



Dry Deposition of atmospheric aerosols over various topography and Seasons. *Colorado State University*



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Fluxes of Aerosol Continuous Observing Network

FALCON



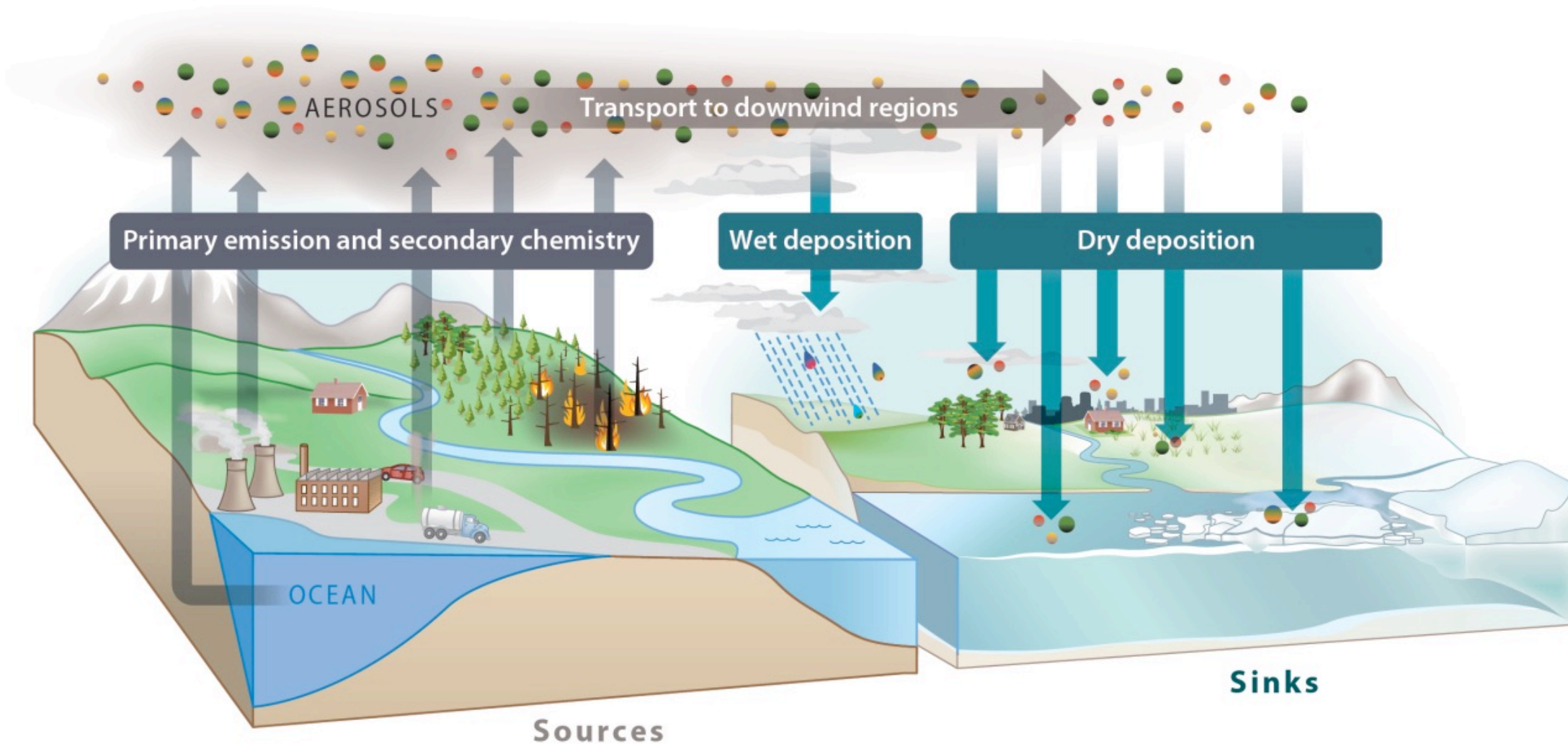
U.S. DEPARTMENT OF
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Science



“All the world's a stage, and all the [particles] merely players: they have their exits and their entrances”

William Shakespeare

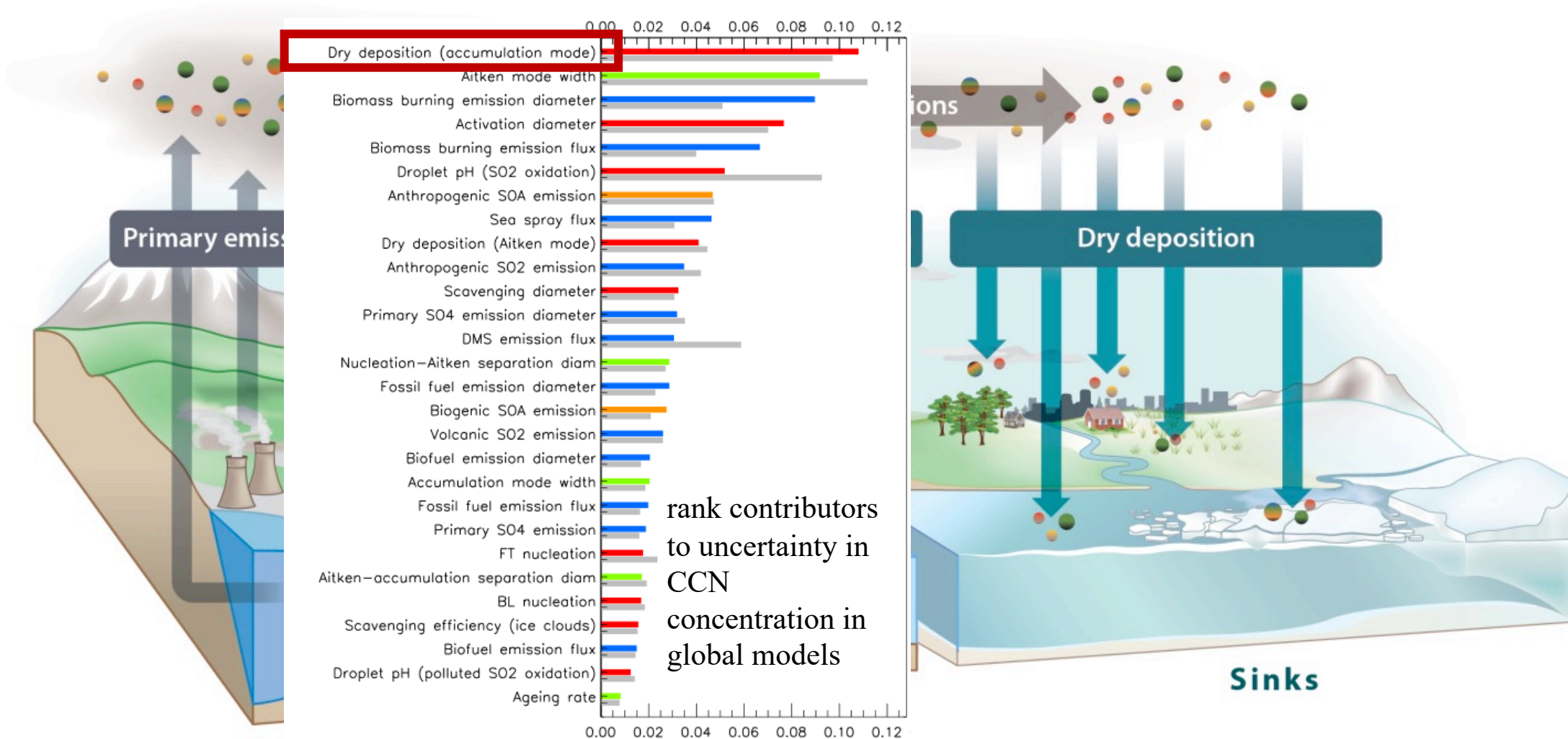


[Farmer et al. Ann Rev in Phys Chem. 2021]



