Characterization of Aerosols and Surface Optical Properties from Airborne Spectral Measurements of Directional Reflectance

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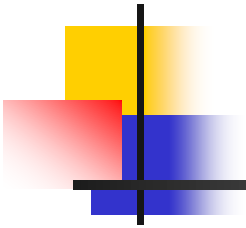
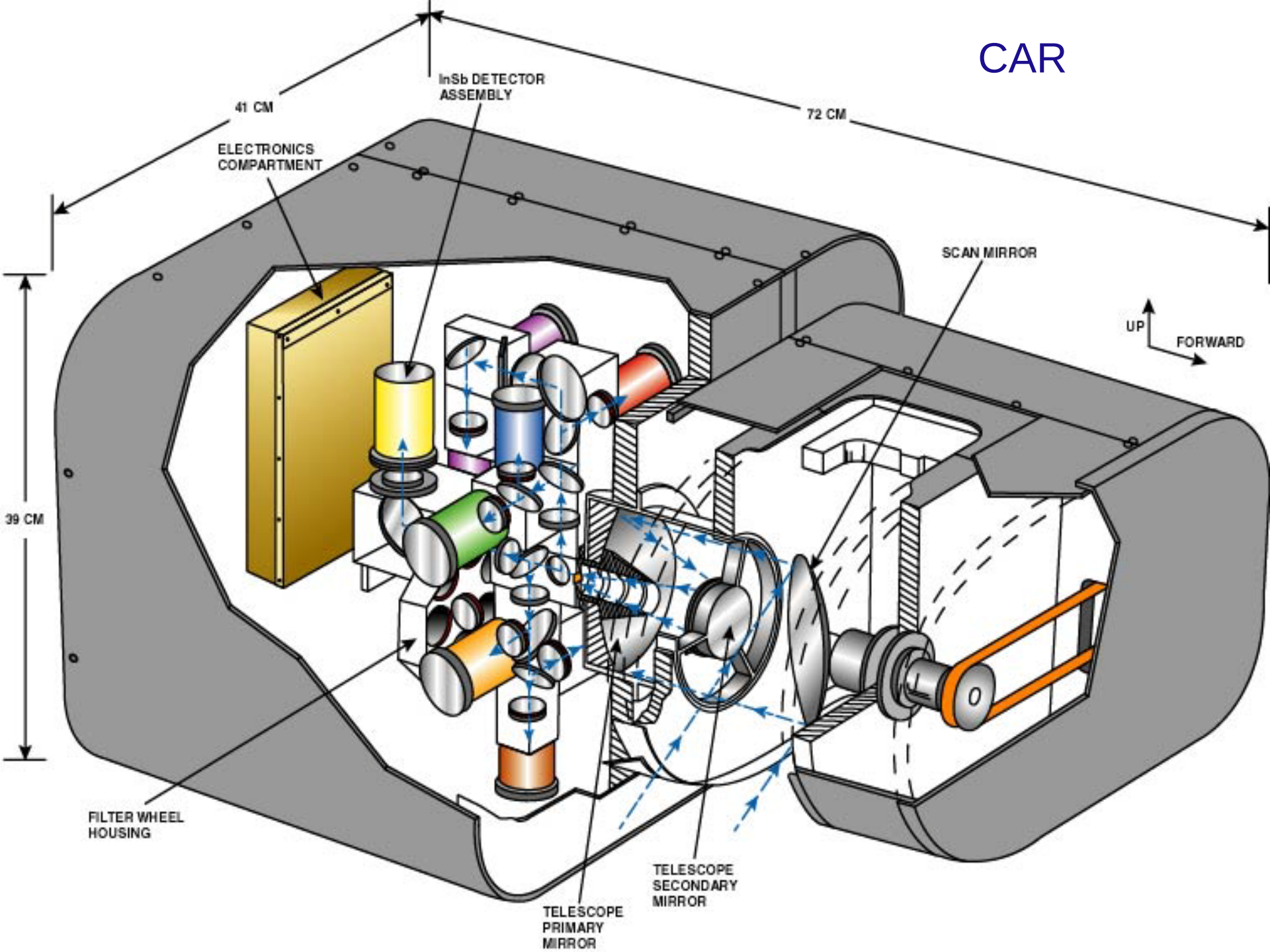


