

# **Aerosol Light Scattering and Absorption Measurements during CLASIC**

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NOAA/ESRL/GMD**

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# CLASIC/CHAPS Platforms

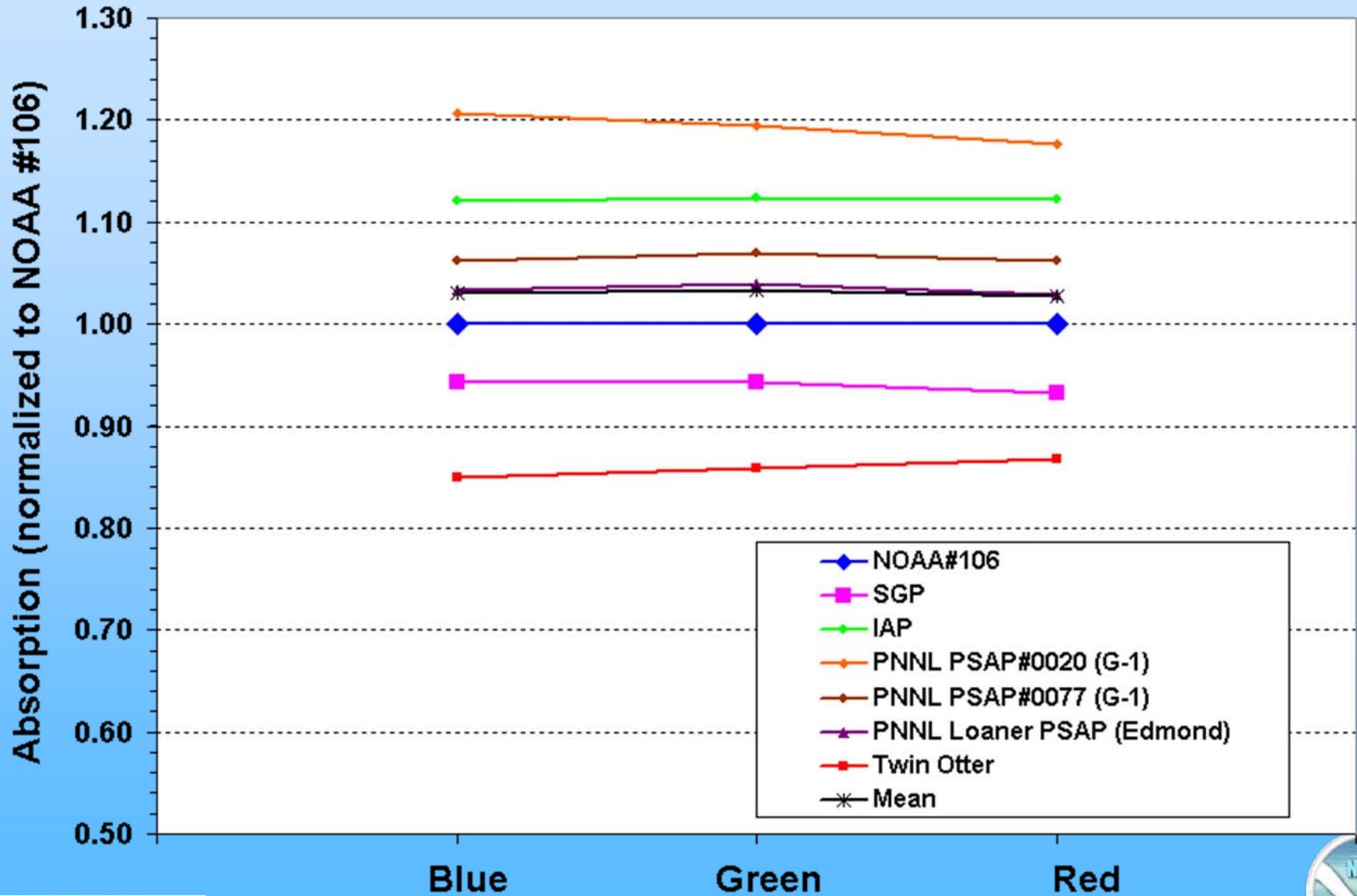
- **Instruments**
  - Integrating nephelometer
  - Particle/soot absorption photometer (PSAP)
  - 3- $\lambda$  measurements (blue, green, red)
- **Aircraft**
  - Twin Otter
  - Cessna 206
  - Gulfstream G-1 (dual neph/PSAP)
- **Ground stations**
  - SGP
  - Edmonds, OK (PNNL)