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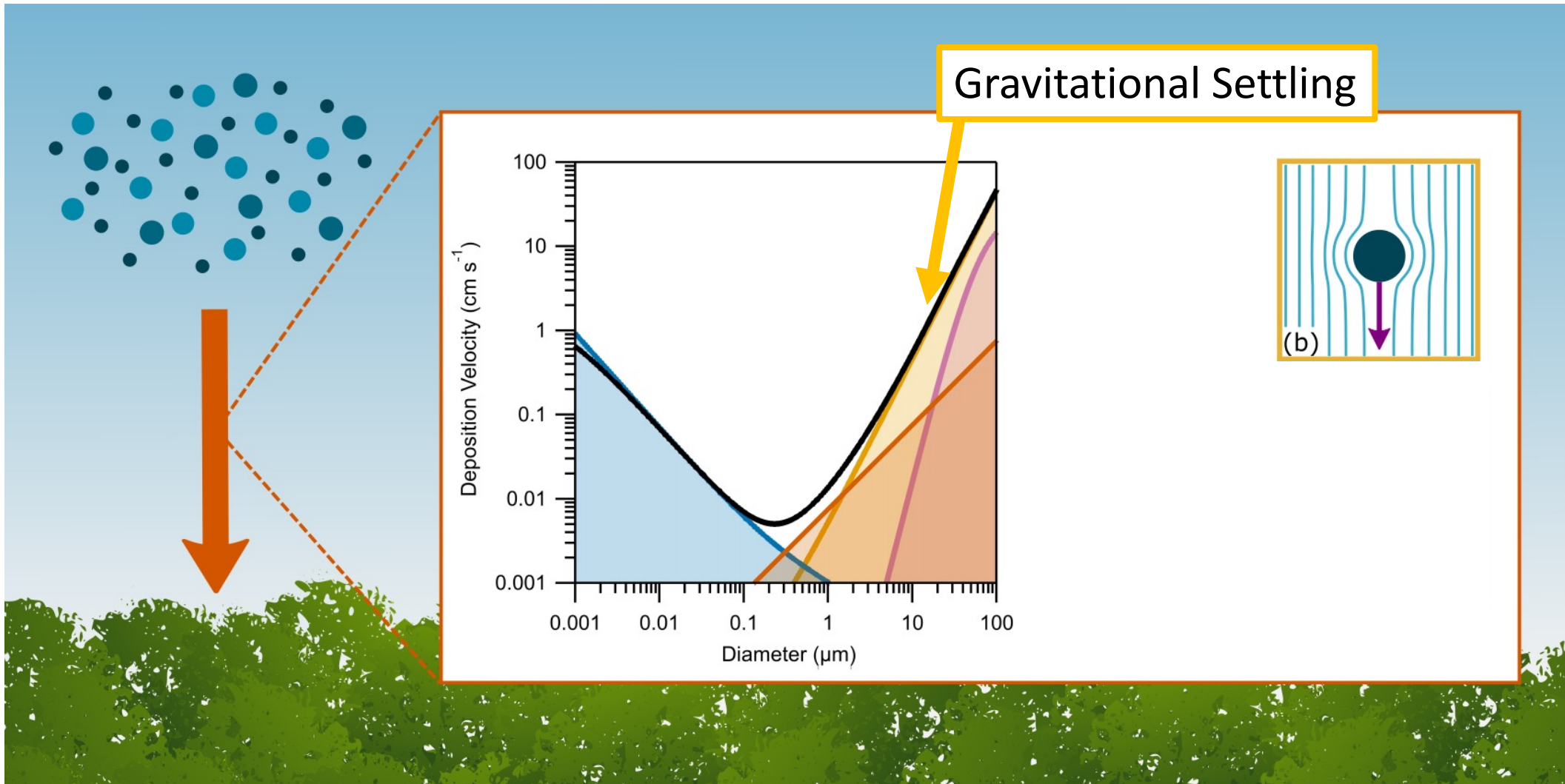
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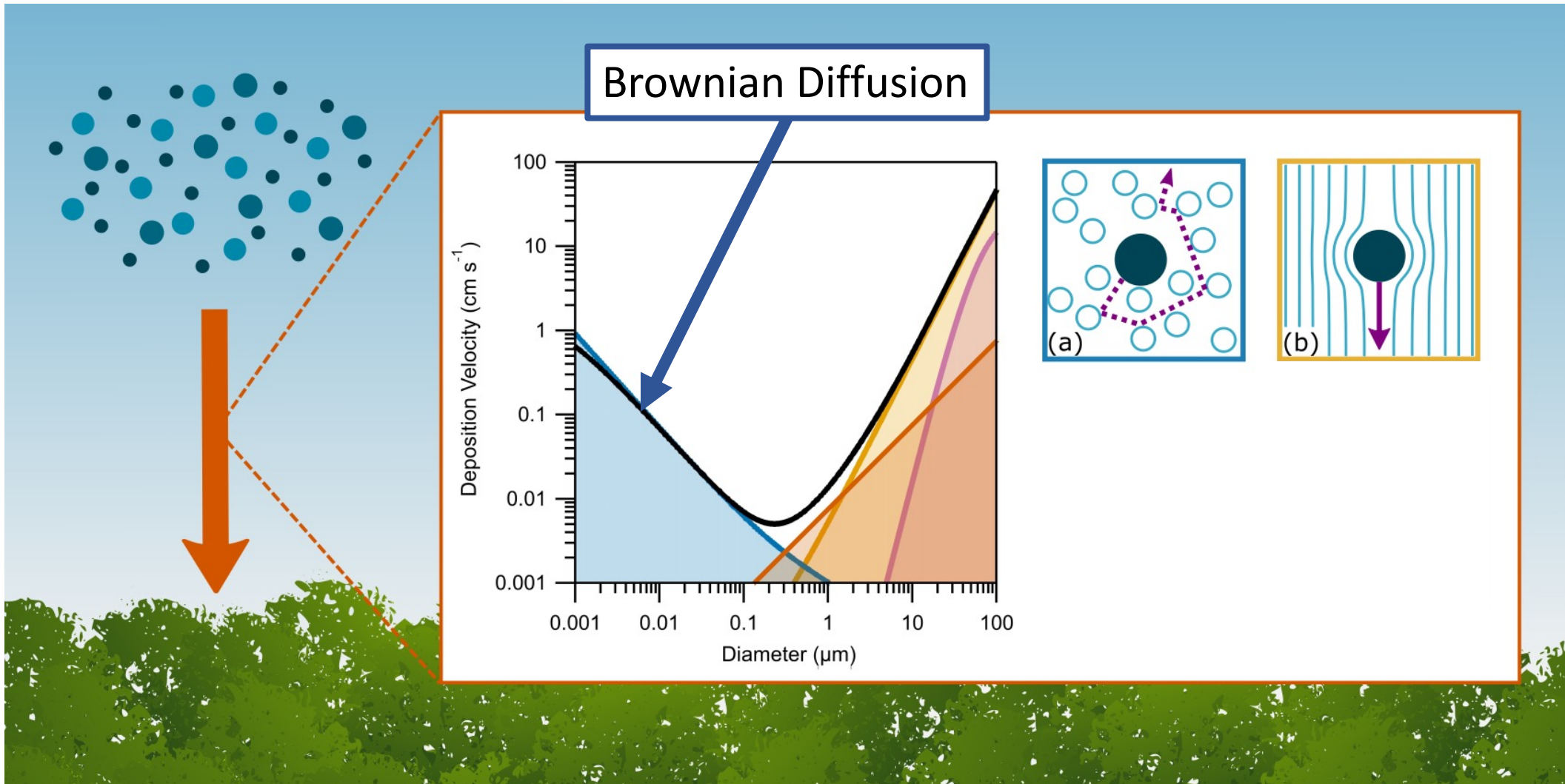
[Lee et al. Atmos Chem Phys 2013]

