Pervasive long-range of aerosols at Jeju observed with PASS-3: Reduced SSA at 405nm by organics

B. Flowers, M. Dubey, E. Stone, J. Schauer, C. Mazzoleni, V. Ramanathan, G. Carmichael, M. V. Ramana, S. Kim and S. C. Yoon

CAPMEX, August 1 to Sept 30 2008

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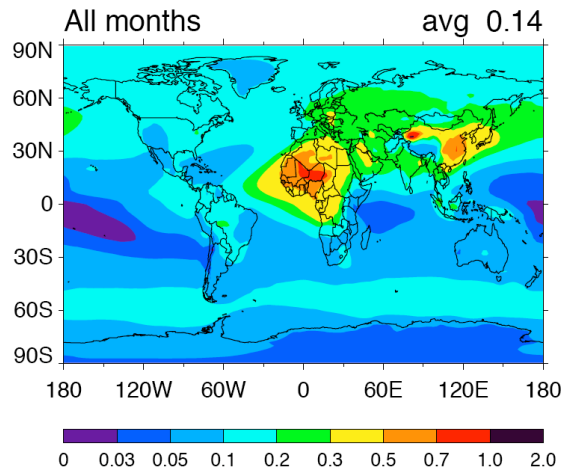
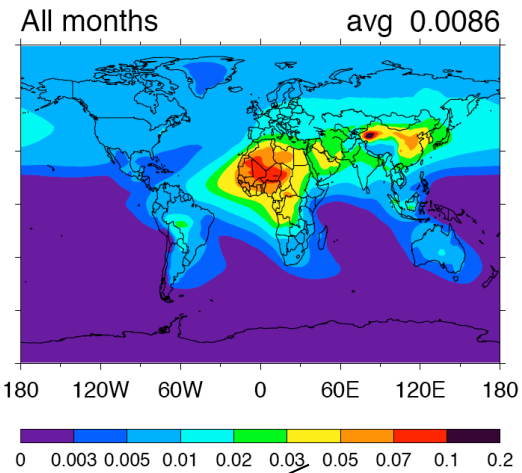
Earth & Environmental Sciences

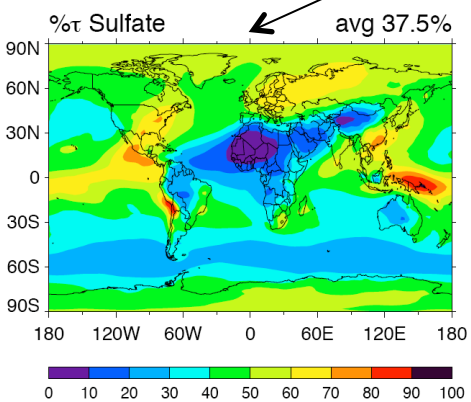
Aerosol Pollution: Radiative Effects

$\tau(550)$
2000–2007

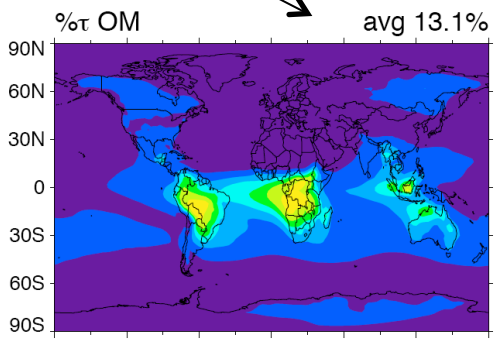




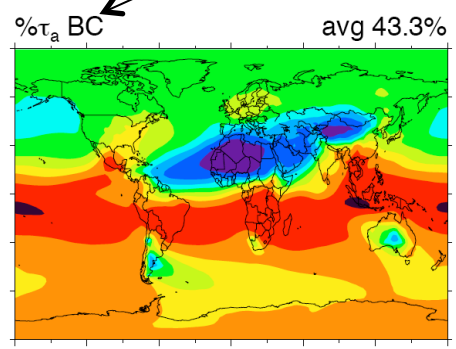
$\tau_a(550)$
2000–2007



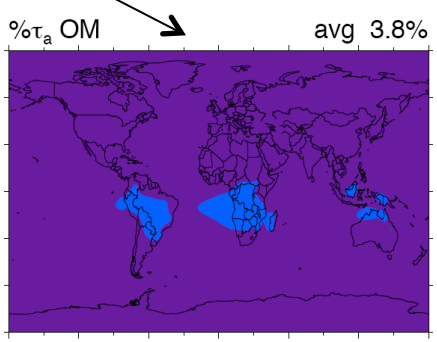
38% SO_4



13% OM



43% BC



4 % OM

Light absorption by pollution, dust, and biomass burning aerosols: a global model study and evaluation with AERONET measurements

Mian Chin[1], T. Diehl[1,2], O. Dubovik[3], T. F. Eck[1,2], B. N. Holben[1], A. Sinyuk[1,4], and D. G. Streets[5]

