



# ACCLIP GV Data Information for Air Quality Research

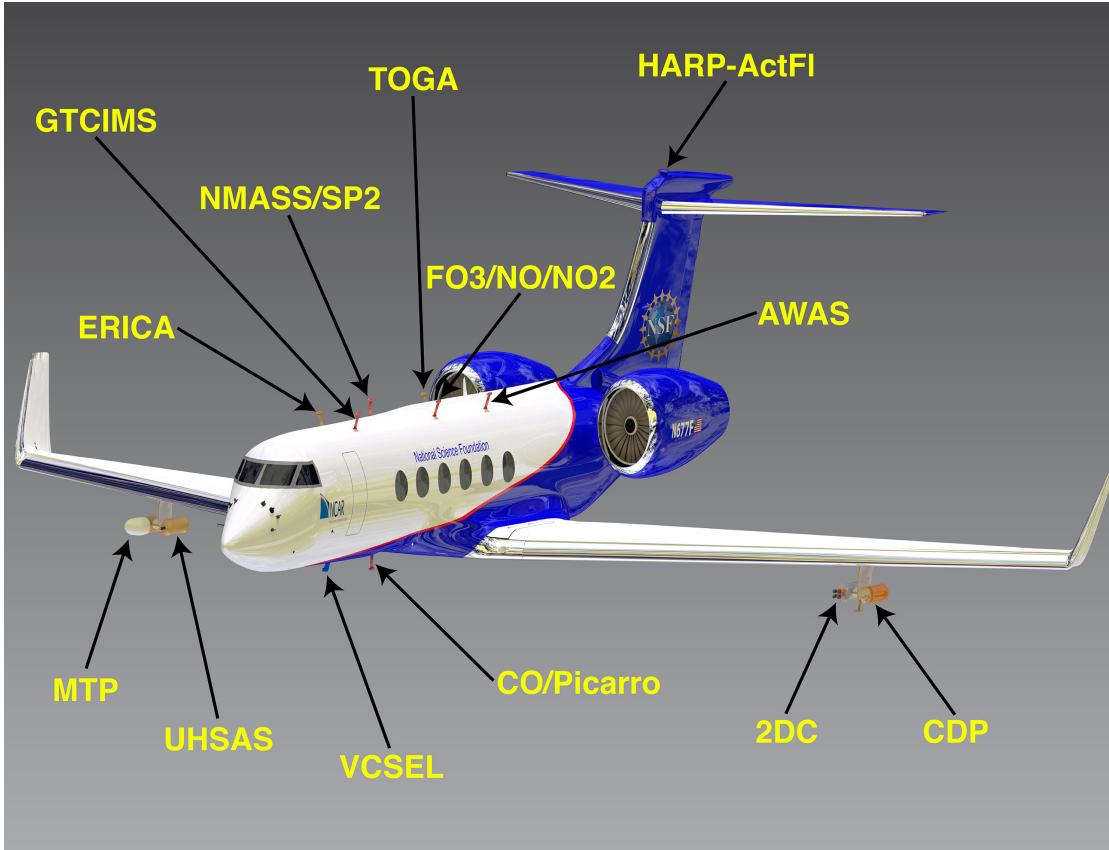
Laura Pan, October 2021, Seoul

With contributions from GV Instrument team PIs:

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- **CDP & 2DC**: Jorgen [Jensenbj@ucar.edu](mailto:Jensenbj@ucar.edu)



