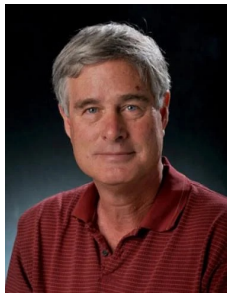
Science and Operations Highlights of the ACCLIP Campaign 2022

Laura Pan, Paul Newman, Elliot Atlas, Troy Thornberry,
Bill Randel, Brian Toon, & **ACCLIP Science Team**

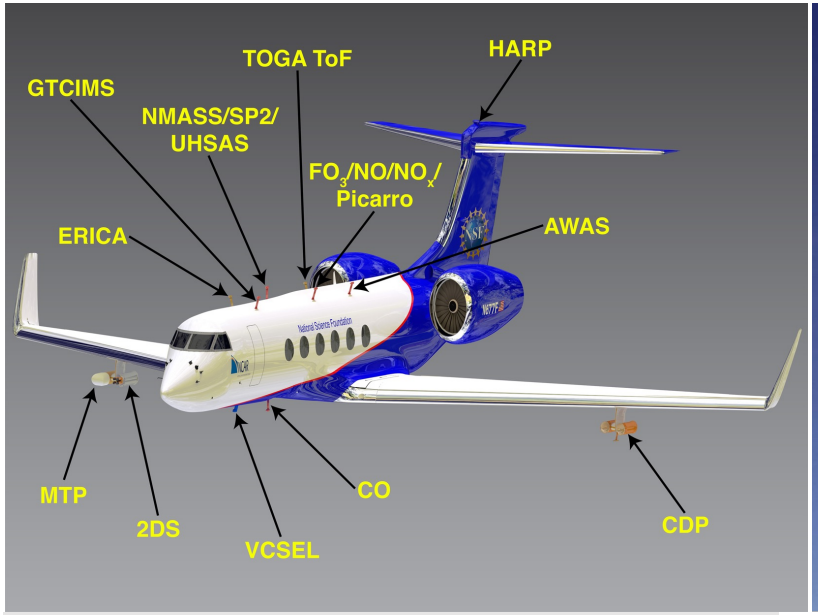


ACCLIP Team at Osan AFB

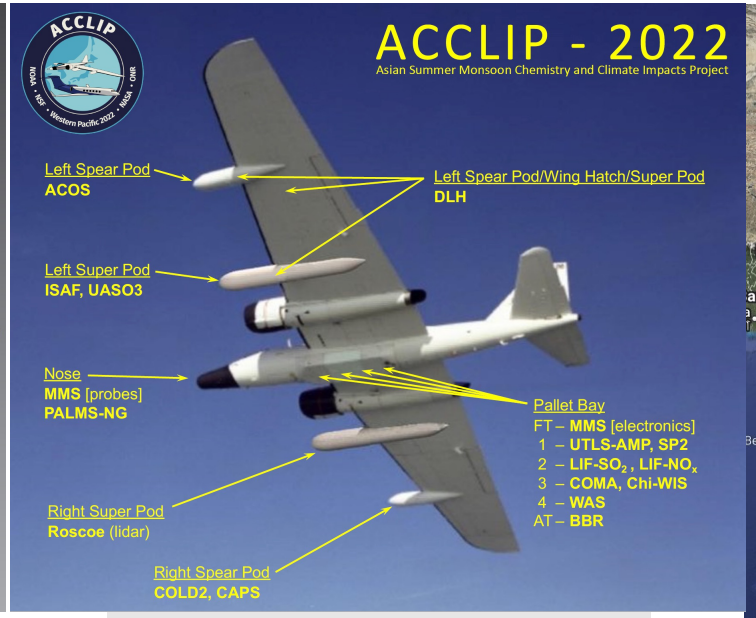
July 27 – September 2, 2022

Asian Summer Monsoon Chemical and Climate Impacts Project (ACCLIP)