[Farmer et al. Ann Rev in Phys Chem. 2021]

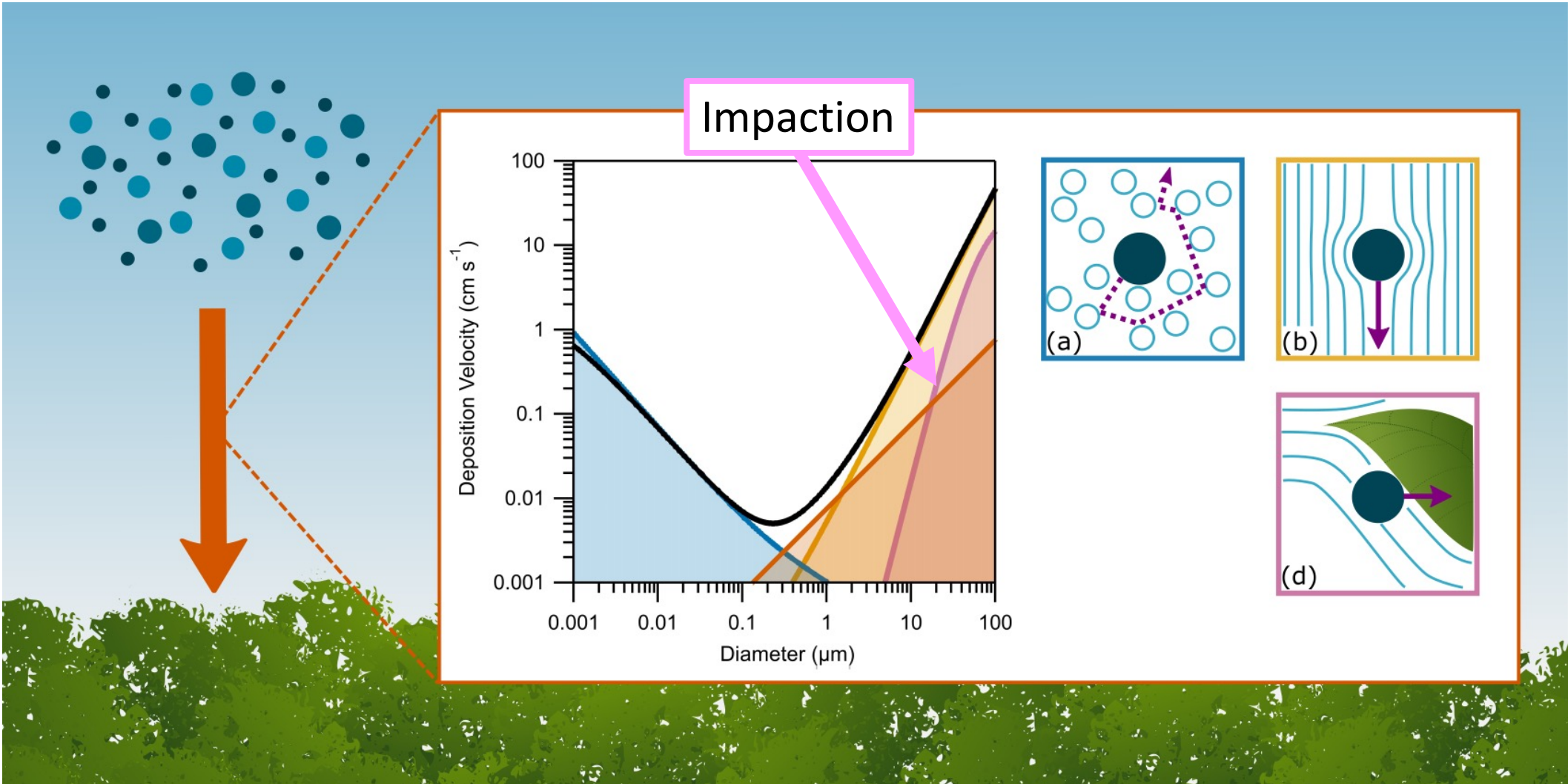
Particle dry deposition: Processes



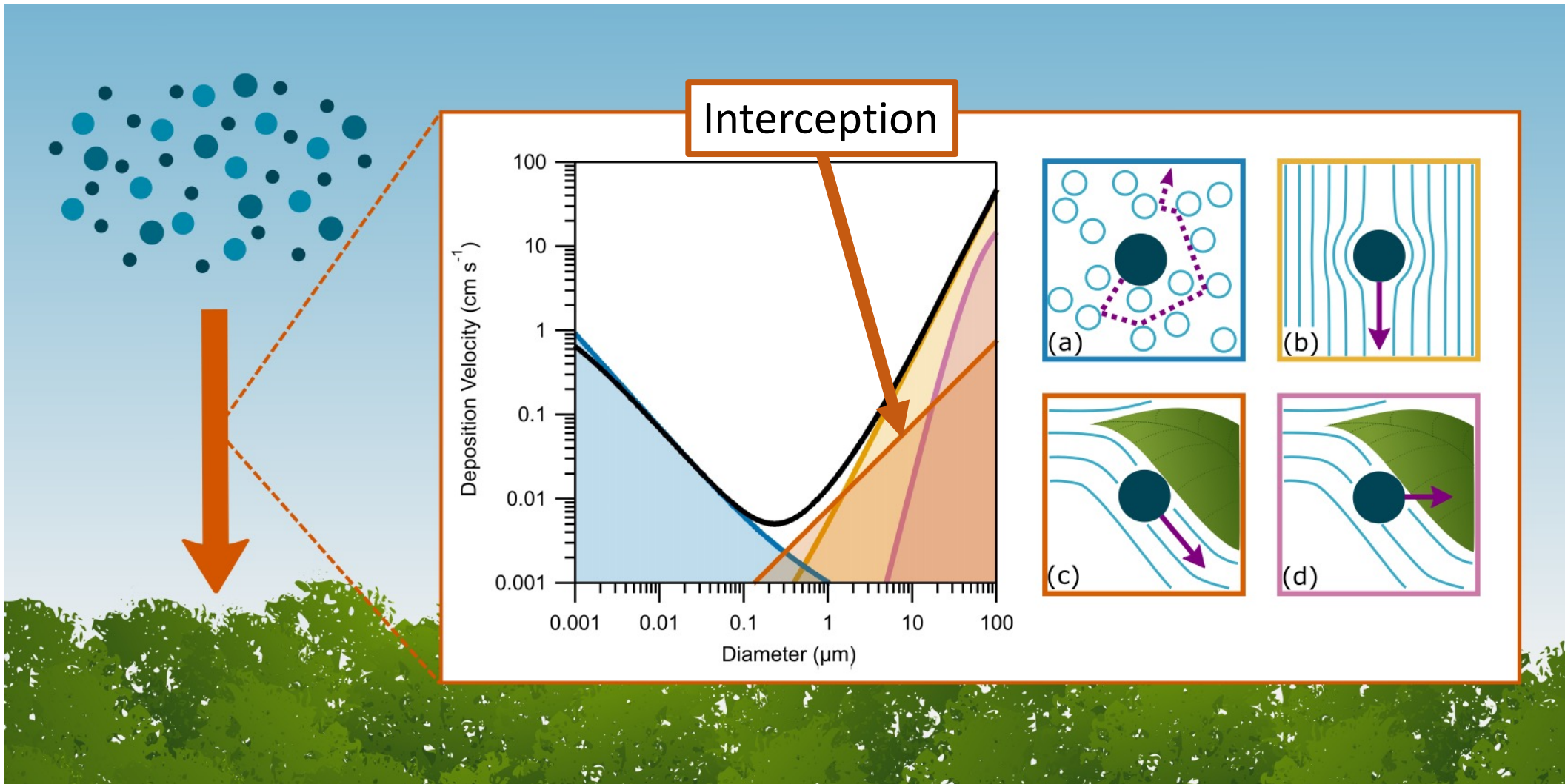
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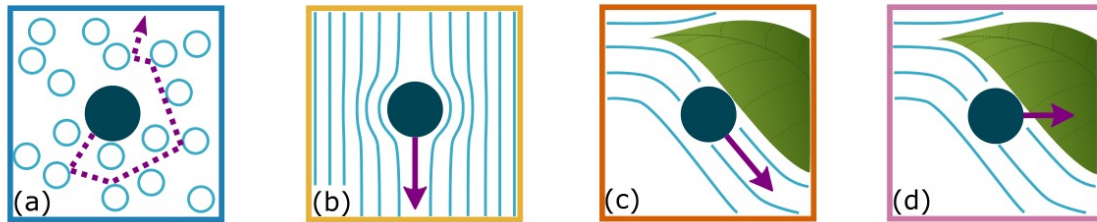