Ann. Geophys., 27, 3439–3464, 2009

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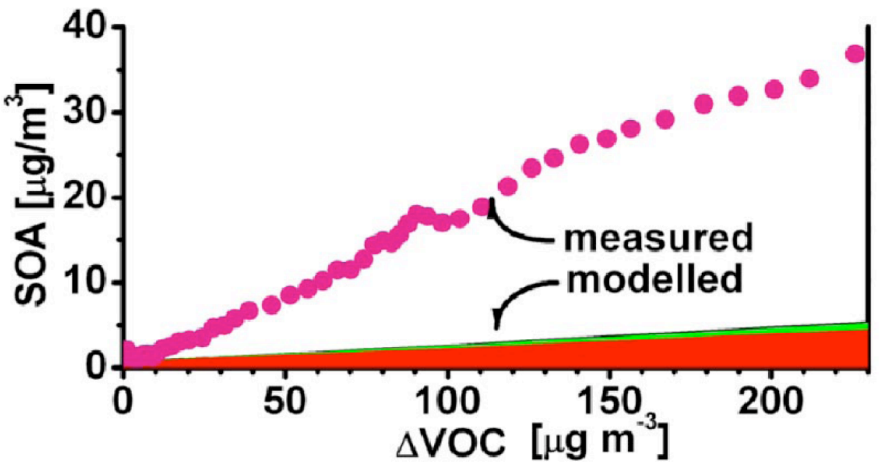
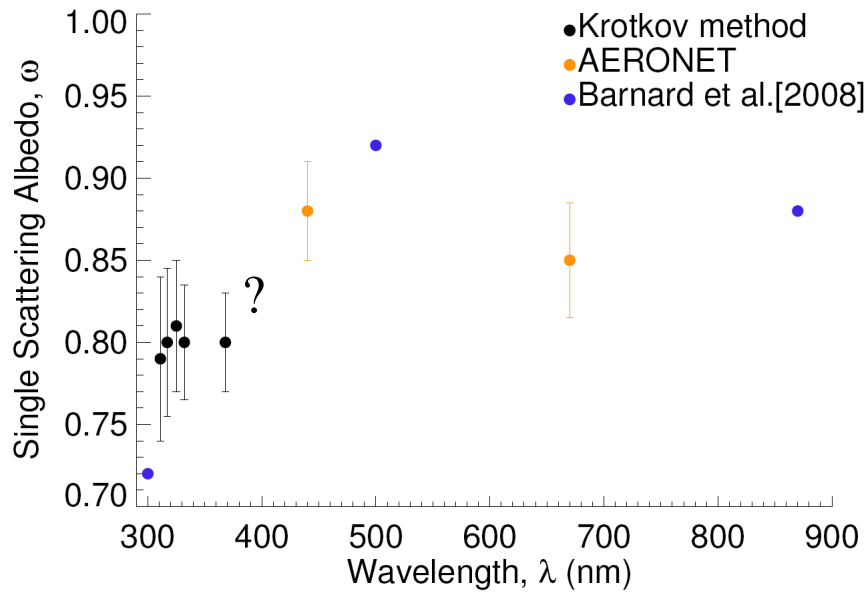
Measurements vs Models: Missing Mechanisms?

