



NPS-CIRPAS Airborne Research Facility Update

Anthony Bucholtz





FY21 Twin Otter Missions Completed

1. CTV Test Flights: (May 2021 - 1 week)

- **PI:** Qing Wang/Ryan Yamaguchi, NPS
- **Location:** Marina, CA
- **Goal:** Test the updated Controlled Towed Vehicle (CTV)
- **Sponsor:** ONR

2. CARB: (June 2021 - 4 weeks)

- **PI:** Allen Goldstein, U. Berkeley
- **Location:** Burbank, CA
- **Goal:** Flux measurements of volatile organic compounds and nitrogen oxides in LA basin and San Joaquin Valley
- **Sponsor:** CA Air Resources Board (CARB) and South Coast Air Quality Management District (SCAQMD); NOAA

3. CLASI Phase 1 & 2: (Phase 1: July 2021 - 2 weeks; Phase 2: Aug 2021 - 2 weeks)

- **PI:** Qing Wang, NPS
- **Location:** Marina, CA
- **Goal:** Characterizing atmospheric boundary layer properties that affect high energy laser propagation
- **Sponsor:** ONR



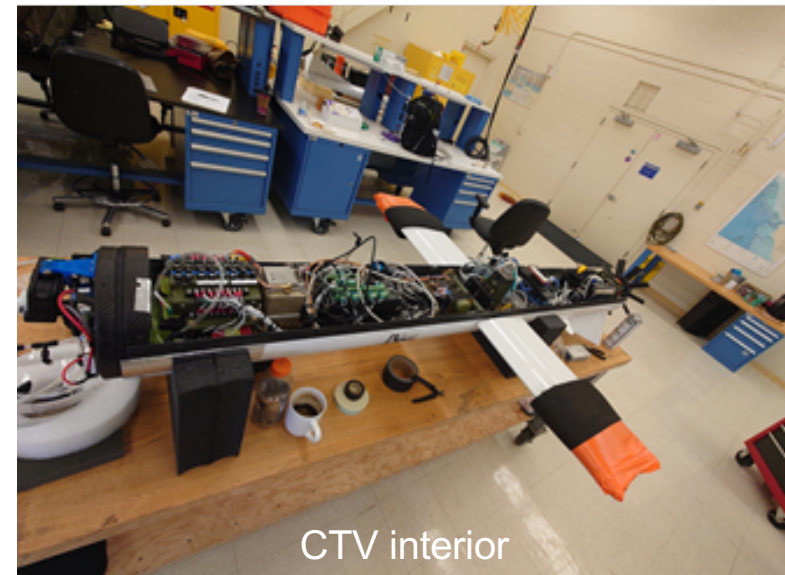
Controlled Towed Vehicle (CTV) Upgrades

- Major upgrades of CTV completed:

- Led by Ryan Yamaguchi (NPS) w CIRPAS
- Upgrades:
 - New data acquisition system
 - Updated video to GoPro
 - New wings and nose
 - New antennas
 - New flight controller (tested in parallel w previous)
 - Mounted C-band transmitting RF beacon
 - Mounted POPS aerosol probe

- Current CTV capabilities:

- 5-hole gust probe: turbulence, sensible/latent heat flux, momentum flux
- Fast response temperature (20 Hz)
- KT15: SST
- Portable Optical Particle Spectrometer (POPS): aerosols (120 nm – 3 microns)
- Li-COR fast-response CO₂ and H₂O
- C-band RF beacon





Controlled Towed Vehicle (CTV) Test Flights

- Test flights of upgraded CTV completed:

- 3 test flights carried out: 18th, 19th, 20th May
- CTV successfully lowered down to and flown at 30 ft above the surface of the ocean
 - Twin Otter flew at 1000 ft
 - CTV flew at 30 ft - target altitude for near surface flux measurements





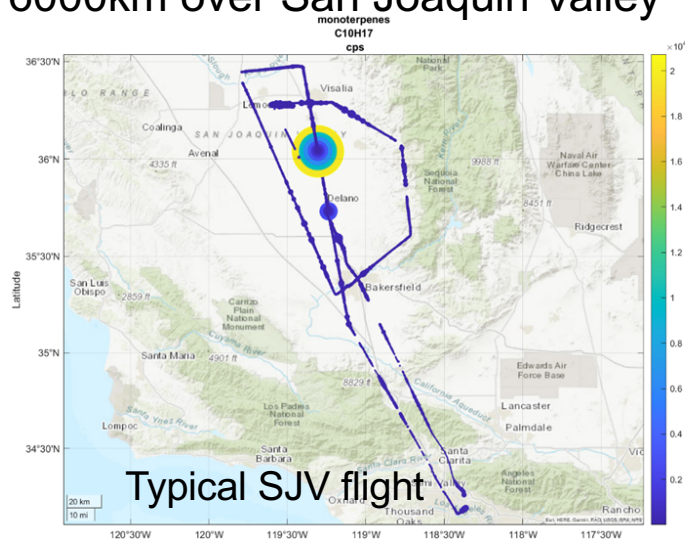
Controlled Towed Vehicle (CTV) Test Flights





