Retrievals of aerosol humidification factors by lidar during CHARMS

(Combined HSRL and Raman Measurement Study)

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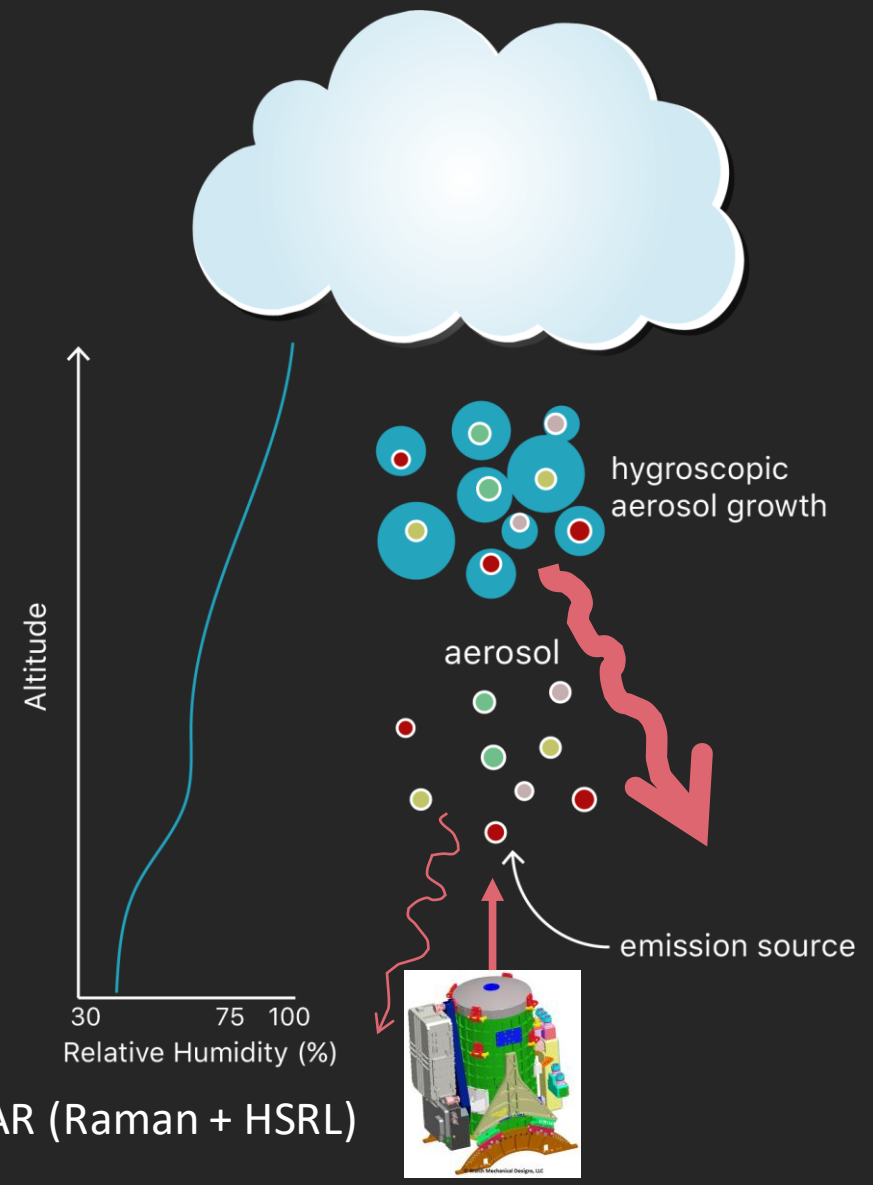
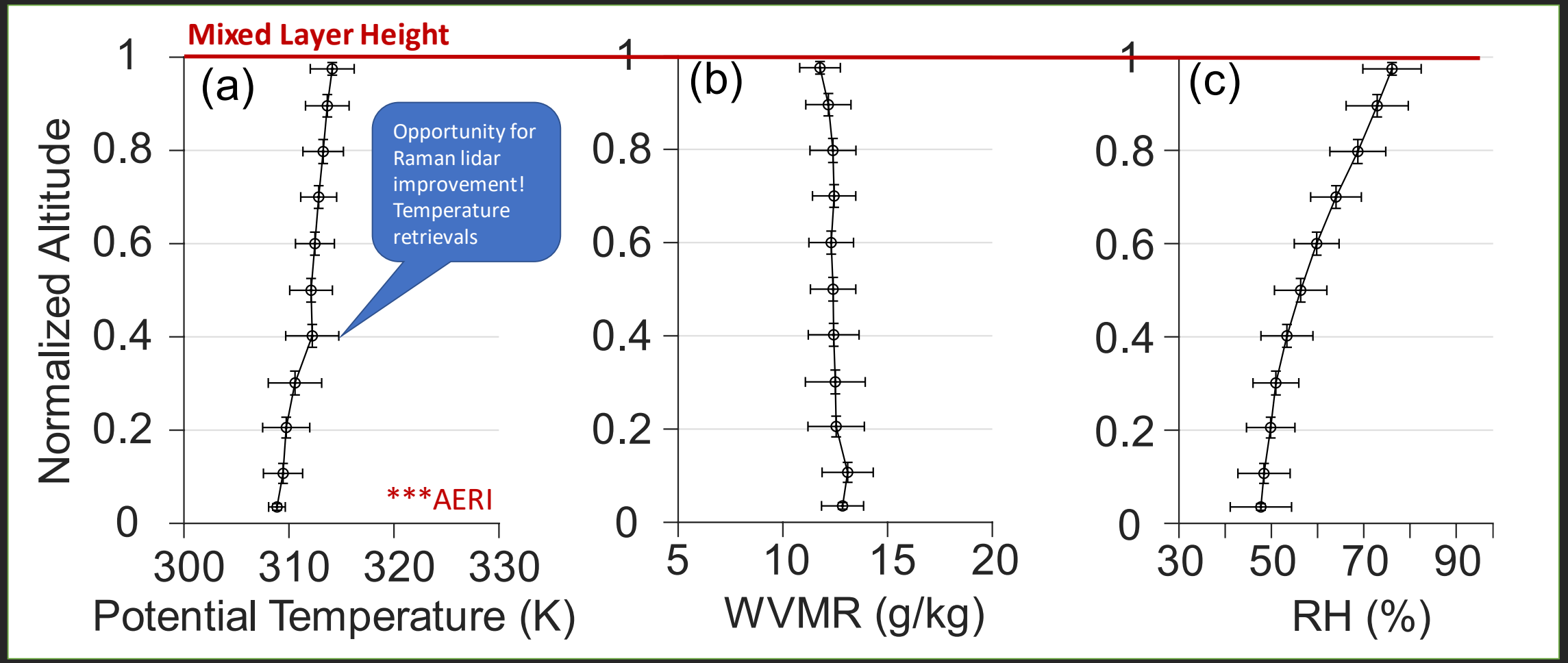
How can lidar *f*(RH) help us to better understand climate?