SOA formation



Modified from Volkamer et al., GRL, 2006

Enhanced UV Absorption



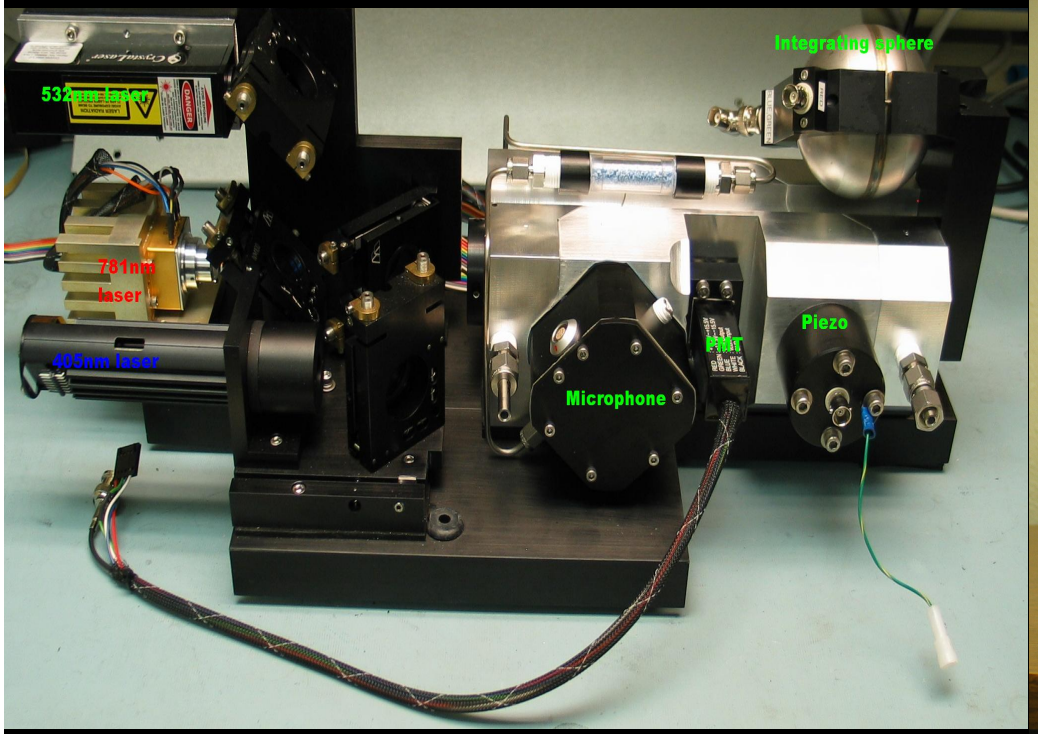
Mexico City

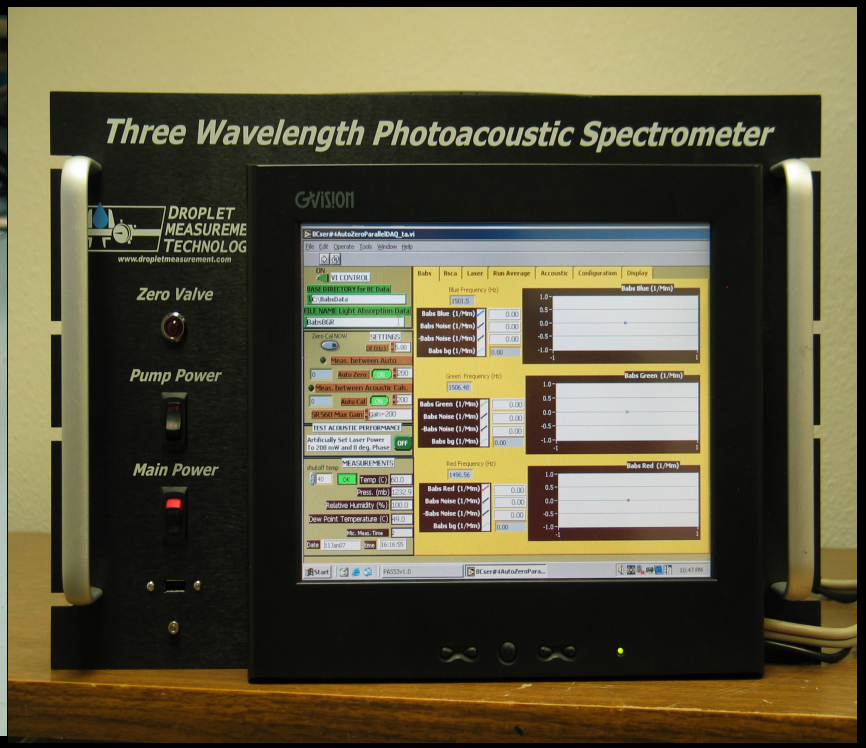
This should increase their role in climate forcing: How much?

Los Alamos DMT 3-Laser Photoacoustic Absorption and Scattering 405, 532, 781nm

Single scattering albedo ω = scattering/(absorption + scattering)

Filter-free direct measurements of abs, scat, ω of dry aerosols





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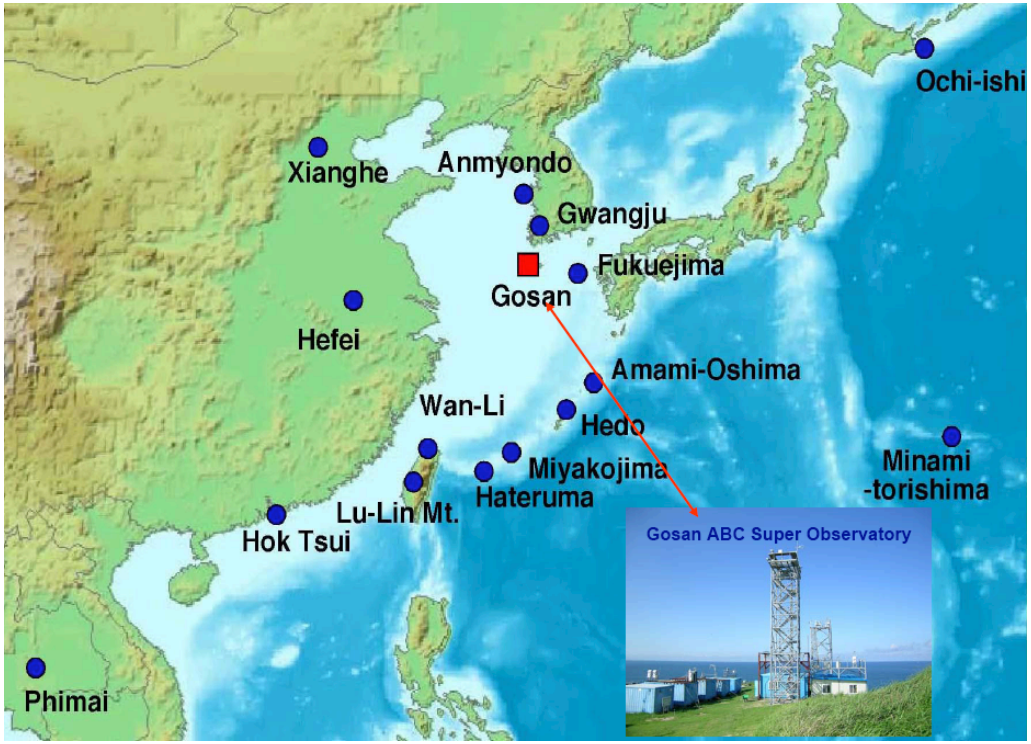
Long range Asian pollution: Jeju S. Korea