# NSF/NCAR Gulfstream V (GV)

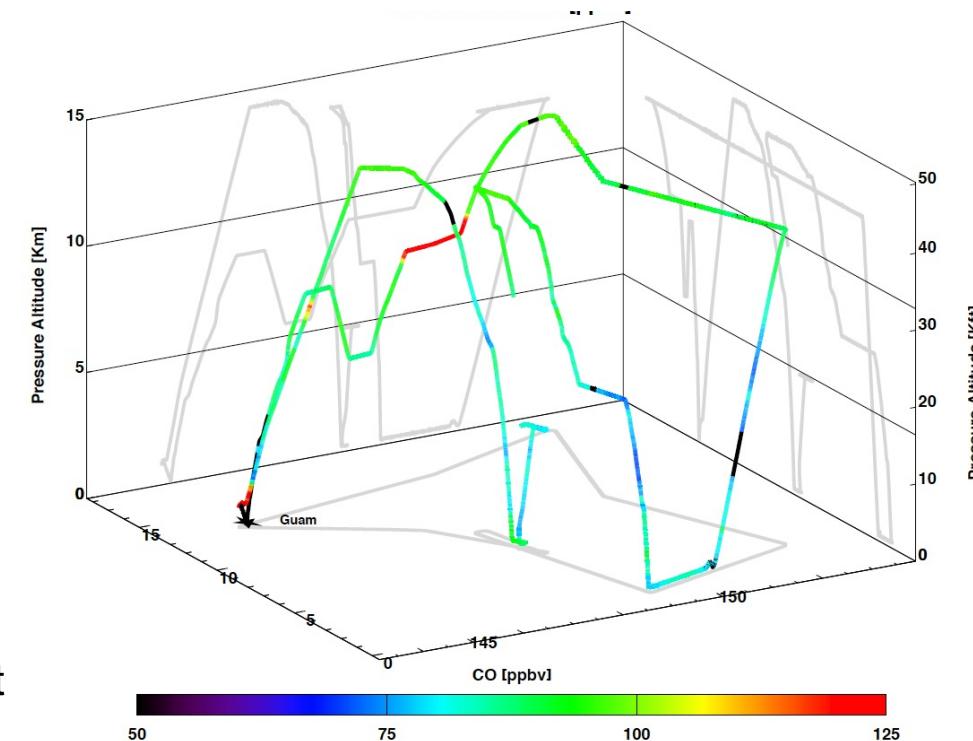


Extensive chemistry and aerosol payload:

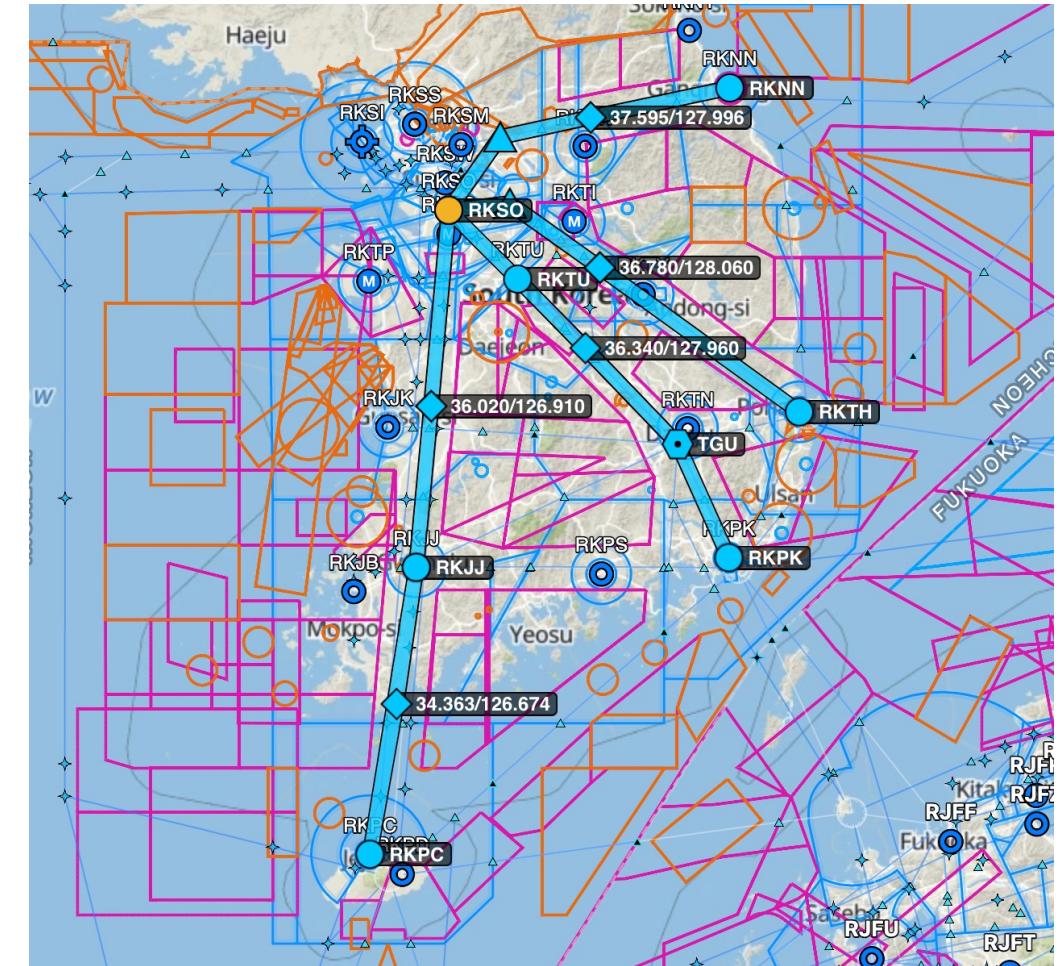
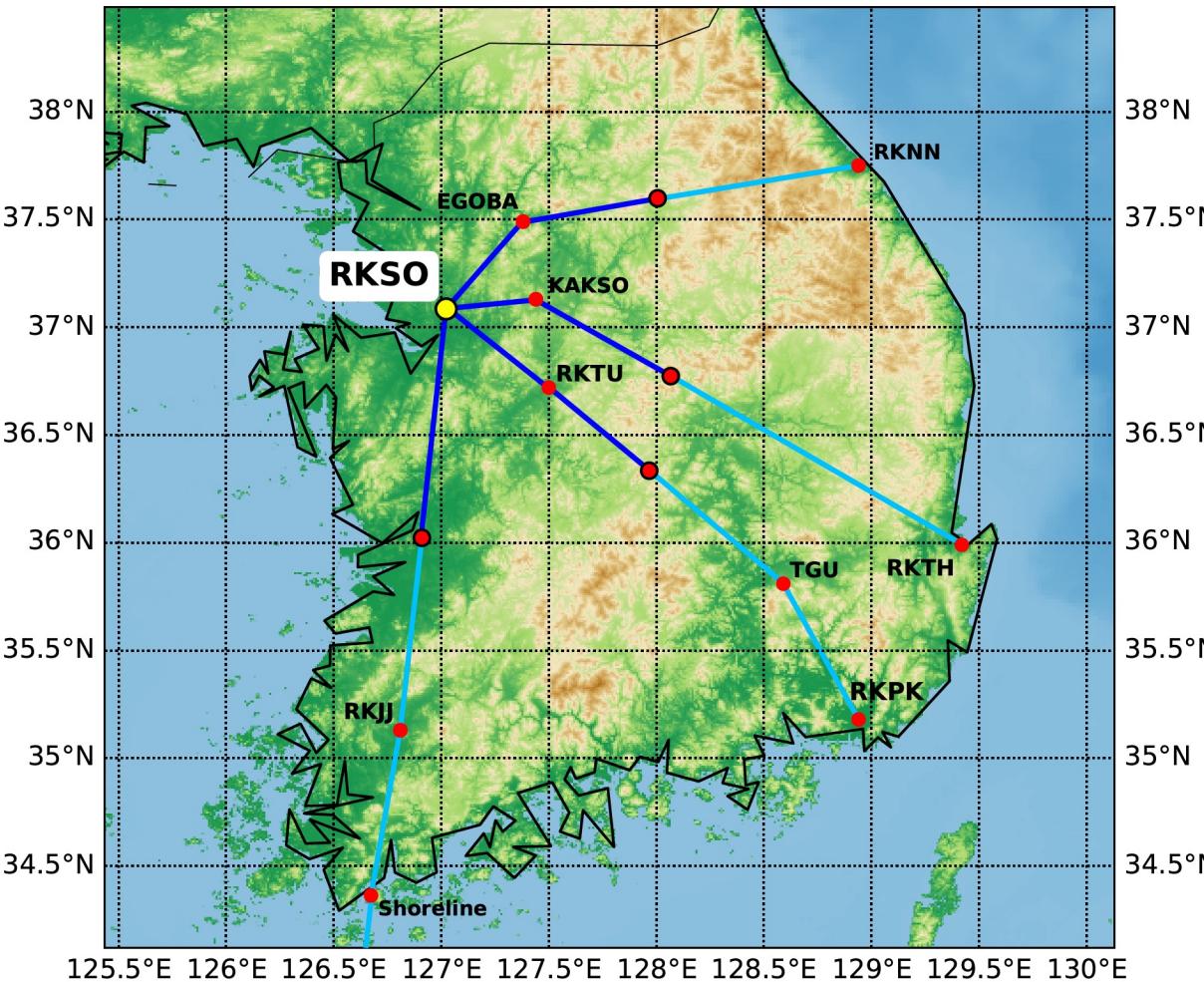
- O<sub>3</sub>, CO, CO<sub>2</sub>, H<sub>2</sub>O, NO, NO<sub>2</sub>, SO<sub>2</sub>, CH<sub>2</sub>O, NMHC and CFCs
- aerosol particle size distribution, BC, aerosol chemical content
- cloud particle number and size distribution
- Spectrally resolved upward and downward atmospheric radiation flux for photochemistry

## Flight Profiles:

- Nominal duration: ~ 8 hr flight, 3000 nmi
- 1000 ft (0.3 km) and FL 470 (14.7 km)
- Example flight over TWP 2014



Ground tracks for airways to takeoff from Osan in NE, SE(2), S directions  
 Points of track color change make the estimated location of reaching 15Kft (proxy for the top of the boundary layer)