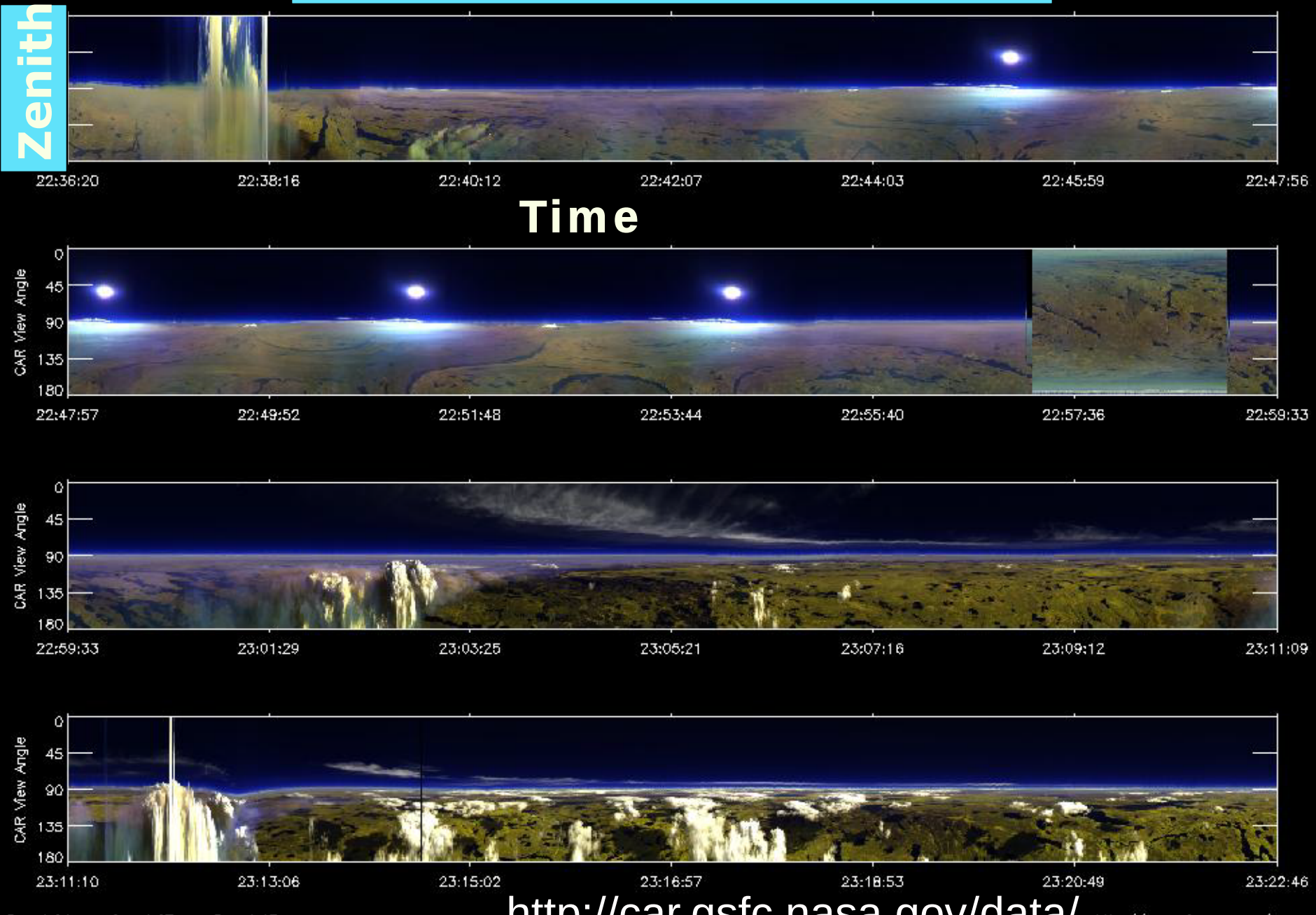
Background:

CAR Airborne Platforms 1998-2008

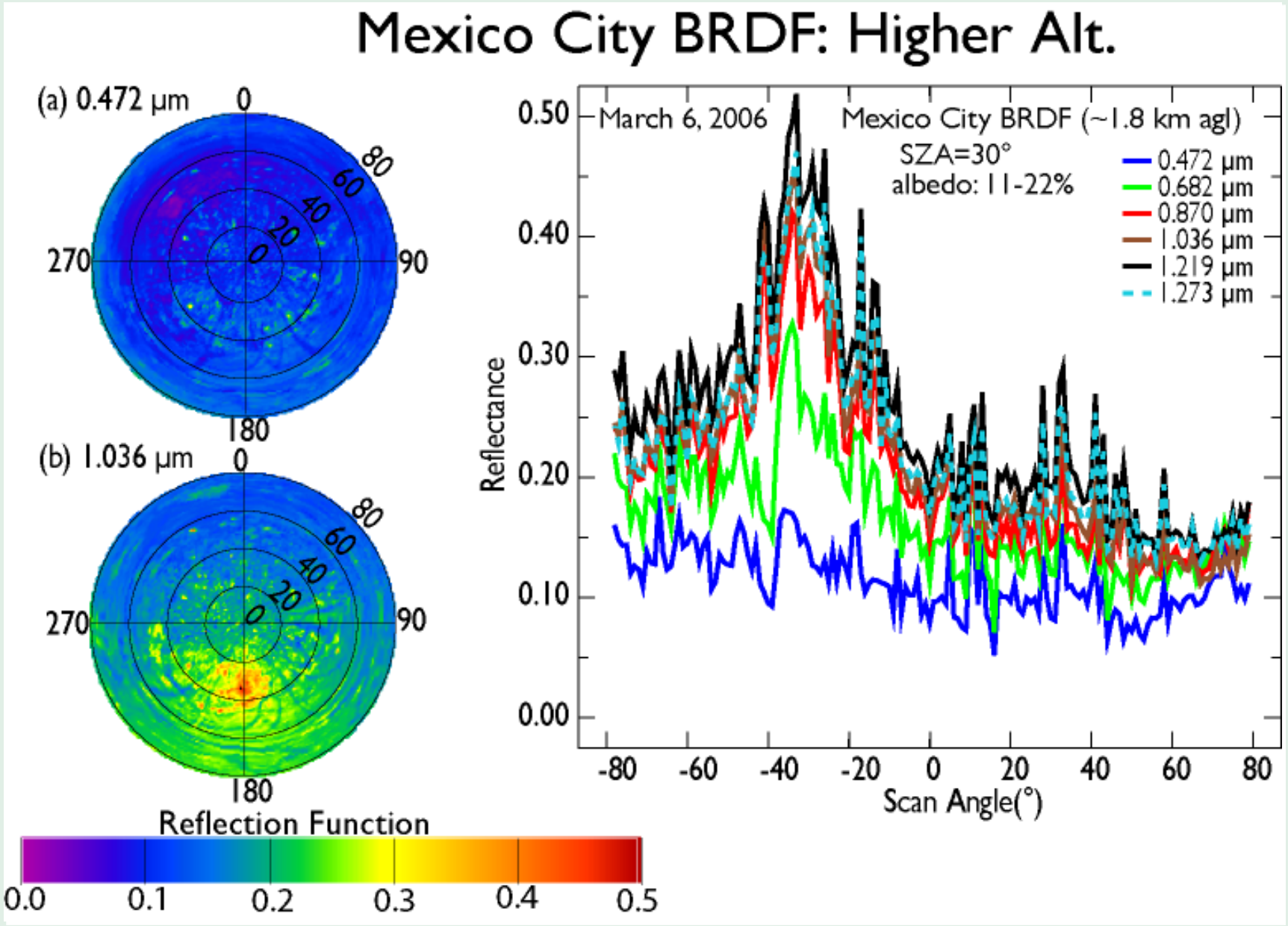
CAR


41 CM
InSb DETECTOR ASSEMBLY
72 CM
ELECTRONICS COMPARTMENT
SCAN MIRROR
UP
FORWARD
39 CM
FILTER WHEEL HOUSING
TELESCOPE PRIMARY MIRROR
TELESCOPE SECONDARY MIRROR