CAPMEX, Gosan, Jeju Island S. Korea

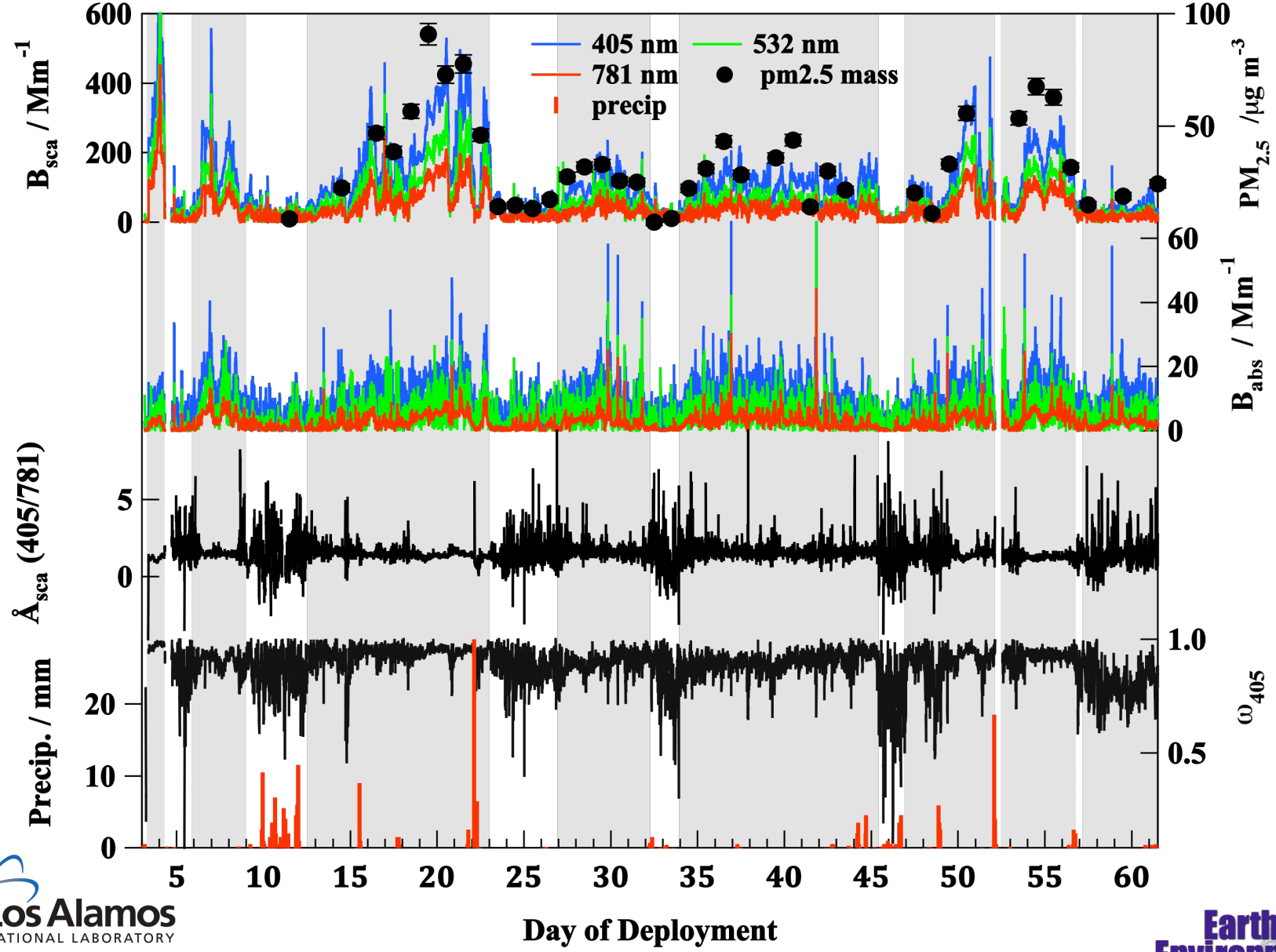


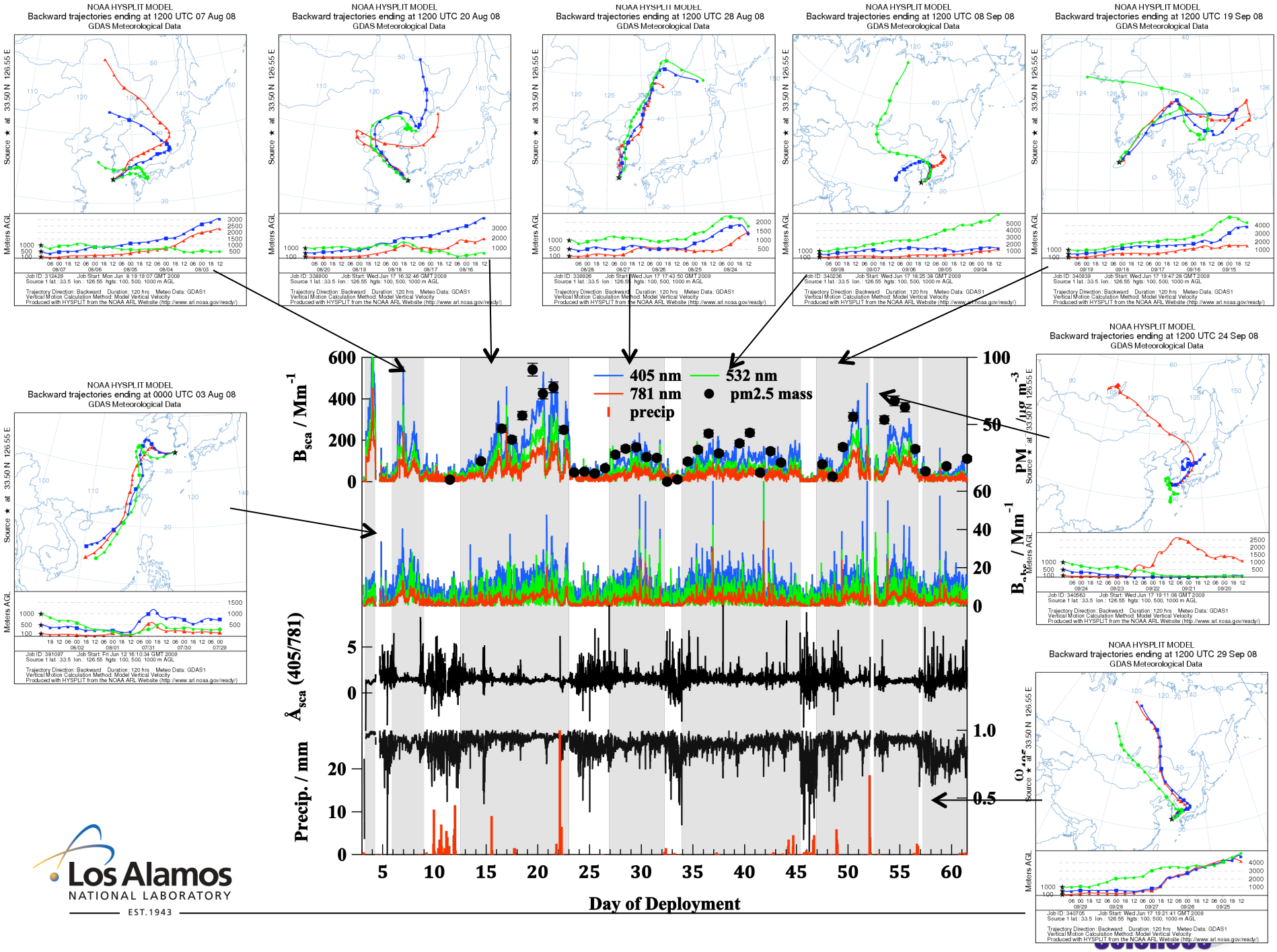
PASS-3 *in situ* optical observations

Filter collection and laboratory analysis of aerosol mass and chemical composition