- Produce a data record of *f*(RH) at or near cloud base
- Model improved by more accurate hygroscopicity parameterizations
- Reduced uncertainty on indirect effect

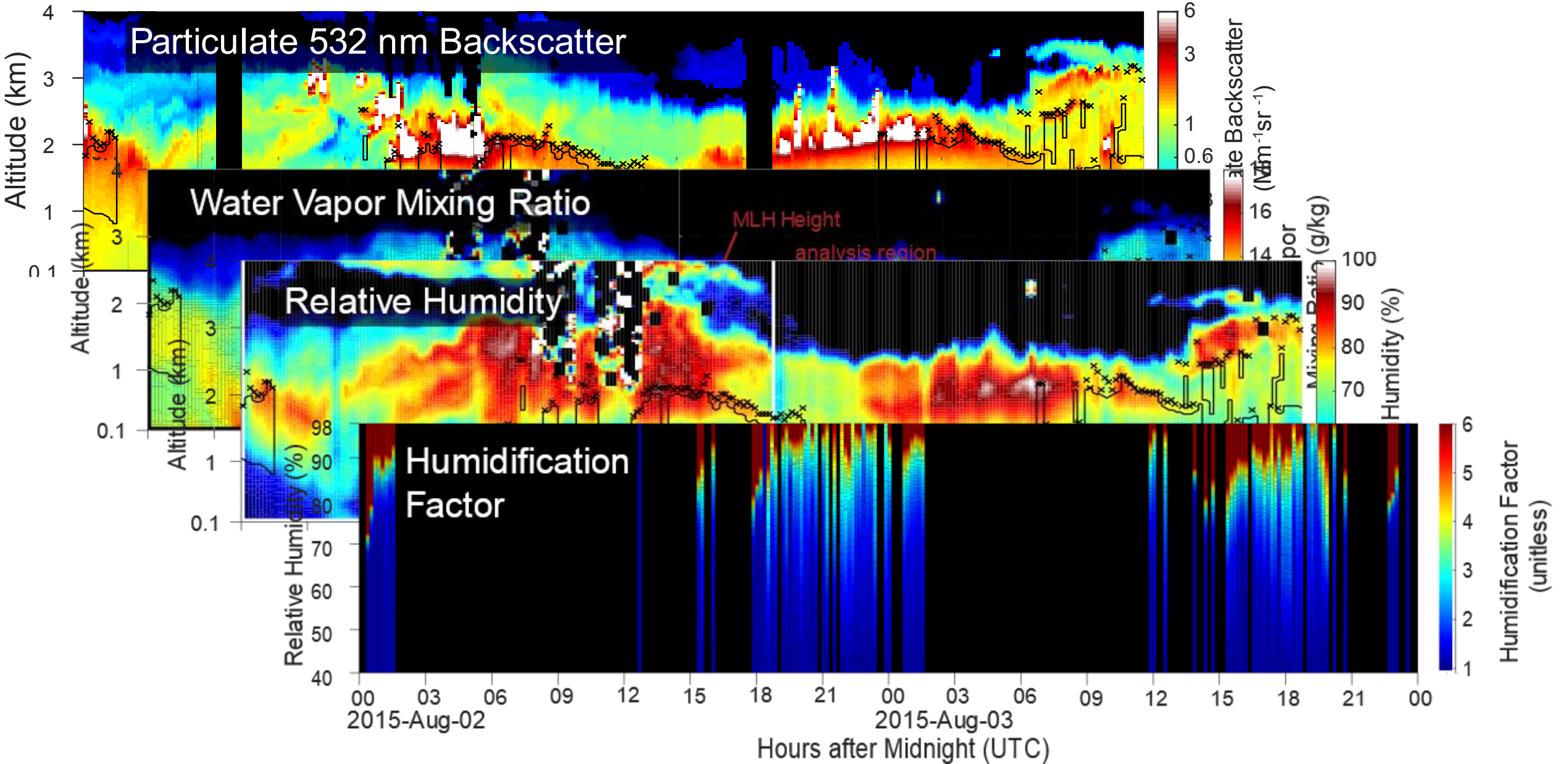


LIDAR (Raman + HSRL)

