Panel: Taking an idea to orbit

August 4, 2022

- Brian Cairns – Earth Venture Suborbital and Directed Missions
- Ivona Cetinic – Earth Venture Suborbital
- Ryan Vandermuelen – Earth Venture Instruments
- Lorraine Remer - Cubesats
- Jeremy Werdell – Directed Missions

Airborne instruments

Alternatives:

1. Buy one
   - They might not have what you want
   - It may be too expensive
   - May not exist
2. Write proposals to NASA Earth Science Technology Office
   - Advanced Component Technology (ACT) program – pays for new technologies, some funding for in situ but really more interested in advancing spaceflight capabilities
   - Instrument Incubator Program (IIP) – pays for development of prototype instruments, not necessarily capable of being used for airborne science, but can be
   - Airborne Instrument Technology Transition – take a prototype and make it capable of use in NASA's airborne science program

Earth Venture Suborbital

Have clear objectives

Have a good plan

Make sure you have great project manager! (Mary Kleb, LaRC and Bernie Luna ESPO, thank you!)

It’s a big investment, there have to be people in leadership roles who have done this before – **successfully**

Don’t be discouraged, if at first you don’t succeed, it’s definitely worth trying again……..and some proposals that don’t succeed become directed projects (with some additional effort) ☺

The North Atlantic Aerosols and Marine Ecosystems Study (NAAMES)

Have clear objectives:

1. characterize plankton ecosystem properties during primary phases of the annual cycle and their dependence on environmental forcings
2. determine how these phases interact to recreate each year the conditions for an annual plankton bloom
3. resolve how remote marine aerosols and boundary layer clouds are influenced by plankton ecosystems.

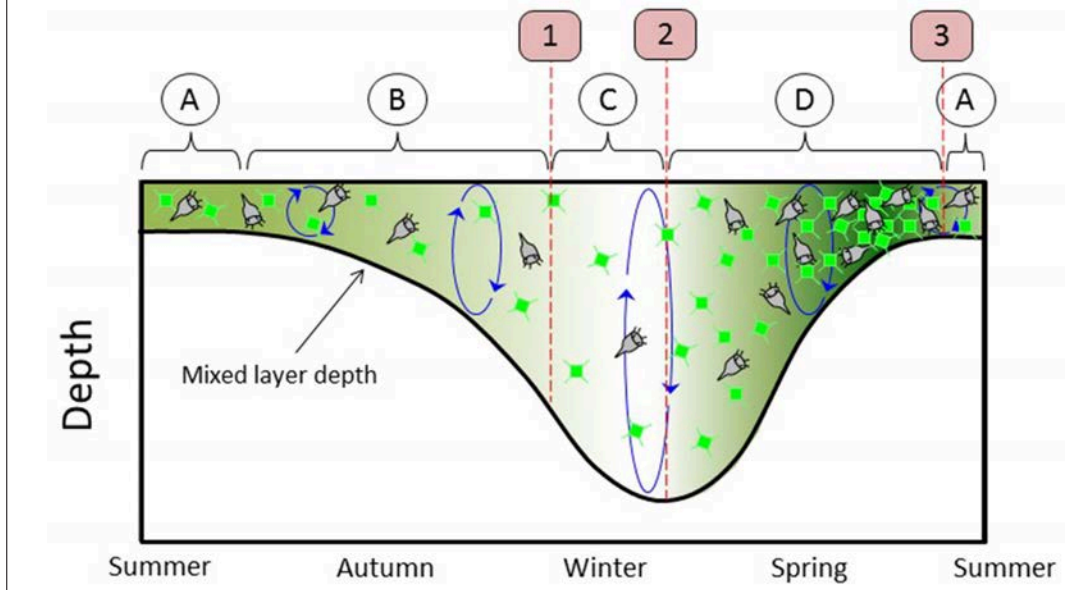
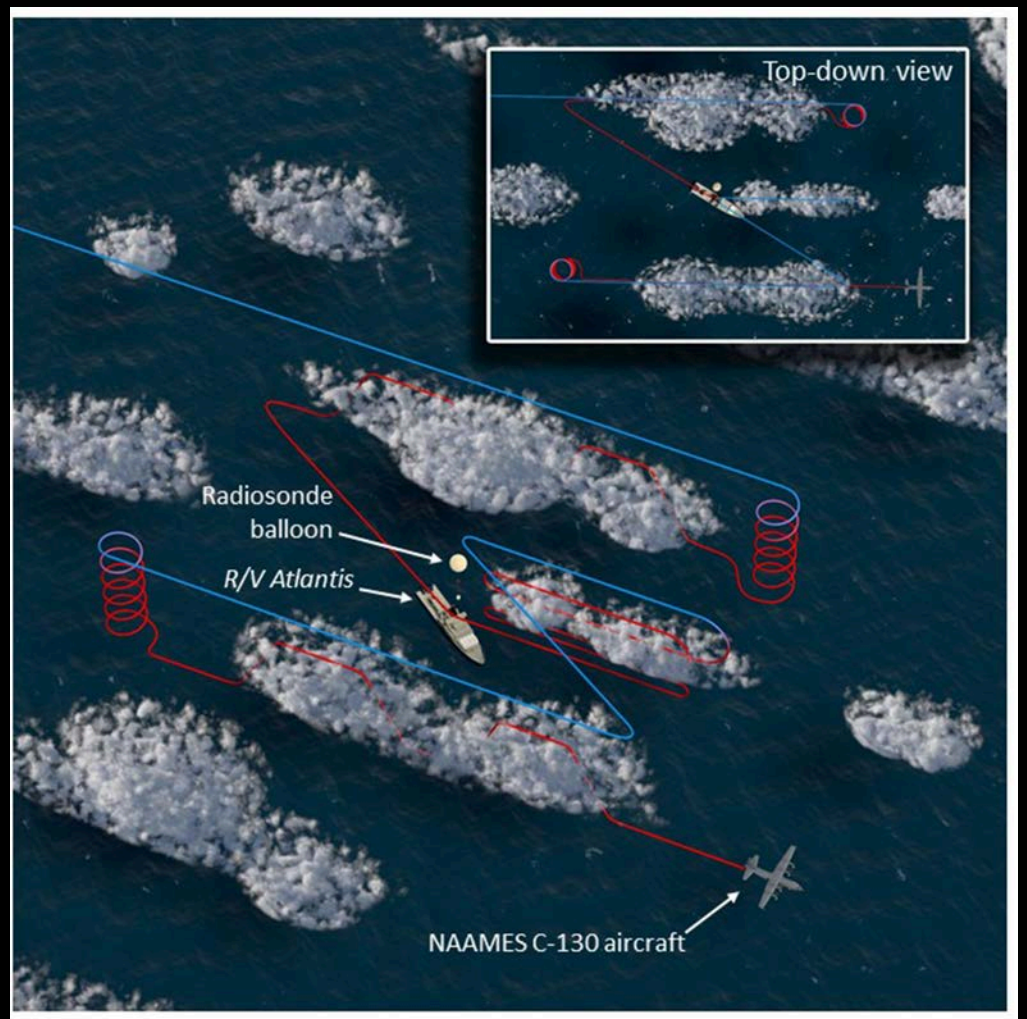


