Changes in Absorbing Aerosol Properties during Transport in the Southeast Atlantic

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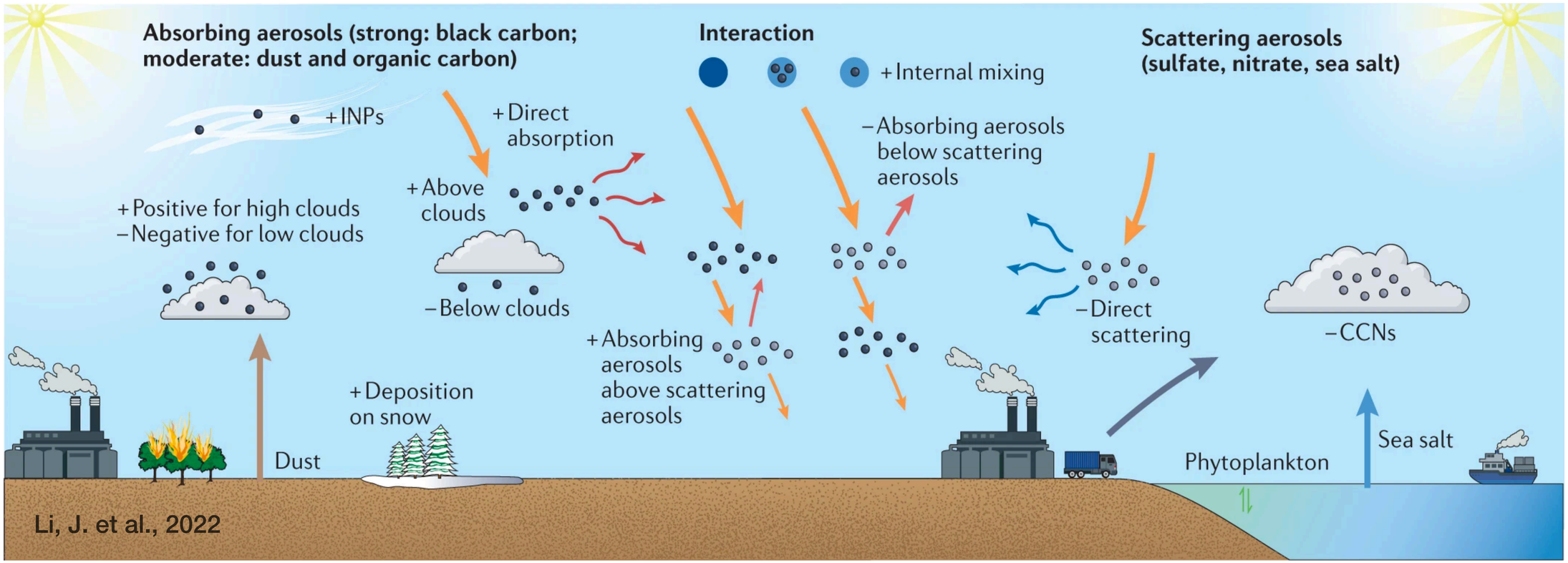
CLouds · CLimatE · Aerosols · Radiation

Background to Study

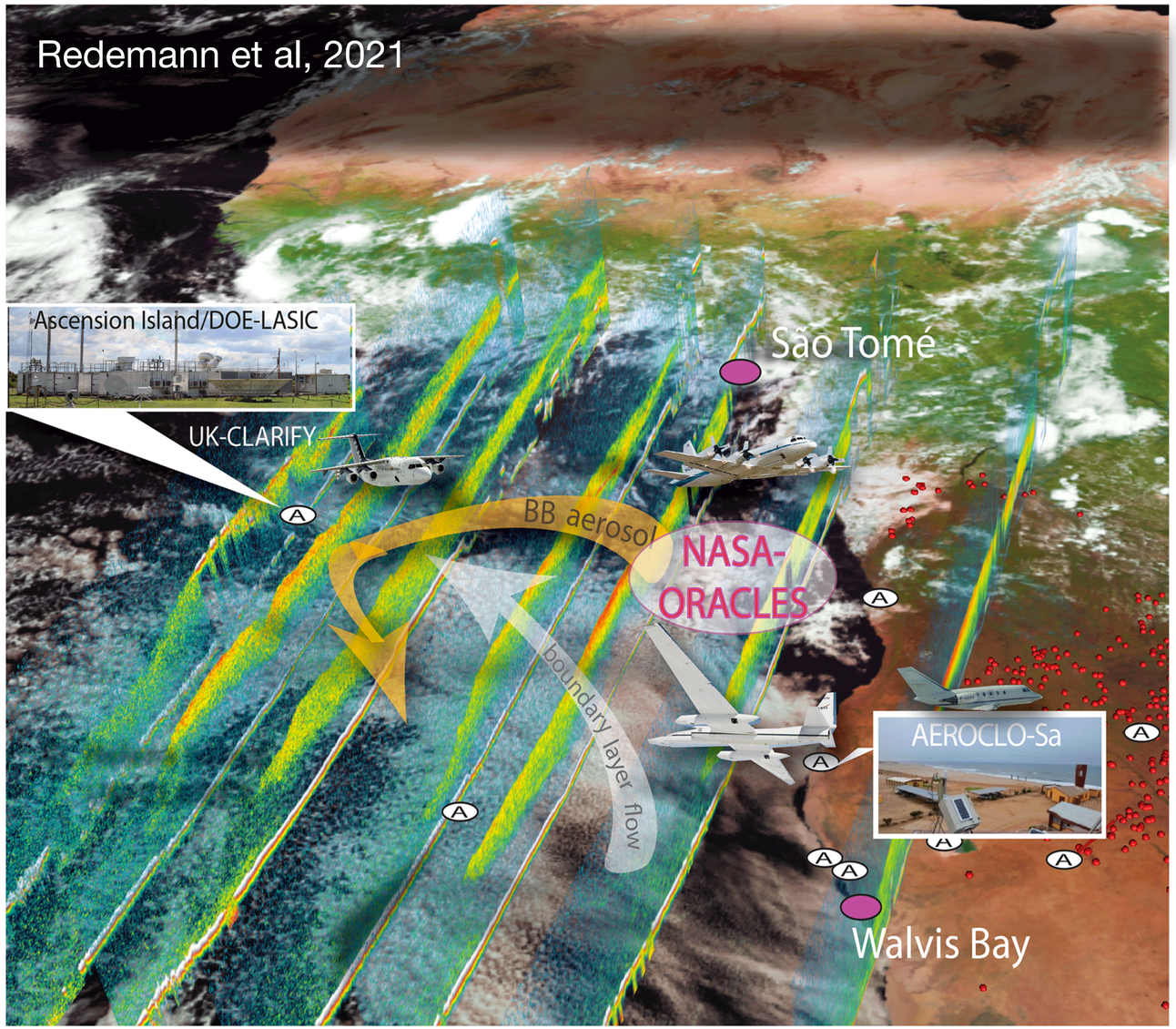
- **Biomass burning** is a large source of absorbing aerosols globally and accounts for about 40% of **black carbon** in the atmosphere.