CAR Quicklook Image 2008

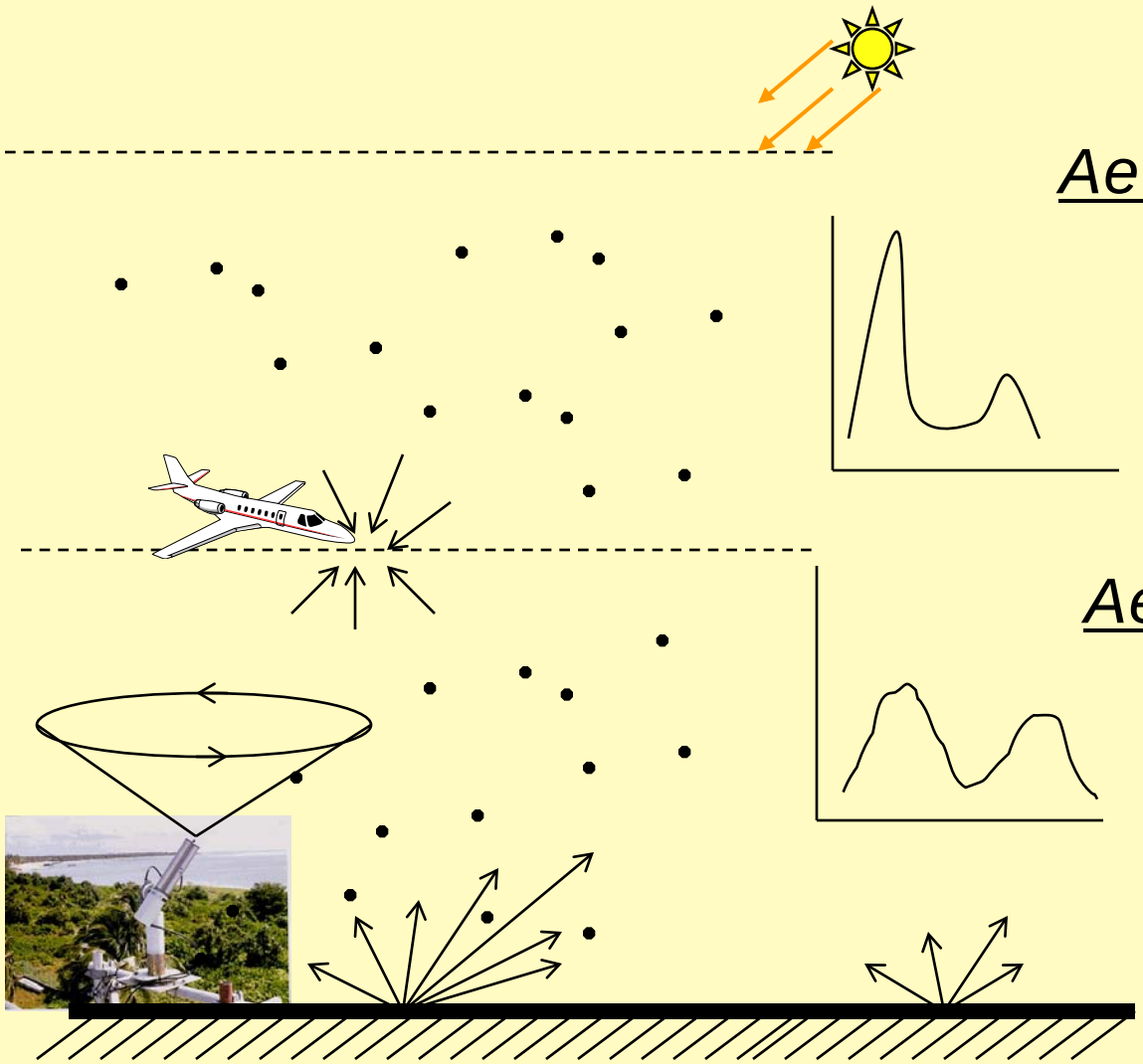


BRDF Measurements



Aerosol Inversion:

Retrieval using combinations of up- and down-looking observations



Retrieved:

<u>Aerosol above plane</u>:

- *size distr.*
- *real ref. ind.*
- *imag. ref. ind*

<u>Aerosol below plane</u>:

- *size distribution*
- *real ref. ind.*
- *imag. ref. ind*

<u>Surface Parameters</u>:

- *albedo, etc.*

Inversion Method

Inversion (Dubovik & King 2000)
[JGR, Vol. 105, 20,673]