FIGURE 1 | Stylized annual plankton cycle, beginning on left in midsummer and ending in early summer. Thick black line = mixed-layer depth (MLD). Green phytoplankton cells and green shading represent phytoplankton concentration. Gray ciliates stand for all phytoplankton predators. Circled A = summer condition of near-equilibrium between phytoplankton division and loss rates. Circled B = depletion phase. Circled C = phase where division exceeds loss but MLD is still deepening, phytoplankton concentrations are stable or decreasing, and phytoplankton biomass integrated over MLD is increasing. Circled D = accumulation phase. Boxed 1 = winter transition. Boxed 2 = transition to increasing phytoplankton concentration. Boxed 3 = climax transition.

NAAMES

Have a good plan: sample each season, repeat meridional transect at 40°W, co-ordinate ship and plane – plane for context and detailed cloud in situ measurements, ship for ocean ☺



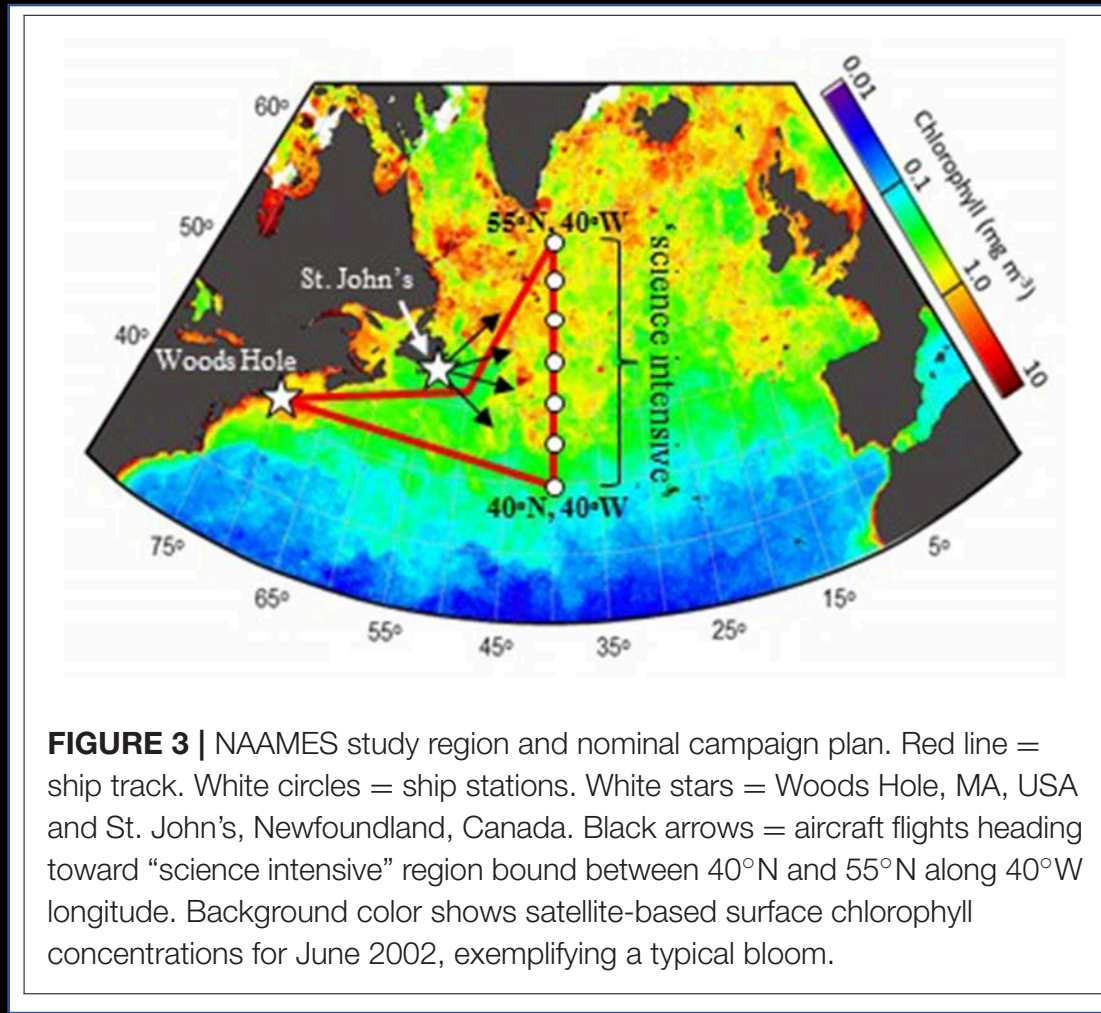
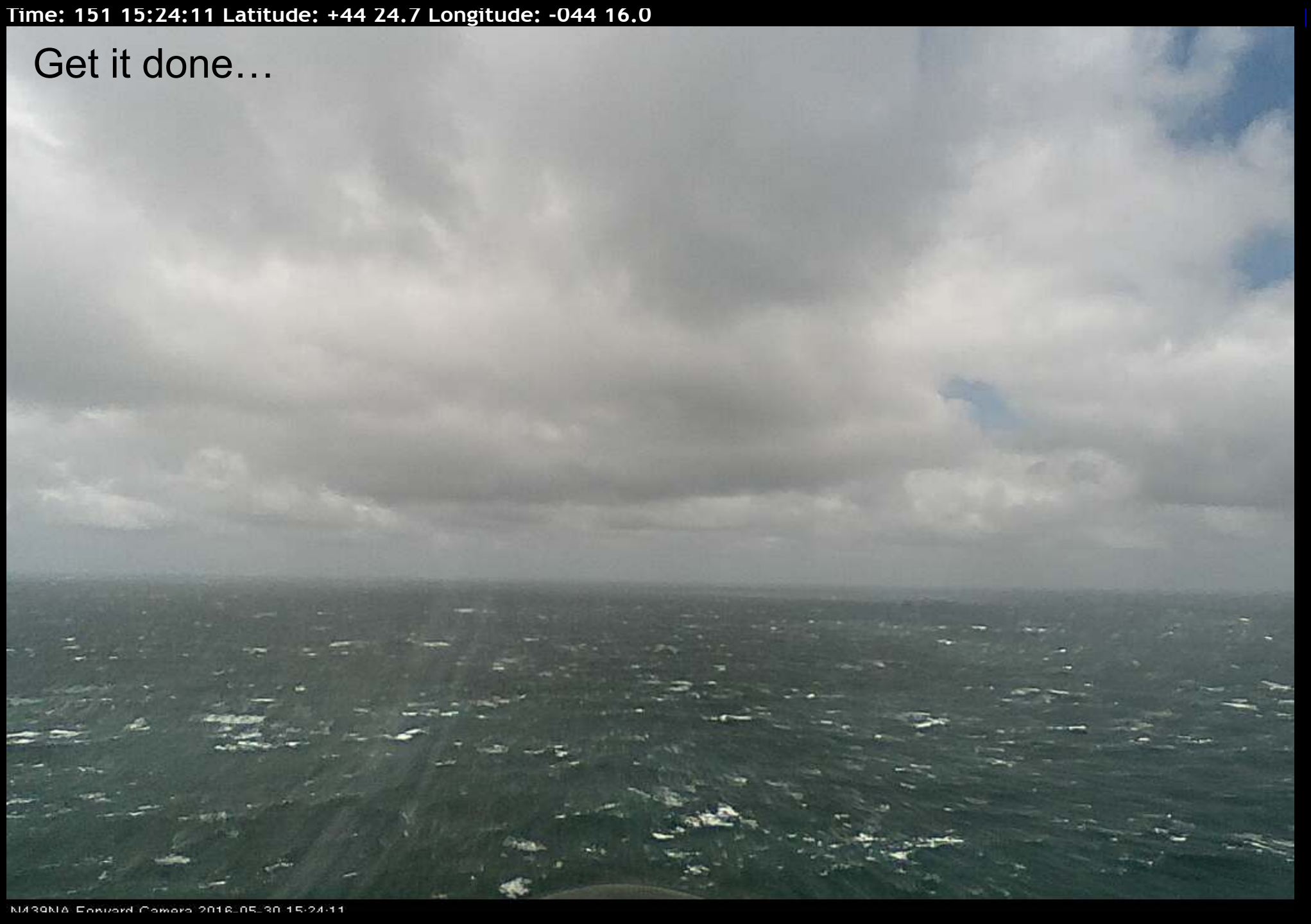