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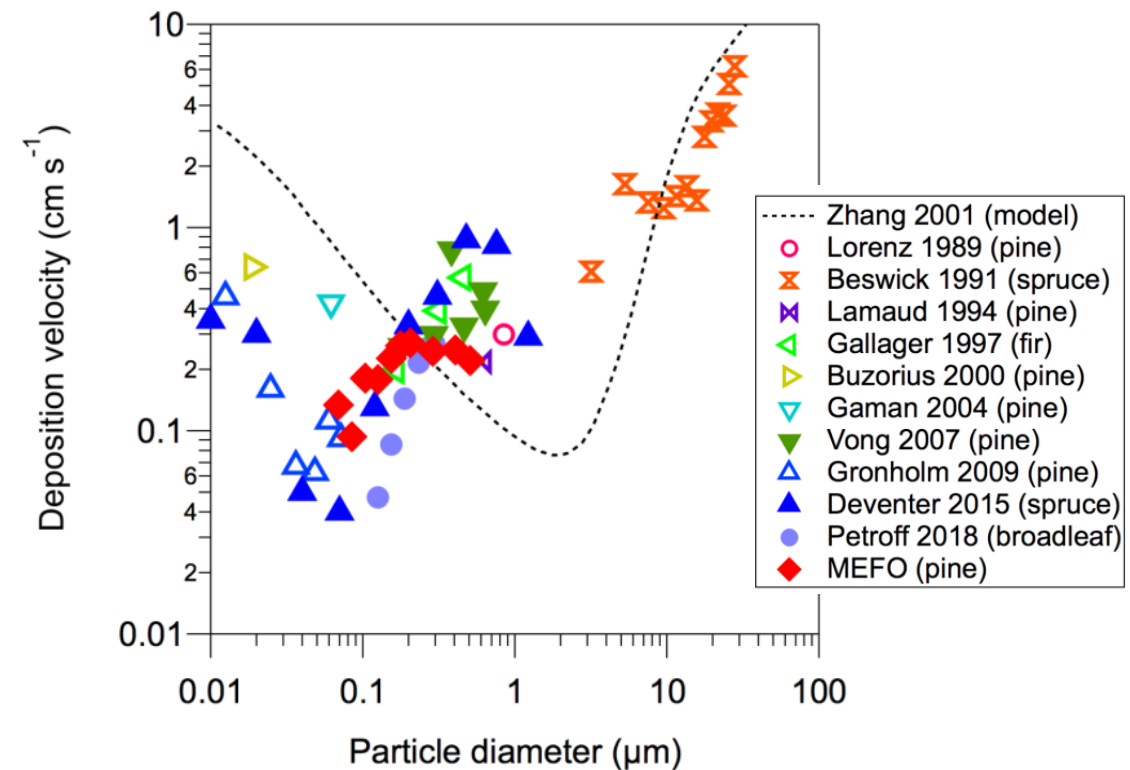




Particle dry deposition: Modelled V_{dp}



- 1) Aerosol deposition model parameterize V_{dp} to describe particle losses through each of these processes.
- 2) The collection efficiencies of these deposition mechanisms depends on **size, land type, season** and **micrometeorology**.



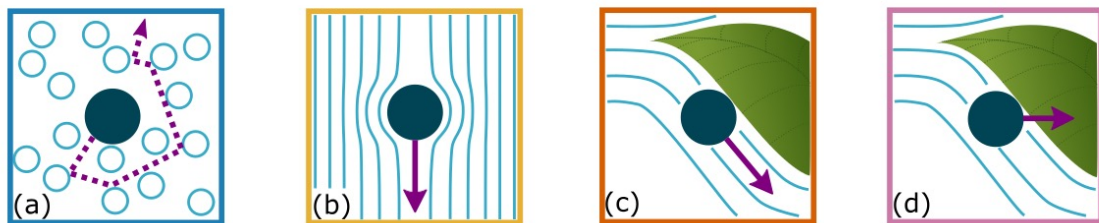
[Saylor et al. Tellus B. 2019]

Discrepancies with observation!

Model developed using **limited observations** over simplified **simple surfaces**, e.g glassland.

