



Science and Operational Highlights of the CONTRAST Campaign

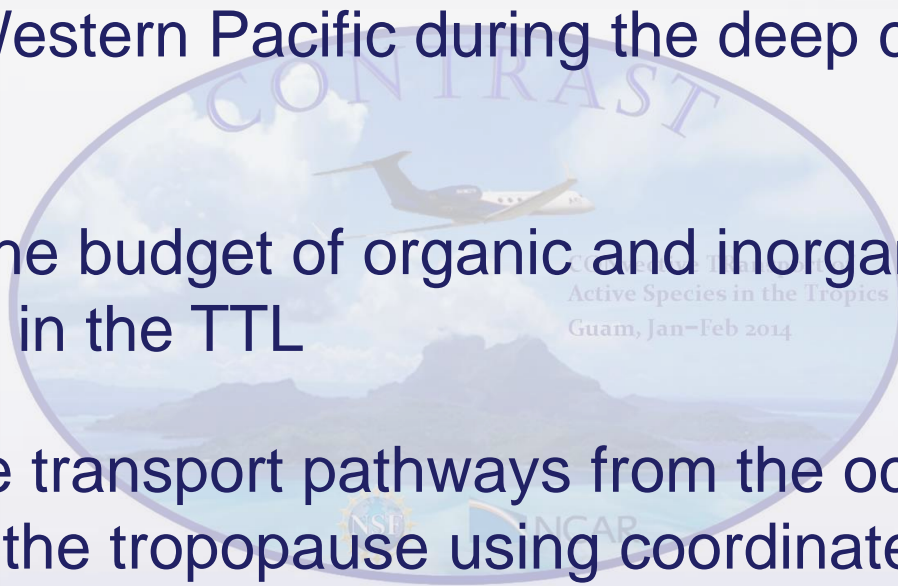
CONTRAST Debrief Meeting, March 24, 2014

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(U.Md.); Laura Pan (NCAR)