# Pre-campaign Comparisons

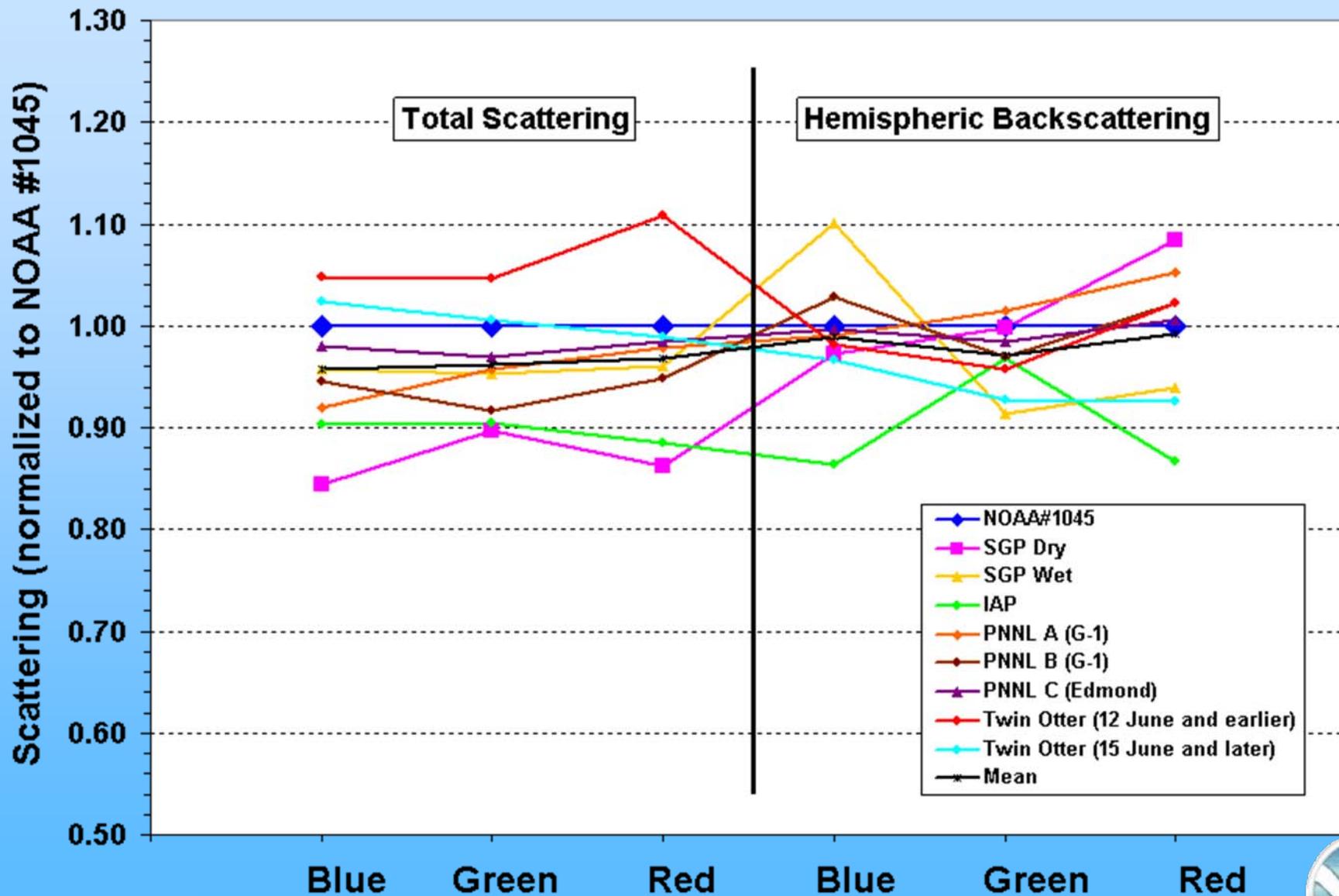
- Procedure was designed to identify major instrument problems before CHAPS/CLASIC experiment started
- Large (57L), stirred mixing chamber was used to provide well-mixed aerosols to instruments
- Identical flow rates and lengths of conductive tubing were used
- Ambient aerosols were occasionally augmented by ammonium sulfate and kerosene soot when necessary
- All instruments were compared against a NOAA mobile reference nephelometer and PSAP