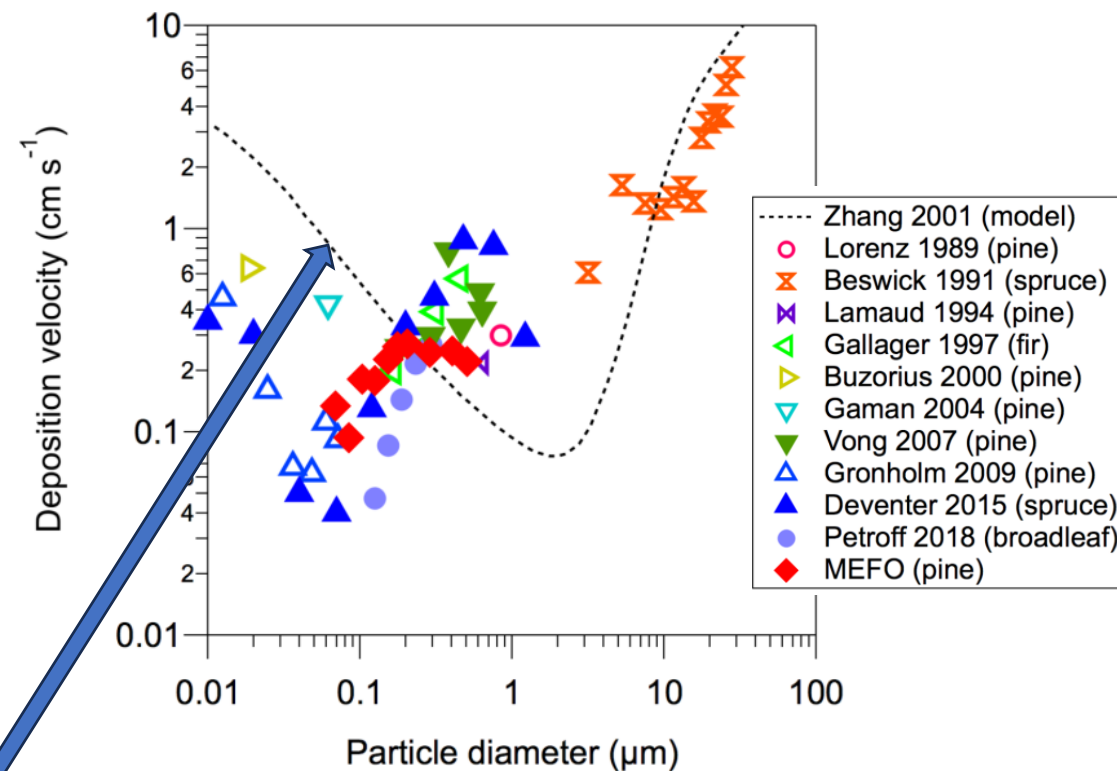


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Widely used model in GLOMAP and GEOS-chem!



[Saylor et al. Tellus B. 2019]

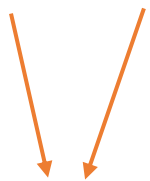
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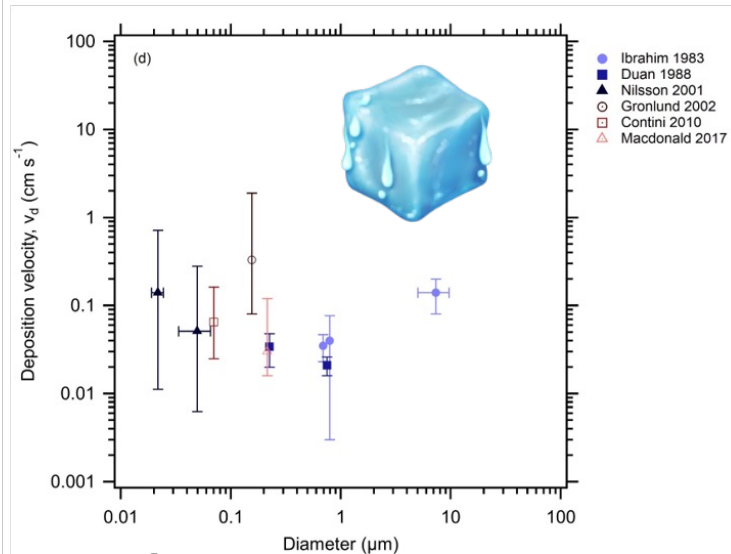
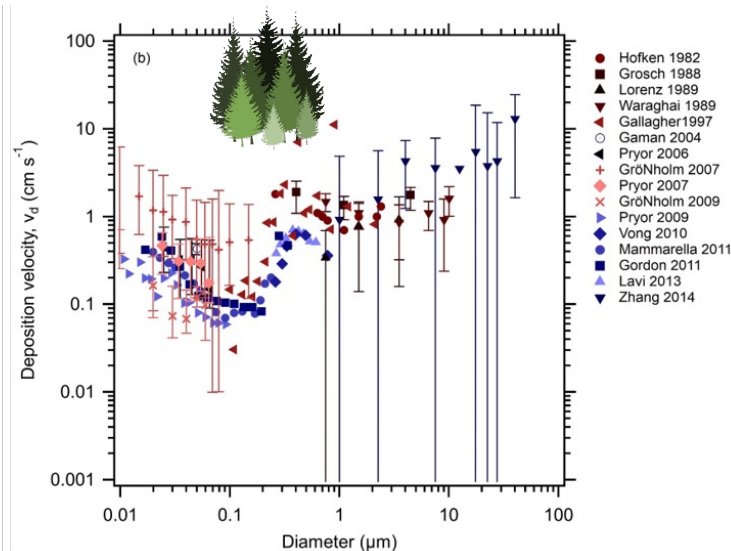
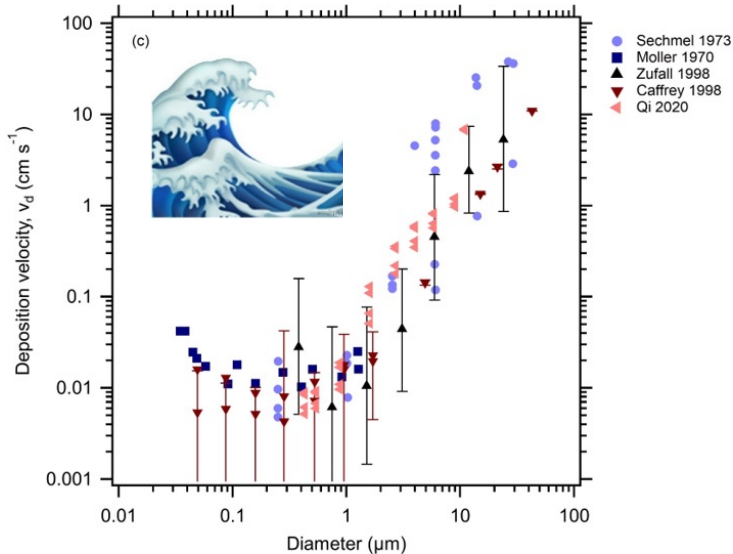
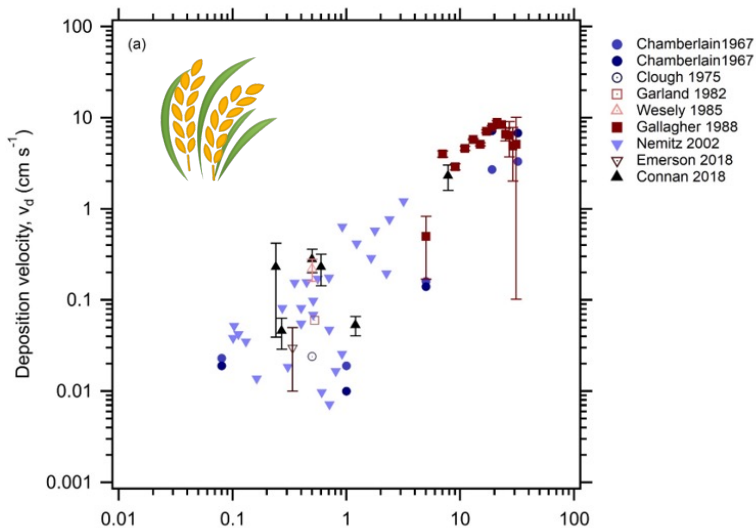
Particle dry deposition: Measurements

