



# Aerosol Simulation with the Heidelberg Monte Carlo Model

Suniti Sanghavi, Christoph v.Friedeburg, Steffen Beirle, Christian  
Frankenberg, Walburga Wilms-Grabe, Sven Köhl, Stefan Kraus, Michael  
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and Ulrich Platt



# Classification of Aerosols

Type >> Height a.s.l. VV	I	II	III	IV	V
Lower tropospheric (0-3 km)	Urban (mostly Anthropogenic)	Rural (Biomass burning, etc.)	Maritime (Sea salts)	Mineral (Dust, etc.)	Volcanic (Ash, etc.)
Upper troposphere (3-10 km)	Urban (mostly Anthropogenic)	Rural (Biomass burning, etc.)	Maritime (Sea salts)	Mineral (Dust, etc.)	Volcanic (Ash, etc.)
Stratosphere (10-50 km)	Fresh volcanic	Background			
Mesosphere (50-80 km)	Meteoritic	Background			



# Subclassification

Aerosols are further classified on the basis of:

- Size (nucleation/dispersion modes with respective accumulation modes)
- Hygroscopicity/Humidity
- Chemical composition



# Aerosol Parameters:

- Extinction Coefficient,

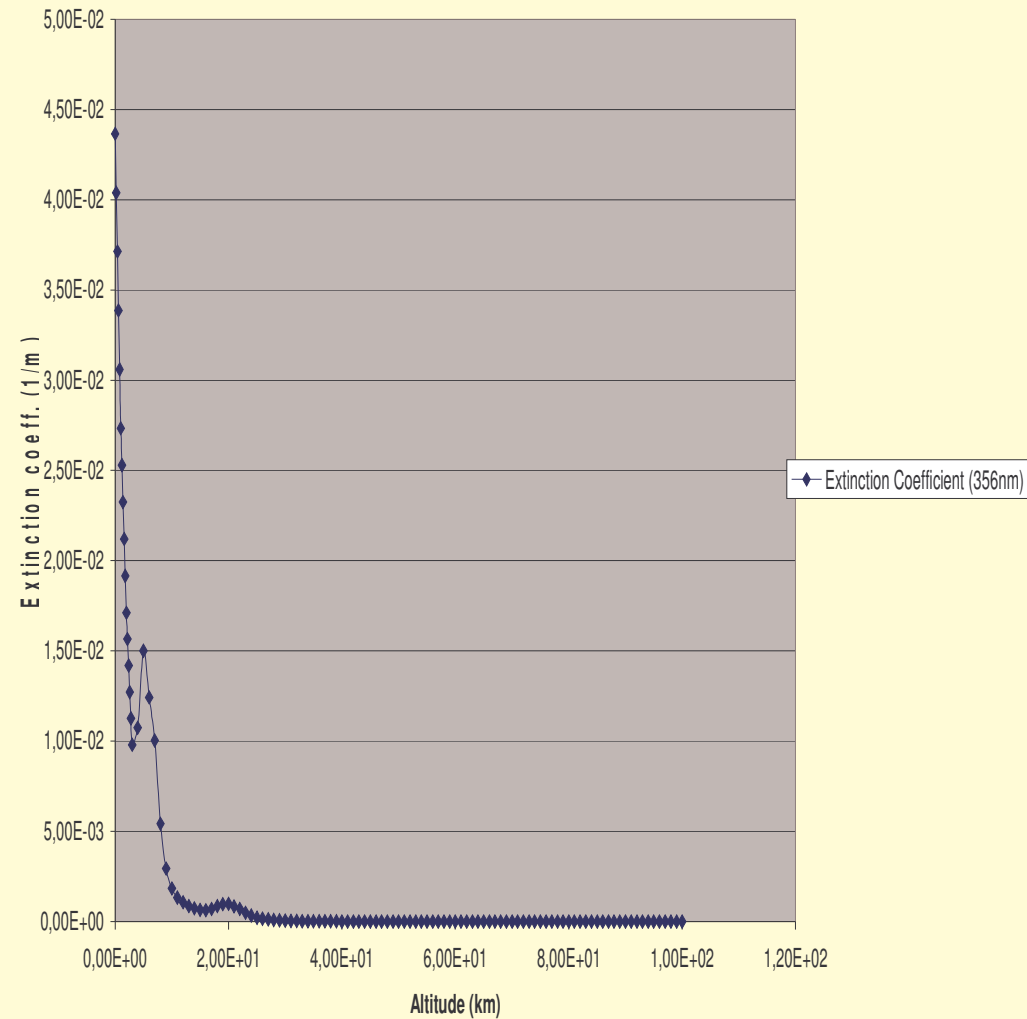
$$K_e = K_a + K_s$$

- Asymmetry Factor,  $g$   
(using Henyey-Greenstein phase function)