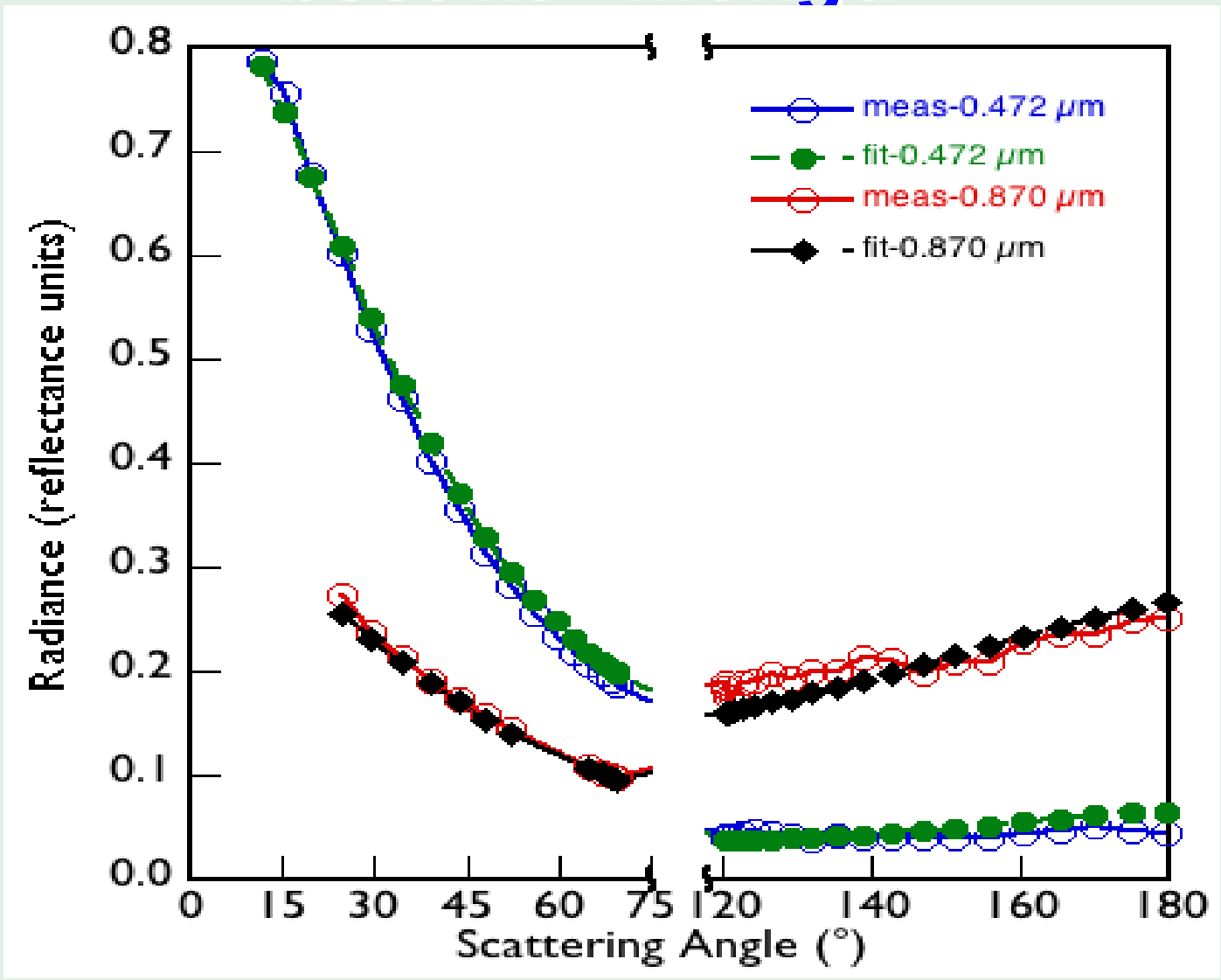
Best soln corresponds to a minimum of

$$\psi(a) = \frac{1}{2}\sum_{k=1}^{9}\gamma_k\{[f_k^* - f_k(a)]^T (W_k)^{-1}[f_k^* - f_1(a)]\},$$

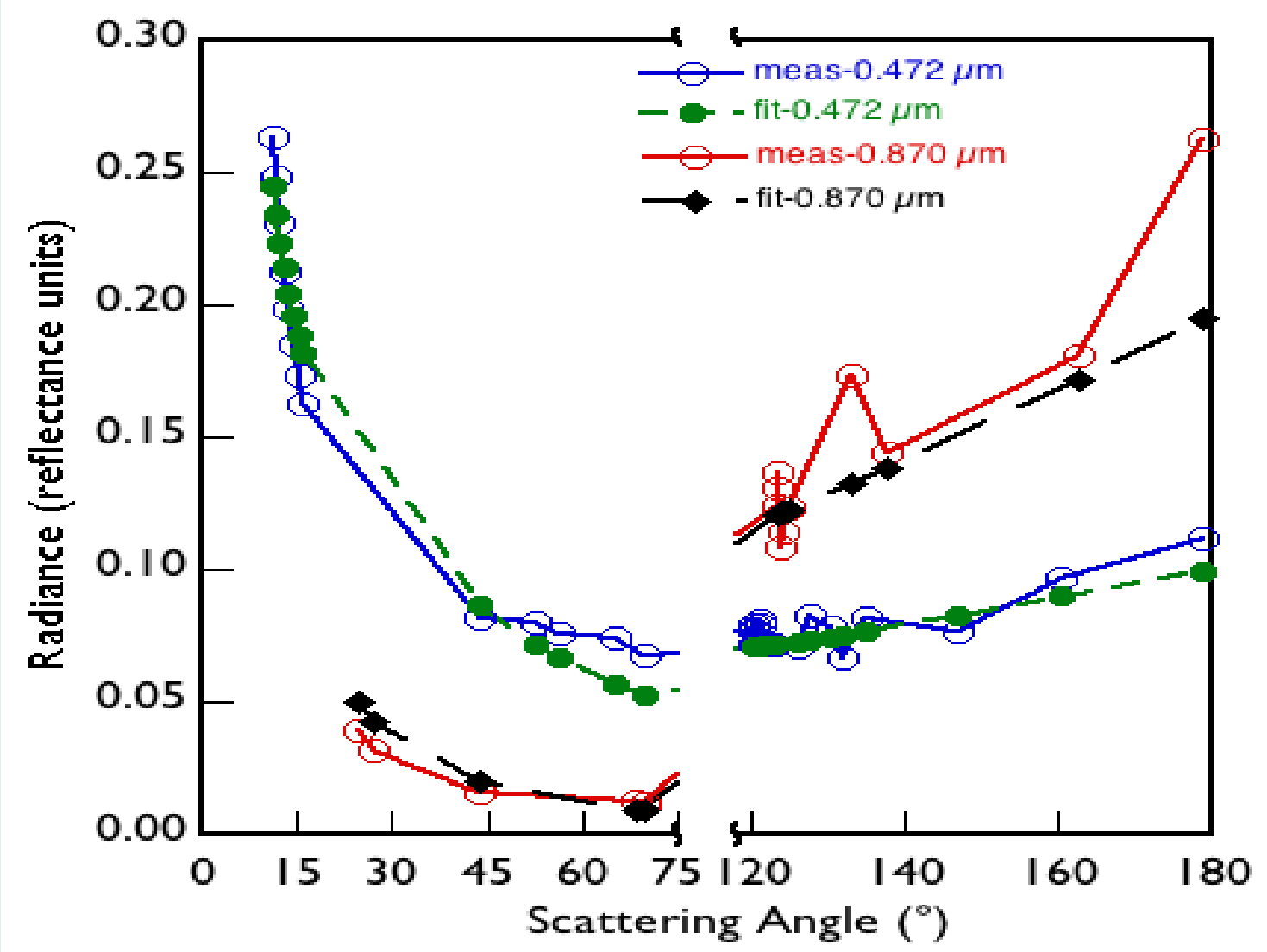
Residual:

$$RES = \left(\sqrt{\frac{1}{N}\sum_{i=1}^{N}[\ln(f_i^*) - \ln(f_i)]^2}\right) * 100$$

CAR Measurements
best fit - Mongu

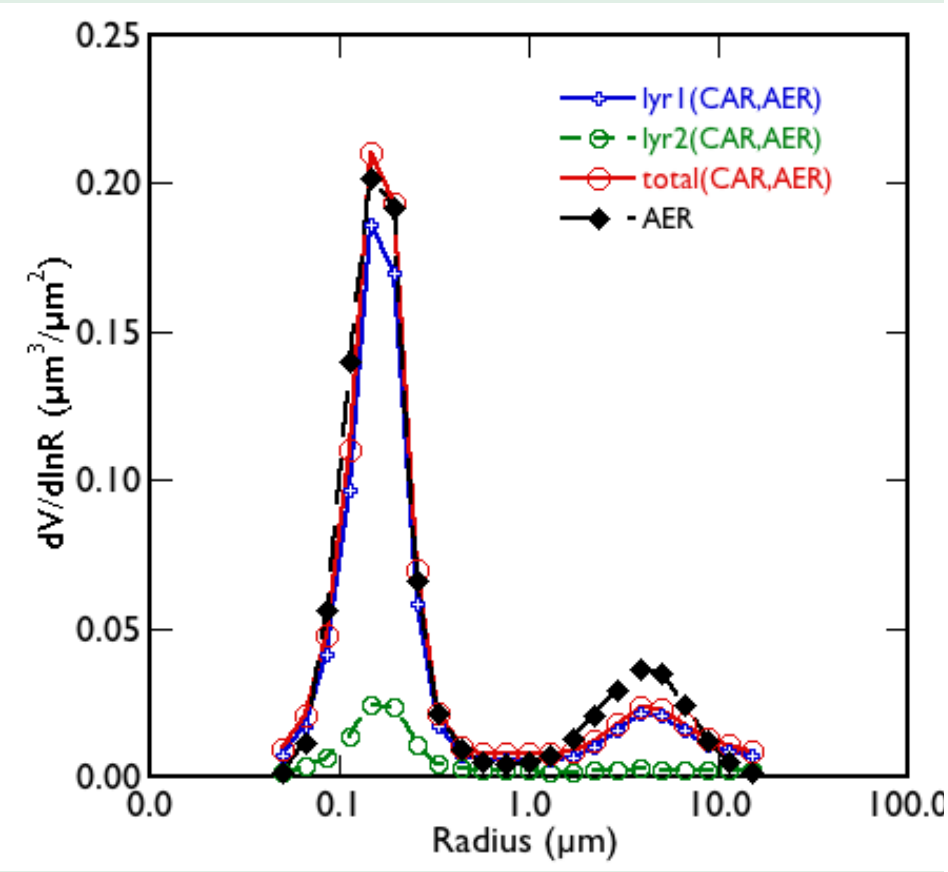


CAR Measurements best fit- Mexico City