$$V_{dp} = \frac{\text{Particle Flux}}{\text{Particle conc.}}$$

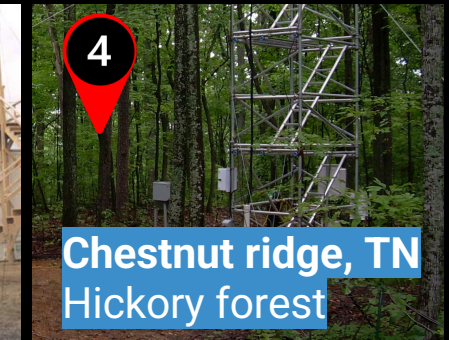
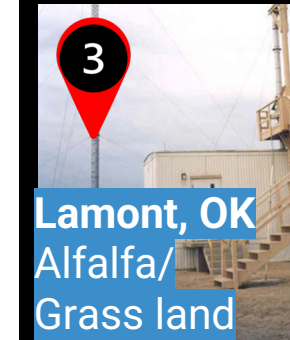
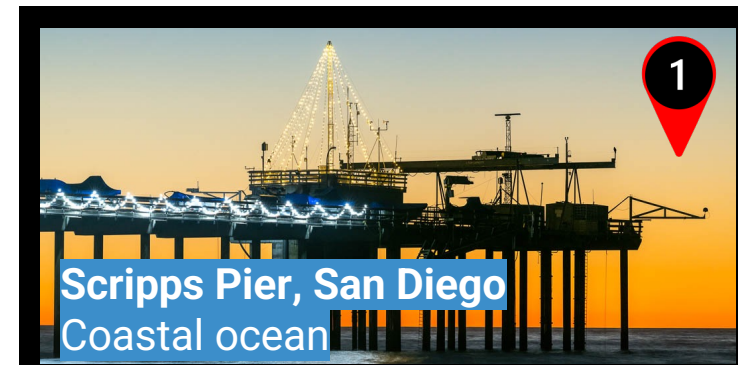
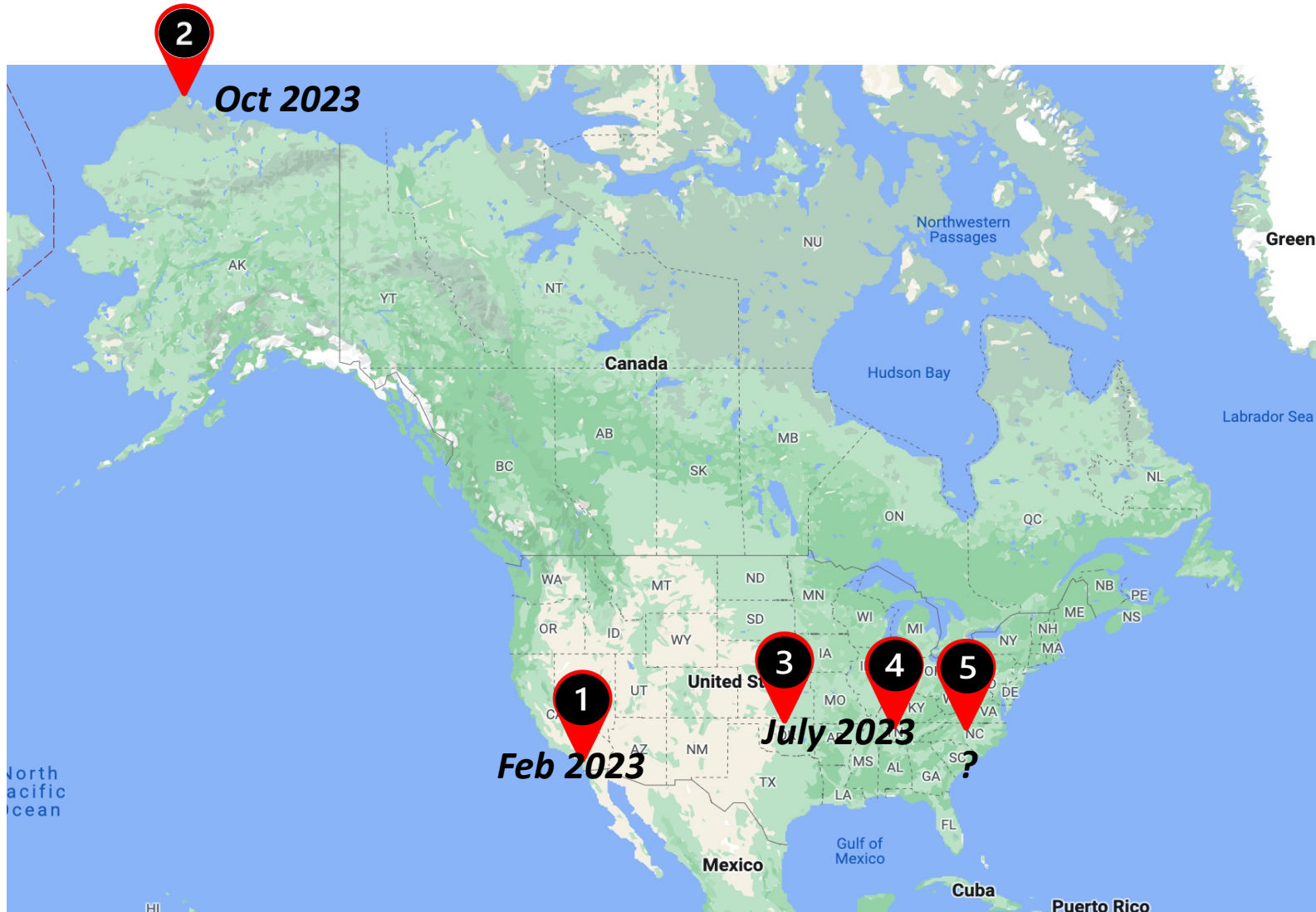


Can be directly measured

The lack of particle dry deposition measurements hinders our understanding of dry deposition



Fluxes of Aerosol Continuous Observing Network



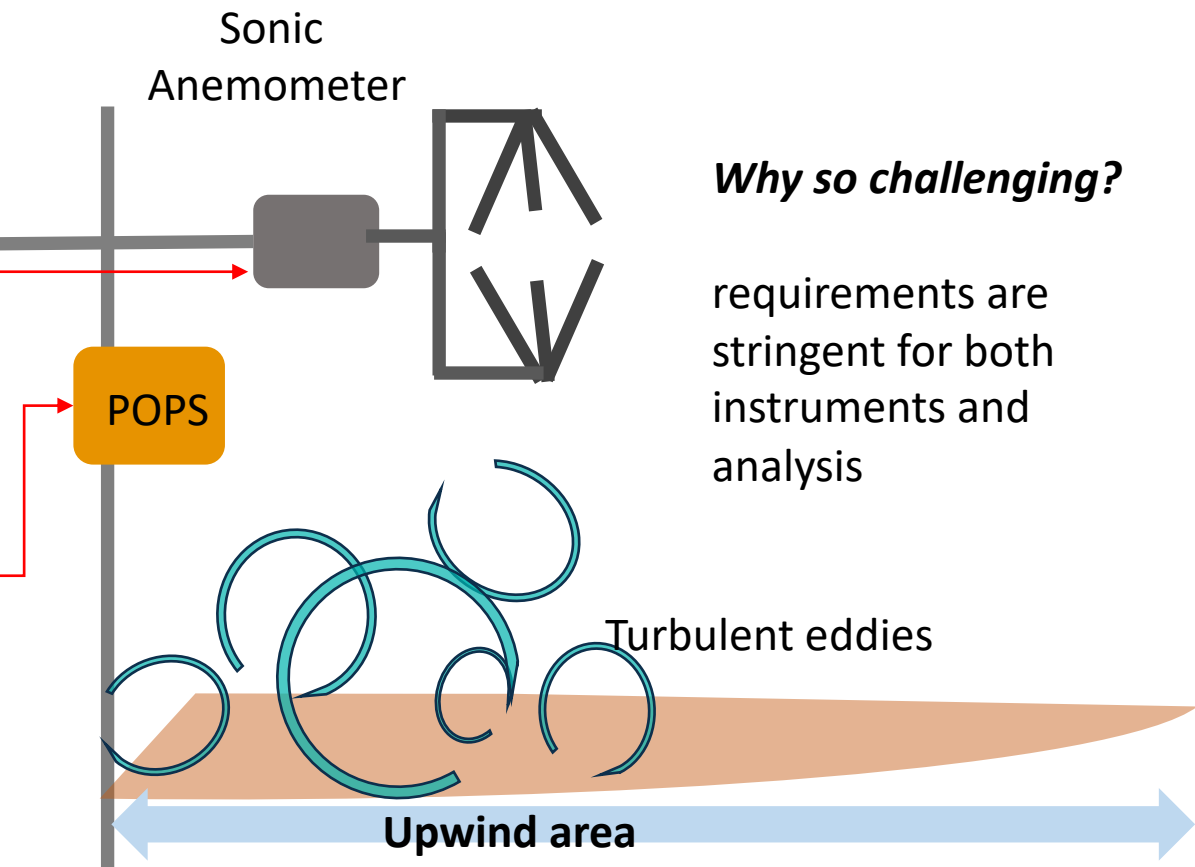
Project aim: Measure size-resolved particle flux Measurements for a Long-Term (yr+) over different landscapes.