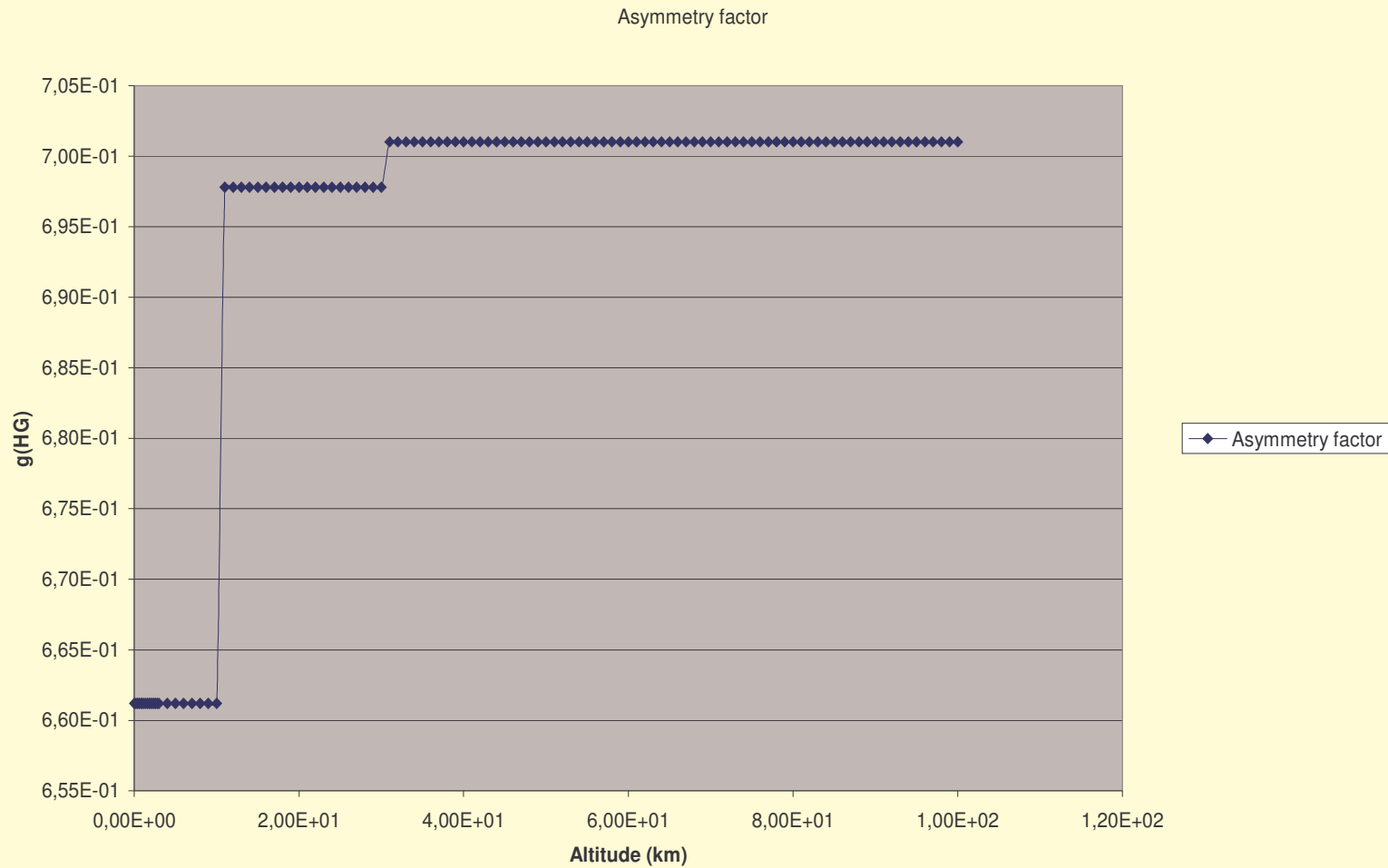


# Specimen profile for Extinction coefficient of (unknown) aerosol type at 356 nm.

Extinction Coefficient (356nm)