- The **Southern African** region contributes approximately 35% of Earth's biomass burning aerosol (BBA) emissions.



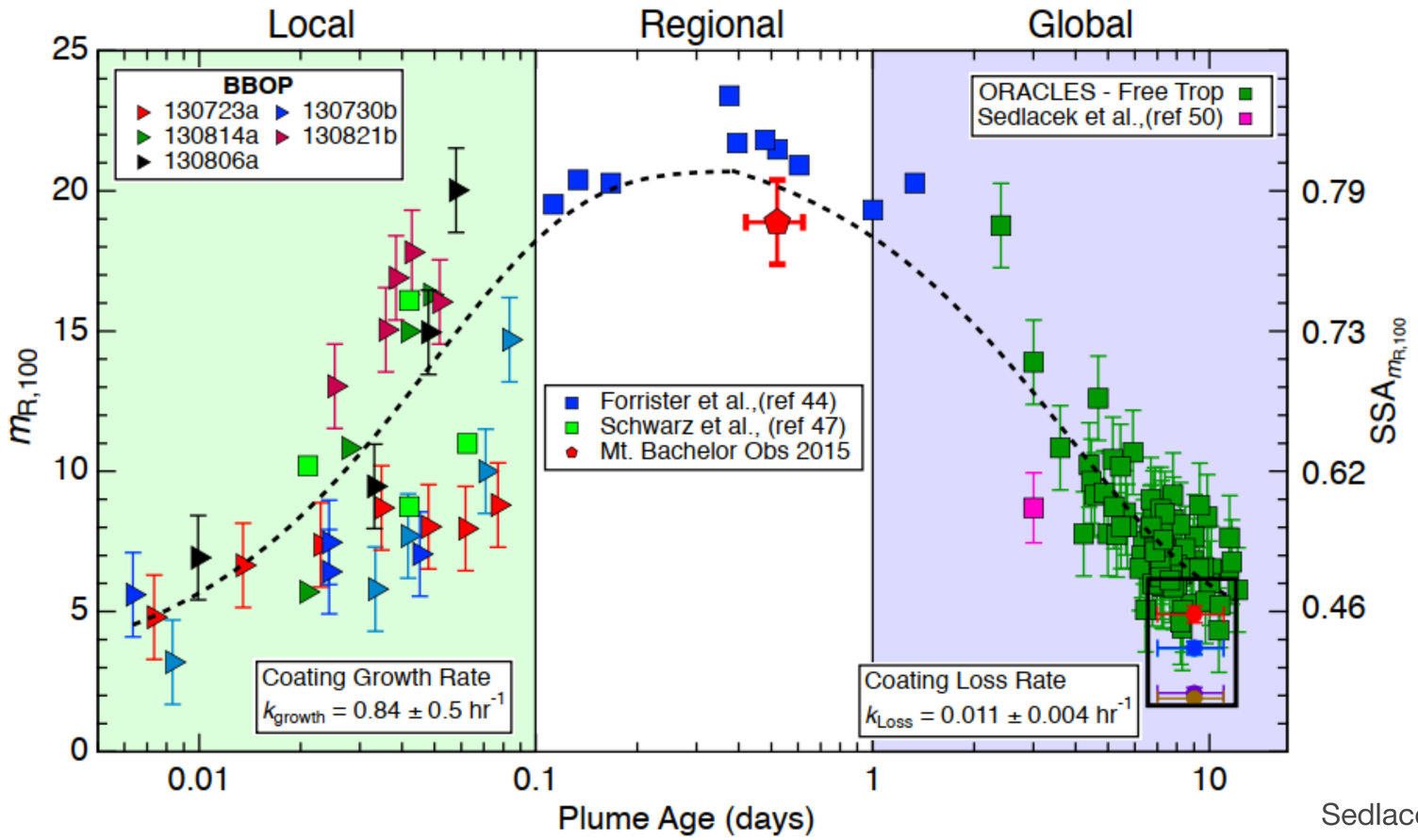
Background to Study

- The emissions are advected over the southeast Atlantic
- Different processes begin to change particulate properties.
- The **evolution** of these **properties** is not well-documented
- Single Scattering Albedo (SSA) contributes significantly to estimates of Direct Radiative Forcing (DRF)



Objective

To study the changes in BBA properties that can be detected by remote-sensed observations



Sedlacek III et al *(submitted)*

Methods - Dataset

Ground-based:

Aerosol Robotic Network **(AERONET)**

- spectral AOD, aerosol microphysics.

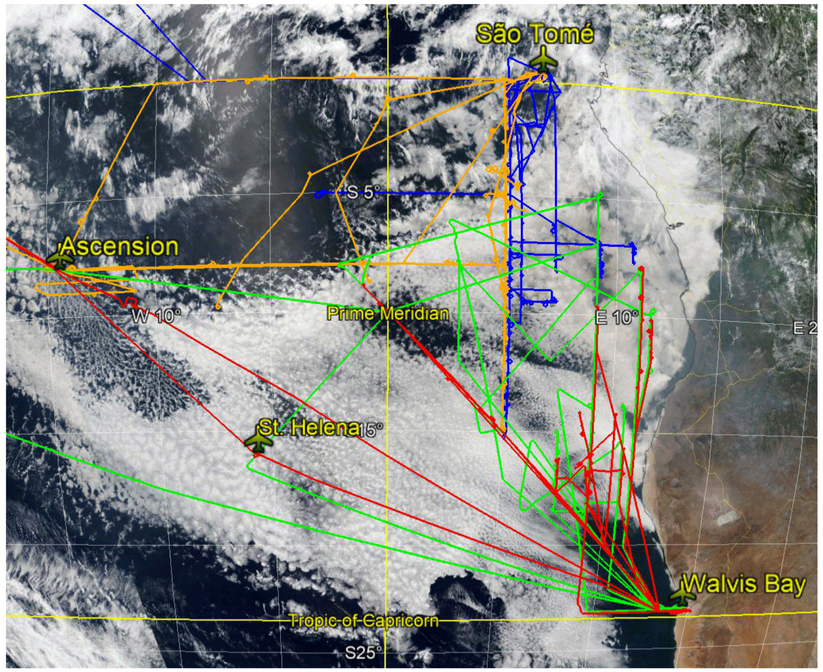
Stations: Mongu, Huambo, Namibe, Ascension

Airborne:

Spectrometer for Sun-Tracking Sky-Scanning Atmospheric Research **(4STAR)**

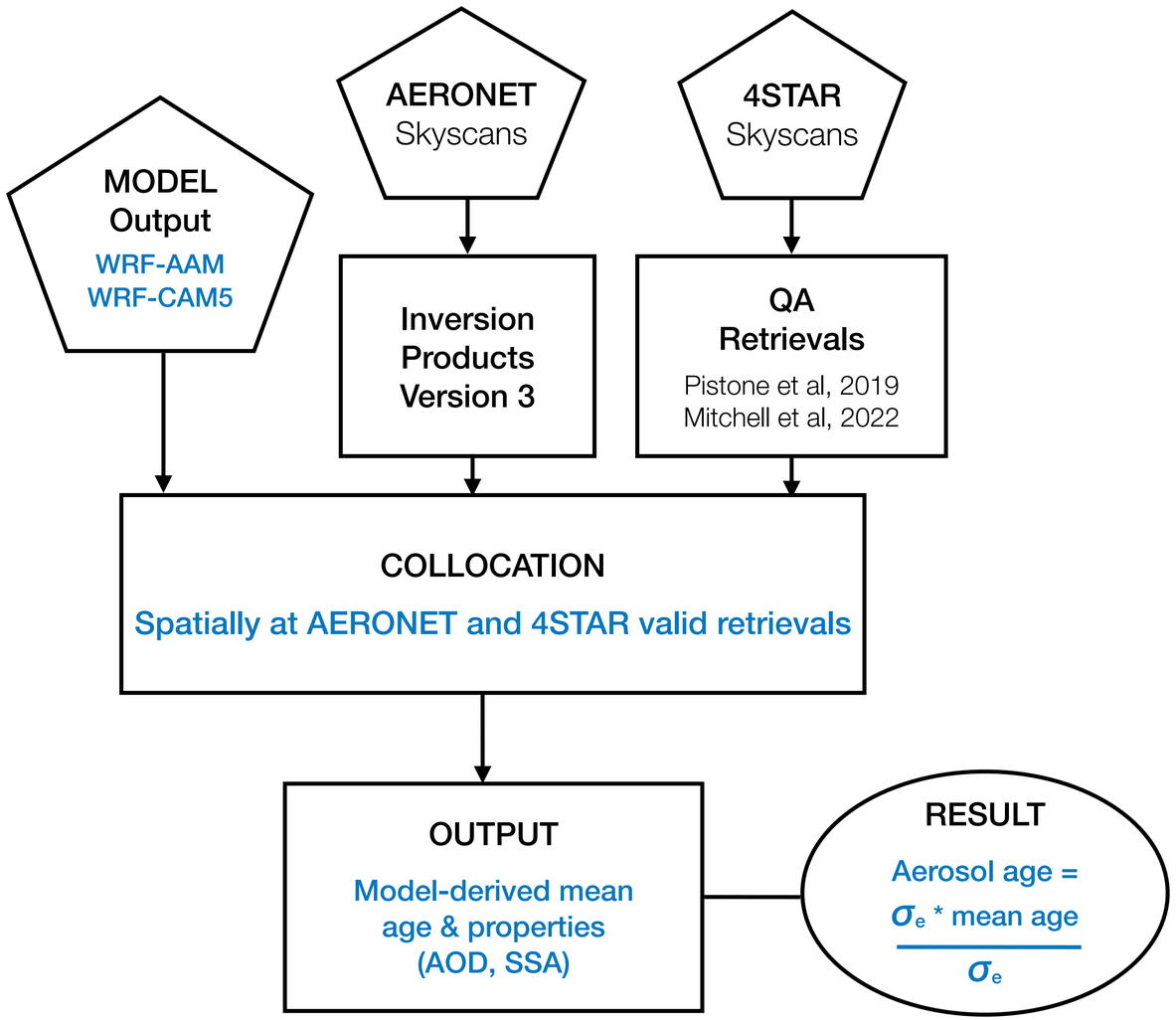
- hyper-spectral AOD, aerosol microphysics.

On P-3 in ORACLES 2016, 2017, 2018.