Principal Investigators: Laura Pan (NCAR), Paul Newman (NASA)
Lead Co-Investigators: Elliot Atlas (Univ. Miami), William Randel (NCAR), Troy Thornberry (NOAA), Brian Toon (CU)



NSF/NCAR Gulfstream V (GV)
Duration: ~ 8 hr flight
500 ft (0.2 km) and FL 470 (14.7 km)
(~51 kft ,15.4 km GPS altitude during ACCLIP)



NASA WB-57
Duration: ~ 6 hr
FL 430 (13 km) and FL 620 (19 km)

Ground Based Soundings

Sensors:
Ozonesondes, CFH, Particle soundings, Ground-based lidar, Whole air samples

***Participated by*:**
US: NSF/CU; **Korea:** Multiple universities & NIER
Japan: Universities and NIES; **China:** CAS/IAP
Taiwan & UK: Academia Sinica & University of East Anglia
Germany: AWI

ACCLIP Airborne Measurements

Measurement	WB	GV
State Parameters		
Position, Pressure, Temperature, Winds, Humidity	Aircraft, MMS	Aircraft, VCSEL
Temperature profile (above/below aircraft)		MTP
Trace Gases		
CO	COMA, COLD2, ACOS	Aerodyne, Picarro
CO_2	ACOS	Picarro
CH_4		Picarro
N_2O	COMA	Aerodyne
O_3	UAS O3	FAST_O3
NO, NO_2	NO-LIF	NO_NOy
SO_2	SO2-LIF	GTCIMS
HCl, HO_2NO_2, HNO_3 HCOOH, CH_3COOH		GTCIMS
CH_2O	ISAF	TOGA
COS	ACOS	AWAS
H_2O	DLH, CHiWIS, ACOS	VCSEL
H_2O Isotopes	ChiWIS	
VOCs (many)	WAS	TOGA, AWAS
Aerosols		
Particle size/mass distributions	NMASS, CAPS, POPS, UHSAS	NMASS, UHSAS
Chemical composition/size	PALMS	ERICA
cloud particle size/imaging	2D-S	2DS
cloud droplet size	FCDP	CDP
Cloud/aerosol distributions above/below aircraft	ROSCOE	
Radiation		
Radiative flux/Photolysis frequencies	BBR	HARP

A New Chapter of Monsoon Research:

Atmospheric Composition and the Asian Monsoon

Satellite data alone cannot address the questions of ASM impacts on Atm. Composition

Airborne and balloon borne in situ measurements are necessary for the process understanding

A SPARC/IGAC jointly sponsored activity

Remember the pioneer effort of SEAC⁴RS 10 years ago (2010-2012)

Survivor of the COVID-19 pandemic (2020-2022)