# Absorption Comparisons

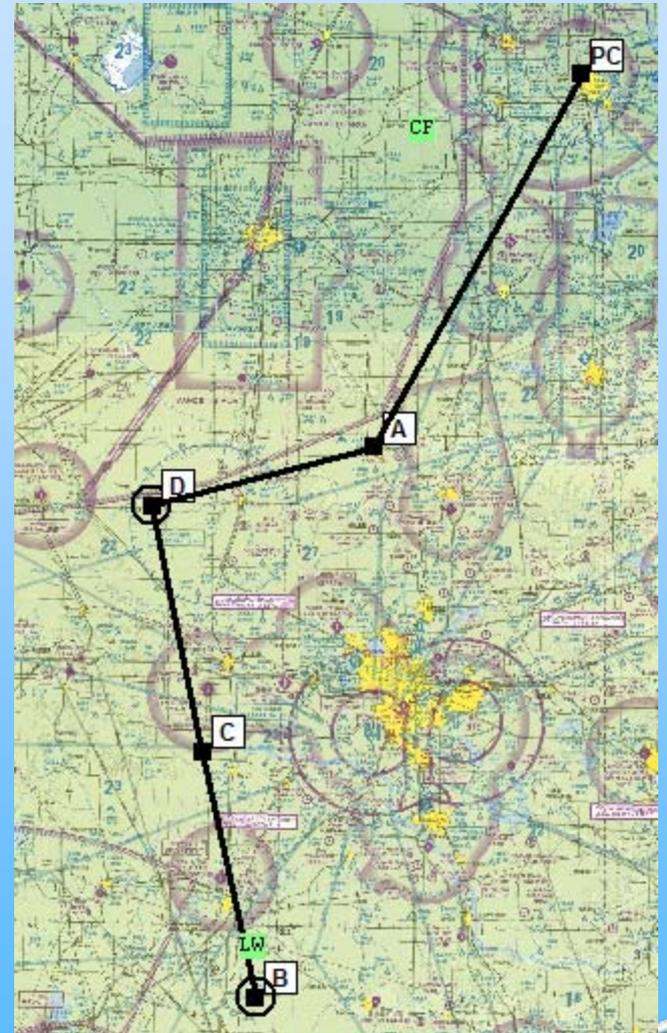


# Scattering Comparisons



# CALIPSO Underflights 2007-06-19

- Satellite track B-C-D
- Stacked aircraft:
  - ER-2
  - *Beech B-200*
  - *Twin Otter*
  - *G-1*
  - *Cessna 206*
  - Bell helicopter
- All at “C” at 19:53:01 UTC