# Specimen asymmetry factor profile of the same aerosol.

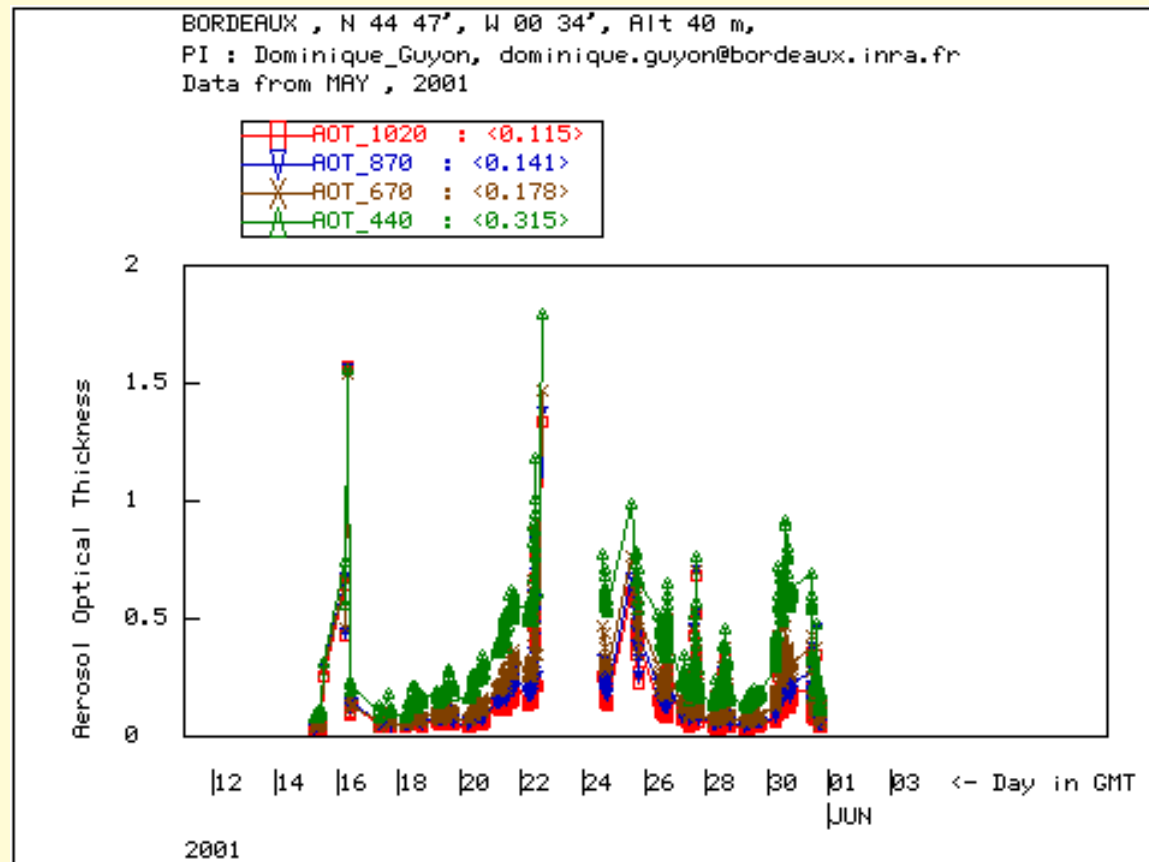


# Influence of aerosols on trace gas SCD measurements





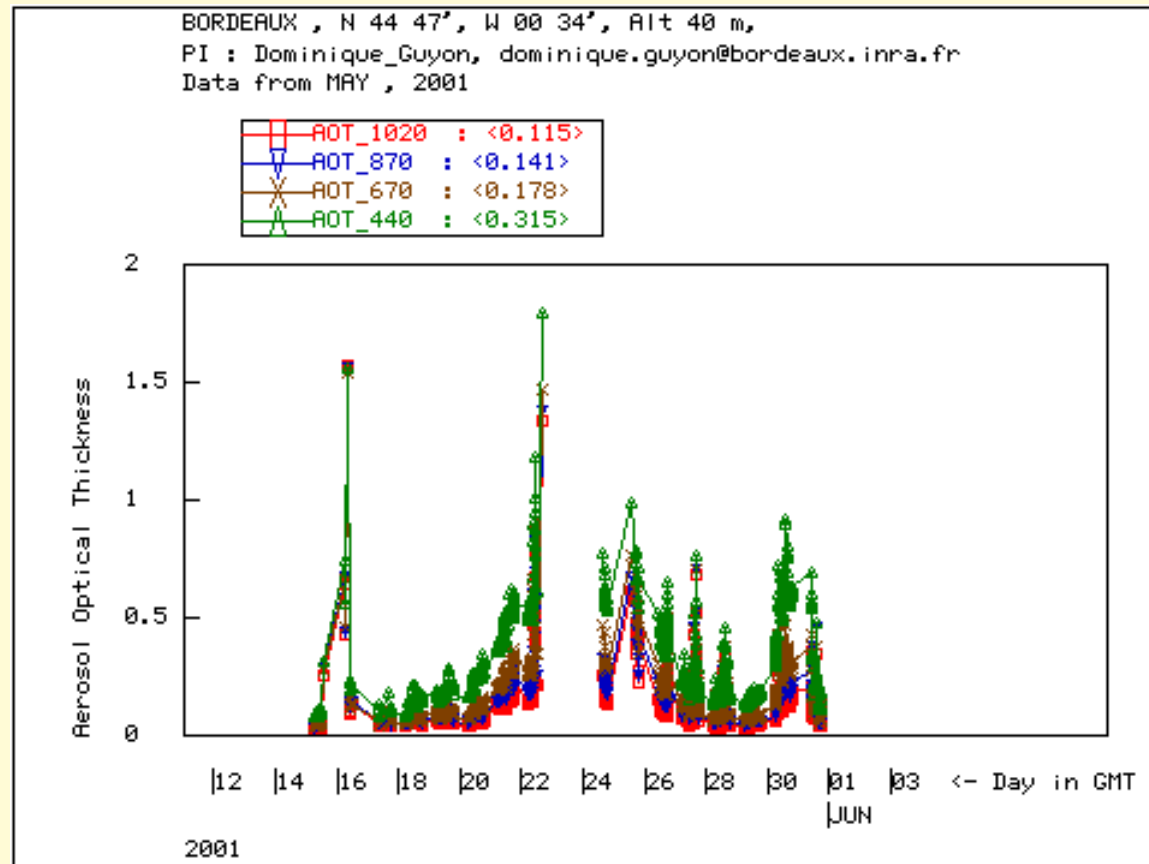
