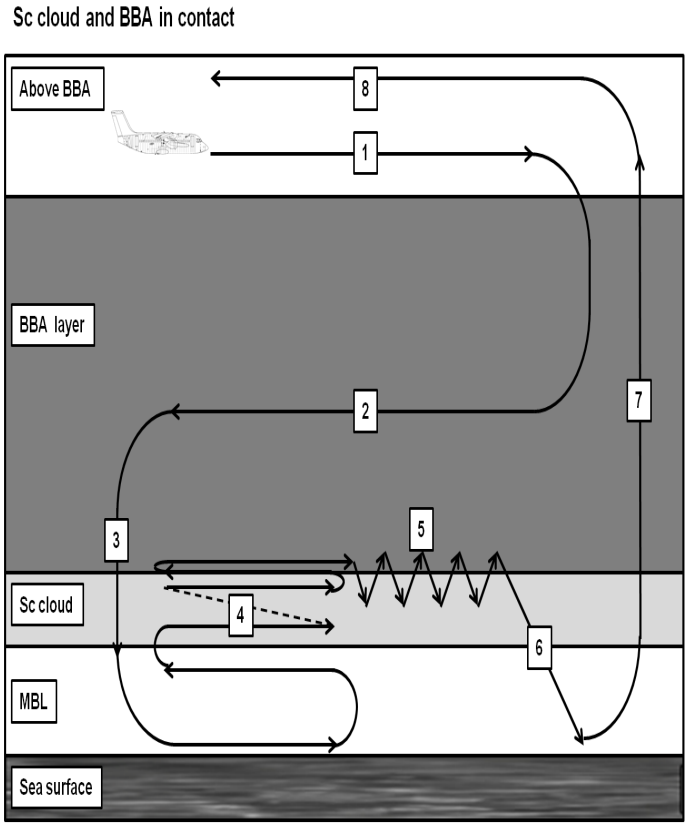
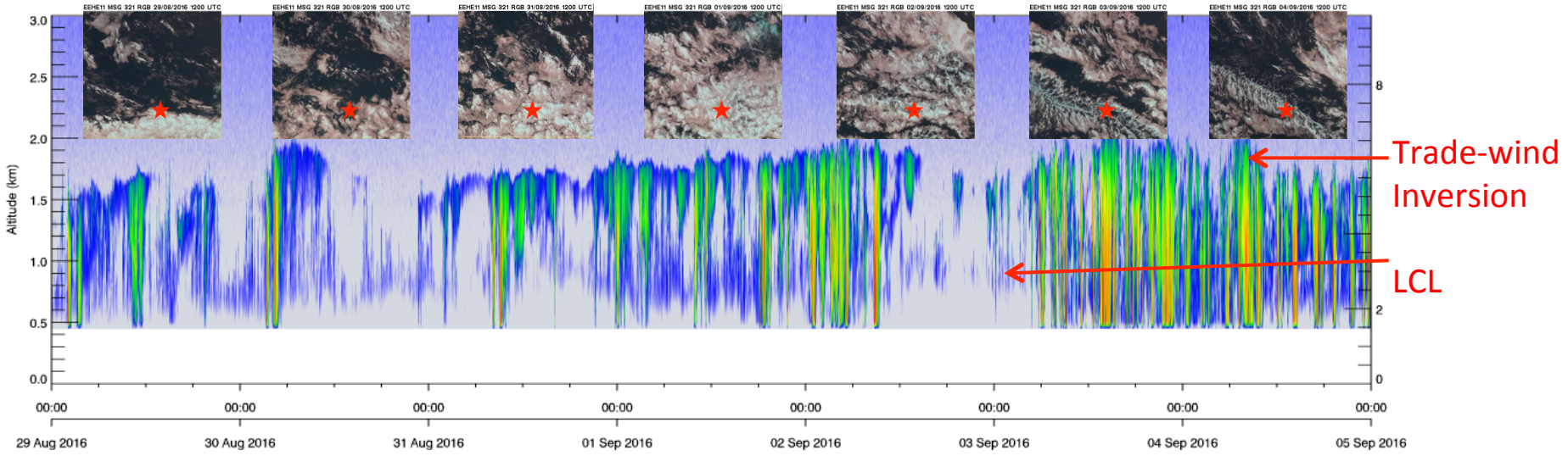


Figure x. A schematic of the flight patterns for WP3.



Complementing LASIC



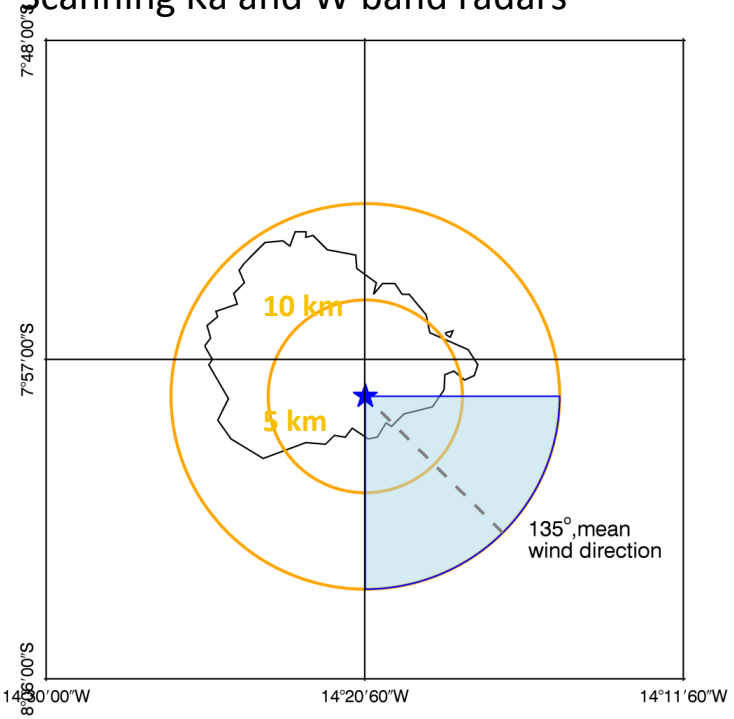
The boundary layer is often decoupled. Are the surface based aerosol measurements the same as at cloud-base or being entrained at cloud top?

Frequent occurrence of clouds at Ascension limits the ability of surface remote sensing to detect smoke in the free troposphere.

Co-ordinating with LASIC

Upwind legs at 1000 ft ASL same altitude as AMF1
Direct over-flights of surface site (5000 ft?)

Scanning Ka and W band radars



Radar will perform RHI scans over a 90 degree sector centred on the mean wind direction (blue shading).
Co-ordinated flying in range of the radar.

Aircraft observations provide in-cloud and above-cloud measurements
AMF1 radars capture the spatial structure and evolution of the clouds measured by the aircraft
Complementary observations to constrain the direct effect of the smoke in cloud free skies
Use of in-situ measurements to evaluate ground based retrievals

UK data policy

"CLARIFY aircraft datasets will be made available to project partners and collaborators immediately after quality control has been performed.
Data will be made publically available 2 years after the campaign."