EUREC⁴A-ATOMIC

Surface based remote sensing operations that may influence aircraft operations
25 Jan 2020 Version

As shown on the following page, ships will mostly be operating outside of the area of operations of the **Twin-Otter** and the **ATR-42.** Only for transits to and from Barbados are they expected to cross potential airspace for these aircraft. The **R/V L'Atalante** and **R/V Maria S Merian** will mostly be well to the south of the area of aircraft operations, and thus not conflict with airborne measurements. There may also be low-level flights over the **BCO** for calibration.

All ships and the **BCO** operate **ceilometers (similar to Jenoptik CHM 15K)** for which the operating mode is eye safe. Likewise **All ships** and the **BCO** intend to launch radiosondes on a regular schedule (22:45, 2:45, 6:45, 10:45, 14:45, 18:45 UTC).

All ships except L'Atalante are operating **W-band (94GHz) radars** which will conflict with systems on the **WP-3D** and the **ATR-42**. These likely need to be de-conflicted on overpasses.

CloudKites on the **R/V Maria S Merian** and **R/V Meteor** are tethered to the ships. The have a Mode-S and ADS-B transponder but presently are not authorized to use them (no ICAO number). In lieu of the transponder a radar reflector allows detection by a primary radar. In case of a line break, a radio-controlled and barometric cut-down device is used to burn a hole in the bladder, then the helium escapes gradually and the balloon sinks towards the sea surface in a controlled manner. The radio control works in line of sight and has a range of at least 10 km with a directional antenna. The CloudKites will extend downwind of the ship and it is recommended not to enter the airspace within a cylinder of whose top and radius are equal to their stated ceiling.

Ships are asked to coordinate/okay soundings and cloud-kite activities with aircraft in advance of operating in Tradewind Alley.

BCO

- Raman lidar: **Not eye safe but equipped with safety radars** that shut system down if objects detected within 15º of beam. Shutdown tested between 100 m and 12 km, and detects objects as small as birds. Complete specs are available on the lidar wiki.
- HALO photonics wind lidar, eye safe.
- Vertically pointing radar (K-band, 35 GHz and 24 GHz, Safety Radar X-band, 9.4 GHz).

R/V Maria S Merian (near the BCO on 17-19 Jan, at position indicated for Meteor 6-12 February):