STEM chemical transport modeling and back-trajectory analysis

74% of time Jeju experiences long range pollution





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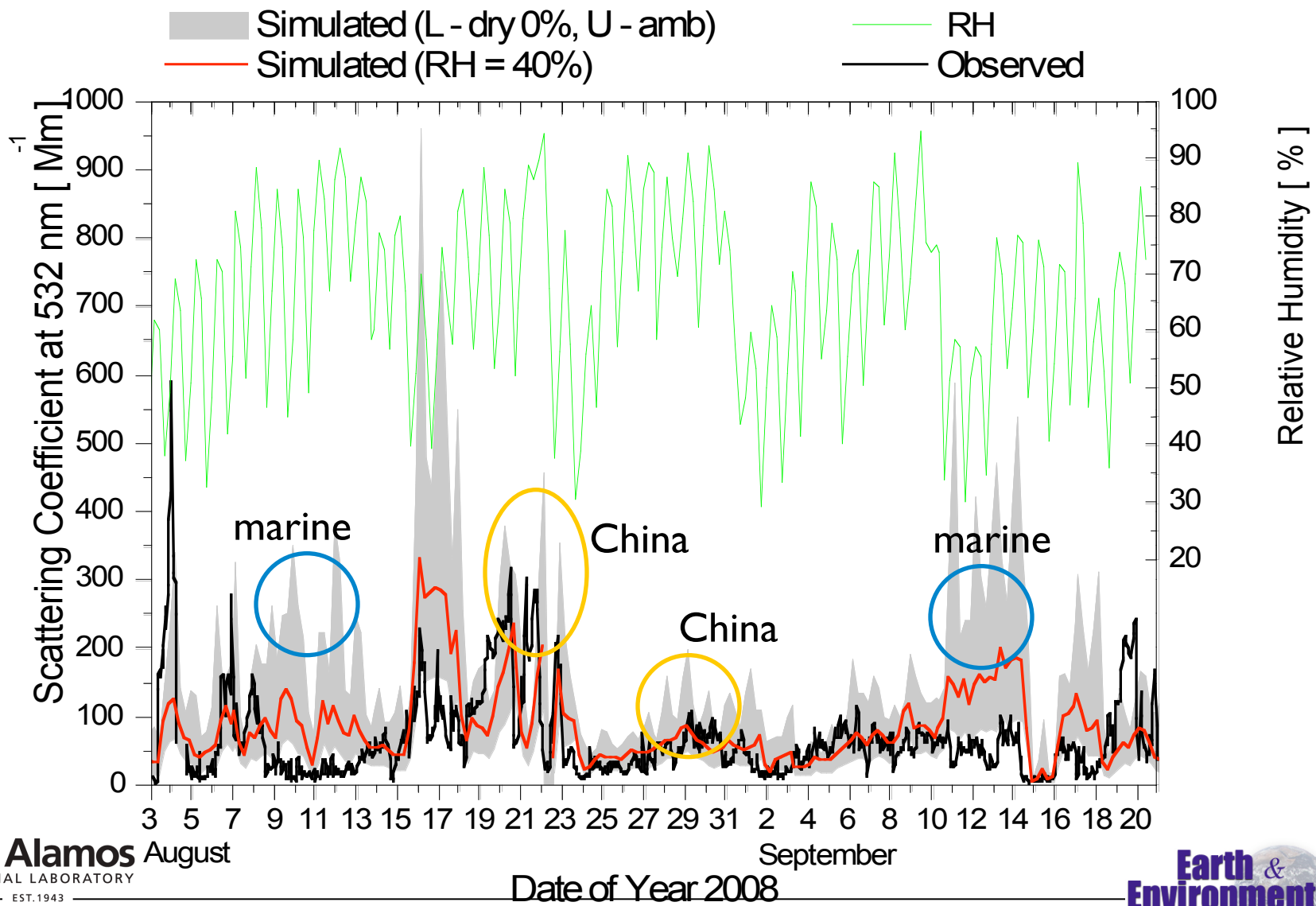
STEM model of Scattering (532) measured from ground at Cheju