# Aeronet retrieval of AOT at Bordeaux

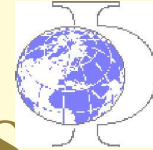




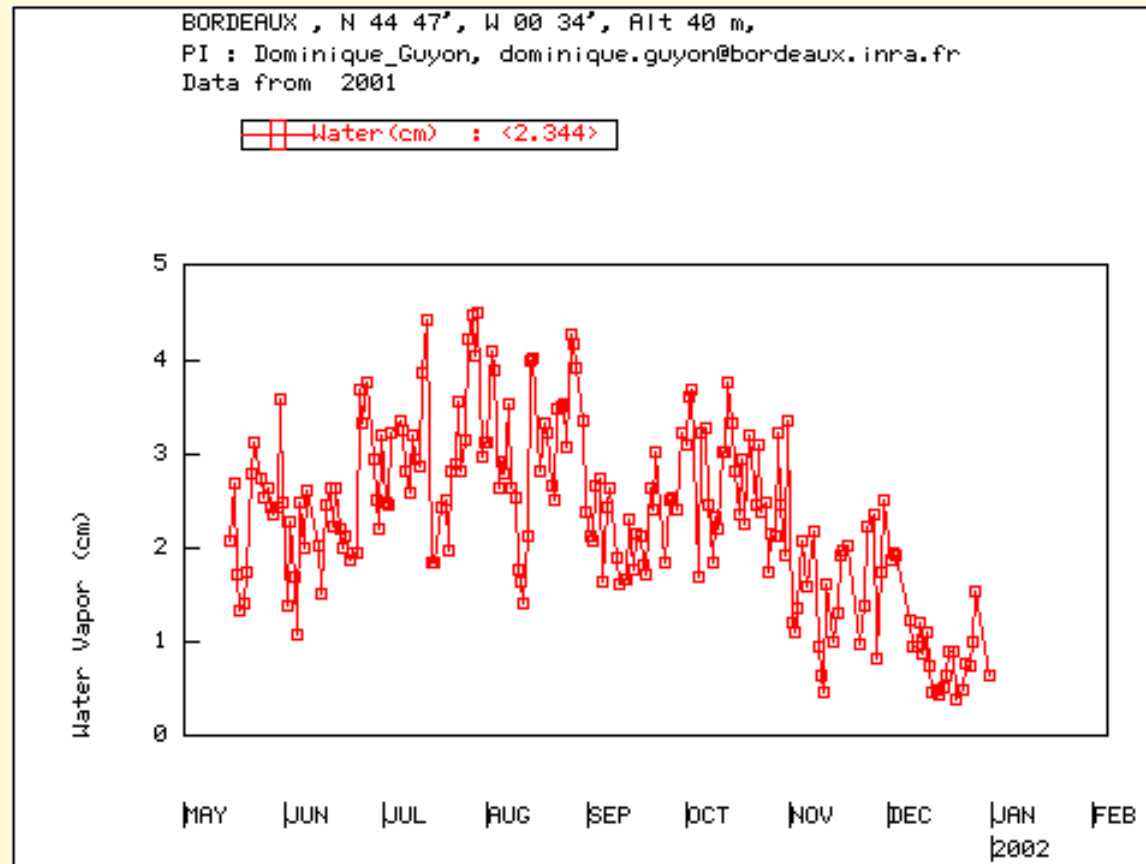


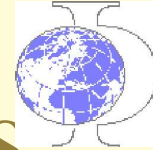