## **Instrument: data; sampling (T/L, ~ 10 minutes 0-15 Kft); point of contact**

### **Gas Species:**

1. FASTO3+NO/NO<sub>2</sub> : O<sub>3</sub>, NO, NO<sub>2</sub>, 1 sec data ; Alessandro Franchin [franchin@ucar.edu](mailto:franchin@ucar.edu), Frank Flocke [ffl@ucar.edu](mailto:ffl@ucar.edu)
2. Aerodyne CO: CO, N<sub>2</sub>O, 2 sec data, Teresa Campos [campos@ucar.edu](mailto:campos@ucar.edu), Frank Flocke [ffl@ucar.edu](mailto:ffl@ucar.edu).
3. Picarro: CO<sub>2</sub>, CH<sub>4</sub>, 2 sec time resolution, Teresa Campos [campos@ucar.edu](mailto:campos@ucar.edu)
4. GT-CIMS: SO<sub>2</sub>, SO<sub>2</sub>/HCl/HNO<sub>3</sub>/HO<sub>2</sub>NO<sub>2</sub>/CH<sub>3</sub>COOH /HCOOH, 5 sec integration period; Greg Huey, [greg.huey@eas.gatech.edu](mailto:greg.huey@eas.gatech.edu)
5. TOGA-ToF: A list of 90 species identified from FIREX-AQ provided in a separate file; duty cycle: approximately 30 seconds every 2 minutes → approximately 5 samples over 10 minutes; Eric Apel [apel@ucar.edu](mailto:apel@ucar.edu), Rebecca Hornbrook [rsh@ucar.edu](mailto:rsh@ucar.edu)

(See additional spreadsheet files for details. PI's note: "Note, there are some VOCs that we have not been able to fully calibrate yet, and those are marked with an asterisk (\*) in the left hand column and the given units "arb ppt" = arbitrary ppt. There may be additional VOCs that we will be able identify and quantify during ACCLIP, so this is not necessarily a comprehensive final list. Lastly, many of the species listed are short-lived fire tracers we identified in the FIREX-AQ data (denoted with an x in the second-to-left hand column) that will likely be below the TOGA-TOF limit of detection unless we're in a fresh fire plume, but I will still check for many of them, just in case.")

## **Instrument: data; sampling (Takeoff/Landing, 10 minutes each, 0-15 Kft); point of contact, cont.**

### **Aerosol (size):**

6. NMASS: 3-60 nm; 1 sec data; Christina Williamson [christina.williamson@noaa.gov](mailto:christina.williamson@noaa.gov)
7. UHSAS: 60 nm – 1 µm; 1 sec data; Christina Williamson [christina.williamson@noaa.gov](mailto:christina.williamson@noaa.gov)

### **Aerosol (chem. Composition):**

8. SP2: standard data: BC mass concentration, 1 Hz; Joshua Schwarz, [Joshua.P.Schwarz@noaa.gov](mailto:Joshua.P.Schwarz@noaa.gov)

PI's note for non-standard products: "The NOAA SP2 will provide black carbon mass concentrations at 1Hz rate for the entirety of both takeoff and landing. If desired, data can be collected during taxi as well. Upon request, several subsidiary SP2 data products can be provided. This includes the BC mass size distribution (volume-equivalent diameter, assuming a void-free density of 1.8g.cm<sup>3</sup>), BC coating thicknesses (a measure of amount of material internally mixed with black carbon), and concentrations of incandescent iron oxides."

9. ERICA: POC: Franziska Köllner [f.koellner@mpic.de](mailto:f.koellner@mpic.de)

- ERICA-AMS: aerosol mass concentrations of sulfate, nitrate, ammonium, and organic matter; 0.1 Hz;
- ERICA-LAMS: particle number concentrations of refractory species like elemental carbon, sea spray, dust, and anthropogenic metals can be detected together with the information about their internal/external mixing with other substances (such as sulfate, nitrate etc.). We assume to chemically analyze between 1000 and 4000 particles with ERICA-LAMS during the 20 mins time interval (take-off+landing). The detectable size range of ERICA is ~150 nm to ~2 um.

**Instrument: data; sampling (Takeoff/Landing, 10 minutes each, 0-15 Kft); point of contact, cont.**

**Cloud:**

10. CDP: 2 - 50 um, water droplets, ice crystals; <https://www.eol.ucar.edu/instruments/cloud-droplet-probe>; Jorgen Jensen, [bjj@ucar.edu](mailto:bjj@ucar.edu)
11. 2D-C: 10 µm (2-D imaging spectrometer), 20 – 640 µm, ice, water; Jorgen Jensen [bjj@ucar.edu](mailto:bjj@ucar.edu)

**Radiation:**

13. HARP - Actinic Flux will provide the full suite of photolysis frequencies every 3s; Samuel Hall [halls@ucar.edu](mailto:halls@ucar.edu)