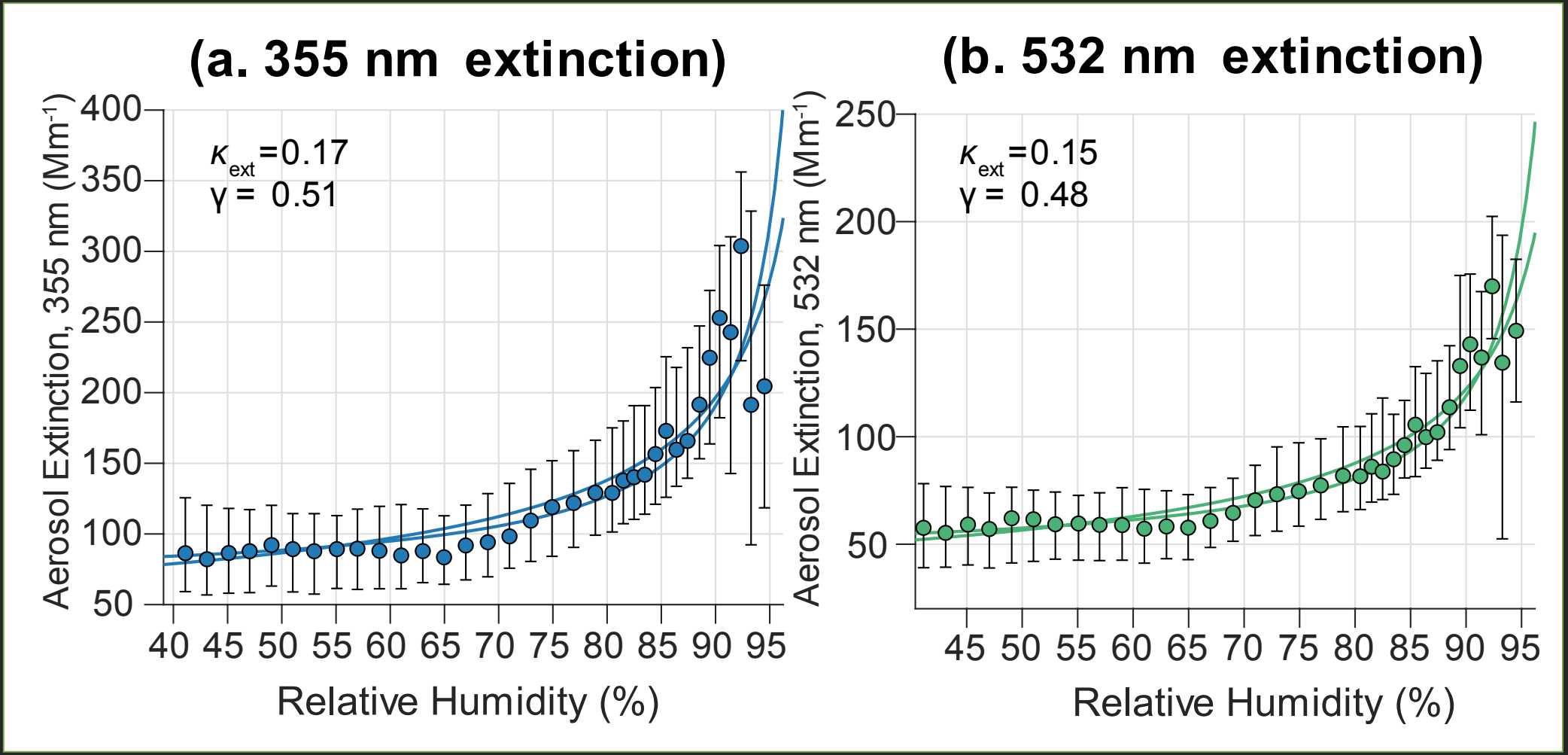
Raman water vapor channel adds essential meteorological information



