2021 Open Data Workshop
(December 7th)

DCOTSS
NASA Earth Venture Suborbital 3
Dynamics and Chemistry of the Summer Stratosphere

# Balloon Sondes for DCOTSS

**Ozone_Sondes & Ozone-H2O_Sondes**

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# Data Collection/Creation Process

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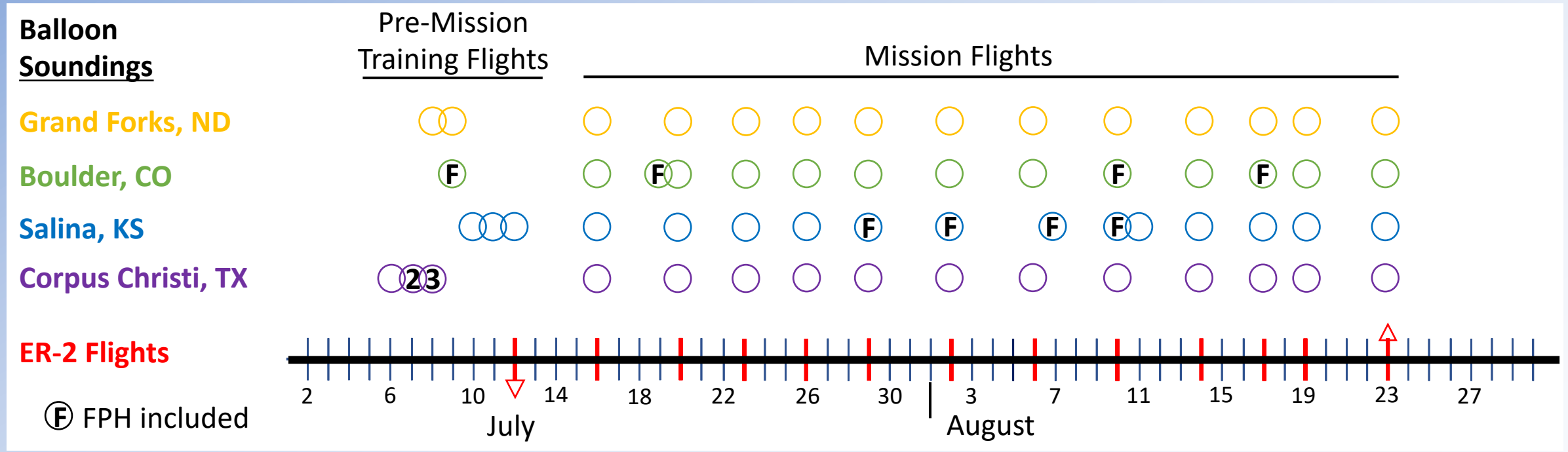
- Total of 62 instrumented balloons launched at 4 different sites in coordination with ER-2 flights from Salina (6 July – 23 August, 2021)

**Grand Forks, ND (n=14)** **Boulder, CO (n=14) – 4 w/FPH**

**Salina, KS (n=16) – 4 w/FPH** **Corpus Christi, TX (n=18)**



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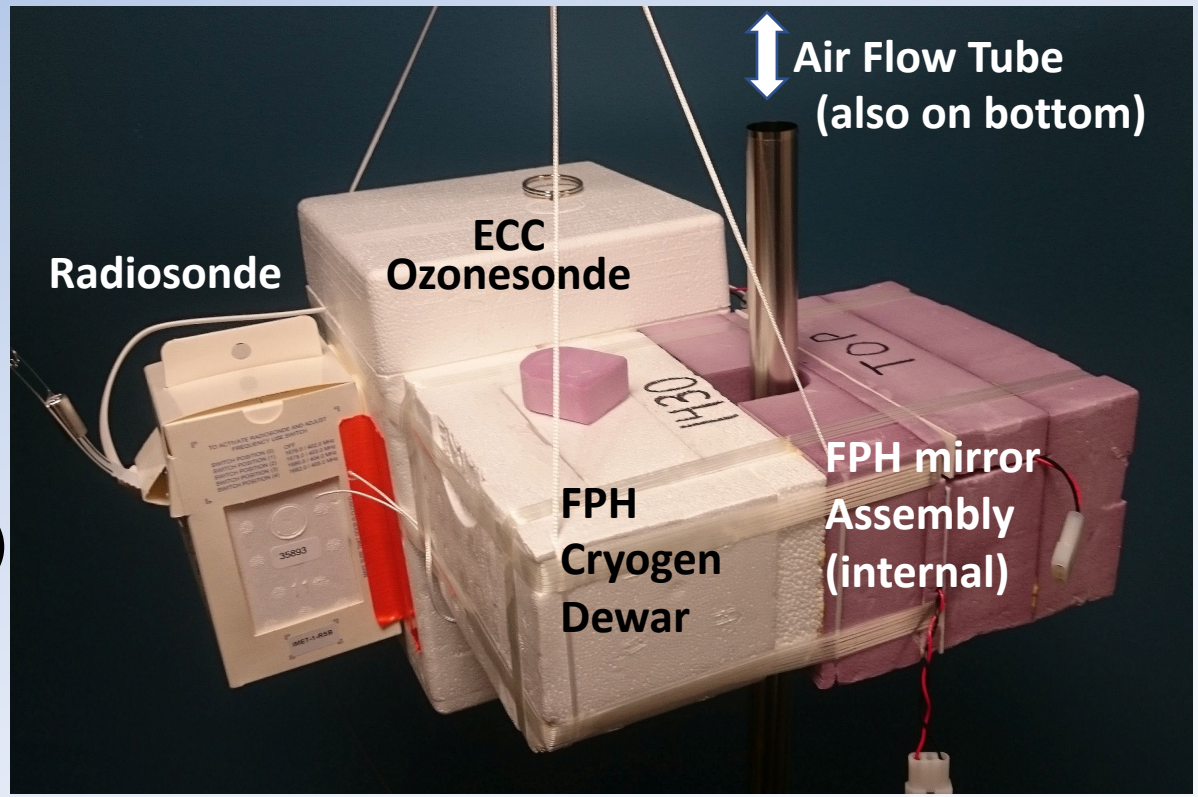