Convective Transport of Active Species in the Tropics

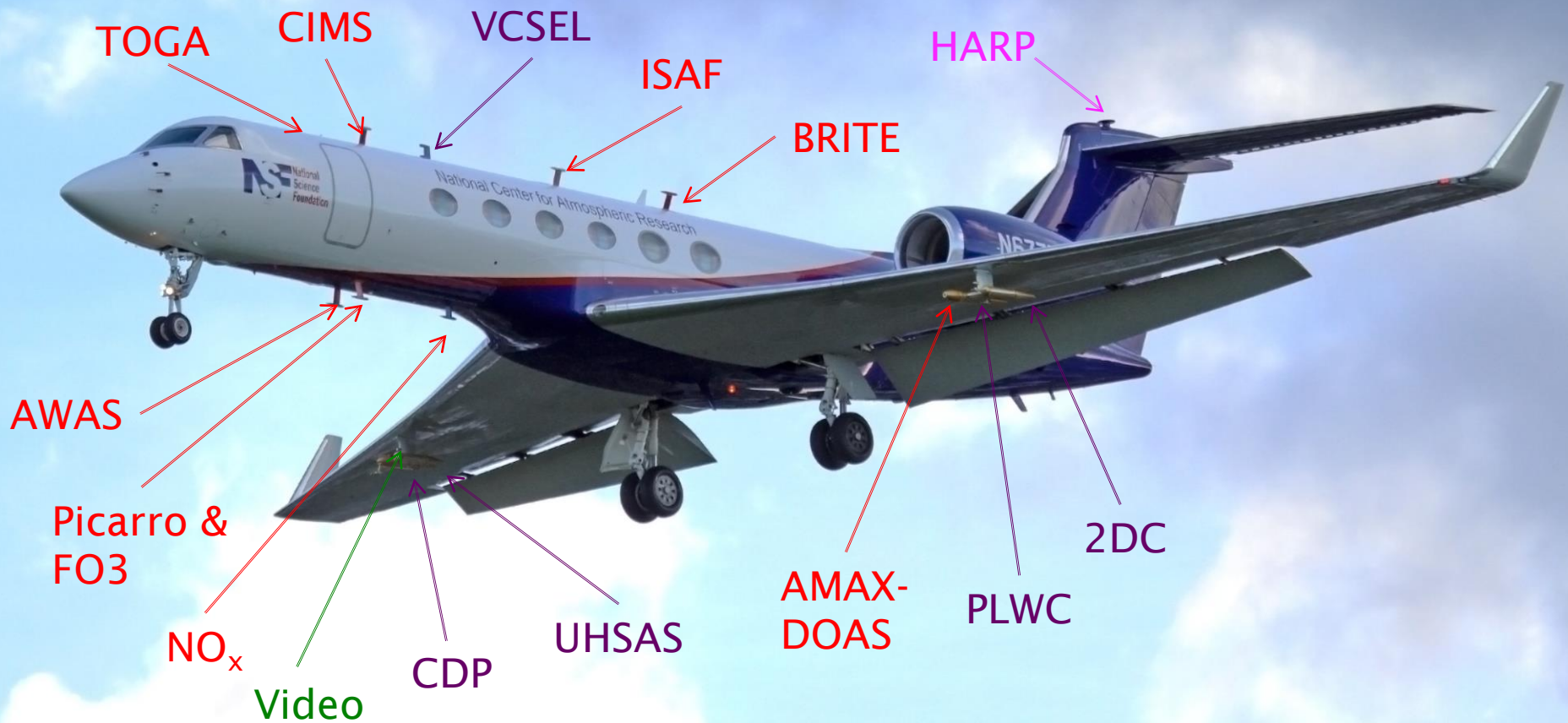
CONTRAST: Scientific Objectives

- Characterize the chemical composition and ozone photochemical budget at the level of convective outflow over the Western Pacific during the deep convective season
- Evaluate the budget of organic and inorganic bromine and iodine in the TTL
- Investigate transport pathways from the oceanic surface to the tropopause using coordinated flights of the GV, BAe-146 and the Global Hawk



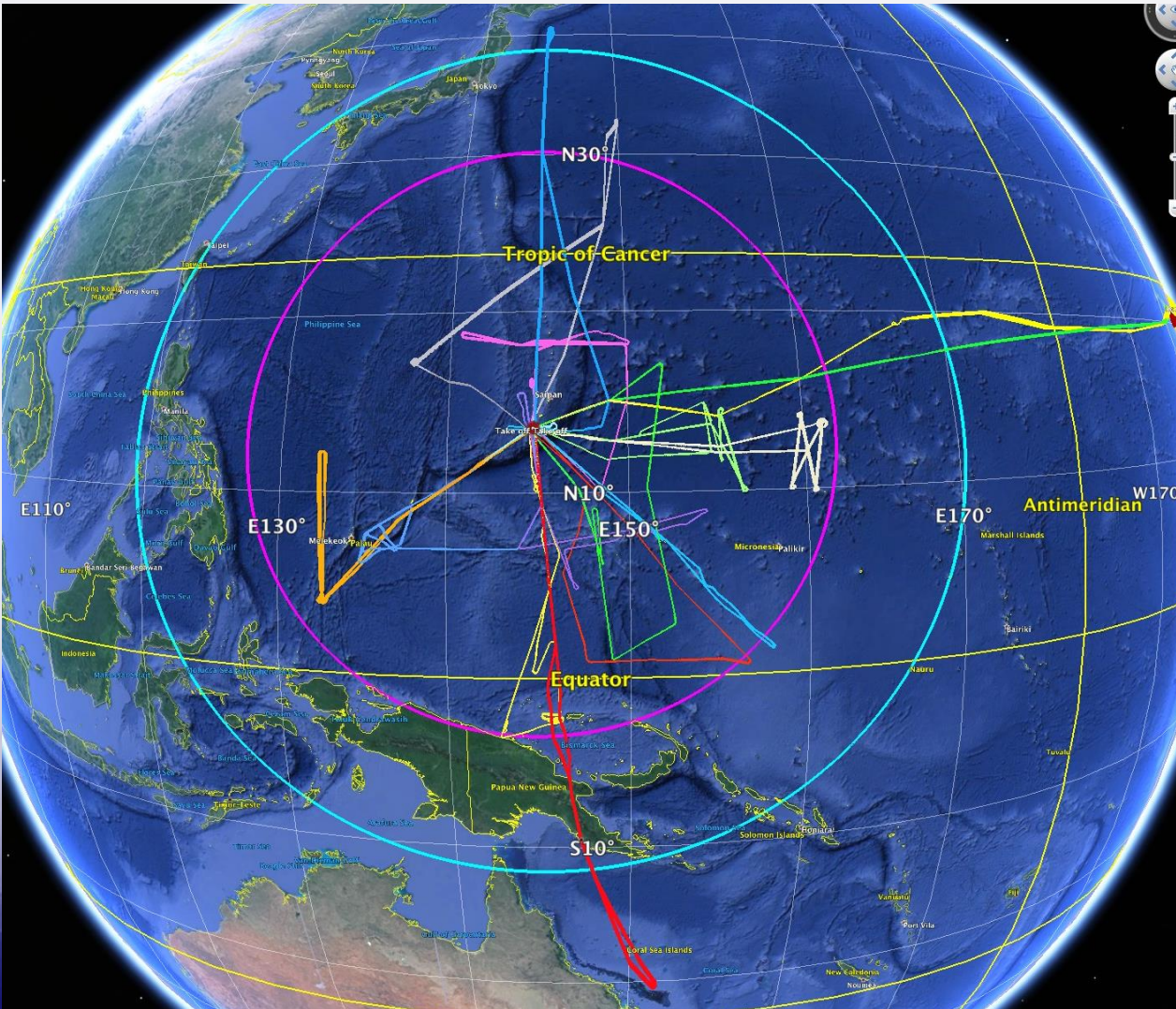
NSF/NCAR Research Aircraft Gulfstream V (GV)