FIGURE 3 | NAAMES study region and nominal campaign plan. Red line = ship track. White circles = ship stations. White stars = Woods Hole, MA, USA and St. John's, Newfoundland, Canada. Black arrows = aircraft flights heading toward "science intensive" region bound between 40°N and 55°N along 40°W longitude. Background color shows satellite-based surface chlorophyll concentrations for June 2002, exemplifying a typical bloom.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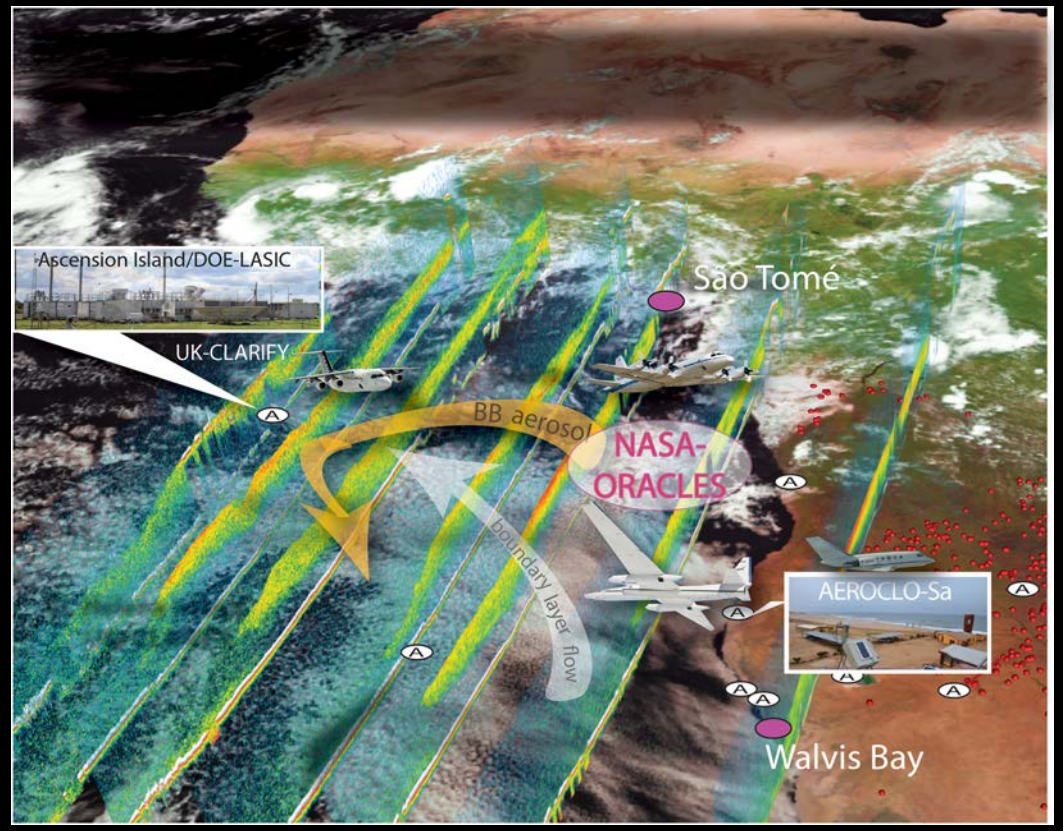
ObseRvations of Aerosols above CLouds and their intEractionS (ORACLES)

Have clear objectives:

1. Determine the impact of African BB aerosol on cloud properties and the radiation balance over the South Atlantic, to generate datasets that can also be used to verify and refine current and future observations.. including assessment of instrument concepts with potential for deployment to space.
2. Improve process-level understanding and representation of factors that govern cloud micro/macrophysical properties and how they couple with cloud effects on aerosol.