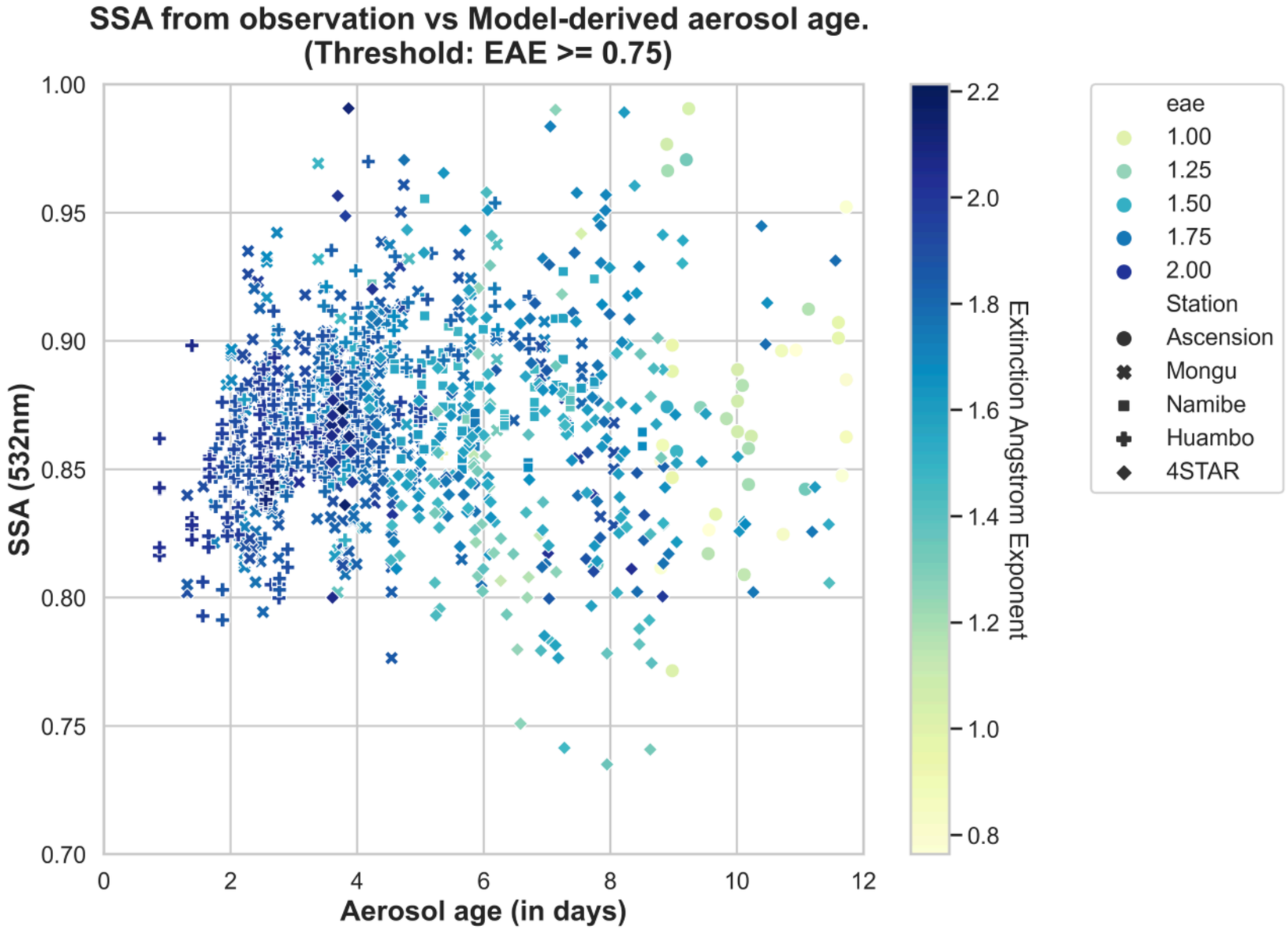
Methods - Workflow

Model/ Parameter	WRF-AAM	WRF-CAM5
Meteorology	NCEP GFS	NCEP FNL
Emission	QFED2	QFED2
Spatial Resolution	12km	36km
Domain	41◦S-14◦N, 34◦W-51◦E	41◦S-14◦N, 34◦W-51◦E
	AERONET	**4STAR**
No of Obsvervations	1600	300