the GV Payload for the CONTRAST Campaign



Convective Transport of Active Species in the Tropics
January 11 – March 2, 2014, Guam

16 Research Flights, 20°S – 40°N, 300 ft – 48 Kft (15.2 km) ASL



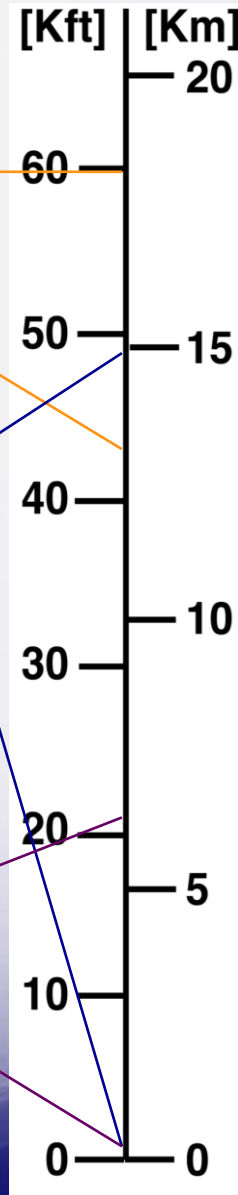
NASA Global Hawk



NSF/NCAR GV



UK FAAM BAe146



Convective Transport of Active Species in the Tropics
January 11 – March 2, 2014, Guam

Flights & Observational Objectives

flight scenarios used to achieve the objectives

1. Domain survey to map regional gradients (including transit) RF01-04,RF07
2. Fresh convective outflow RF05, RF09 (30%), RF10, RF11, RF12, RF14
3. Dawn/Dusk flights for photochemistry evolution RF08, RF13
4. Stratosphere survey/Jet crossing flight RF06, RF15
5. GV/GH/Bae Coordinated flights RF01, RF08, RF11, RF12

Field Phase Highlights

- **Discovery of persistent ozone filaments that are anti-correlated with water vapor**
 - evidence of long-range quasi-isentropic mixing from the lower stratosphere – a not well recognized process for controlling tropical tropospheric ozone
- **Successful sampling of tropical convective outflow and tropical background atmosphere**
 - abundant of data for post campaign analysis and model evaluation
- **Successful measurements (in situ and remote) of inorganic and organic halogen species to evaluate chemical processing and partitioning**
- **Successful sampling of the SH-NH gradient**
 - including a case of mapping the chemical gradient of the ITCZ
- **Co-located measurements w. ozonesonde for validating TTL ozone from sondes.**
- **Obtained measurements to contrast UT vs. LS and sunset/sunrise conditions**
- **Successful involvement of global Chemistry-Climate models in forecast and real time analyses**