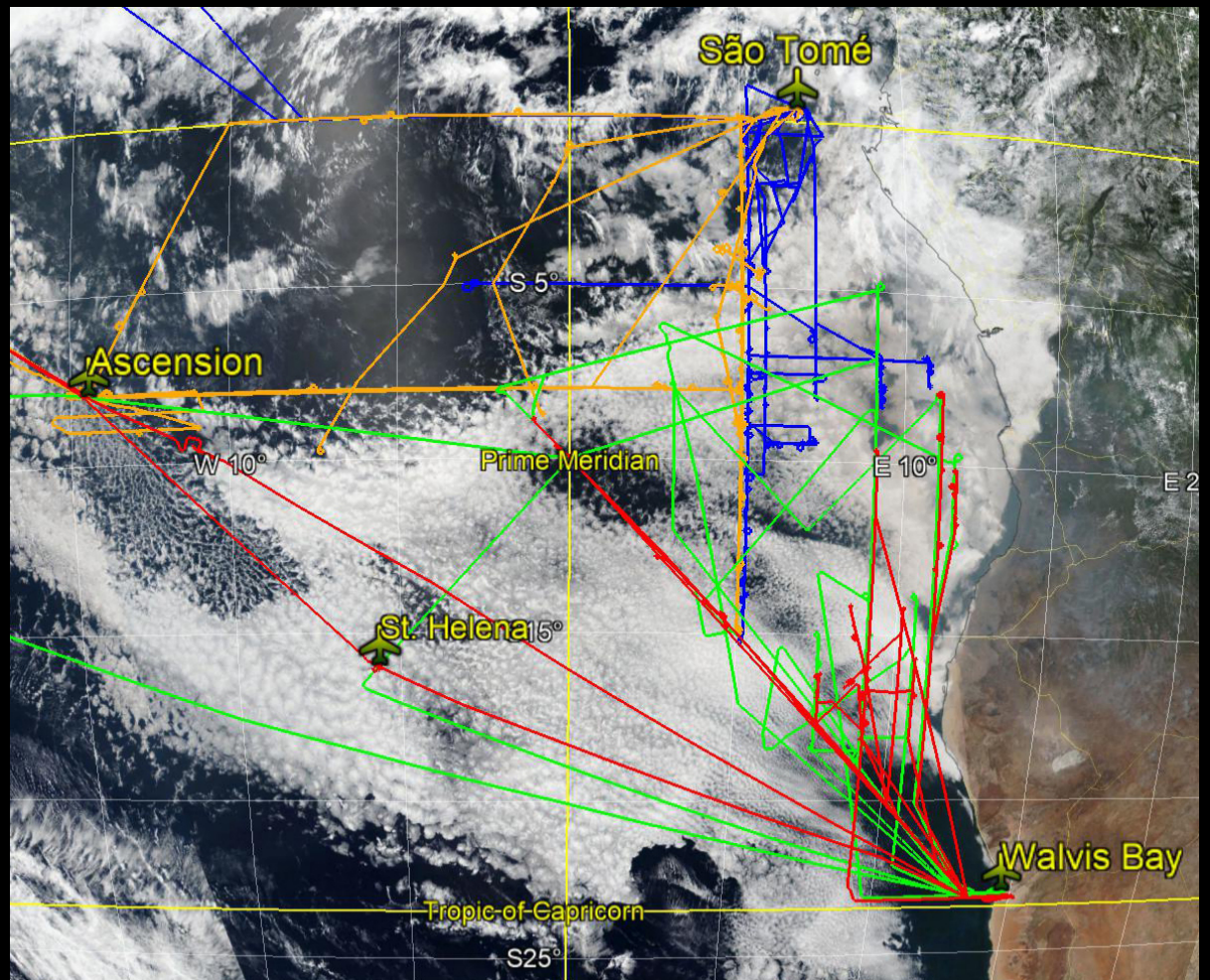


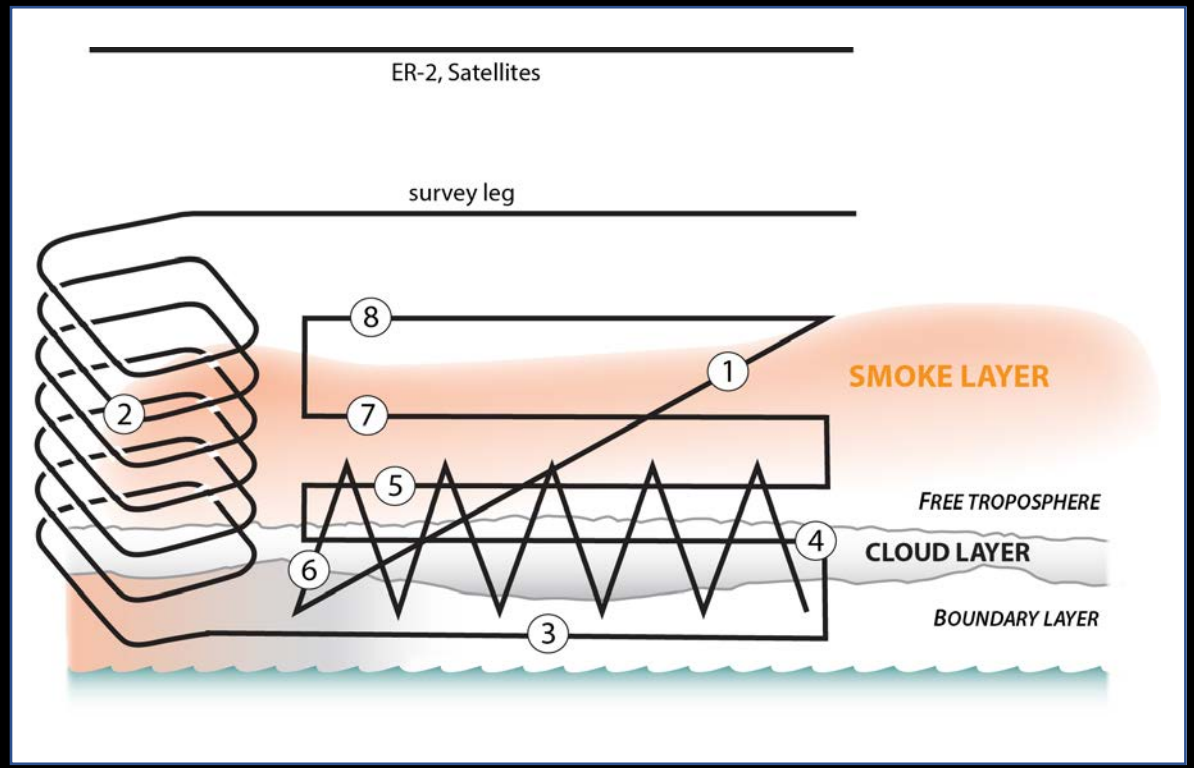
ORACLES

Have a good plan:

Sufficient standard sampling that model comparisons are statistically viable.

Sample through all three months of the burning season in different years.