# Aeronet retrieval of AOT at Bordeaux



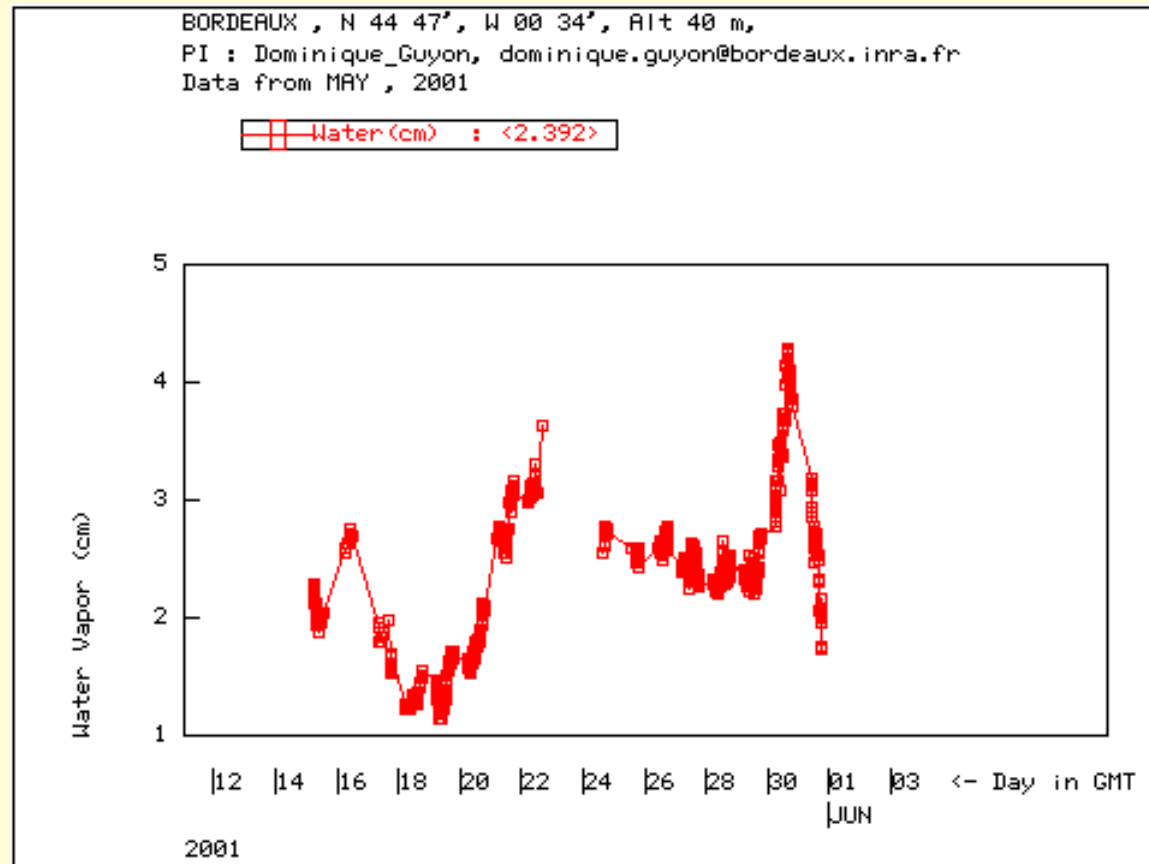


# Aeronet humidity measurements at Bordeaux





# Aeronet humidity measurements at Bordeaux

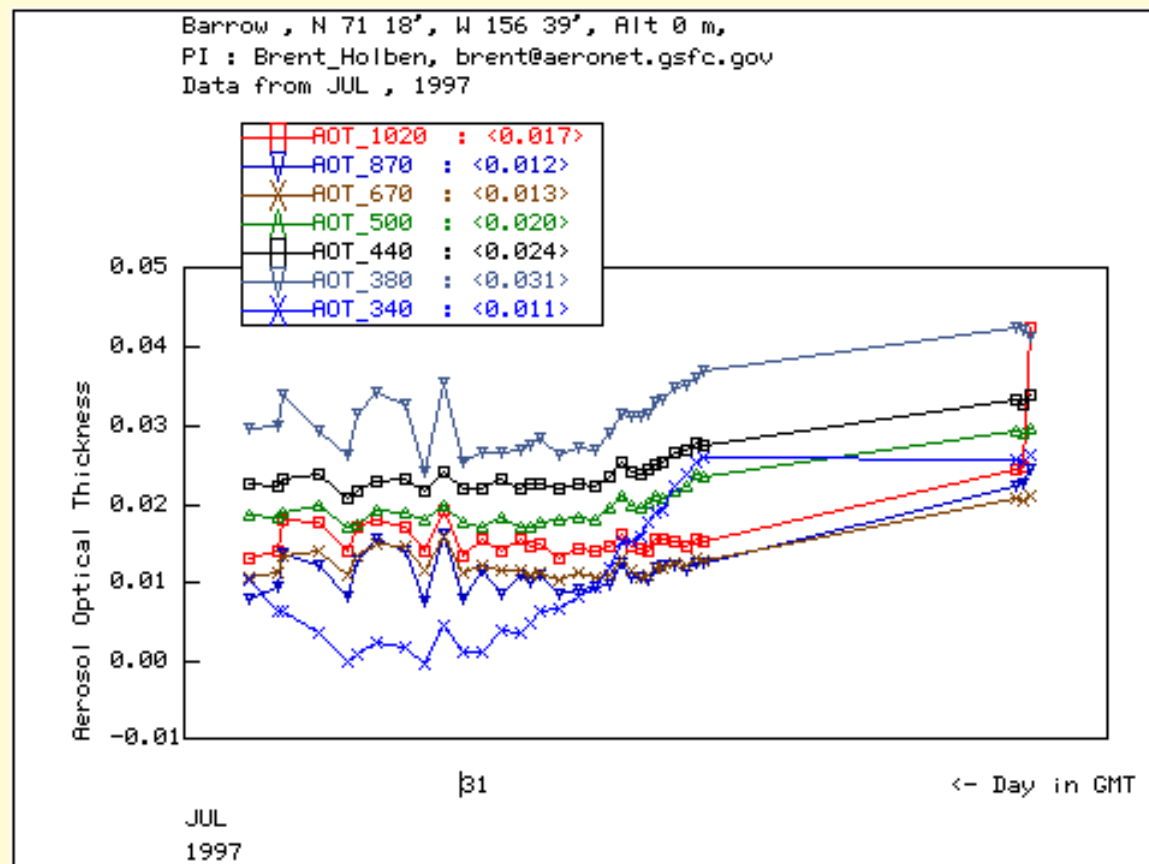