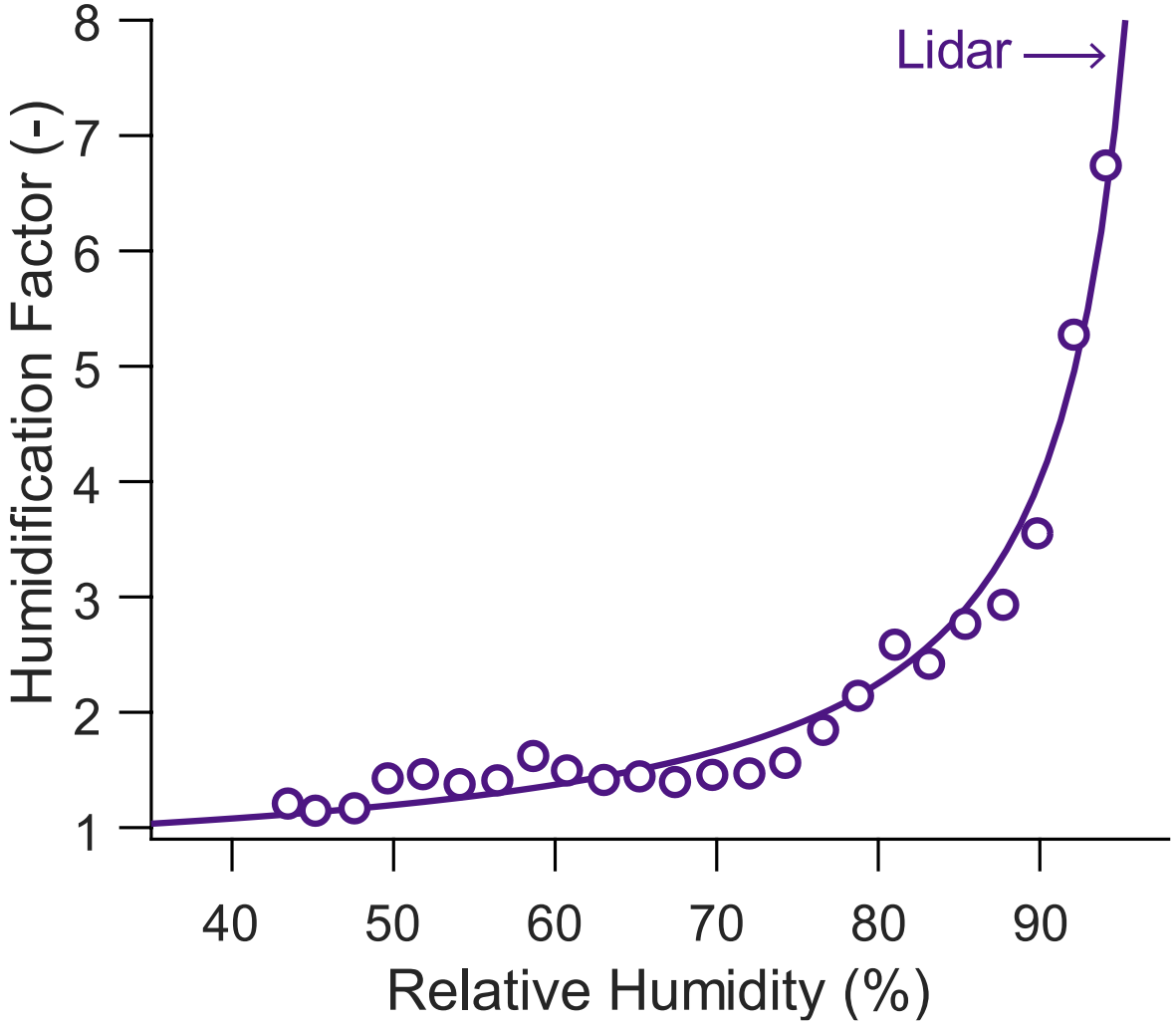
Time series of lidar-retrieved humidification factors could dramatically increase spatiotemporal coverage



Combining with Raman and HSRL extinction gives desirable humidification factor retrieval



How do lidar results compare to the ground?