Aerosol Cloud meTeorology Interactions oVer the western ATlantic Experiment (ACTIVATE)

Have clear objectives:

1. Quantify relationships between *Na*, CCN concentration, and *Nd*, and reduce uncertainty in parameterizations of activation.
2. Improve process-level understanding and representation of factors that govern cloud micro-macrophysical properties and how they couple with cloud effects on aerosol.
3. Assess advanced remote sensing capabilities for retrieving aerosol and cloud properties related to ACI

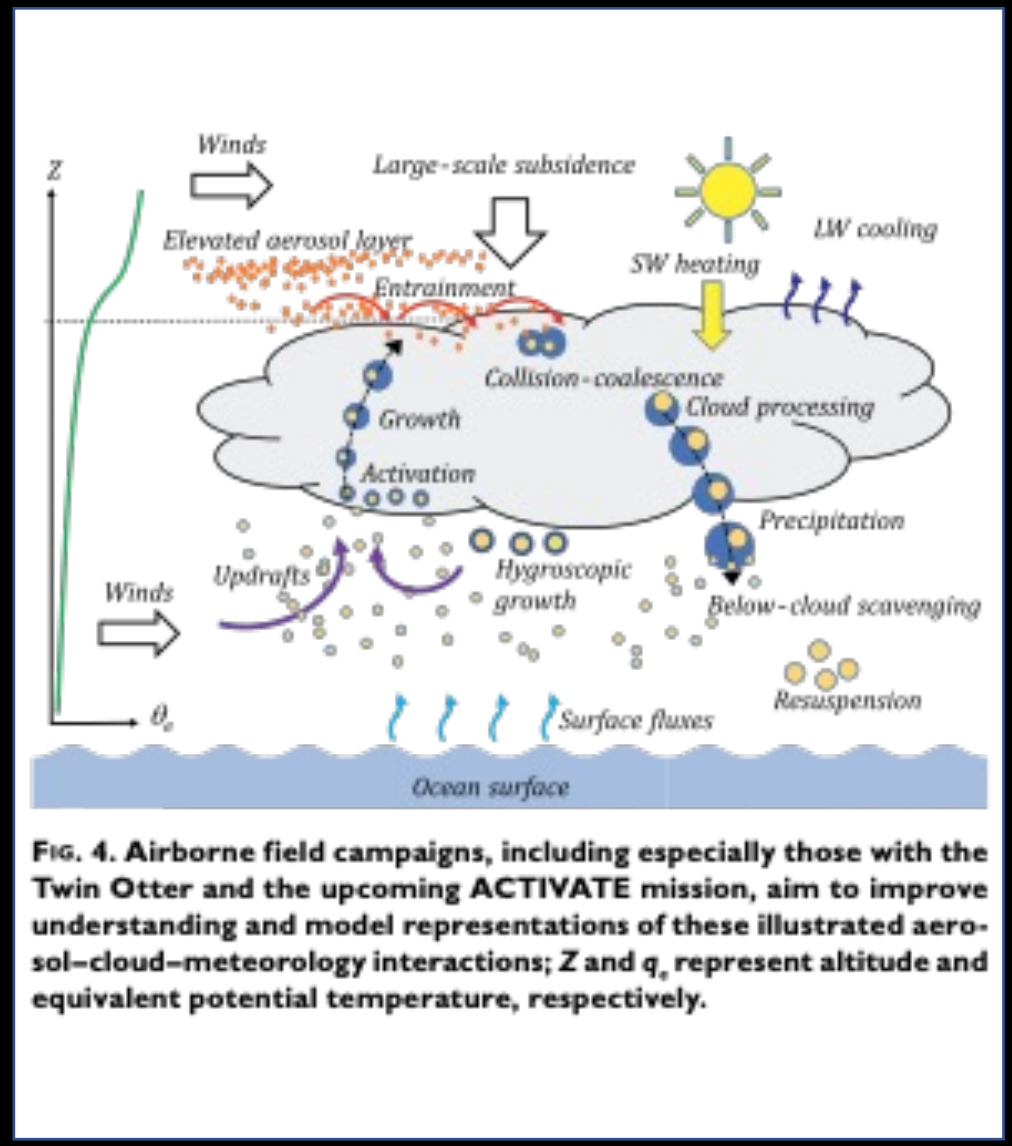
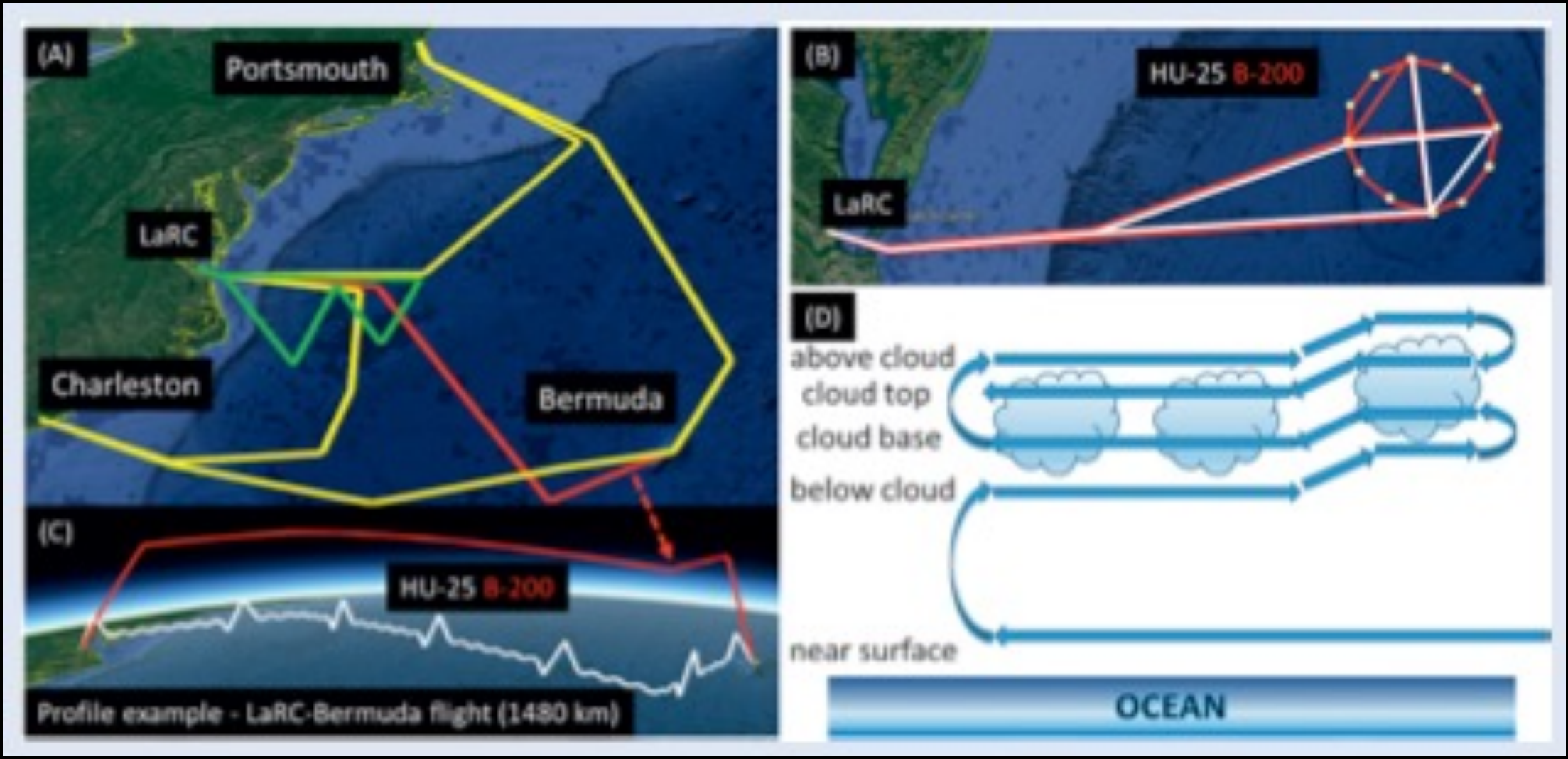
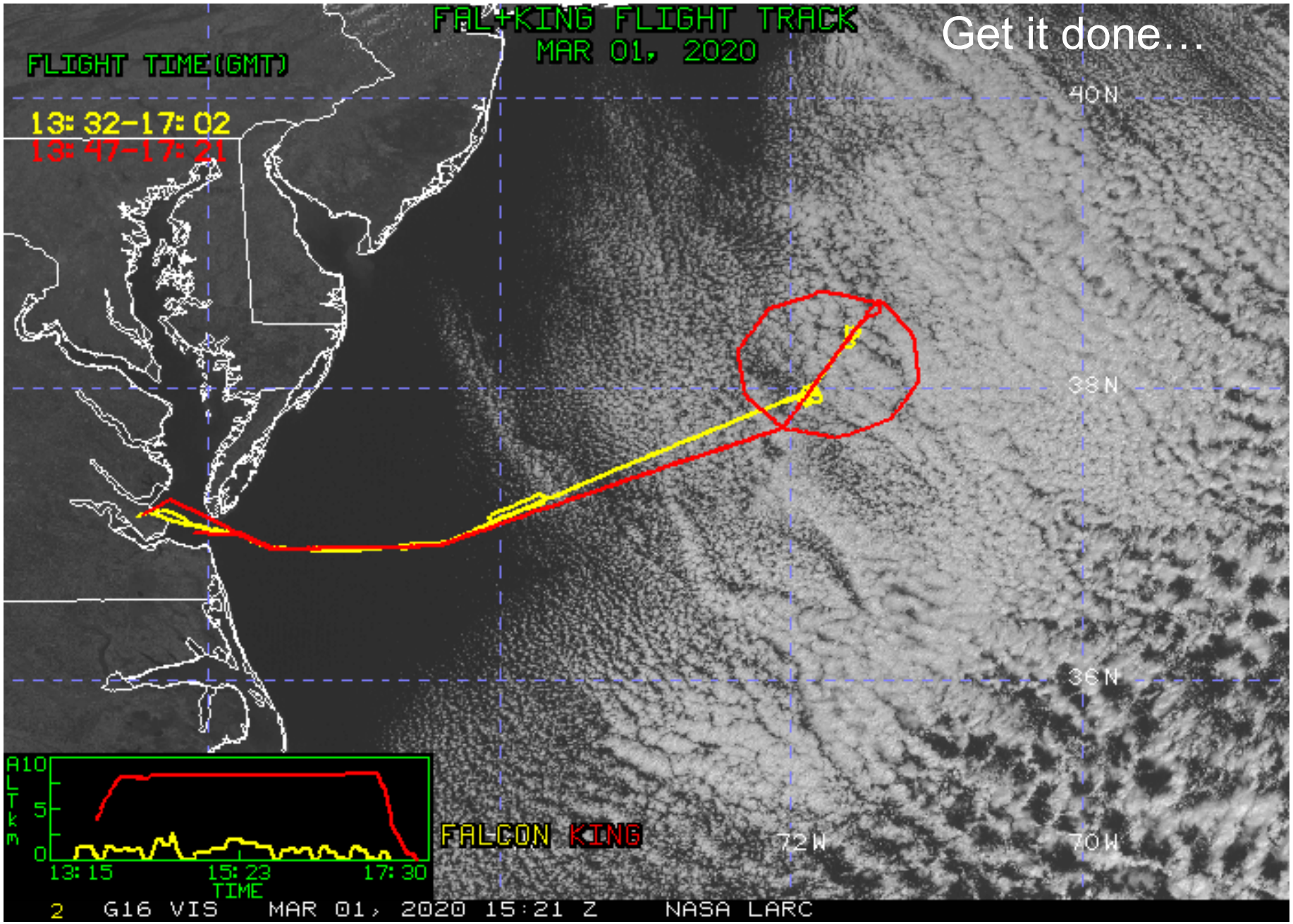


FIG. 4. Airborne field campaigns, including especially those with the Twin Otter and the upcoming ACTIVATE mission, aim to improve understanding and model representations of these illustrated aerosol–cloud–meteorology interactions; *Z* and q_e represent altitude and equivalent potential temperature, respectively.