- Instruments

**EN-SCI Electrochemical Concentration Cell (ECC)**
$O_3$ partial pressure ($P_{O3}$)

**Intermet Radiosonde (RS)**
T, P, RH, GPS 3D location (Lat, Lon, Geom. Altitude)

**NOAA Frost Point Hygrometer (FPH)**
$H_2O$ partial pressure (via frost point temperature)

- Data Products

**$O_3$ mixing ratio** ($P_{O3,}$ P); **$H_2O$ mixing ratio** ($P_{H2O,}$ P); **Theta** (P, T); **Geopotential Altitude** (P, T, RH); **RH** ($P_{H2O,}$ P, T); **$O_3$ partial columns** ($P_{O3,}$ P, T); **Horizontal wind speed & direction** (GPS Lat & Lon); **Tropopause Height** (T, Alt)

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- Websites

  https://gml.noaa.gov/ozwv/ozsondes/

  https://gml.noaa.gov/ozwv/wvap/

- References


Sterling, C.W., B.J. Johnson, S.J. Oltmans, H.G.J. Smit, A.F. Jordan, P.D. Cullis, E.G. Hall, A.M. Thompson and J.C. Witte: **Homogenizing and estimating the uncertainty in NOAA's long-term vertical ozone profile records measured with the electrochemical concentration cell ozonesonde**, *Atmos. Meas. Tech.*, *11*, 3661-3687, doi:10.5194/amt-11-3661-2018, 2018.

Hall, E.G., A.F. Jordan, D.F. Hurst, S.J. Oltmans, H. Vömel, B. Kühnreich, and V. Ebert: **Advancements, measurement uncertainties and recent comparisons of the NOAA frost point hygrometer**, *Atmos. Meas. Tech.*, *9*, 4295–4310, doi:10.5194/amt-9-4295-2016, 2016.

# File Structure & Content

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- Vertical Profile Data (Ascent & Descent) telemetered and recorded at 1-2 s resolution (5-10 m vertical resolution)

  "Ozone_Sondes": Time, Altitude (Geopot. & Geometric), P, T, RH (RS), $\theta$, Lat, Lon, Horiz. Wind Speed and Direction, $O_3$ mixing ratio

  Surface to ~35 kmasl (i.e, balloon burst height)

  "Ozone-H2O_Sondes": add $H_2O$ mixing ratio, RH (FPH), $RH_i$ (FPH)

  Surface to ~28 kmasl (valved balloon turnpoint)

- ICARTT format, ~1 MB per file, 1-sec timestamp intervals

  "Non-updated" 1-sec data are reported as –99999, not repeated

  Data rate is limited by hard-coded radiosonde telemetry rate

# Data Limitations & Considerations

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- ECC ($X_{O3}$): accuracy (±5%); precision (±4% >100 hPa, ±3% <100 hPa)
- FPH ($X_{H2O}$): accuracy (±5% >100 hPa, ±3% <100 hPa); precision (±8% >100 hPa, ±5% <100 hPa)
- RS (T): uncertainty (±0.5K >100 hPa, ±1.0K <100 hPa); reproducibility (±0.3K, ±0.8K, same P ranges)
- RS (P): uncertainty (±1 hPa >400 hPa, ±2 hPa <400 hPa); reproducibility (±0.8 hPa, ±1.5 hPa, " ")
- RS (RH): uncertainty (±5% RH); reproducibility (±3% RH)
- Ascent data recommended for ECC $O_3$ data, but descent data are available (bad are –99999)
  Balloon burst = rapid descent rate, ECC optimized for ascent, latency of RS and ECC sensors' responses
- Ascent & descent data good for FPH $H_2O$ data
  Valved balloon = controlled (~5 m $s^{-1}$) balloon descent, uncontaminated descent $H_2O$
- Use RH values calculated from FPH measurements, especially above ~10 km
- Geopotential altitude f(P, T, RH) ≠ Geometric altitude (GPS)

# ~~Tentative~~ Archival Timeline

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- Final data "R0" have been archived for all 62 flights!

Questions?