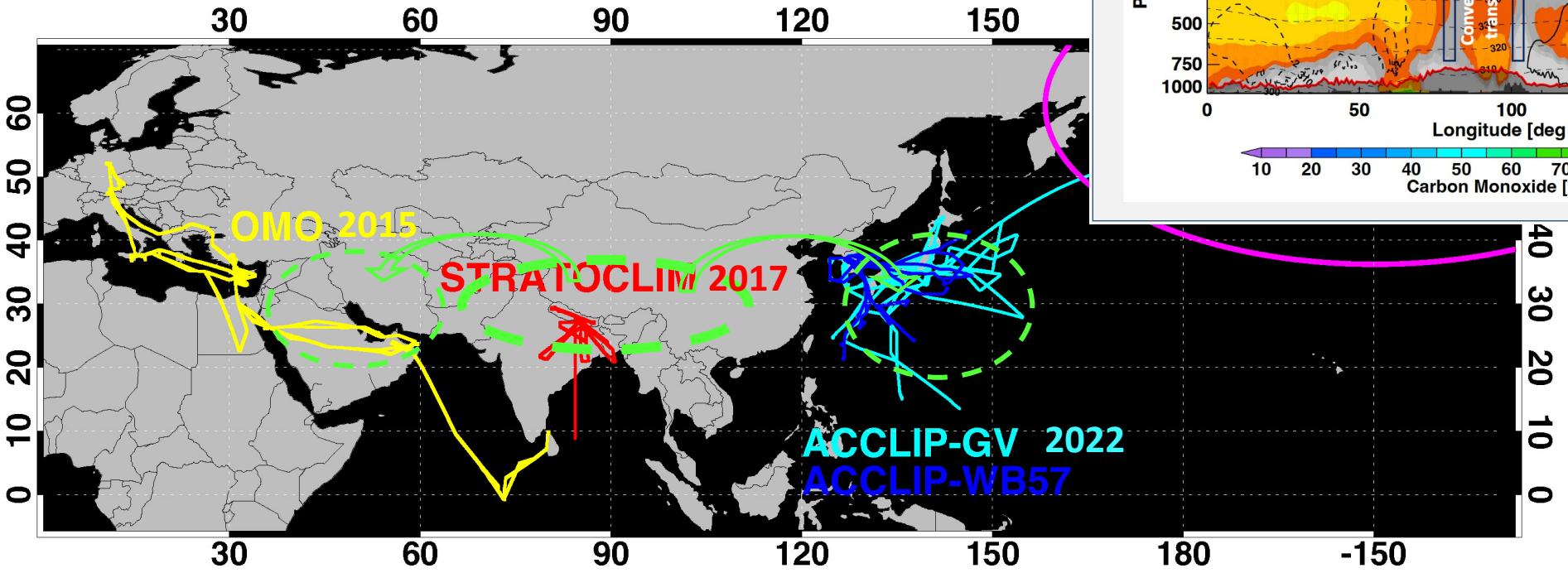
WB-57 & GV (HIAPER), 2022

HALO 2015

Geophysica, 2017

HALO, 2023

Tri-modal structure of the AMA and East/Westward Eddy Shedding

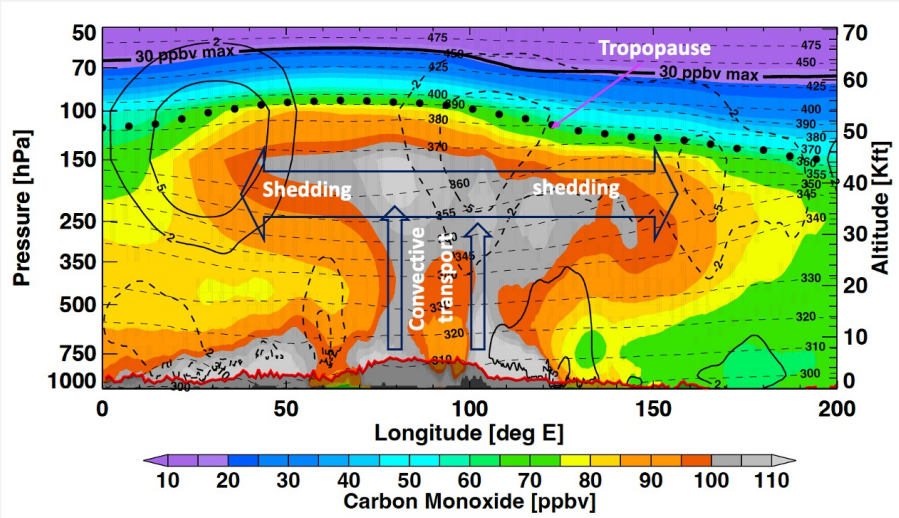


Westward Eddy shedding

Tibetan Anticyclone

Eastward Eddy shedding