Particle flux measurement setup

Eddy Covariance Approach

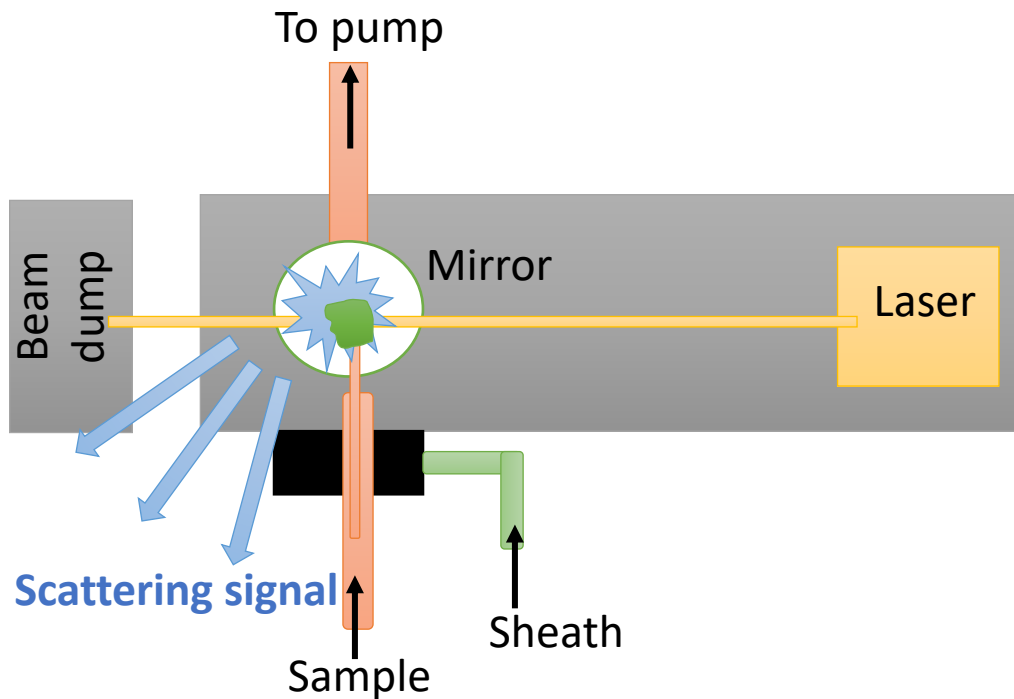
$$\text{Aerosol Flux}_{30 \text{ min}} = \overline{w' C'}$$



Why so challenging?

requirements are stringent for both instruments and analysis

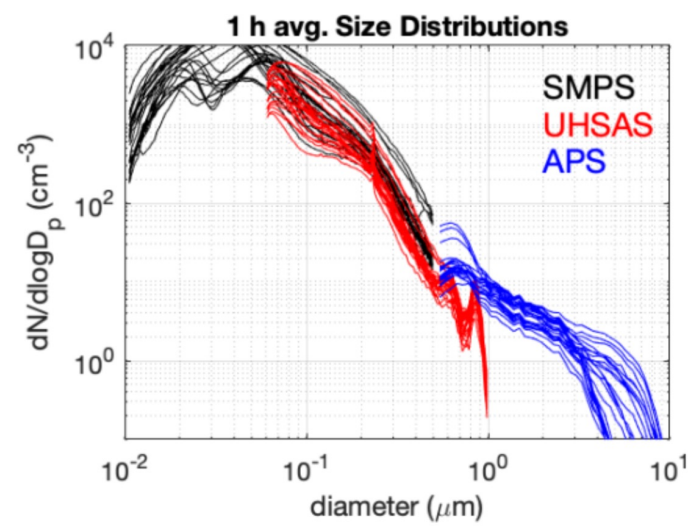
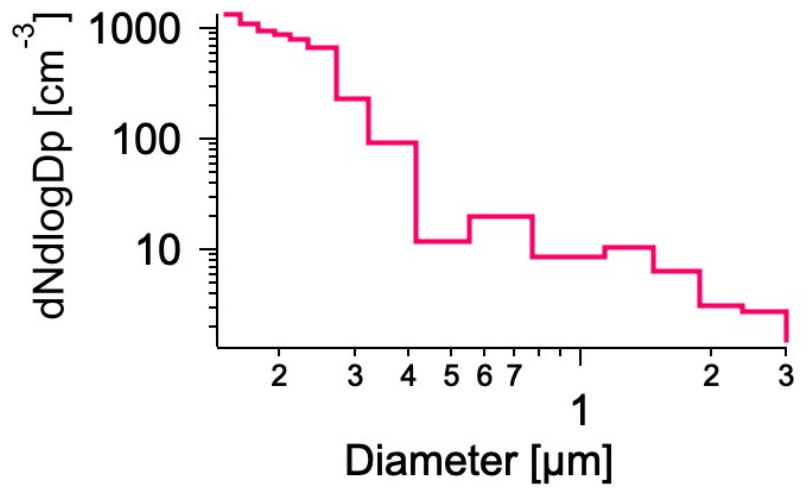
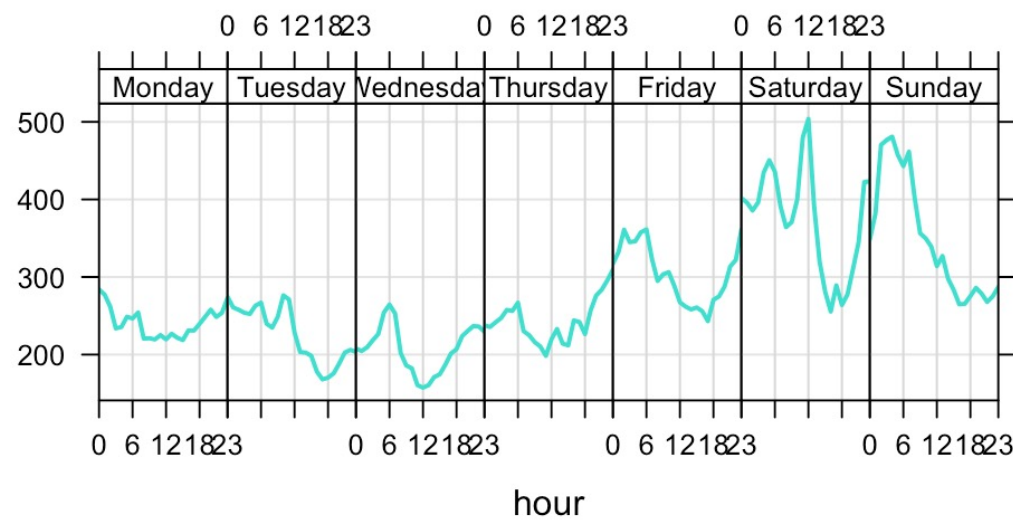
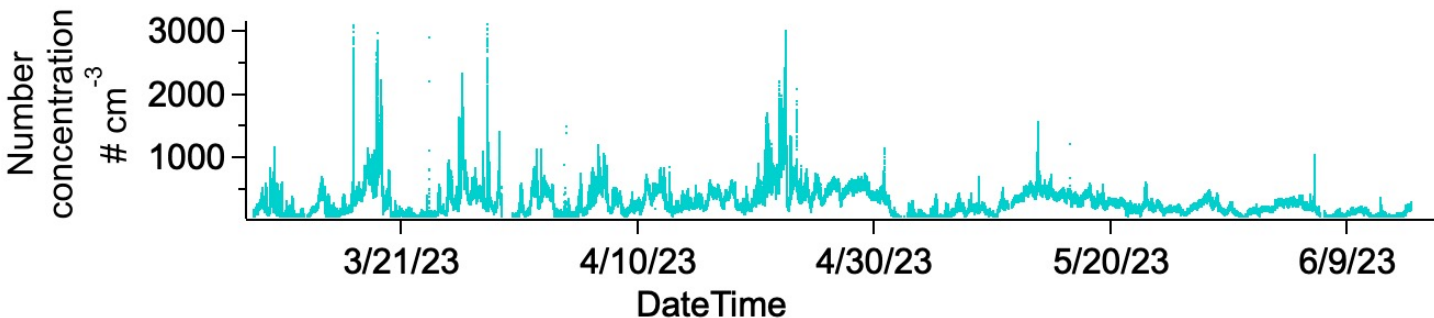
Portable Optical Particle Scanner (POPS)



