Measurements of aerosol absorption during ultra-light global circumnavigation… campaigns

GMAC 2018, NOAA, Boulder, CO

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Aerosol

aero snemanje AEROVIZIJA

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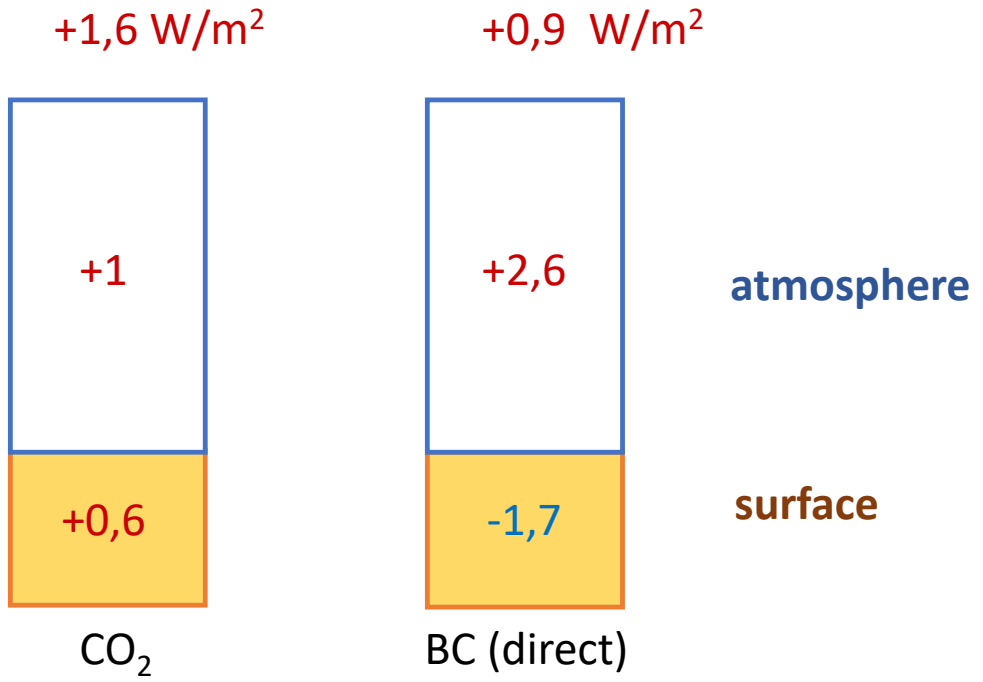
Black Carbon, absorption and heating

- BC is a product of incomplete combustion:

- BC direct radiative efficiency:

BC total:
+1,1 ± 0,7 W/m²



Ramanathan and Carmichael, 2008

Aircraft and sampling: measuring @ 10,000 ft and 150 mph

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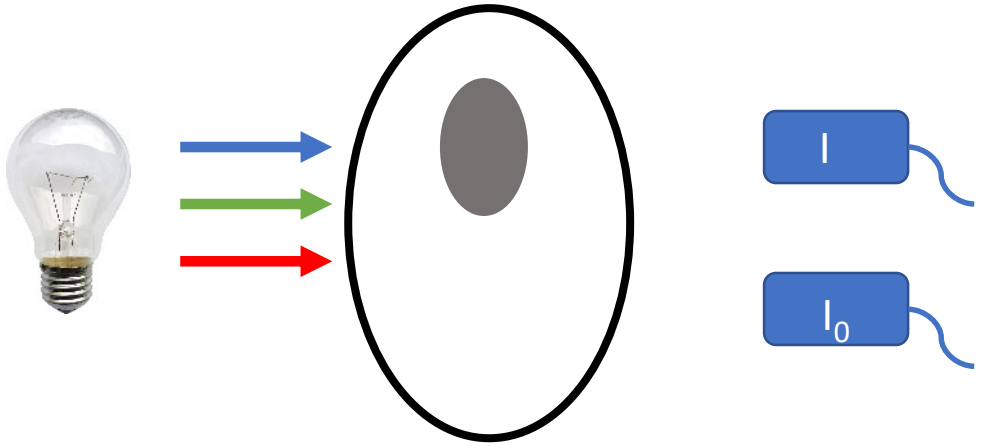
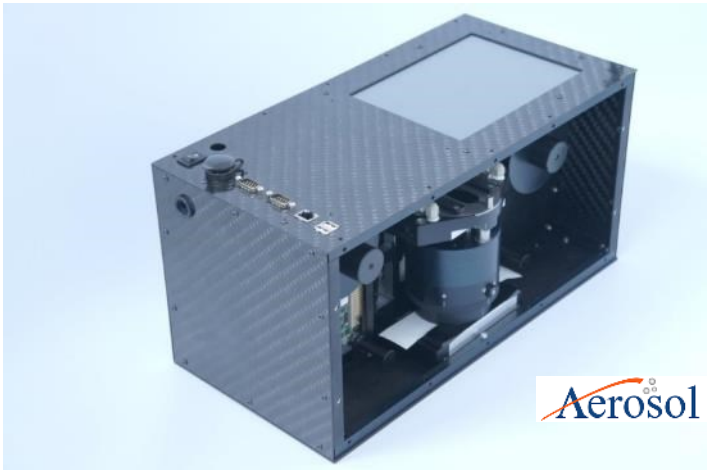
Filter photometers