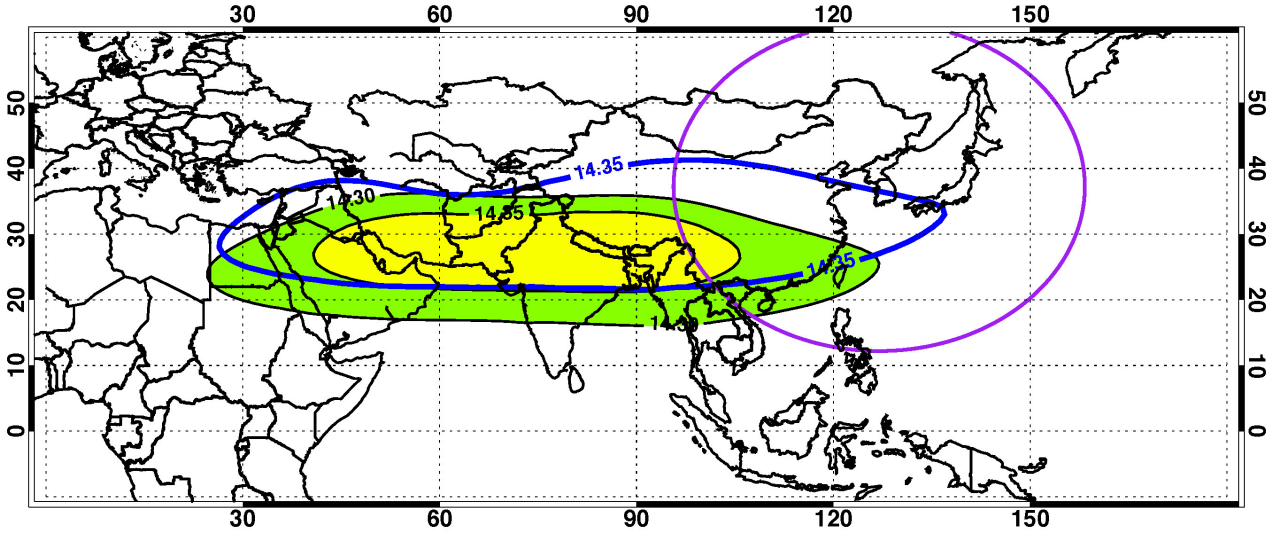
Asian Summer Monsoon Chemical Structure Represented by modeled Carbon Monoxide



Pan et al. 2022

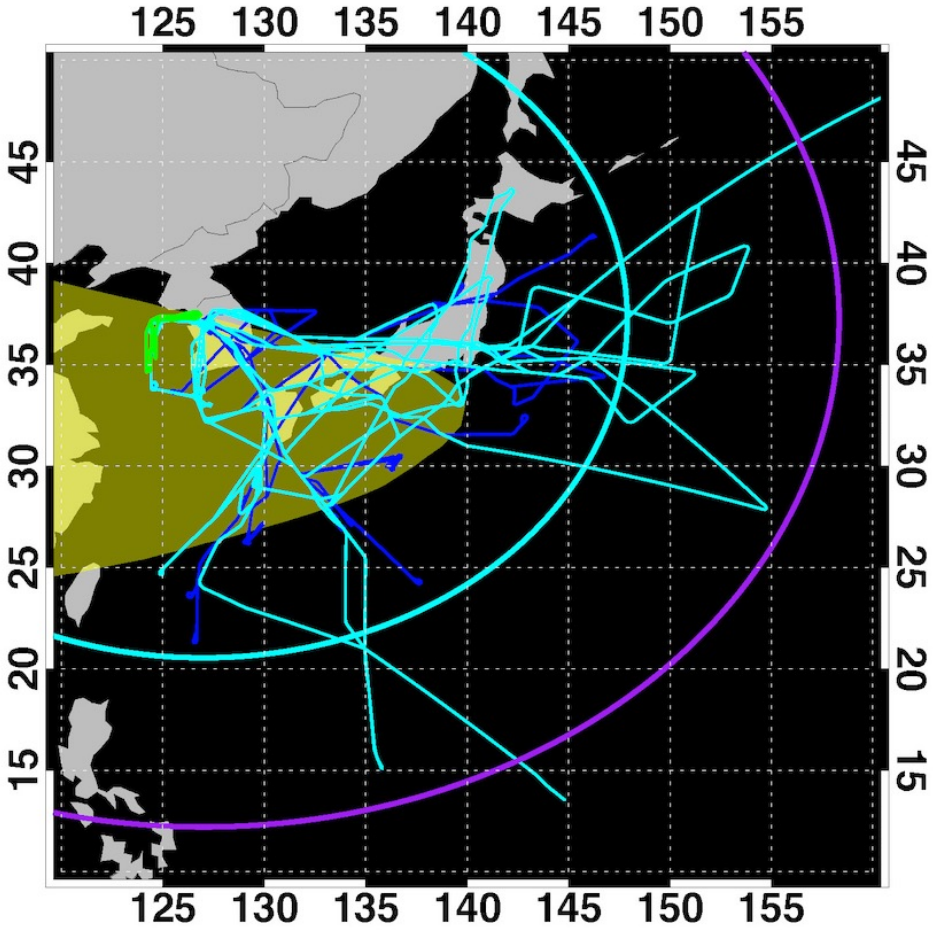
ACCLIP operations highlight : Sampling the eastward shifted Tibetan anticyclone