## Other data retrieved by Aeronet:

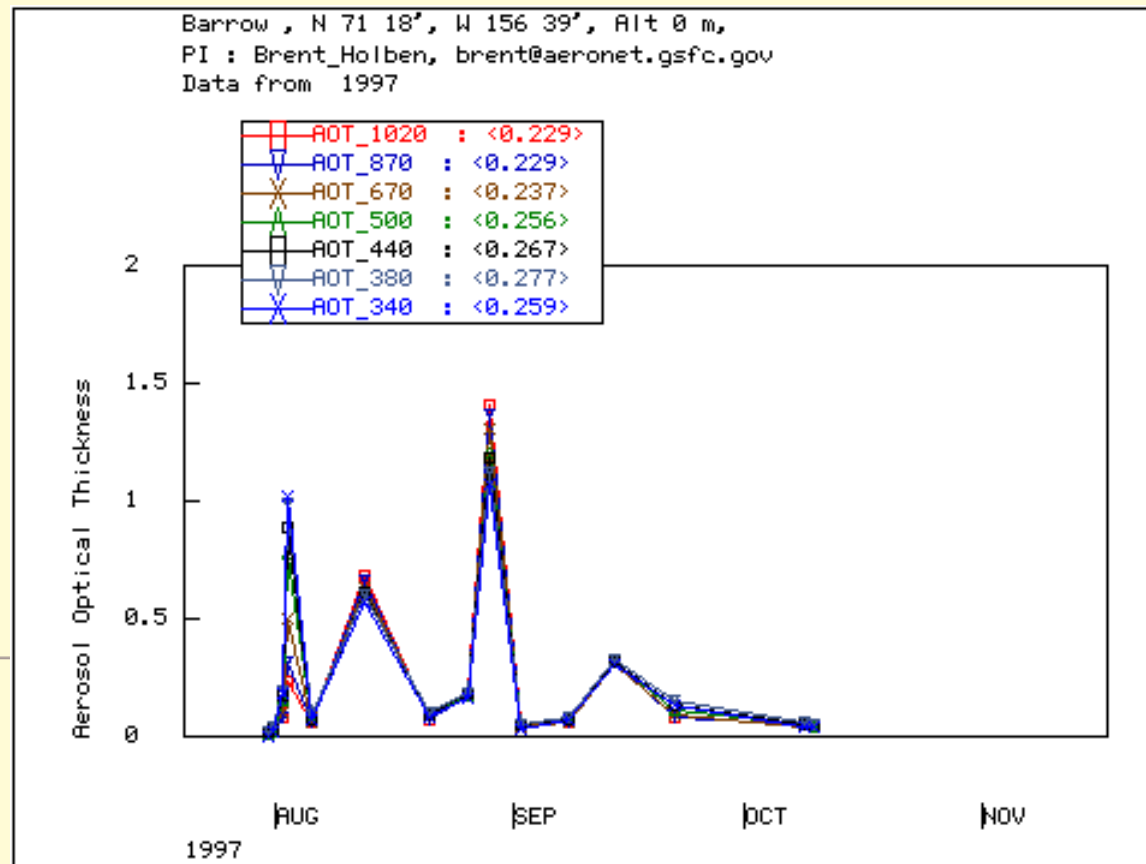
- Direct solar measurements
- Almuquantars
- Principal planes
- SKYRAD retrievals
- Polarization
- Dubovik retrievals