CARB Mission

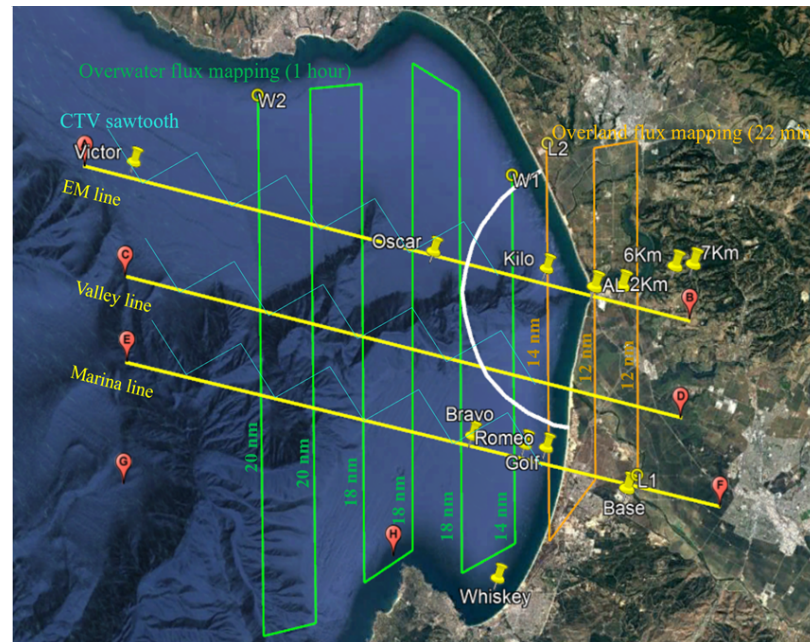
- Integrated new Vocus instrument:
 - **PI: Allen Goldstein** (UC-Berkeley)
 - **Vocus:** Proton Transfer Reaction Time Of Flight Mass Spectrometer
 - Measures concentrations and fluxes of a wide range (hundreds) of volatile organic compounds (VOCs)
 - Developed through ONR's DURIP program
 - Custom designed and built specifically for CIRPAS Twin Otter rack
- Conducted 16 research flights for CARB (w additional support from NOAA and SCAQMD):
 - 1-22 June, 2021 (80 flight hours) out of Burbank, CA
 - Additional payload included: NO_x, CO, CO₂, H₂O, CH₄, CIRPAS met
 - Flights covered 9000 km over LA; 6000km over San Joaquin Valley





CLASI Mission Phase 1

- Conducted 7 research flights during Phase 1:
 - **PI: Qing Wang (NPS)**
 - 12-21 July, 2021 (20 flight hours) out of Marina, CA
 - Included CIRPAS suite of met, turbulence and aerosol probes
 - Correlated with buoy and ship measurements in Monterey Bay
 - **Science goal:** Measure scintillation effects and aerosol extinction and relate to attenuation of laser power density – **utilized CTV**
 - **Phase 2 (In process):** 9 August – 2 September





FY22 Twin Otter Missions Planned

1. **C-HARRIER:** (October 2021 - 1 week)
 - **PI:** Liane Guild, NASA Ames
 - **Location:** Marina, CA
 - **Goal:** Measure coastal and inland water radiance for satellite validation over relevant aquatic targets – supports coastal and inland water quality science
 - **Sponsor:** NASA

2. **CALICO:** (February-March 2022 - 6 weeks)
 - **PI:** Scott Powell, NPS
 - **Location:** Marina, CA
 - **Goal:** Study of post-frontal convection and interactions with the boundary layer
 - **Sponsor:** ONR

3. **SWEX:** (April-May 2022 - 6 weeks)
 - **PI:** Leila Carvalho, UC-Santa Barbara
 - **Location:** Santa Barbara, CA
 - **Goal:** Study downslope windstorms, 'Sundowners', along the Santa Barbara coast
 - **Sponsor:** NSF



FY22 Twin Otter Missions

Tentative

1. **CLASI:** *(May-June 2022 - 2 weeks)*
 - **PI:** *Qing Wang, NPS*
 - **Location:** *Marina, CA*
 - **Goal:** *Effects of the atmosphere on high energy laser attenuation*
 - **Sponsor:** *ONR*

2. **BLUEFLUX:** *(July/October 2022 - 2 weeks each)*
 - **PI:** *Glenn Wolfe, NASA Goddard*
 - **Location:** *Everglades, FL*
 - **Goal:** *Quantify blue carbon fluxes over the Florida everglades*
 - **Sponsor:** *NASA*

3. **REDSAW:** *(August 2022 - 3 weeks)*
 - **PI:** *Qing Wang, NPS*
 - **Location:** *Salton Sea, CA*
 - **Goal:** *Study of radar and EO ducting in the stable atmosphere over water*
 - **Sponsor:** *ONR*



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Questions?