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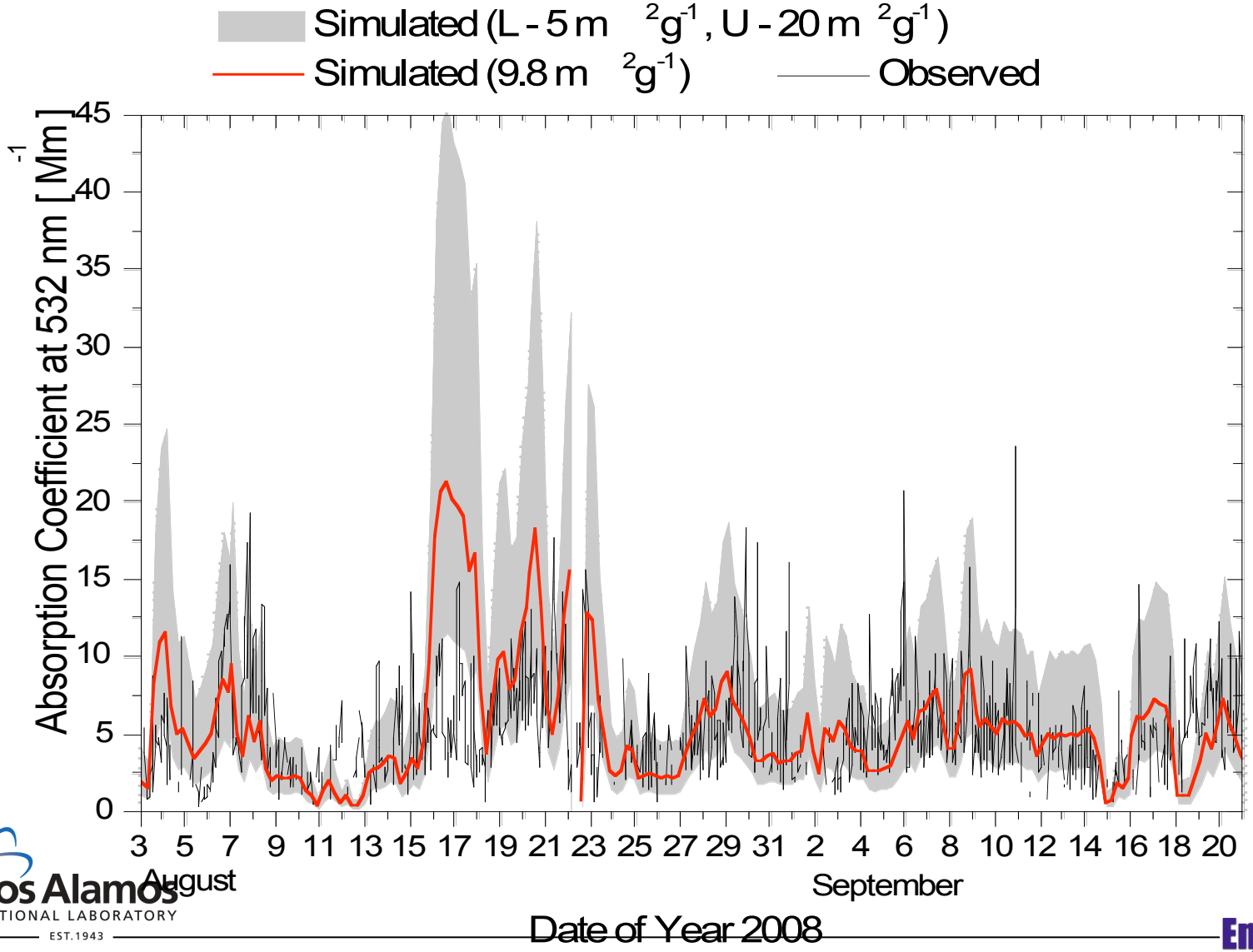
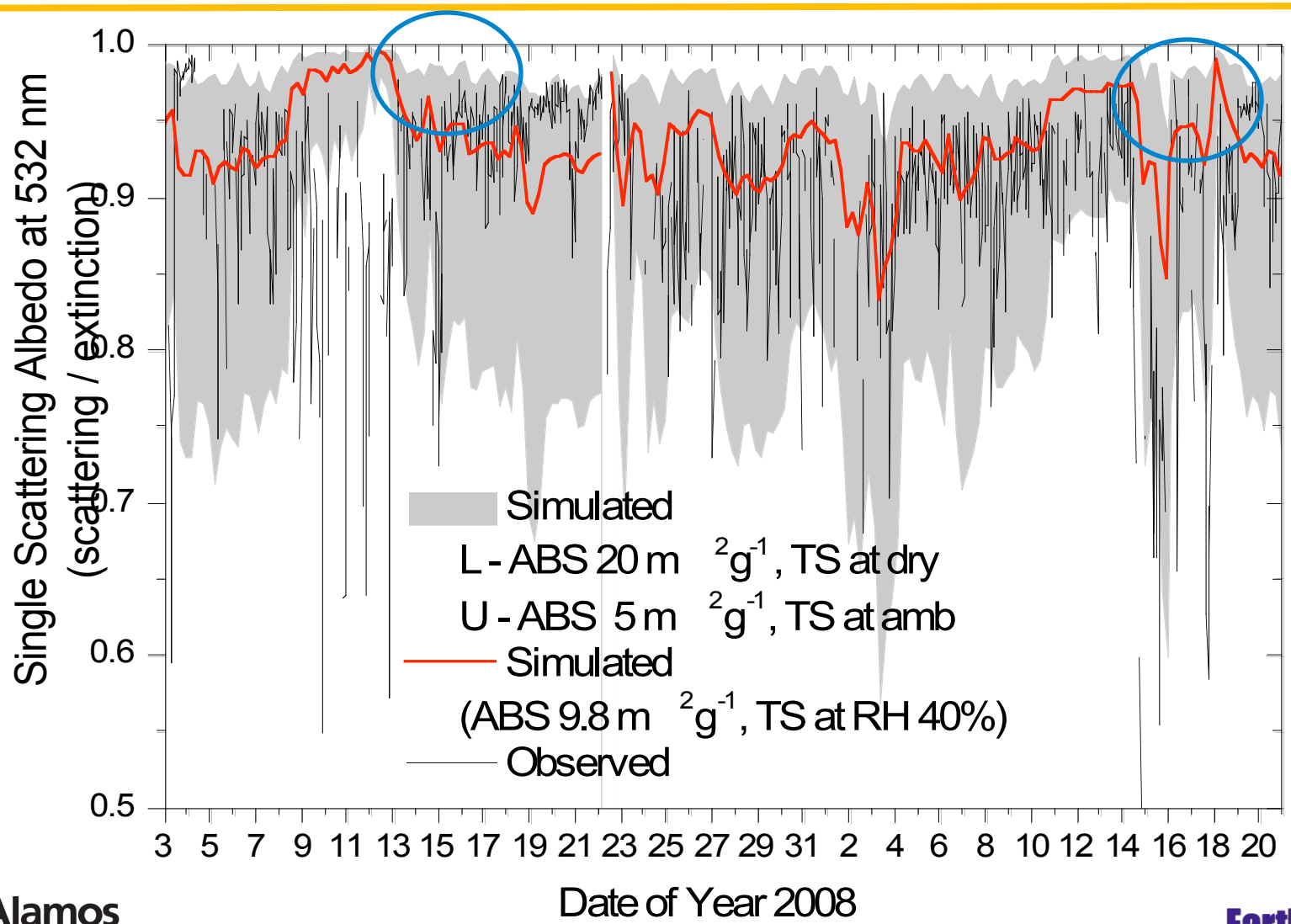