$$ATN = \ln \frac{I}{I_0}$$

$$b_{abs} \sim \frac{\Delta ATN}{\Delta t}$$



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Point vs. distributed sources

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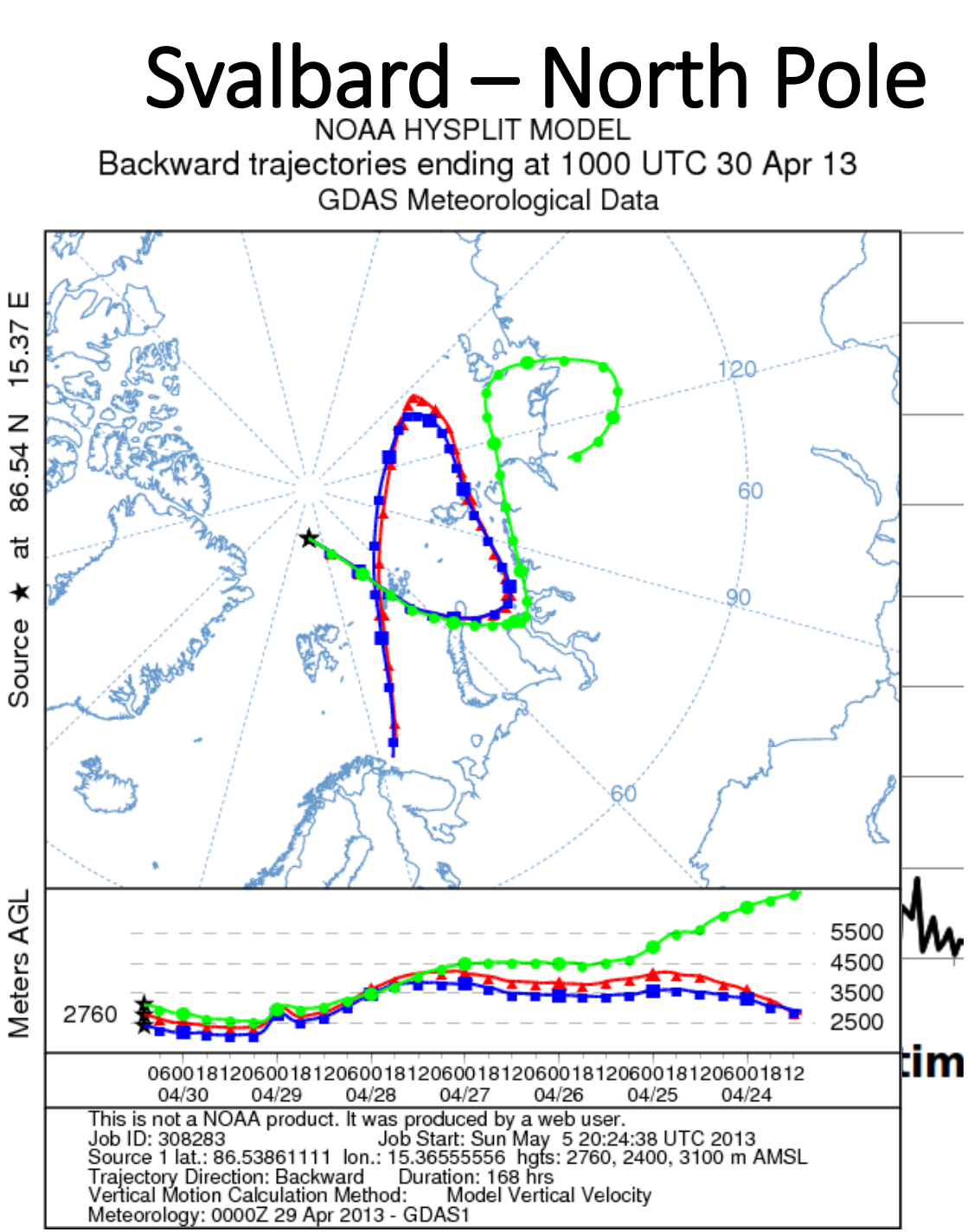
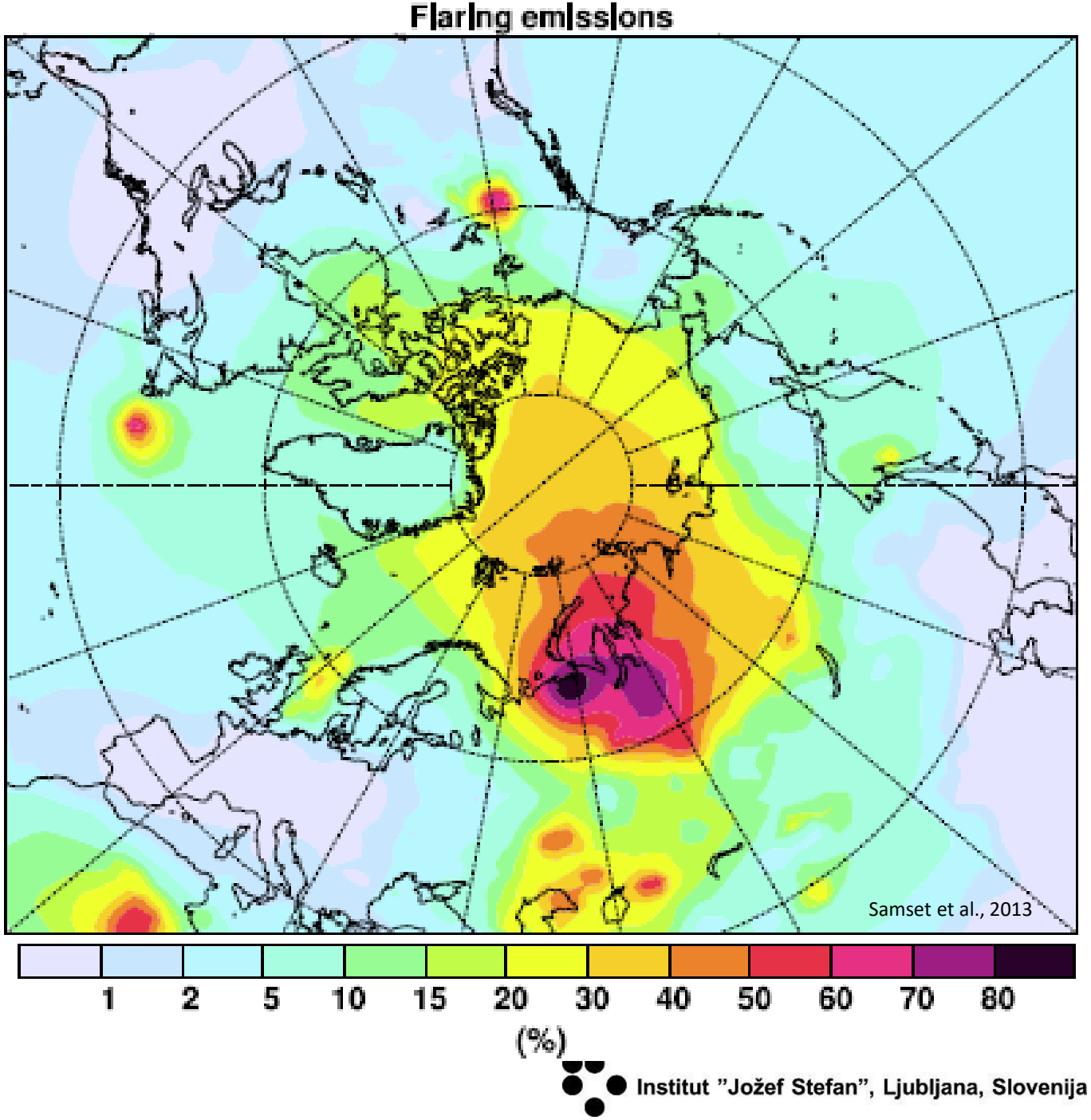
Arctic