Using 150 hPa GPH as a marker of ASM Anticyclone



38 – year Climatology

August 2022

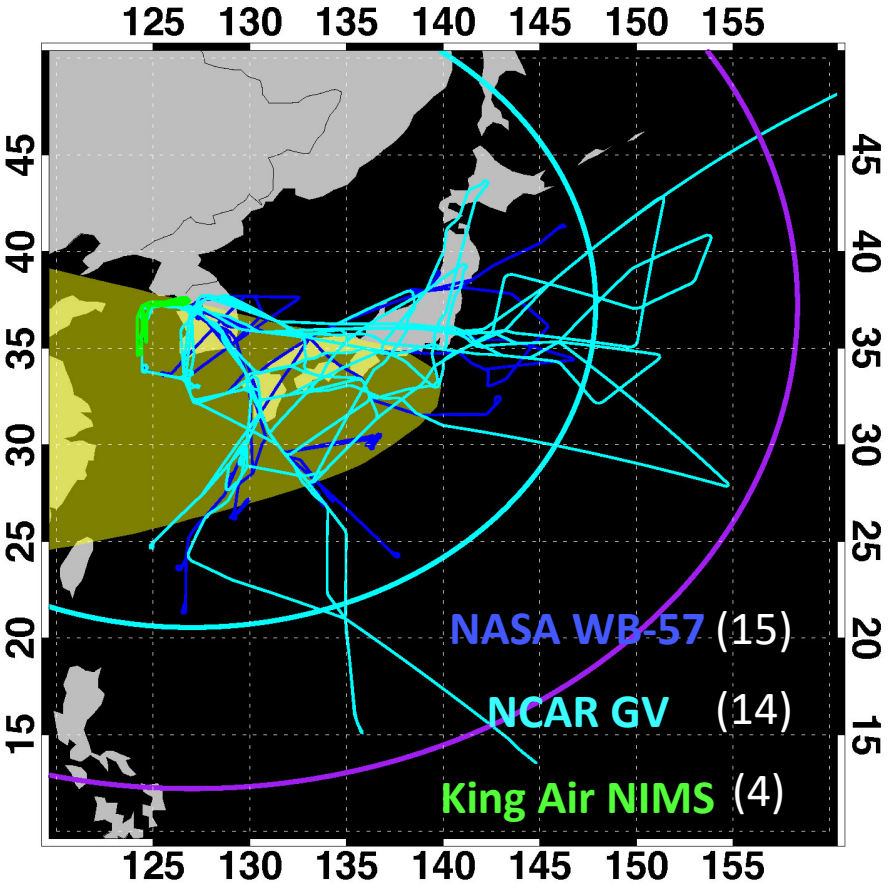


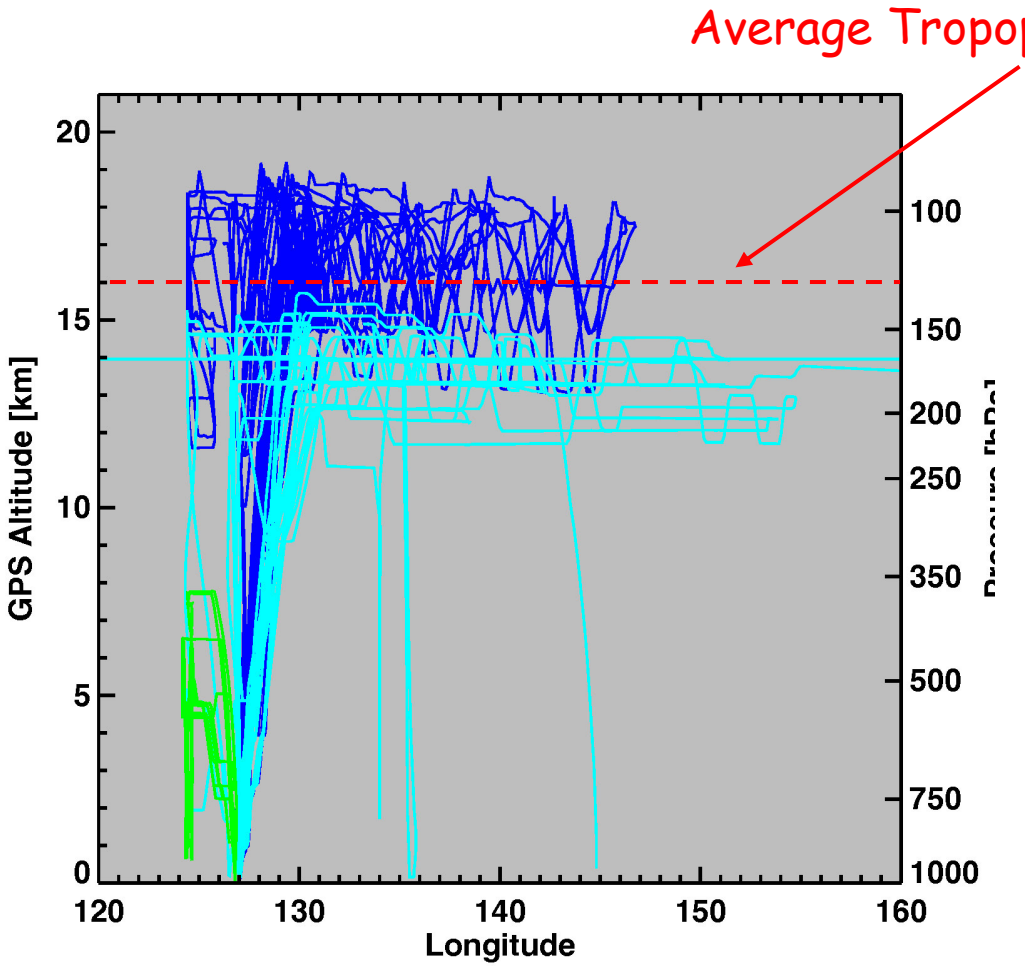
NASA WB-57 (15)

NCAR GV (14)

King Air NIMS (4)

ACCLIP operations highlight : A Total of 29 Research Flights





ACCLIP science highlight : the special role of the East Asian Summer Monsoon (EASM) in ASM transport

Key message:

Campaign result identified the importance of the East Asian Summer Monsoon (EASM) convective transport for UTLS composition and ozone chemistry

More Information on ACCLIP

- ACCLIP Science Home Page:
https://www2.acom.ucar.edu/acclip

- ACCLIP operation NASA ESPO:
https://espo.nasa.gov/acclip

- Data are Available :

  NCAR Archive:
  https://data.eol.ucar.edu/master_lists/generated/acclip/

  NASA Archive:
  https://www-air.larc.nasa.gov/cgi-bin/ArcView/acclip

Thank you