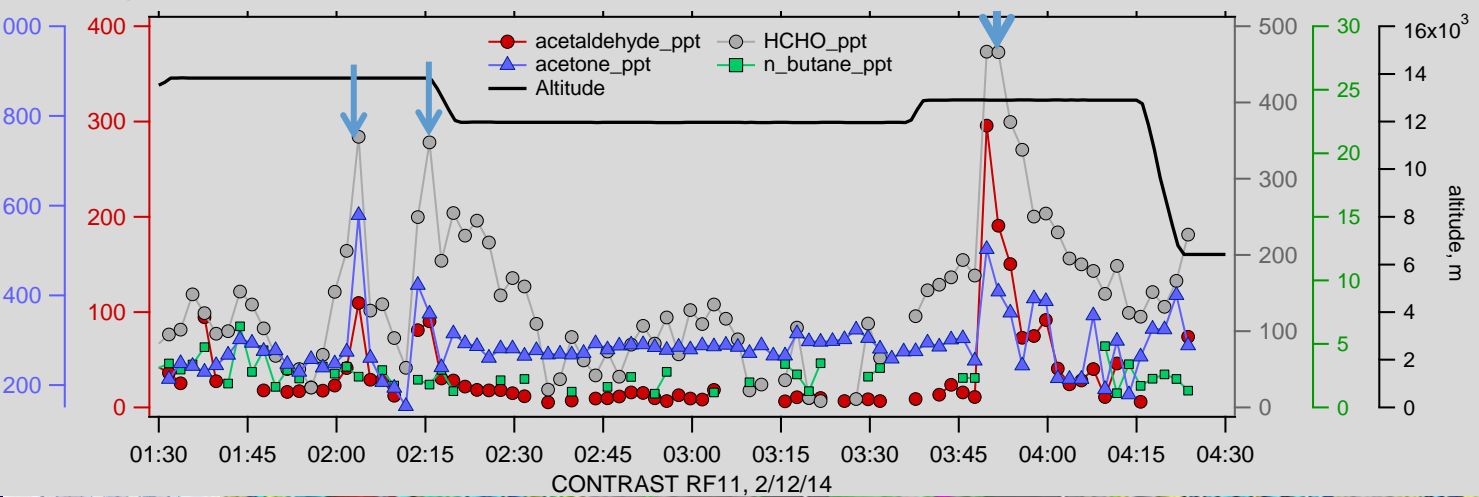
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RF11 convective transport and coordinated flights