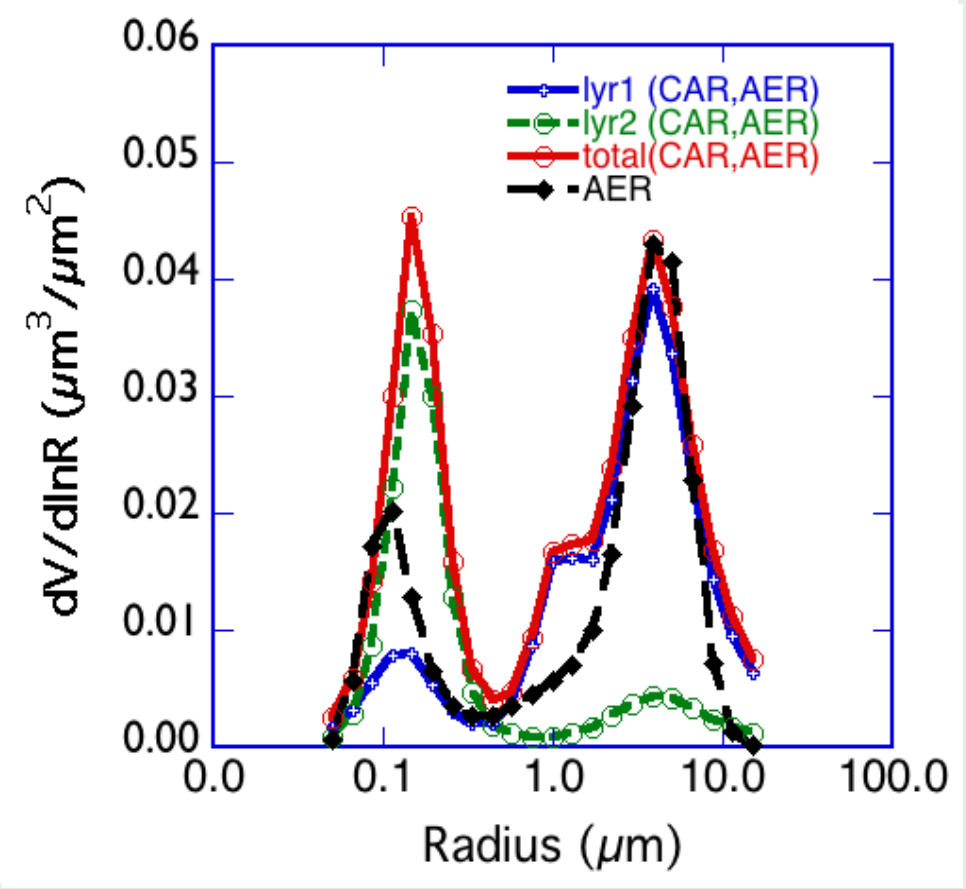


Aerosol Size Distribution

Mongu, Zambia

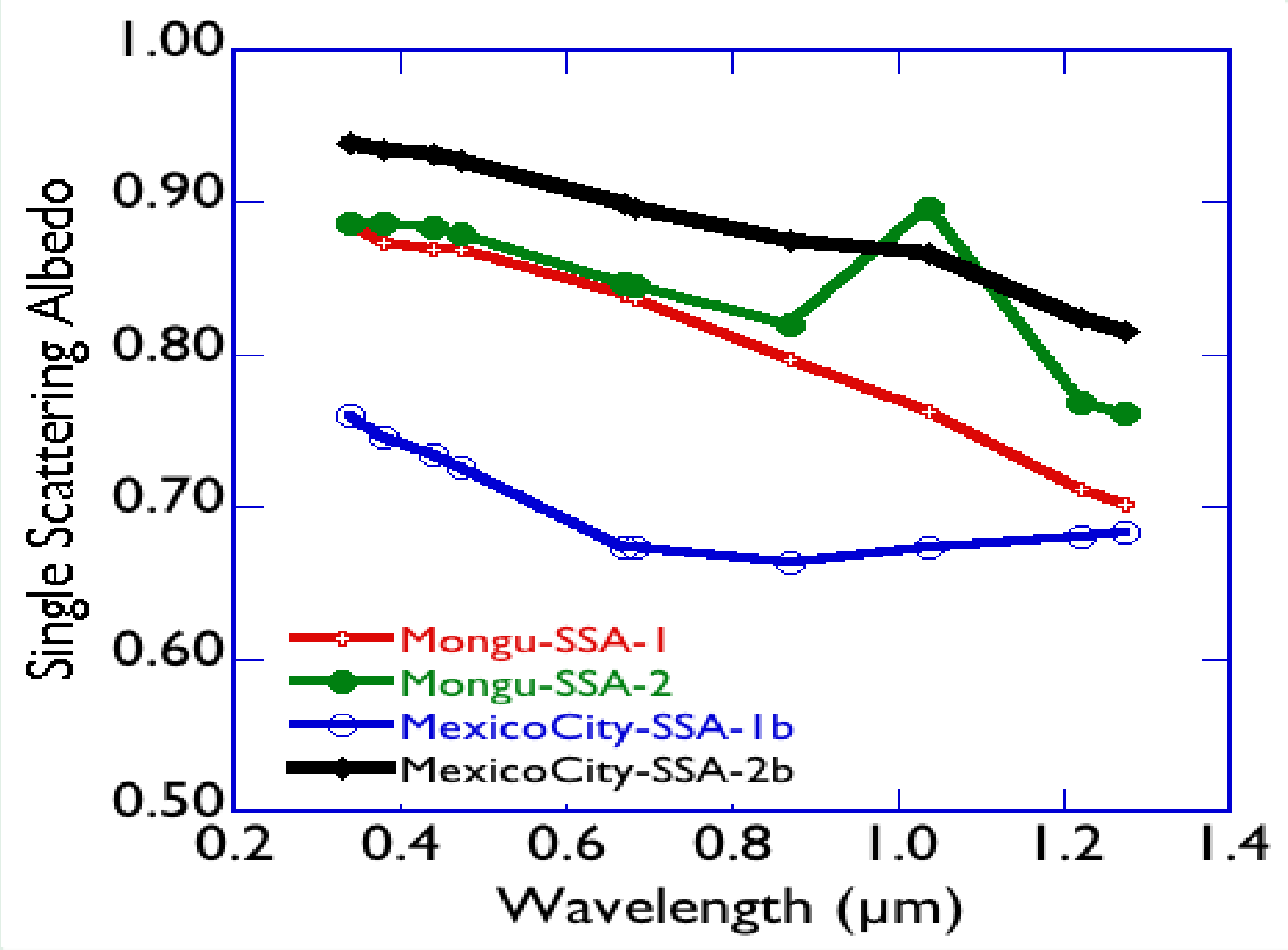


Mexico City, Mexico

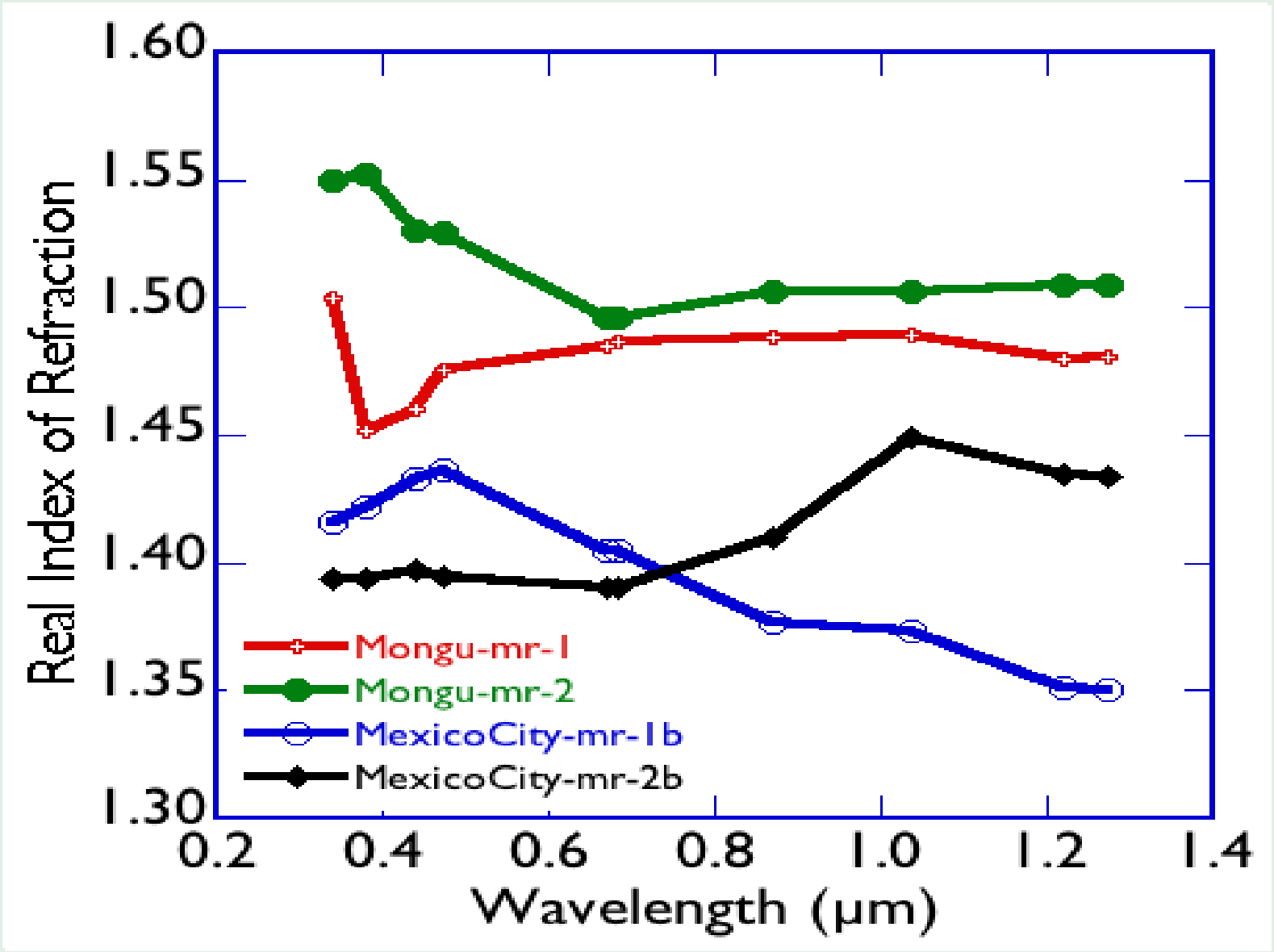