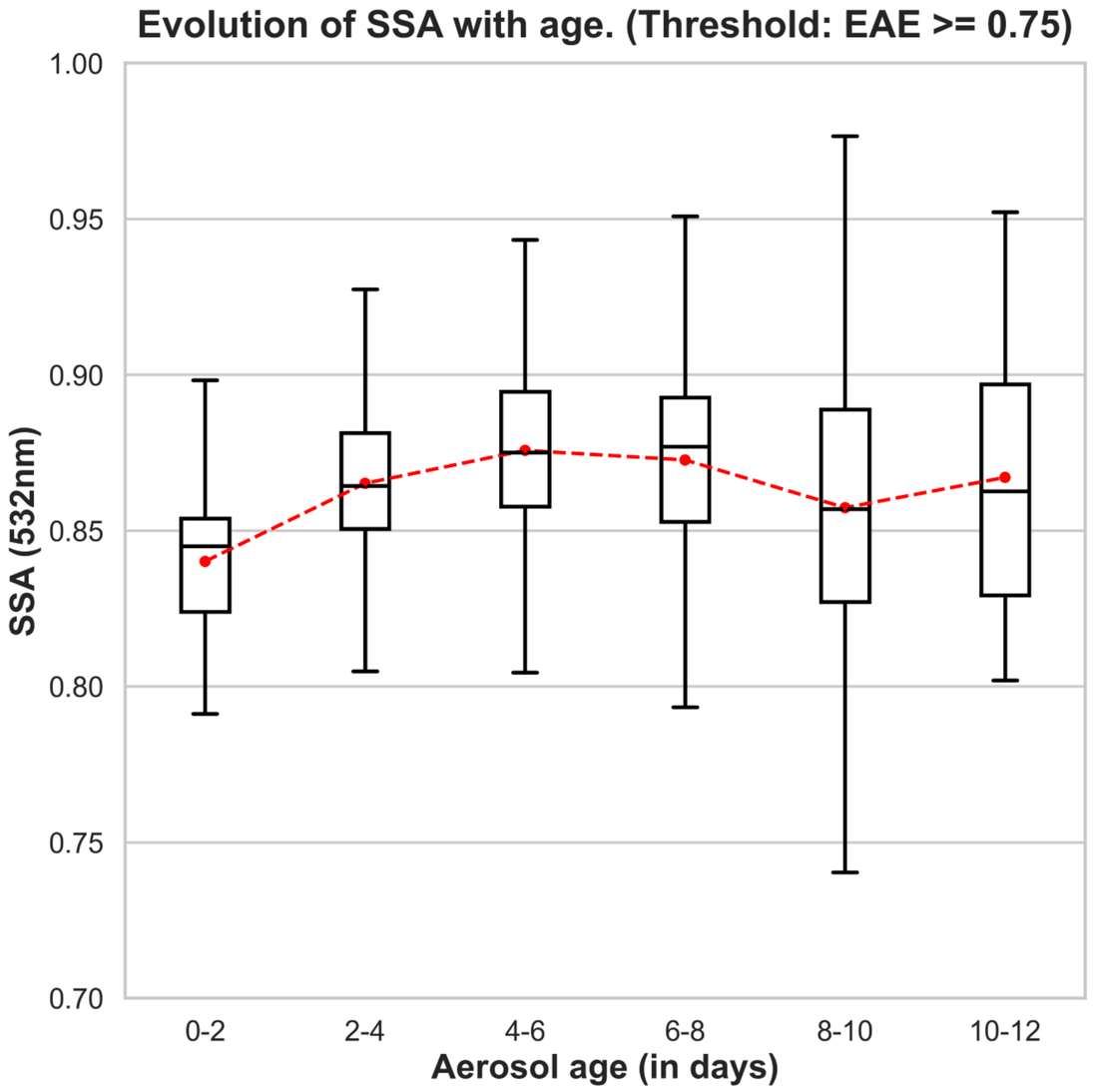


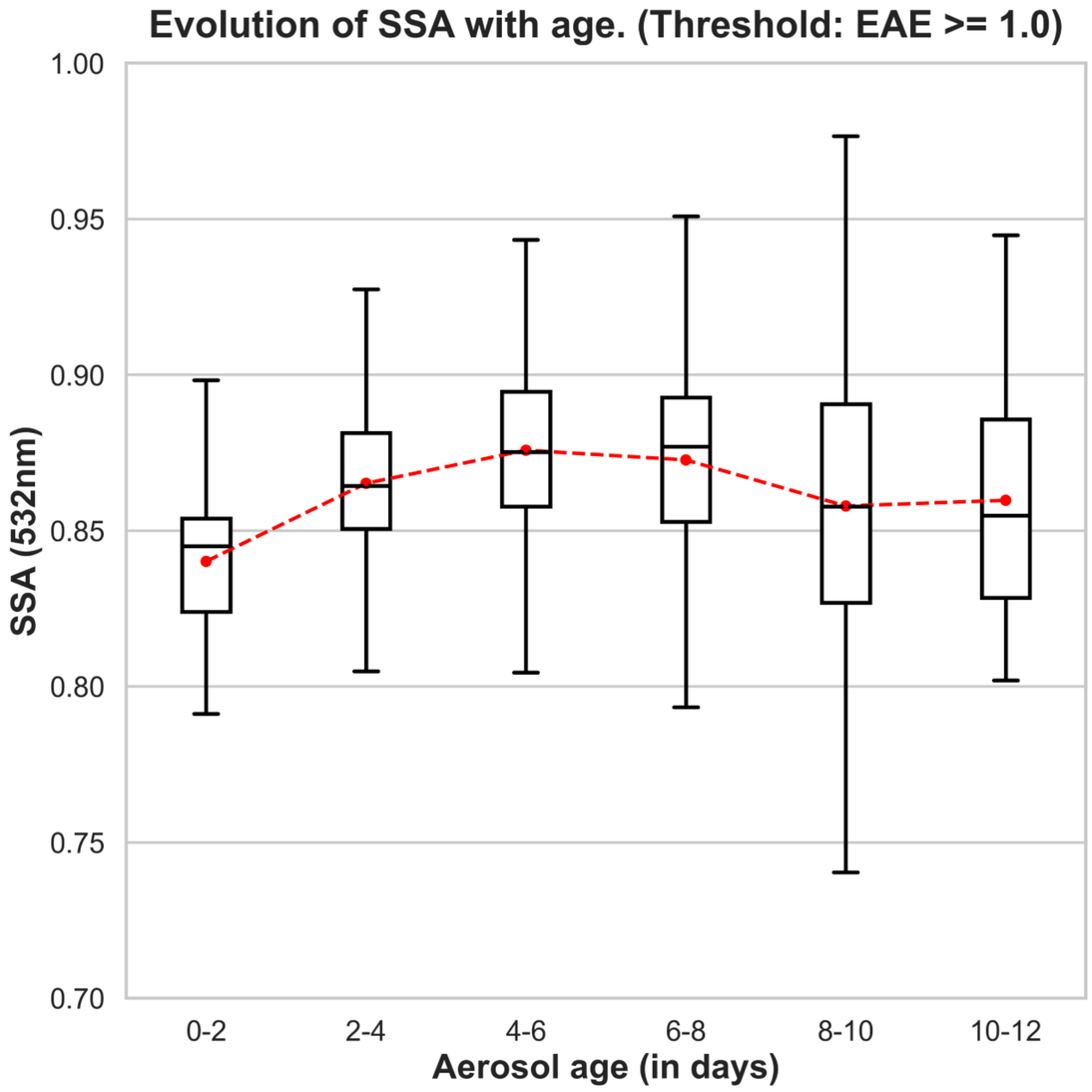
Workflow of the methodology

Results

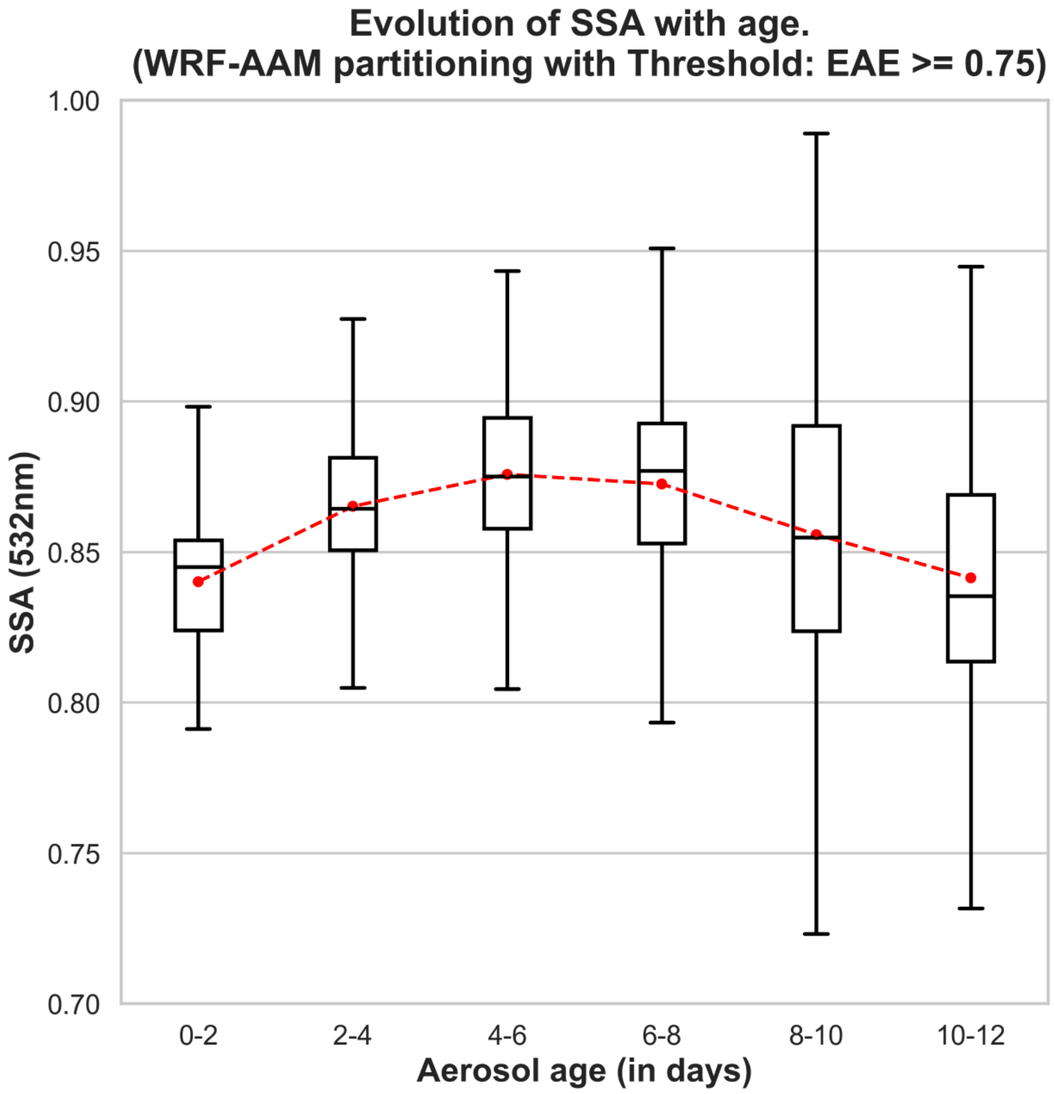

SSA from observation vs Model-derived aerosol age.
(Threshold: EAE >= 0.75)
SSA (532nm)
1.00
0.95
0.90
0.85
0.80
0.75
0.70
0
2
4
6
8
10
12
Aerosol age (in days)
Extinction Angstrom Exponent
2.2
2.0
1.8
1.6
1.4
1.2
1.0
0.8
eae
1.00
1.25
1.50
1.75
2.00
Station
Ascension
Mongu
Namibe
Huambo
4STAR