Svalbard – North Pole





BC @ 10.000 ft

Malaysia

Congo River

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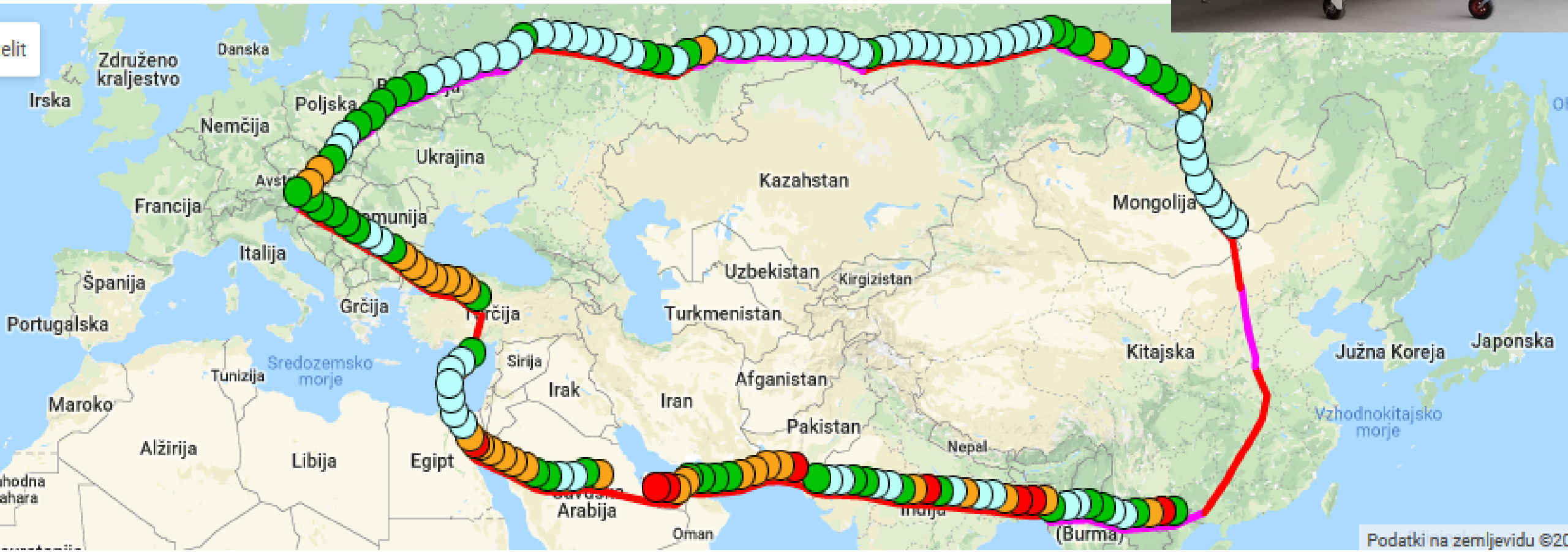
Results 2012

Results 2018



0-4.9 Mm^{-1} 5-9.9 Mm^{-1} 10-19.9 Mm^{-1} > 20 Mm^{-1}

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Thailand

India

BC (ng/m³)