- Retrieved aerosol volume size distribution from combined data sets: CAR and AERONET.

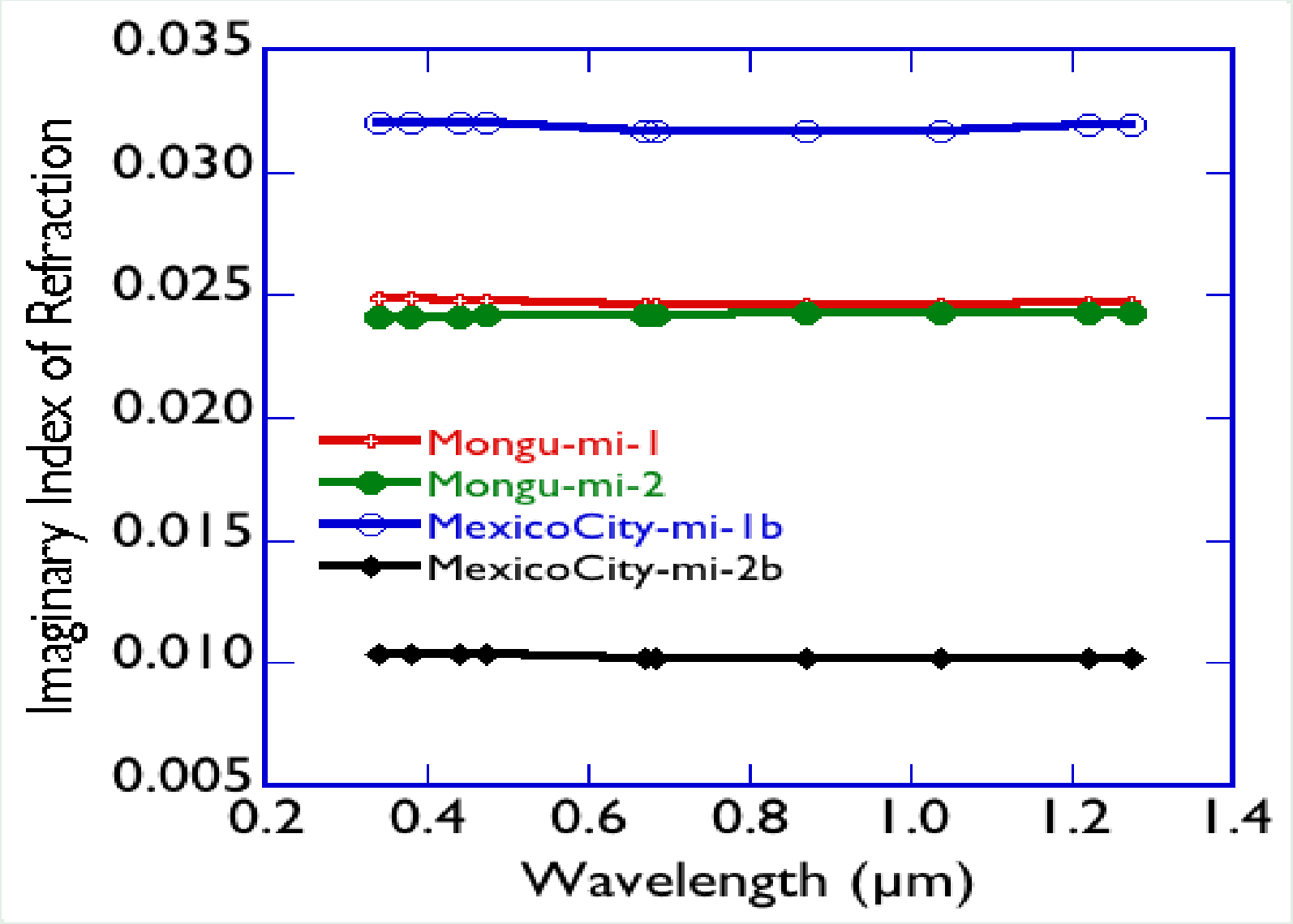
Single Scattering Albedo Retrieved from CAR & AERONET