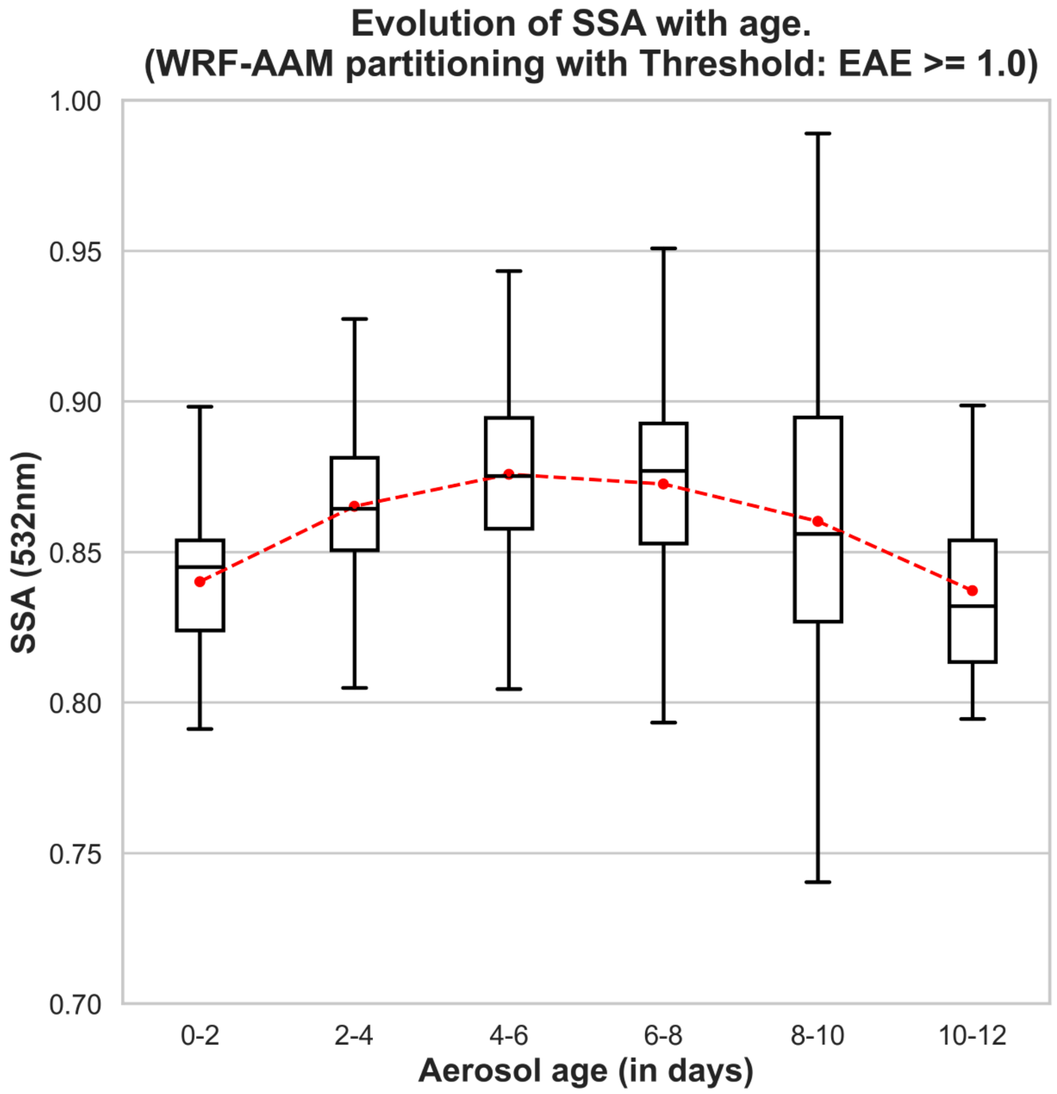
Results - No Partition





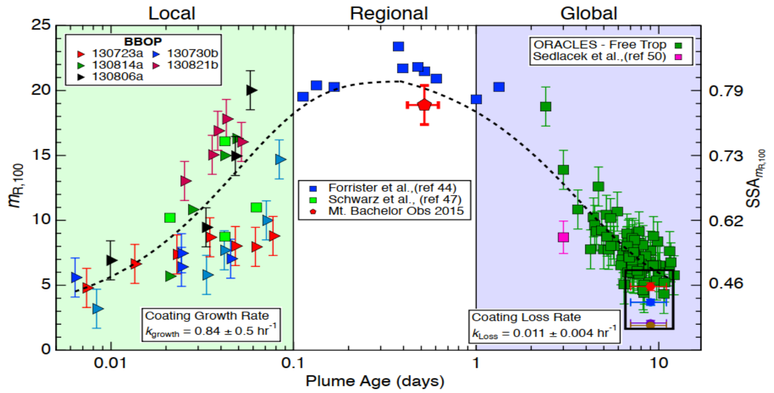
Results - Partition

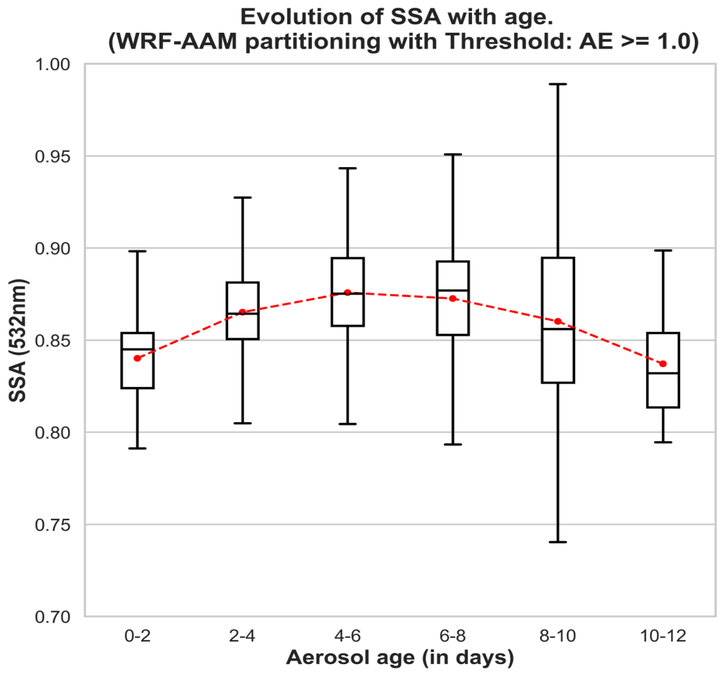




Conclusion

- Near-source samples have lower SSA and higher EAE
- Coastal aerosols have lower EAE
- Ascension Island and 4STAR measurements are oldest (8 - 12 days)
- SSA tends to peak at age 4 - 6 days
- Sharp decline in FT SSA at Ascension Island after partitioning





Future Work

- Partition BL and FT aerosol using model boundary layer products
- Study evolution from model-derived aerosol properties
- Compliment analysis with *in situ* and satellite observations
- Extend analysis to other field campaigns in the SEA (CLARIFY, LASIC) and other regions of long-range biomass burning transport

Key points

- Near-source samples have lower SSA and higher EAE
- Coastal aerosols have lower EAE
- Ascension Island and 4STAR measurements are oldest (8 - 12 days)
- SSA tends to peak at age 4 - 6 days
- Sharp decline in FT SSA at Ascension Island after partitioning

Thank you

Contact:

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