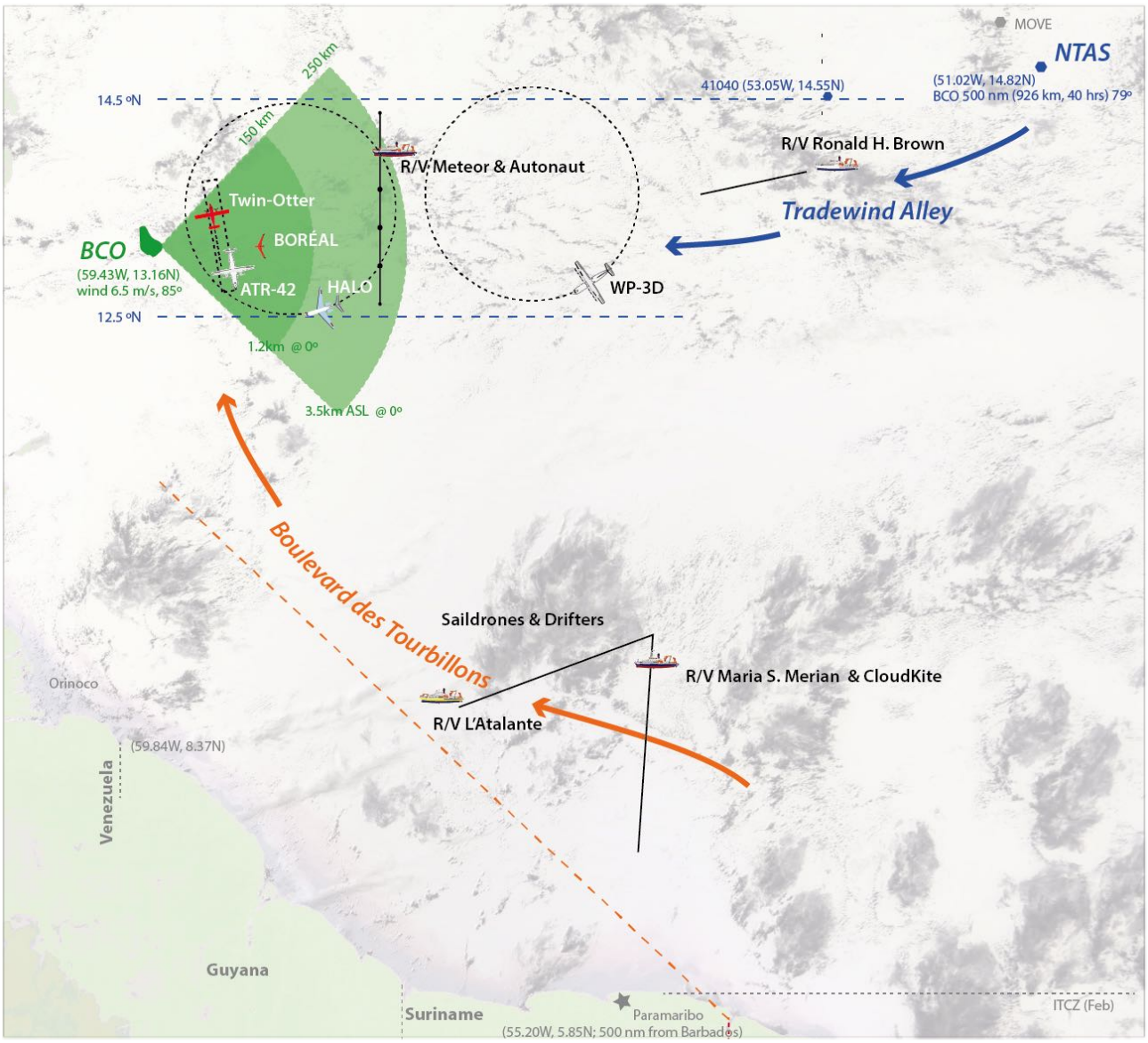
- Vertically pointing radar (W-band, 94 GHz system, X-Band 9.4 Ghz, and K-band, 24 GHz Micro-rain radar).
- Three lidars (ARTHUS Raman lidar, 2 HALO Doppler lidars). All are eyesafe for aircraft overflights at all heights. Their UV and IR lasers have low enough intensities according to IEC 60825-1 and ANSI Z136.6-2015. No automatic shutoff needed.
- 250 m^3 CloudKite with 2.5 km ceiling (see above).

R/V Meteor (Near BCO 12-20 Jan, position TBD for 6-12 February):

- Additional (two hourly) soundings during a 10 day period TBD..
- Vertically pointing radar (W-band, 94 GHz system, X-Band).
- UAV: Ship-based (quad-copter) 500 m ceiling.
- LICHT Raman lidar, same specs as CORAL system at BCO (see above). Not eye safe but safety radar shuts it down when objects approach within 15º of beam.
- Wind lidars (1565 nm) eye safe (similar to HALO photonics system) on Merian.
- 75 m^3 CloudKite with 1.5 km ceiling (see above).

R/V Ronald H. Brown (crossing the radar region during transits (24-5 Jan, 28 Jan)

- Vertically stabilized Doppler lidar on the Ron Brown. It is invisible and eye-safe at the output window — so there are no eye-safety concerns from this system.


MOVE
NTAS
(51.02W, 14.82N)
BCO 500 nm (926 km, 40 hrs) 79º
41040 (53.05W, 14.55N)
14.5 ºN
250 km
150 km
R/V Meteor & Autonaut
R/V Ronald H. Brown
Tradewind Alley
Twin-Otter
BOREAL
BCO
(59.43W, 13.16N)
wind 6.5 m/s, 85º
ATR-42
HALO
WP-3D
12.5 ºN
1.2km @ 0º
3.5km ASL @ 0º
Boulevard des Tourbillons
Saildrones & Drifters
R/V Maria S. Merian & CloudKite
R/V L'Atalante
Orinoco
(59.84W, 8.37N)
Venezuela
Guyana
Suriname
Paramaribo
(55.20W, 5.85N; 500 nm from Barbados)
ITCZ (Feb)