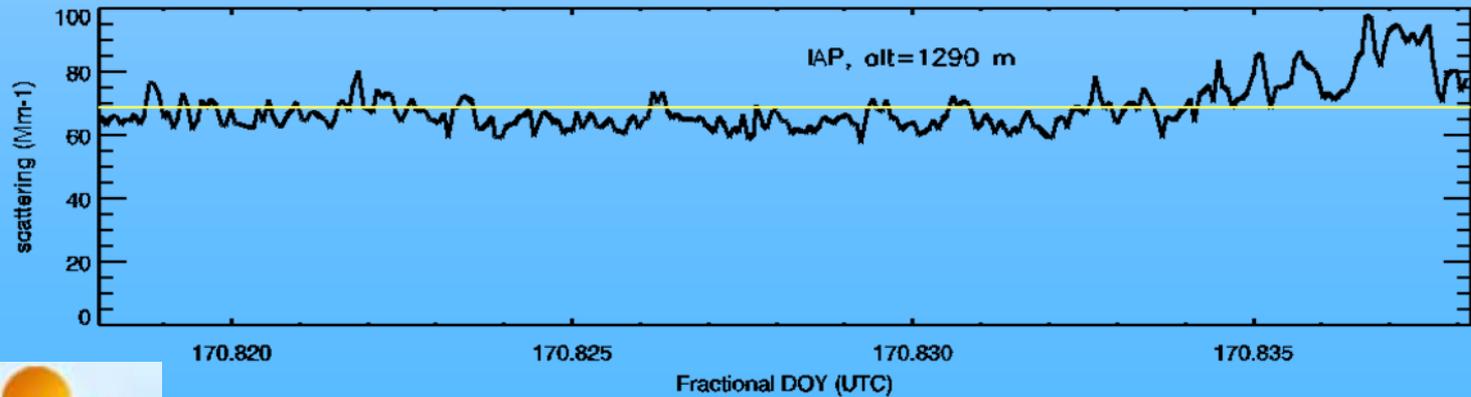
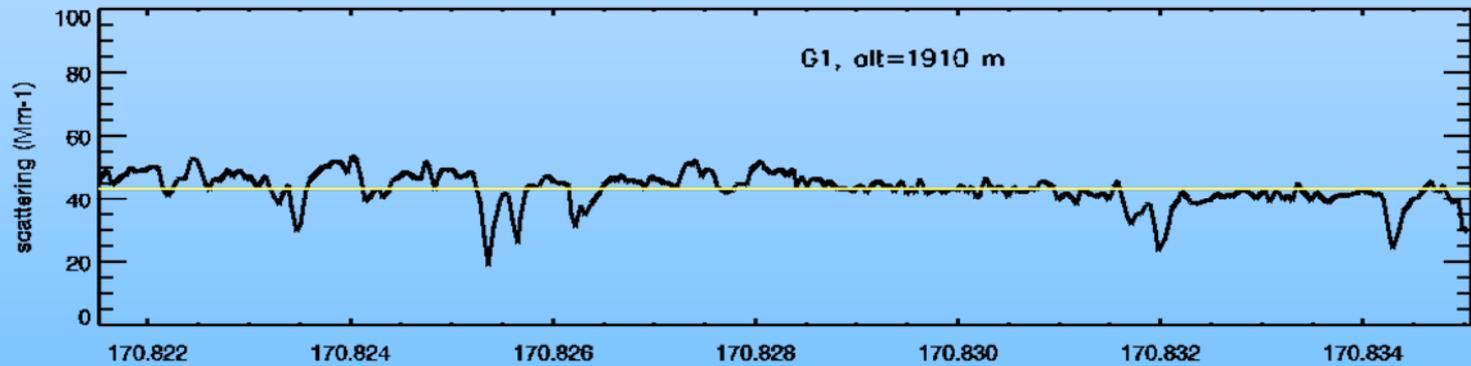
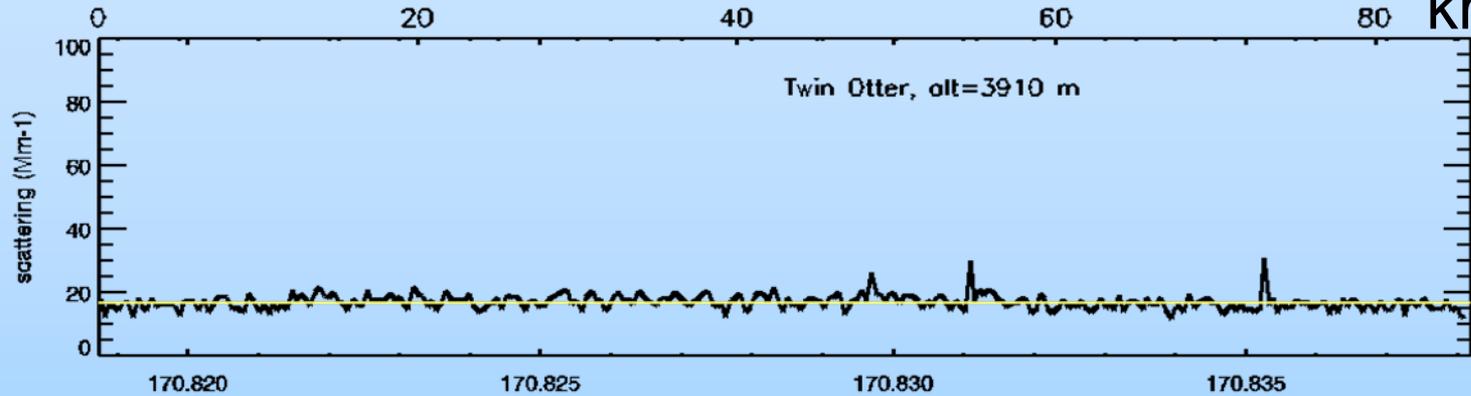


