



# Aerosol Characterization with a Calibrated CCD Sky Imager

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## 1. Motivation

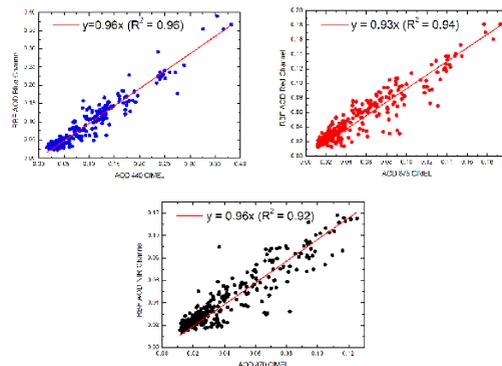
Derive aerosol optical depth (AOD) and particle size distribution in uniform aerosol layers through inversion of sky radiance observations to complement AOD derived from direct sun observations e.g. CSPHOT, MFRSR, NIMFR.

## 2. Approach

- Developed a Radial Basis Function neural network on Whole Sky Imager calibrated radiances in 3 channels (450, 650, 800nm) along the principal plane
- Input data: 1047 cloud-free images at SGP from 2001-10-01 to 2002-09-29
- Training and Evaluation data: two separate subsets of concurrent Cimel Sunphotometer (CSPHOT) AOD retrievals (440, 675, 870 nm) from AERONET

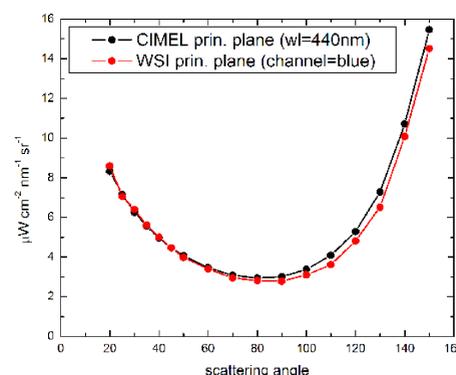
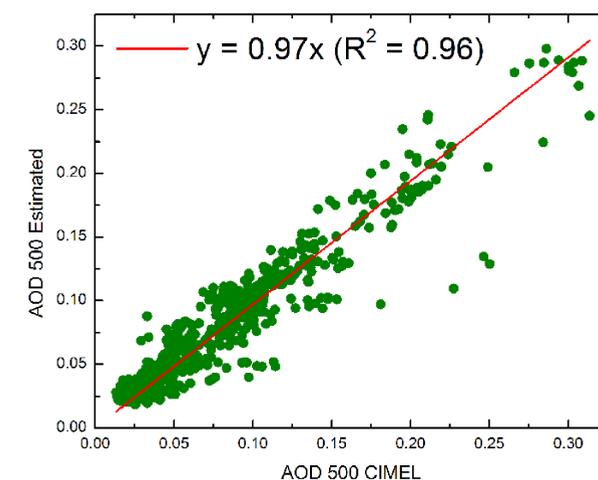
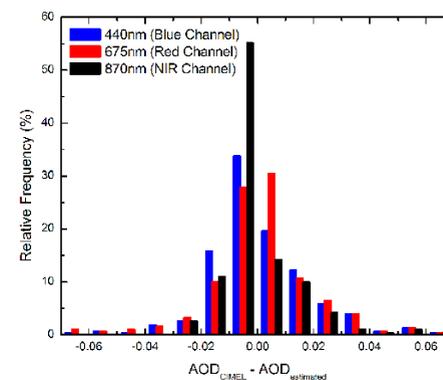
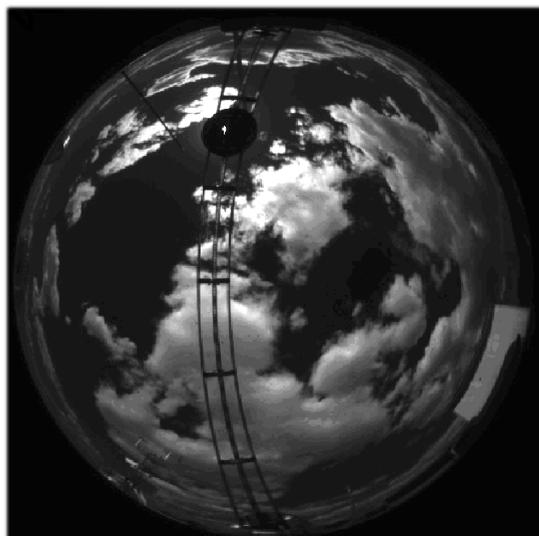
## 3. Optical properties

Neural network-based models estimate the AOD and the Ångström coefficients using the radiance extracted from the principal plane of sky images from the WSI (Cazorla et al., 2008)



## Summary

The 500 nm AOD interpolated using the Ångström coefficients derived from the neural network analysis of principal plane radiances of cloud-free WSI scenes correlates well with the AOD derived by AERONET from the collocated CSPHOT. Using a spheroid particle model similar to the retrievals used by AERONET, particle size distributions can be derived, and preliminary results also compare well with AERONET. This means that the WSI can be used to supplement the AERONET observations during the first 10 years of the ARM program.



The Ångström coefficients  $\alpha$  and  $\beta$  are derived and then used to estimate AOD at 500nm and correlated to the 500nm channel of the CSPHOT for validation.

**Reference:** A. Cazorla, J. E. Shields, M. E. Karr, A. Burden, F. J. Olmo, and L. Alados-Arboledas. 2008. Calibrated sky imager for aerosol optical properties determination. *Atmos. Chem. Phys. Discuss.*, **8**, 19989–20018, 2008  
<http://www.atmos-chem-phys-discuss.net/8/19989/2008/>