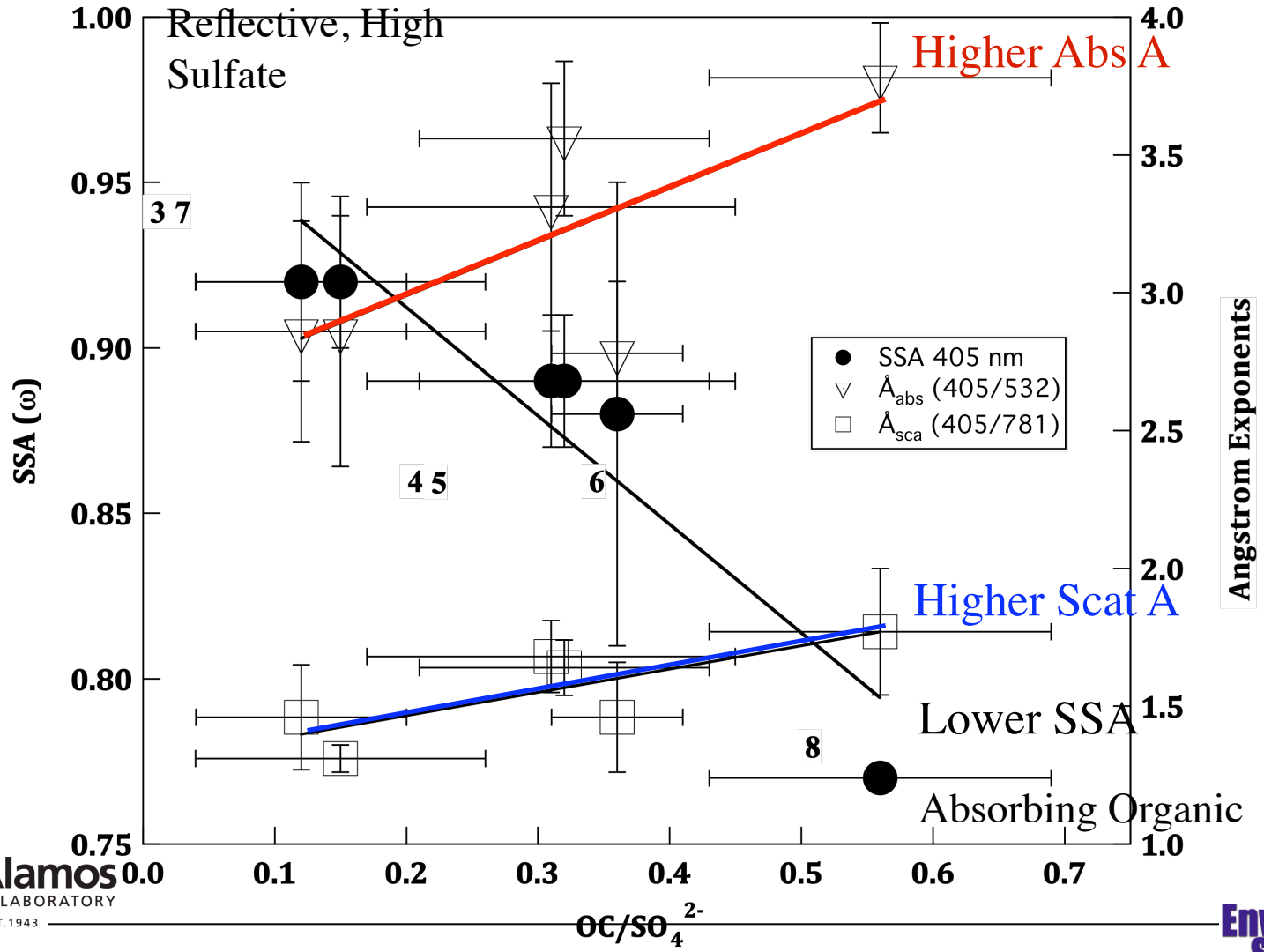
STEM model of Absorption (532) measured from ground at Cheju