# Aircraft Positions at 2007-06-19 19:53:01Z

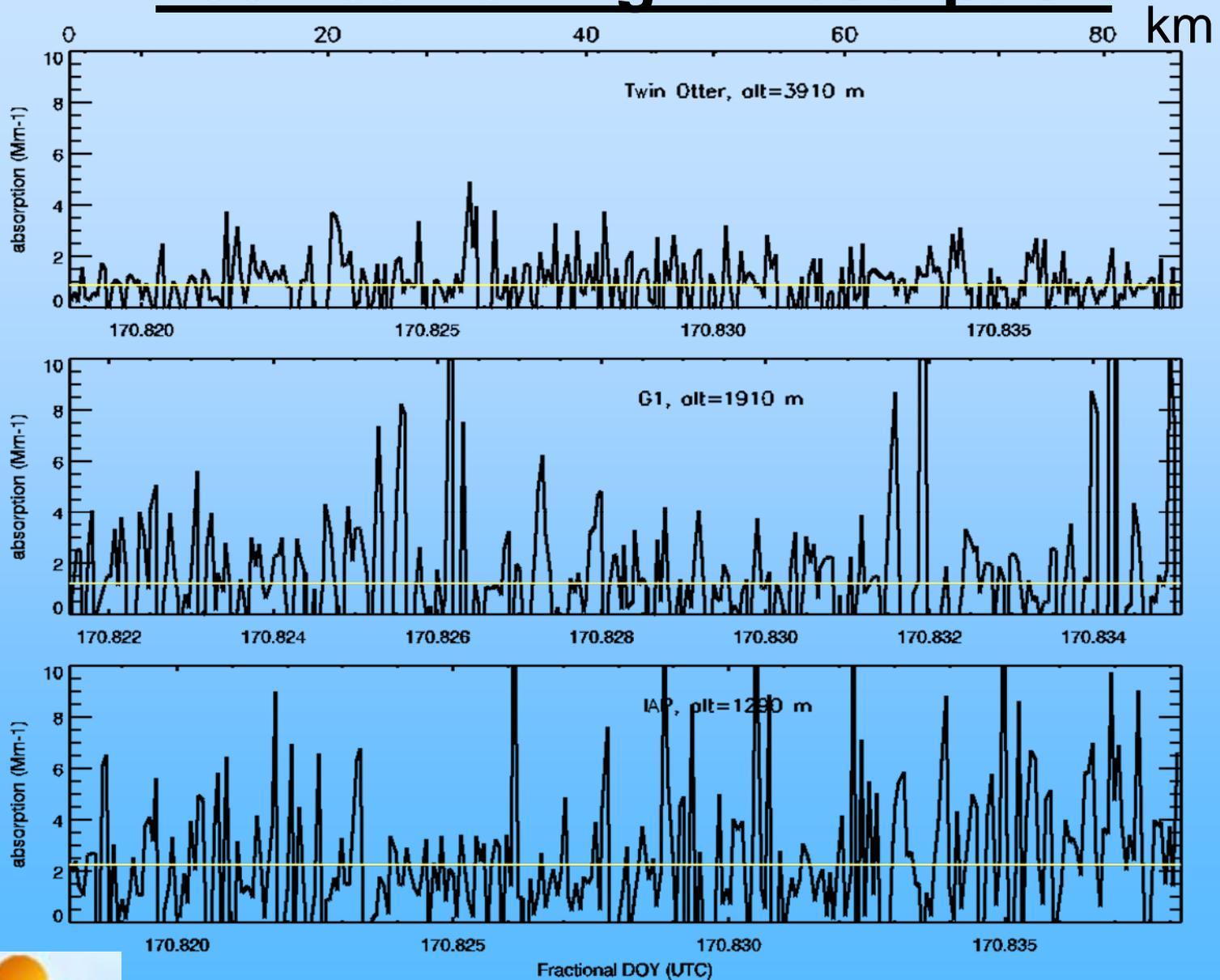


# 2007-06-19: Light Scattering

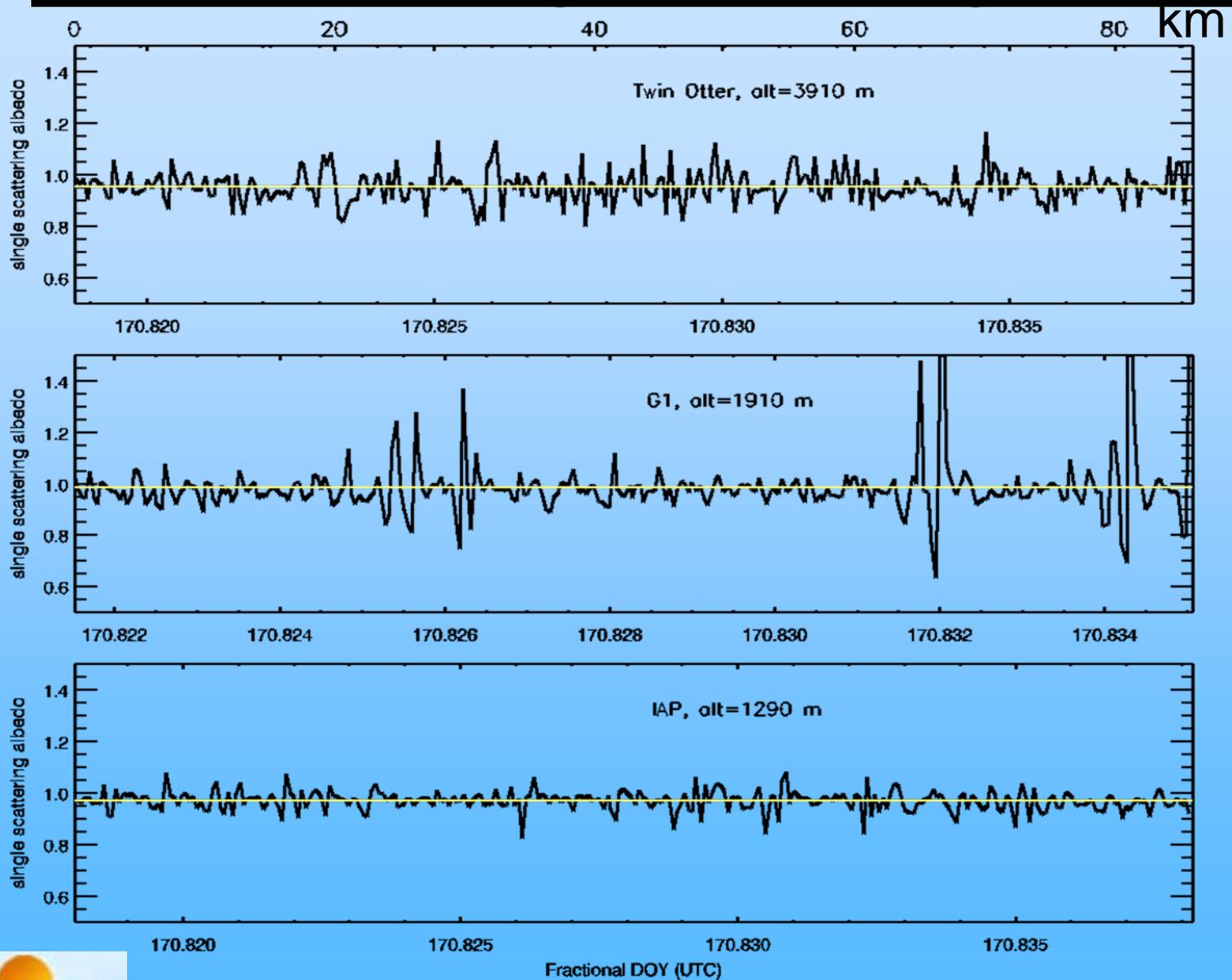
km



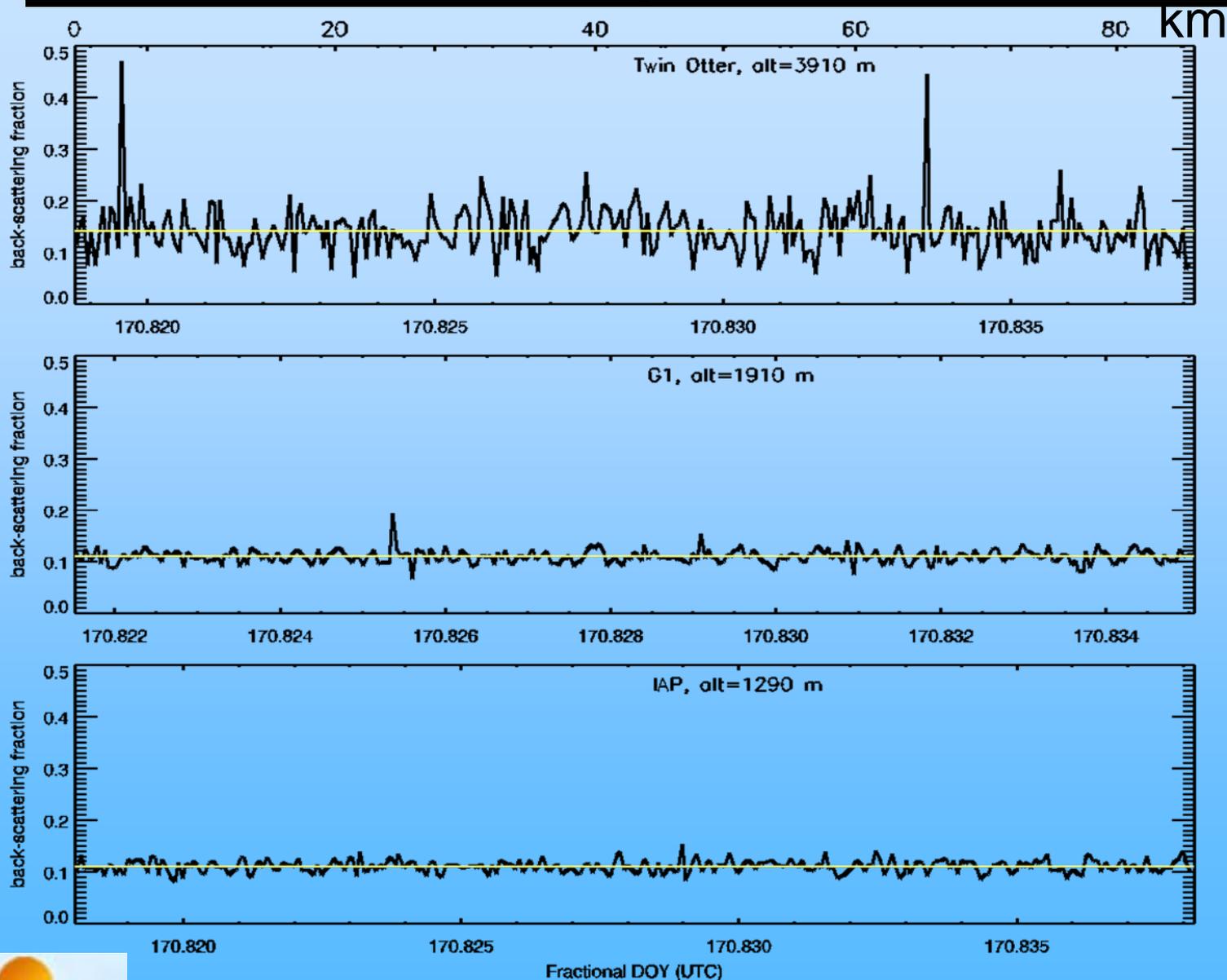
# 2007-06-19: Light Absorption



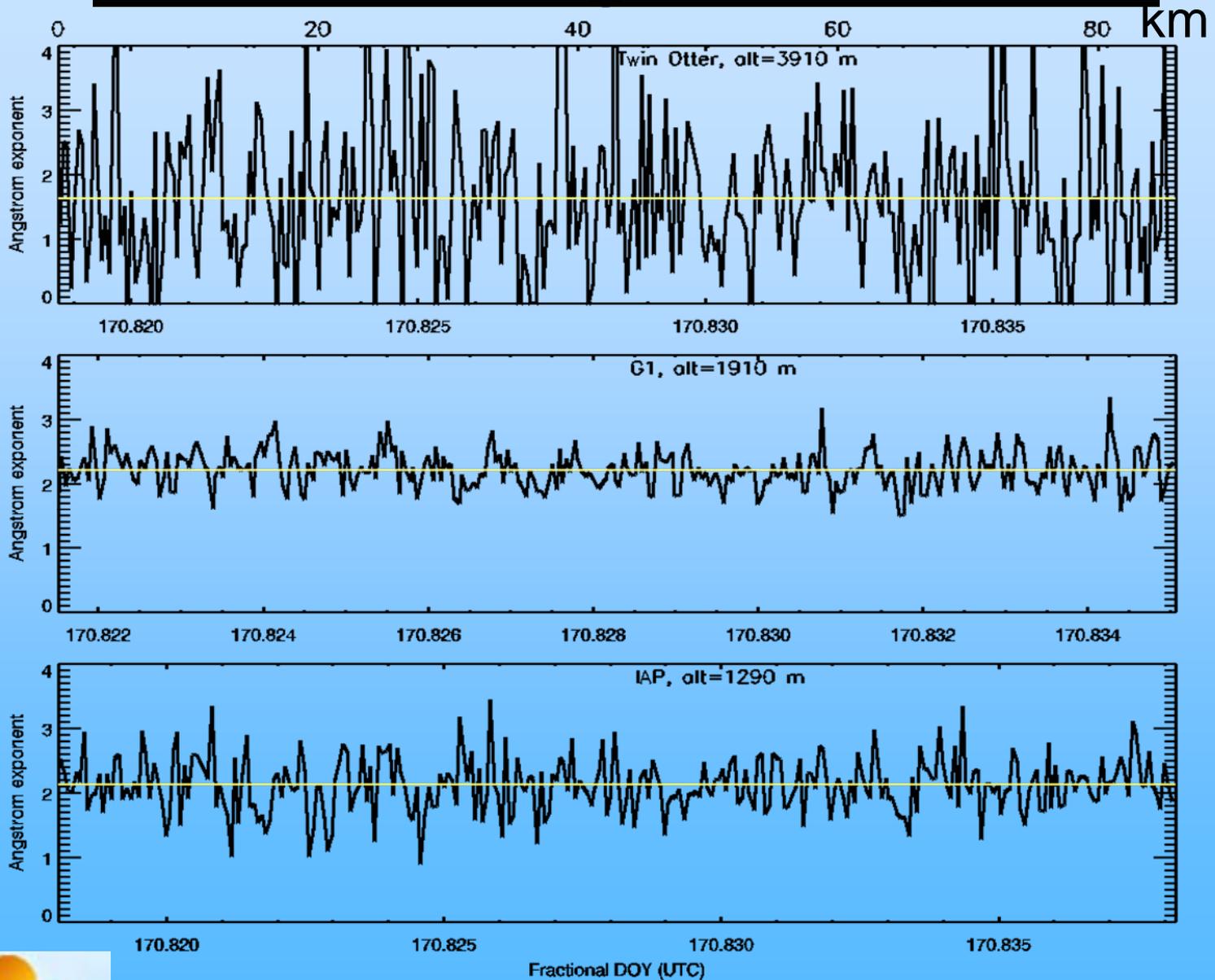