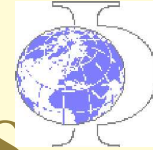
# Aeronet retrieval of AOT at Barrow





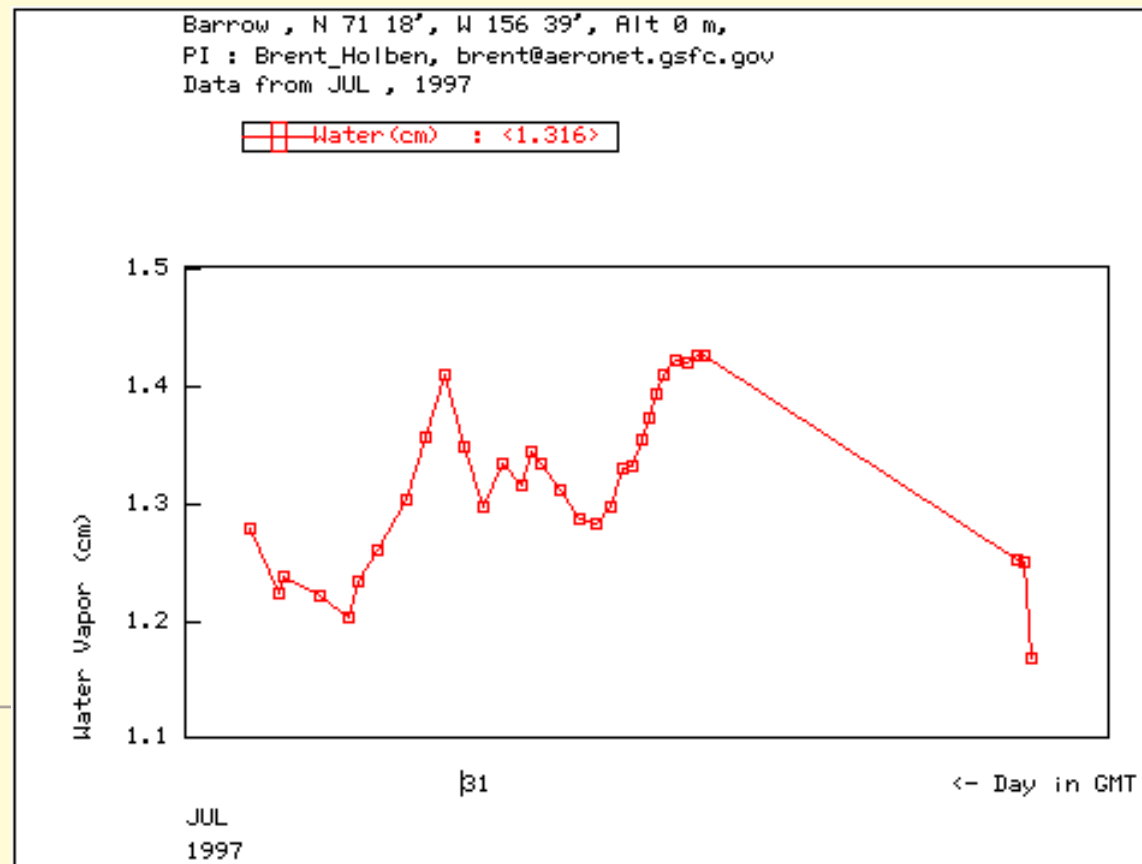
# Aeronet retrieval of AOT at Barrow



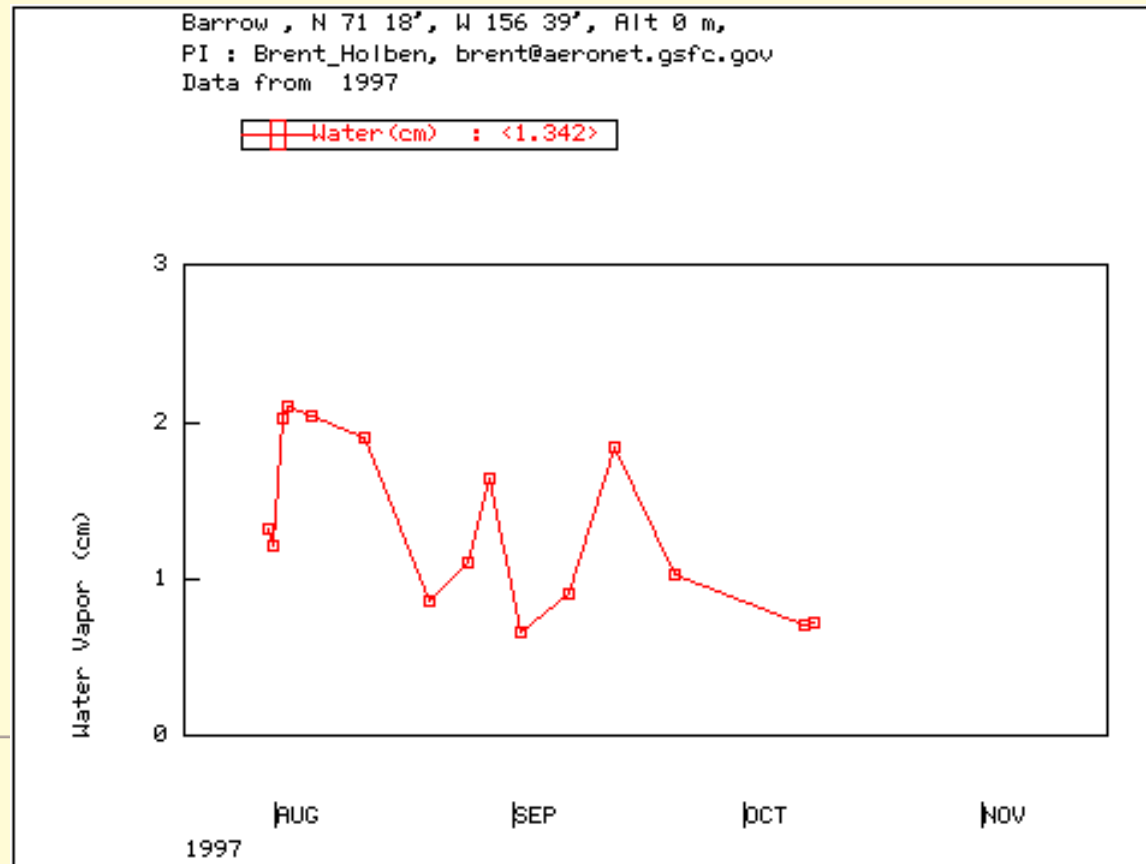
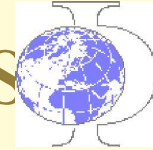


# Aeronet humidity measurements

## at Barrow



# Aeronet humidity measurements at Barrow







# Further Possibilities

- Use of iterative methods to determine composition of local aerosols corresponding to local AOTs measured using ground based sunphotometers (eg. Aeronet).
- Using temporal variation of AOTs to study aerosol lifecycles and/or corresponding cloud formation.
- Determining influence of aerosols on retrievals of trace gases in different wavelength ranges and with different viewing geometries.



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