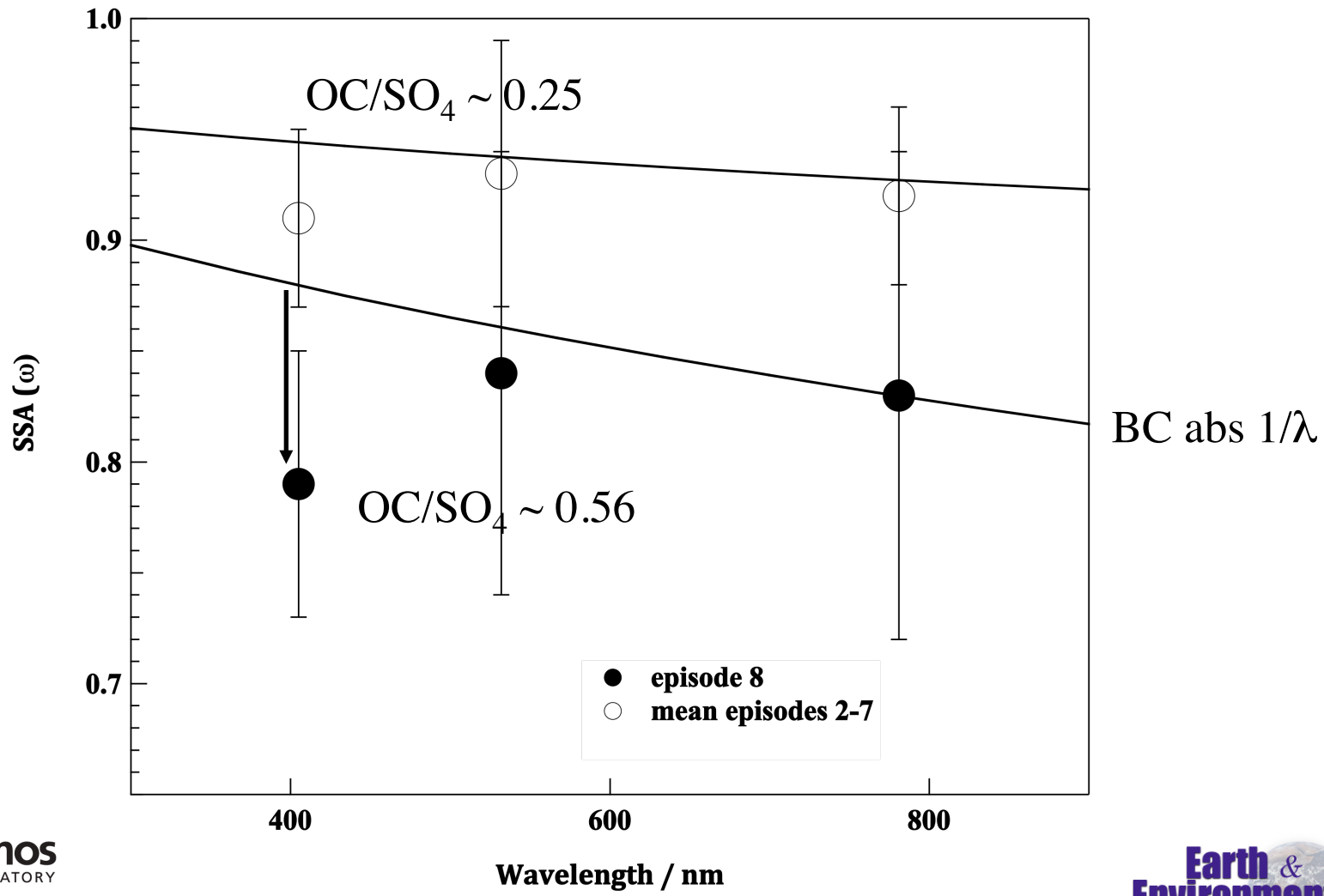
STEM model of SSA measured from ground at Cheju



Optical (405 nm) - Chemical Composition (BC-OC-SO4)



Reduced SSA (relative to BC) at 405 nm



Conclusions

- Pervasive long range pollution (74%) at Jeju in Aug/Sept
- STEM models can reproduce the observed absorption, scattering, SSA
- In situ evidence of reduced SSA at 405 nm (relative to BC) is attributed to high OC/SO_4 fraction