1400
1200
1000
800
600
400
200
0

1:00 UTC
3:00
5:00
7:00
9:00
11:00

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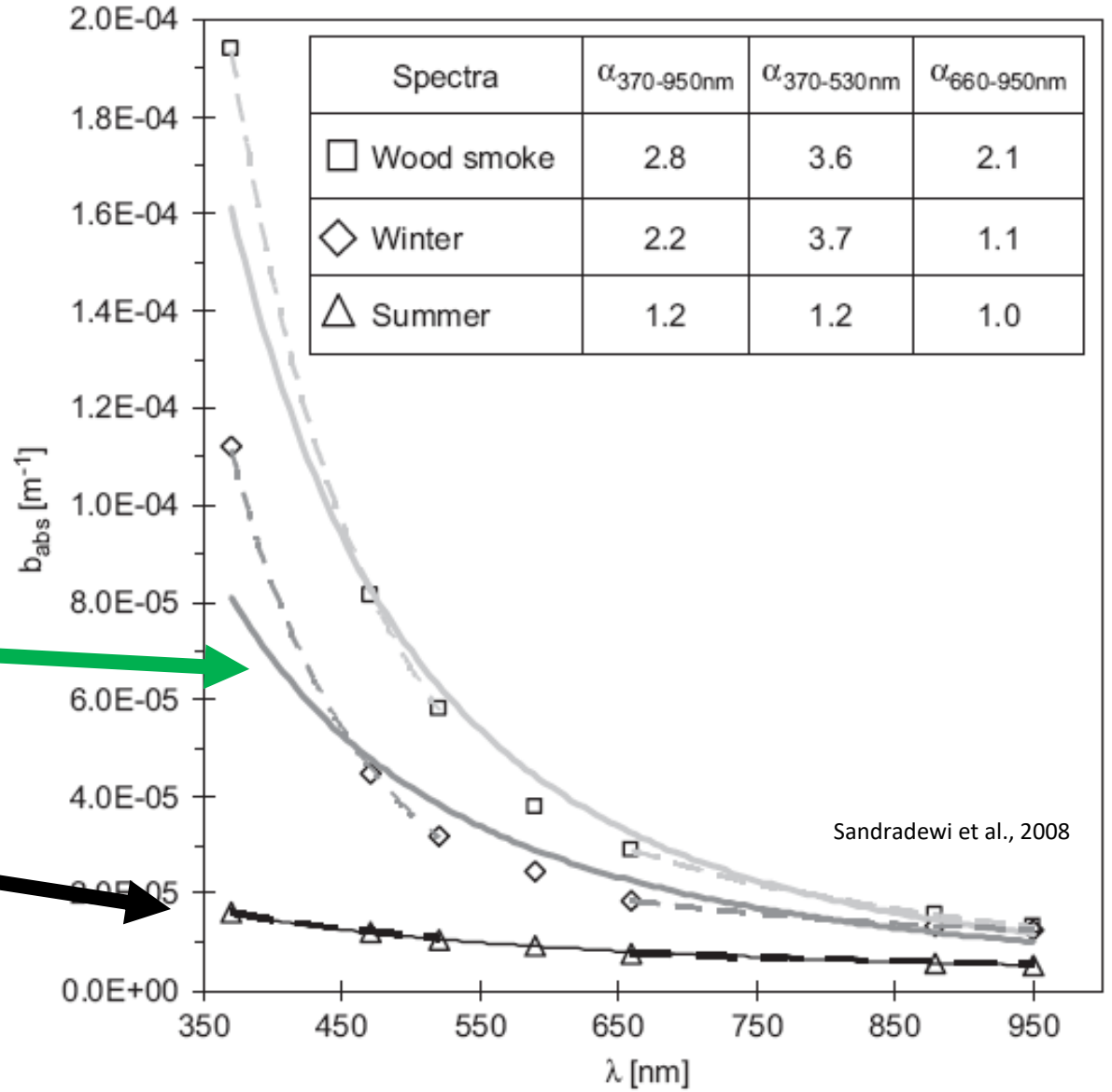
Sources: absorption wavelength dependence

- Absorption Angstrom Exponent AAE
- Source specific

biomass AAE ~ 2

fossil fuel AAE = 1



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Conclusion

- **aerosol absorption** depends on, **sources, meteorology**
- **regional** transport, atmospheric mixing
- we saw **AAE ≥ 1.3** regionally in contrasted environments
- **models** assuming DRE ~ BC are **biased low** by 25%

Thank you!

Questions?

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http://www.worldgreenflight.com/