ACTIVATE
Have a good plan:
Two planes and sample the heck out of it! ~ 200 flights over three years





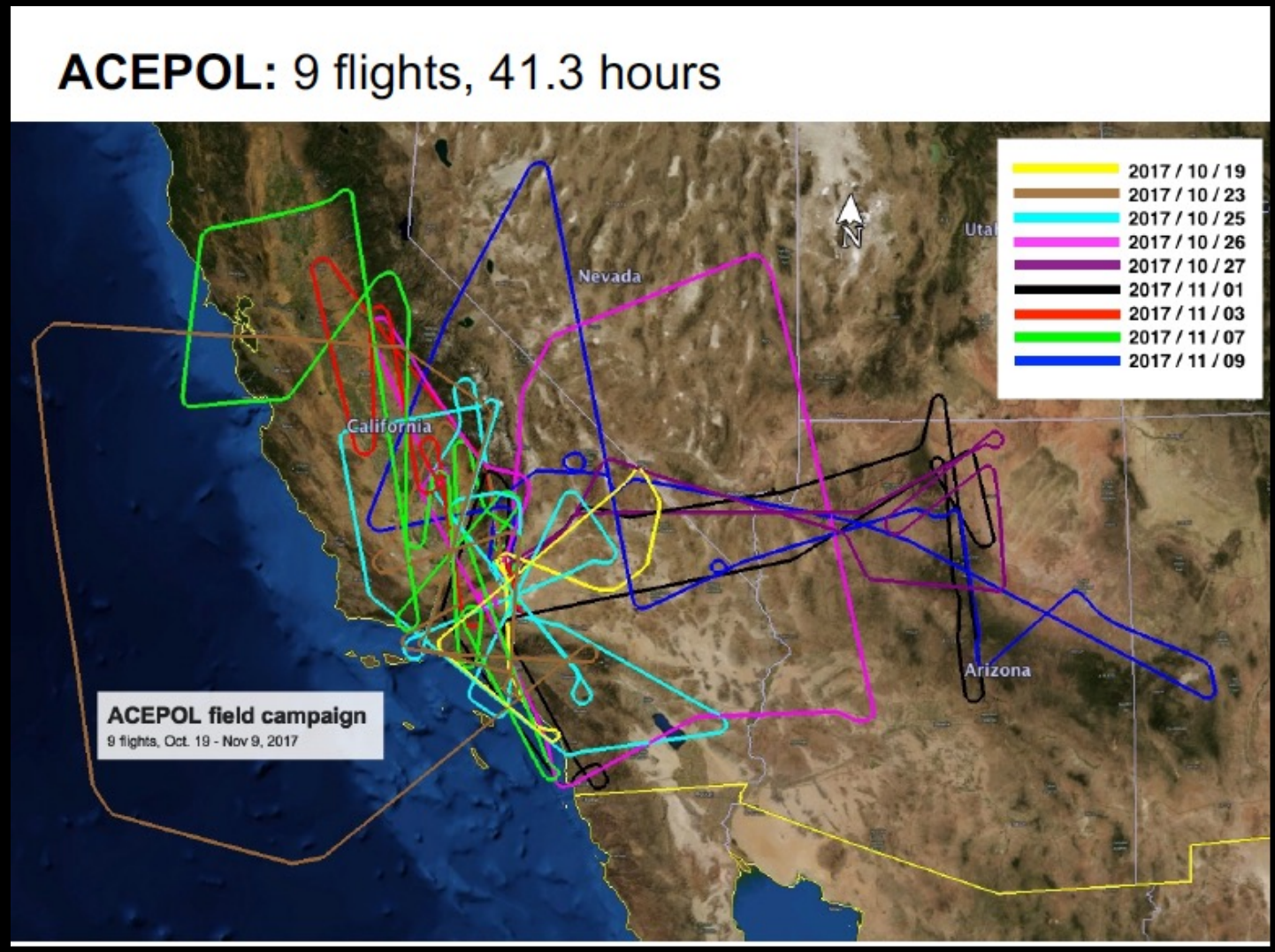
Get it done…

From https://satcorps.larc.nasa.gov/

PACE-Post-launch vAlidation eXperiment (PAX)

Two planes, one high one low – in situ validation and proxy validation + calibration evaluation. September 2024.

1. ER-2
   – AirHARP, SPEXairborne, Prism (UV hyperspectral), Picard (SWIR hyperspectral), RSP (polarized reference), HSRL2.
2. CIRPAS-TO
   – Aerosol size (PCASP), scattering(TSI neph), absorption (TAP/PSAP), particle counters, Cloud precip size (CIP), droplet size (CAS/FSSP). Need to add aerosols size backup and some way of getting humidification.



PACE-Post-launch vAlidation eXperiment (PAX)