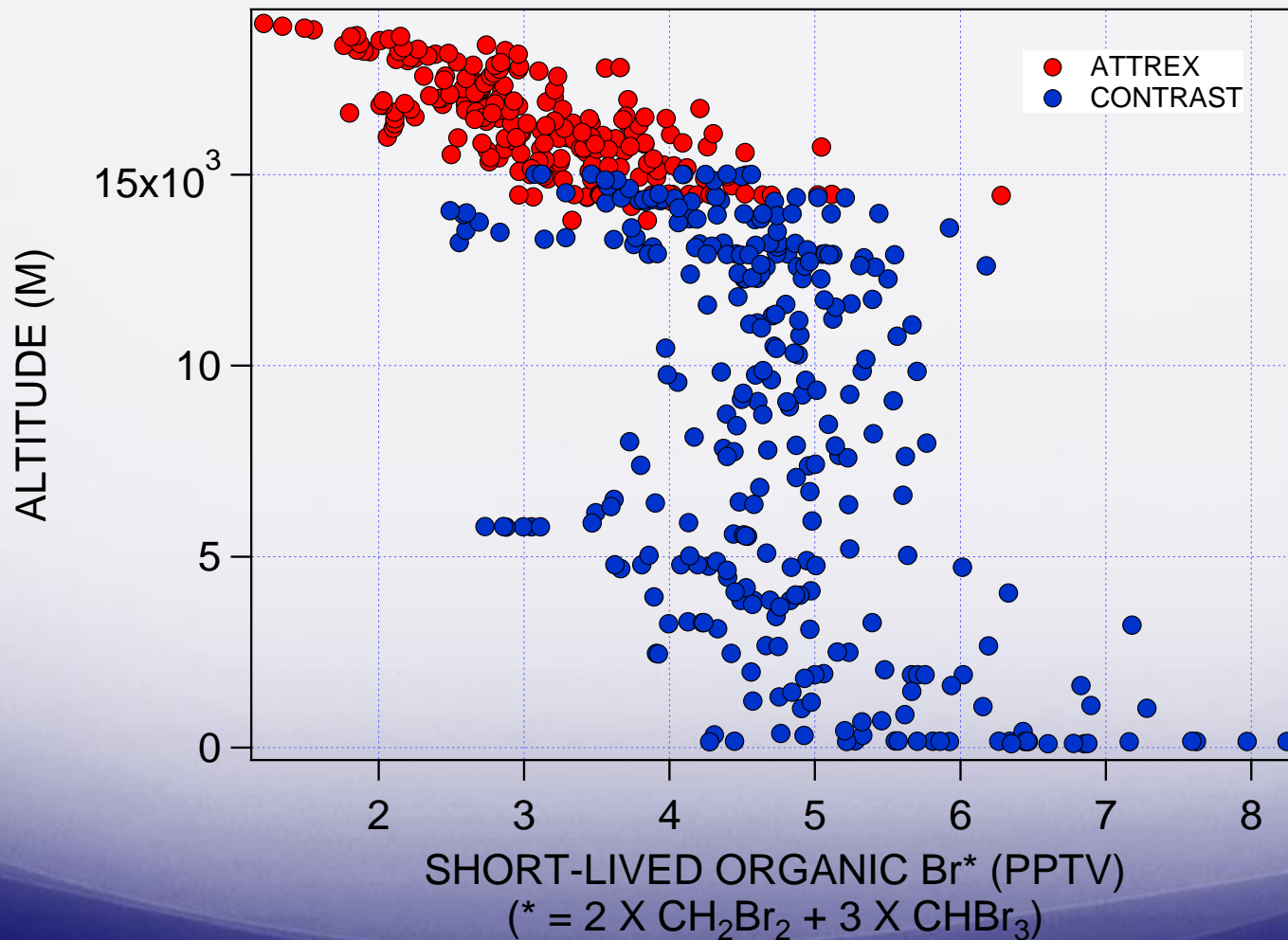
Becky Hornbrook, Dan Riemer, Eric Apel (TOGA Prelim. data)



CHOUK

Vertical distribution of VSL Br from WAS, CONTRAST & ATTREX

WAS & TOGA: Source Gas Injection (shown below for WAS)
CIMS & DOAS: Product Gas Injection (not shown)



Feedbacks for EOL Field Support and GV Operations I

- **Success in targeting convective outflow, in some cases extremely “fresh”, - exceeded expectation**
 - **2 thumbs up for the pilots, the mission coordinators, and the met team on the ground (including the two grad students from U. Hawaii)**
- **Effectiveness in Field catalog and GV MC display adjustment to meet the need in-field – excellent**
 - **RF14 is an outstanding example – a big “thank you” to Tom Baltzer, Greg Stossmeister and Scot Loehrer**
- **Excellent Op setup from site survey (choice and setup of the op center and the FBO hangar space)**
- **The real-time observation capability of the GV - transforms how airborne campaigns are conducted**
 - **The MC and FC display, the Aeros software, the downlink of key variables, the digital camera, the chat, ... ENABLING the involvement of the entire team at every moment of the flight, in-air and on-ground**
- **The team enjoyed excellent support for the E/O activities**

Feedbacks for EOL Field Support and GV Operations II

Wish for more

- A more unified project management- more effective with a single project manager
- Invest into building a flight planning tool, potentially Google Earth based, to connect science team plan to the pilot plan
- Invest in improving the Aeros software to be more than just quick data monitoring. It is so widely used and appreciated, the enhanced capability of handling larger dataset and additional functionality will pay-off.
- Further develop enhanced ground-to-air control/communication of on-board instruments. Success with AMAX-DOAS...opportunities for other instruments?

CONTRAST

Guam, Jan-Feb 2014



CONTRAST/ATTREX/CAST Joint Group Photo, Feb 15, 2014