# 2007-06-19: Single-scattering Albedo



# 2007-06-19: Hemispheric Backscatter



# 2007-06-19: Ångström Exponent



# Mean and Variability of Aerosol Radiative Properties

	<b>Cessna 206 1290 m asl</b>	<b>G-1 1910 m asl</b>	<b>Twin Otter 3910 m asl</b>
$\sigma_{sp}$ (Mm <sup>-1</sup> , 550 nm)	<b>69 ± 8</b>	<b>43 ± 5</b>	<b>17 ± 2</b>
$\sigma_{ap}$ (Mm <sup>-1</sup> , 550 nm)	<b>2.2 ± 2.9</b>	<b>1.2 ± 3.3</b>	<b>0.9 ± 1.1</b>
$\omega_o$ (550 nm)	<b>0.97 ± 0.04</b>	<b>0.99 ± 0.13</b>	<b>0.95 ± 0.06</b>
Ångström exponent (550/700 nm)	<b>2.1 ± 0.4</b>	<b>2.2 ± 0.3</b>	<b>1.6 ± 1.2</b>
Backscatter fraction (550 nm)	<b>0.11 ± 0.01</b>	<b>0.11 ± 0.01</b>	<b>0.14 ± 0.05</b>
Est. ambient $\sigma_{ep}$ (Mm <sup>-1</sup> , 532 nm)	<b>120</b>	<b>120</b>	<b>12</b>
HSRL meas. $\sigma_{ep}$ (Mm <sup>-1</sup> , 532 nm)	<b>160</b>	<b>100</b>	<b>10</b>

300-m averages