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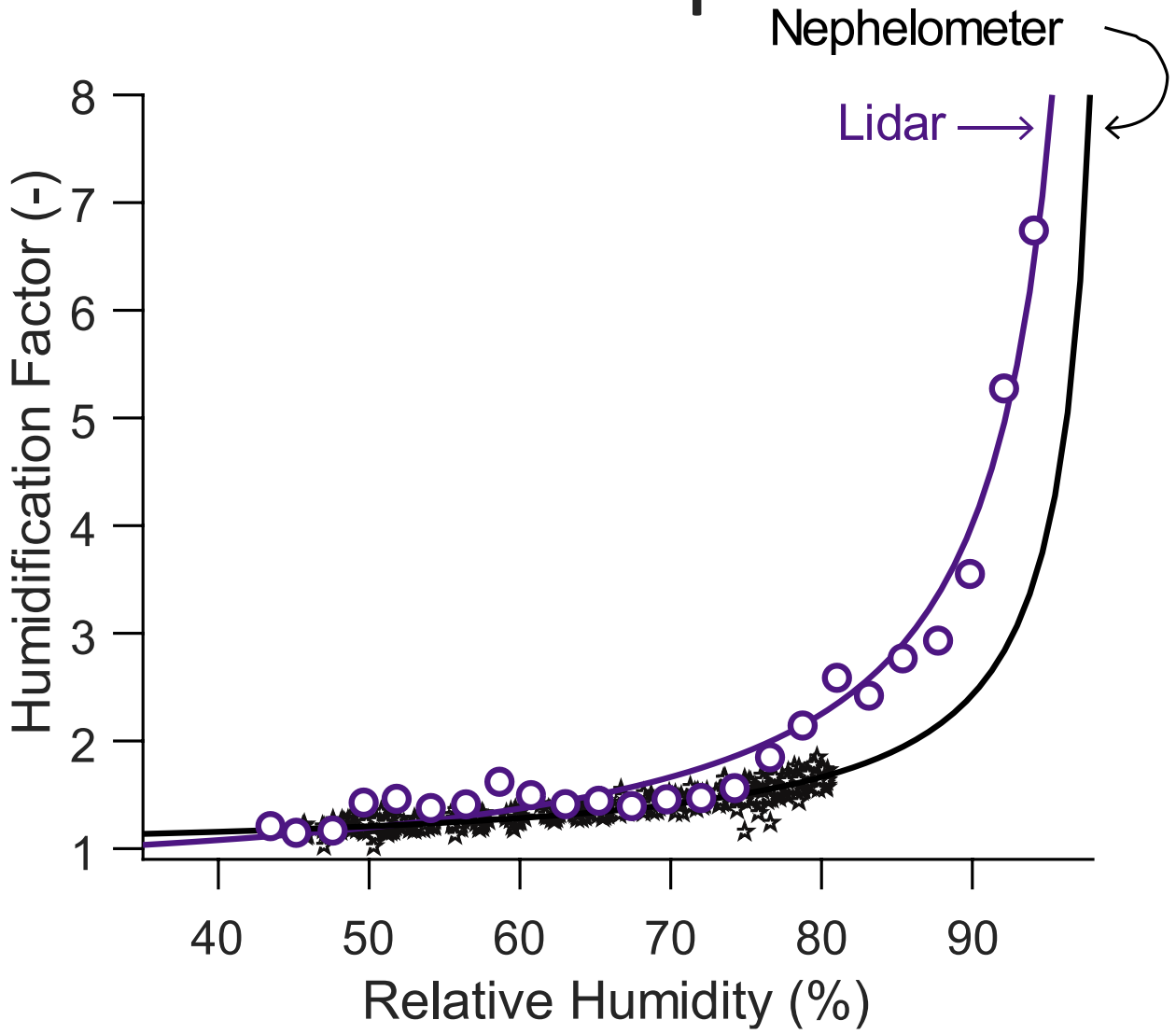

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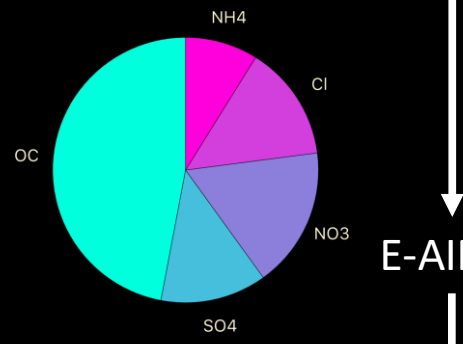
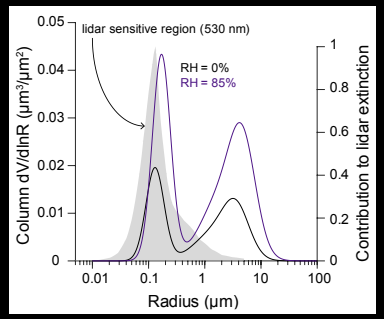
Model Approach:

ACSM Chemistry

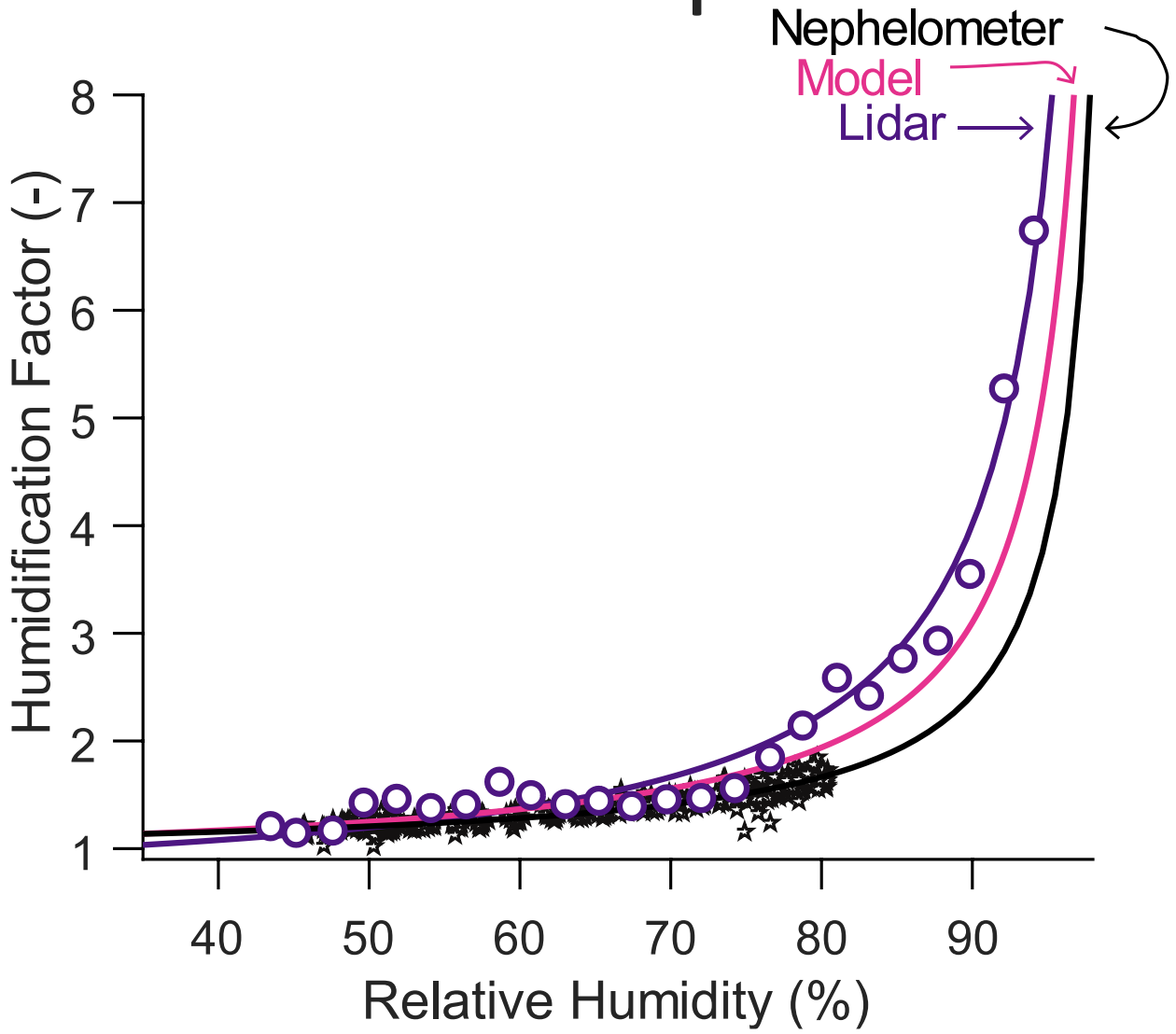


E-AIM

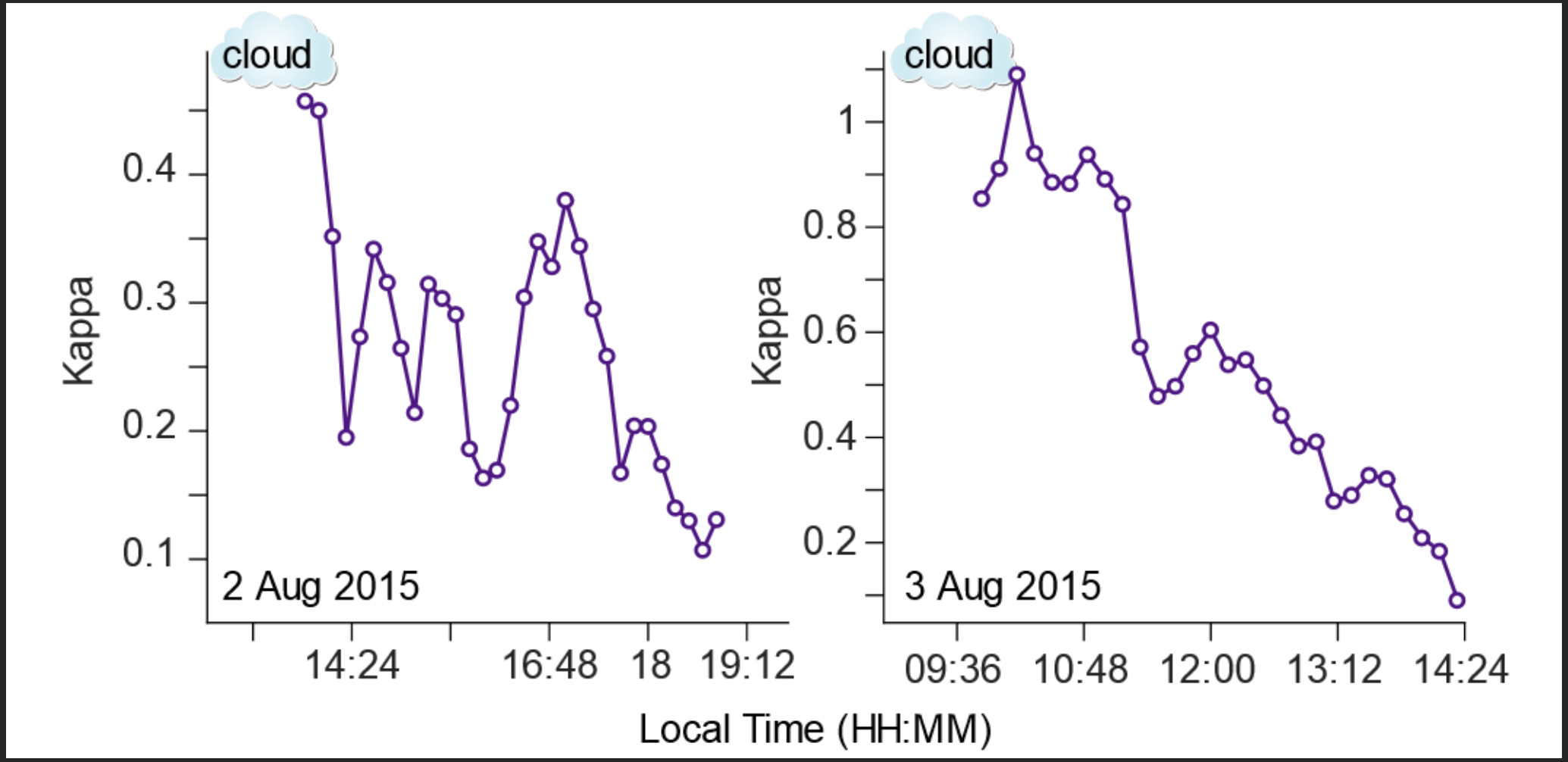
AERONET column PSD



Estimated *f*(RH)



Time series of fit parameters makes sense with cloud humidity halo observations (Rauber et al., 2013)



Take Home Messages

1. Lidar can retrieve aerosol humidification factors *f*(RH)

2. These *f*(RH) are retrieved near cloud base or at the top of the mixed layer where it is important for aerosol-cloud interactions
   *** note 3beta + 2alpha → volume concentrations → kappa as in Petters and Kreidenweis, 2007 ***

3. Lidar *f*(RH) aloft > *f*(RH) from surface nephelometer measurements (i.e. surface PSDs and surface chemistry; reiterating take home message #1). Don't forget about cloud proximity and ACI!

4. Surface chemical composition combined with ambient column PSD retrievals compares better to lidar retrievals (reiterating take home message #1 and #2)

5. CHARMS 2.0???

For more, see poster:

Dawson	Kyle	Lidar-Retrieved Aerosol Humidification Factors at SGP Derived from CHARMS	Results from recent ARM field campaigns	B1	Wed 3:30 - 5:00 pm

Acknowledgements

- Ed Eloranta for his HSRL
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Questions?

For more, see poster:

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