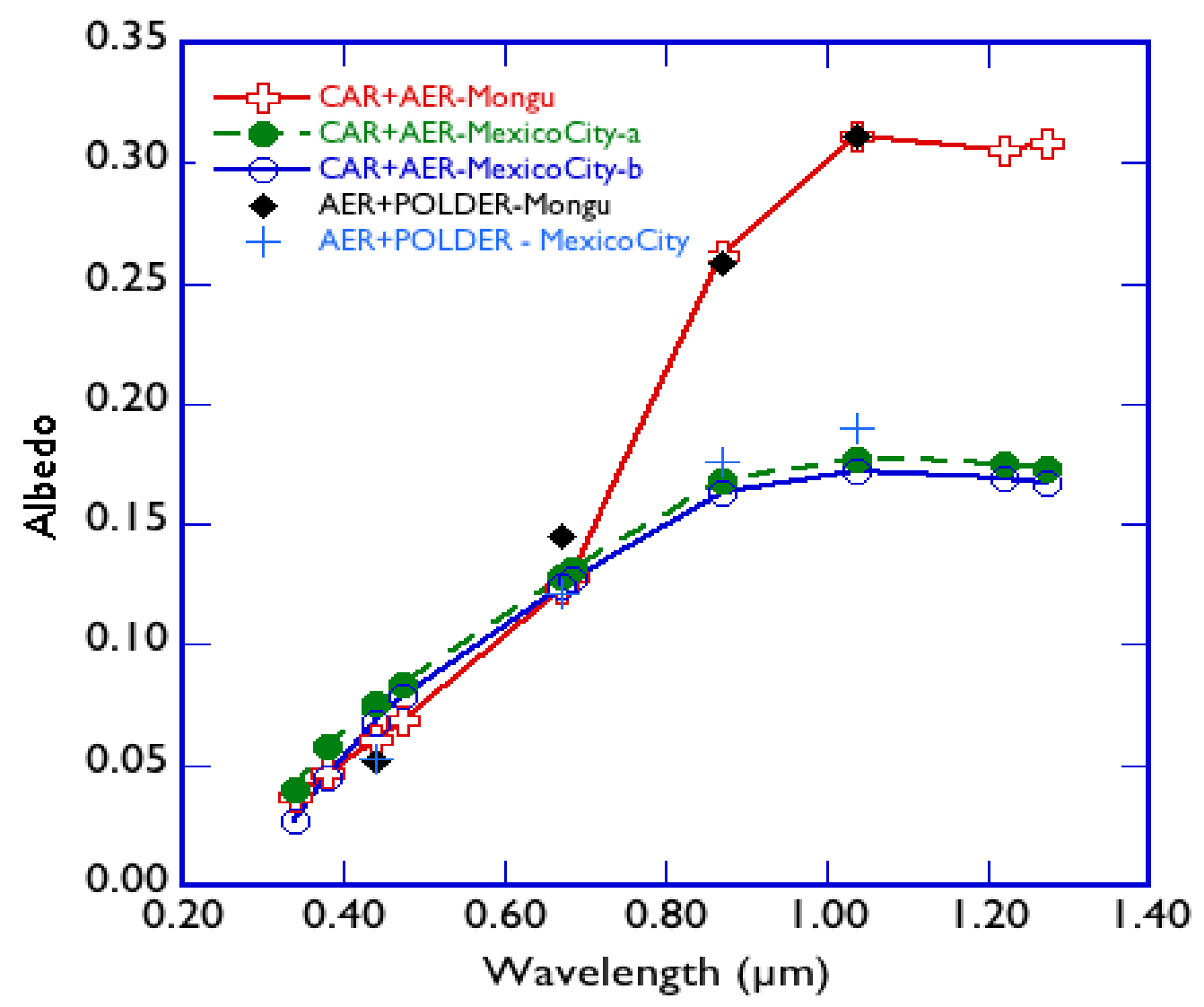
Real Index of Refraction Retrieved from CAR & AERONET



Imaginary Index of Refraction Retrieved from CAR & AERONET



Retrieved Albedo



Conclusion:

- ***Retrieval of both aerosol and surface optical parameters from combined up- and down-looking observations has been demonstrated for both bright and dark surface targets.***

- ***Future efforts will revolve around studies on:***
  - clarifying the use of different BRDF models, optimum parameterization, sensitivity, etc);
  - "closure" experiments for validating the algorithm.