- ❖ POPS uses 405 nm laser and has **size range** from **120 nm to 3 μm** .
- ❖ Mie theory is used to convert scattering signal to optical diameter.



Particle concentrations: SCRIPPS PIER

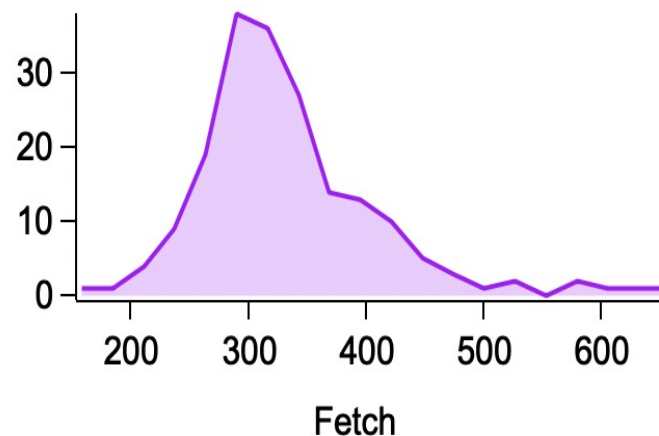
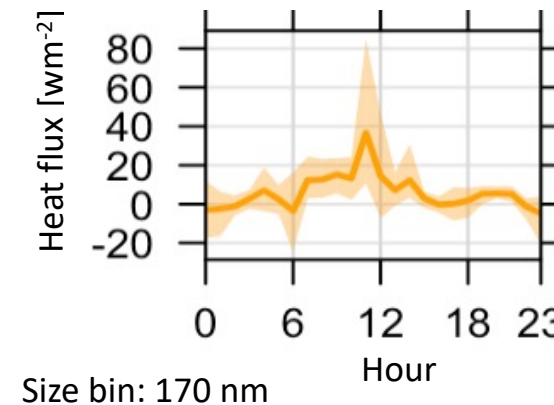
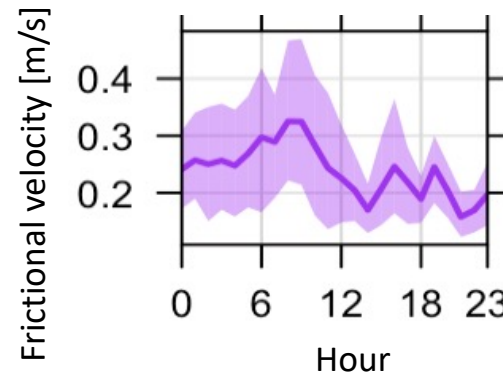
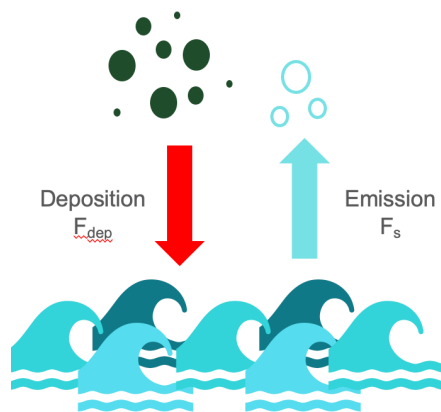
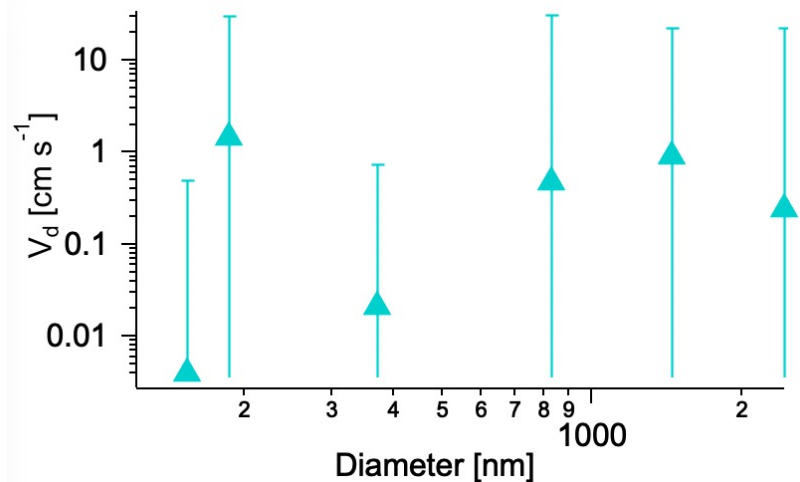


EPCAPE size distribution.
<https://wordpress.cels.anl.gov/clouds/epcape-plots/2023-3-28-aerosols/>





Particle fluxes: SCRIPPS PIER



Post processing:–

- Select better quality of aerosol fluxes, e.g. apply frictional velocity filter.
- Quantify emission flux of sea spray aerosol to separate from overall flux!



Summary and future work

- ❖ We have FALCON network setup for measuring size resolved aerosol fluxes and dry deposition velocities at 3 different sites.
- ❖ At the Scripps site size resolved aerosol fluxes and deposition velocity were calculated.
- ❖ This site is complex due to having emission of sea spray aerosol flux, further work needs to separate these process.



SGP site :Grass land



Chestnut ridge, TN
Hickory forest

A scenic photograph of a sunset over the ocean. The sun is low on the horizon, casting a bright orange glow across the sky and reflecting on the water. In the foreground, there are dark, jagged rocks and some dry, brown grasses. A pier or walkway extends into the water from the left side. A few birds are visible in the sky. The overall mood is peaceful and serene.

Thank you!

Questions?

Sun setting in La Jolla, California