Particle aging and radiative interaction – aerosol dynamic processes influence plume dispersion after the Raikoke 2019 eruption

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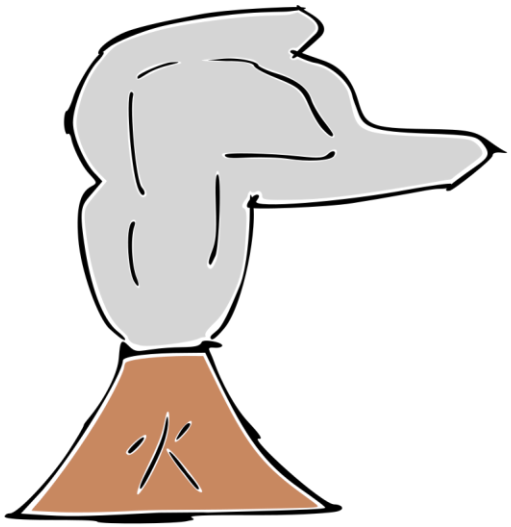
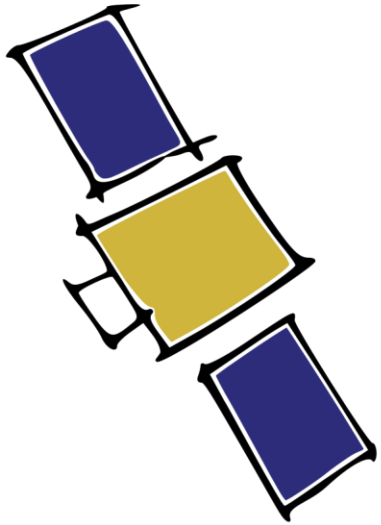
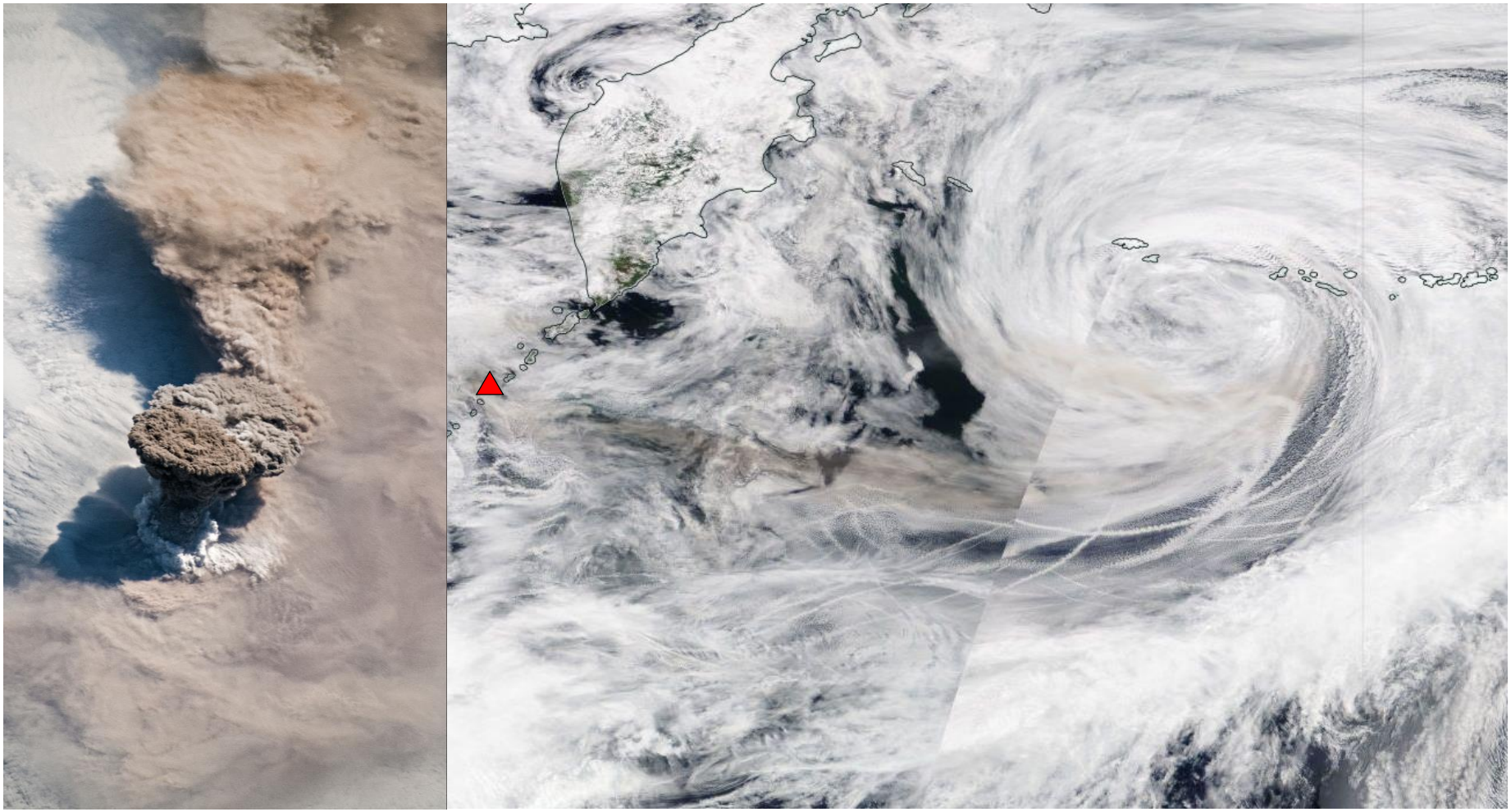




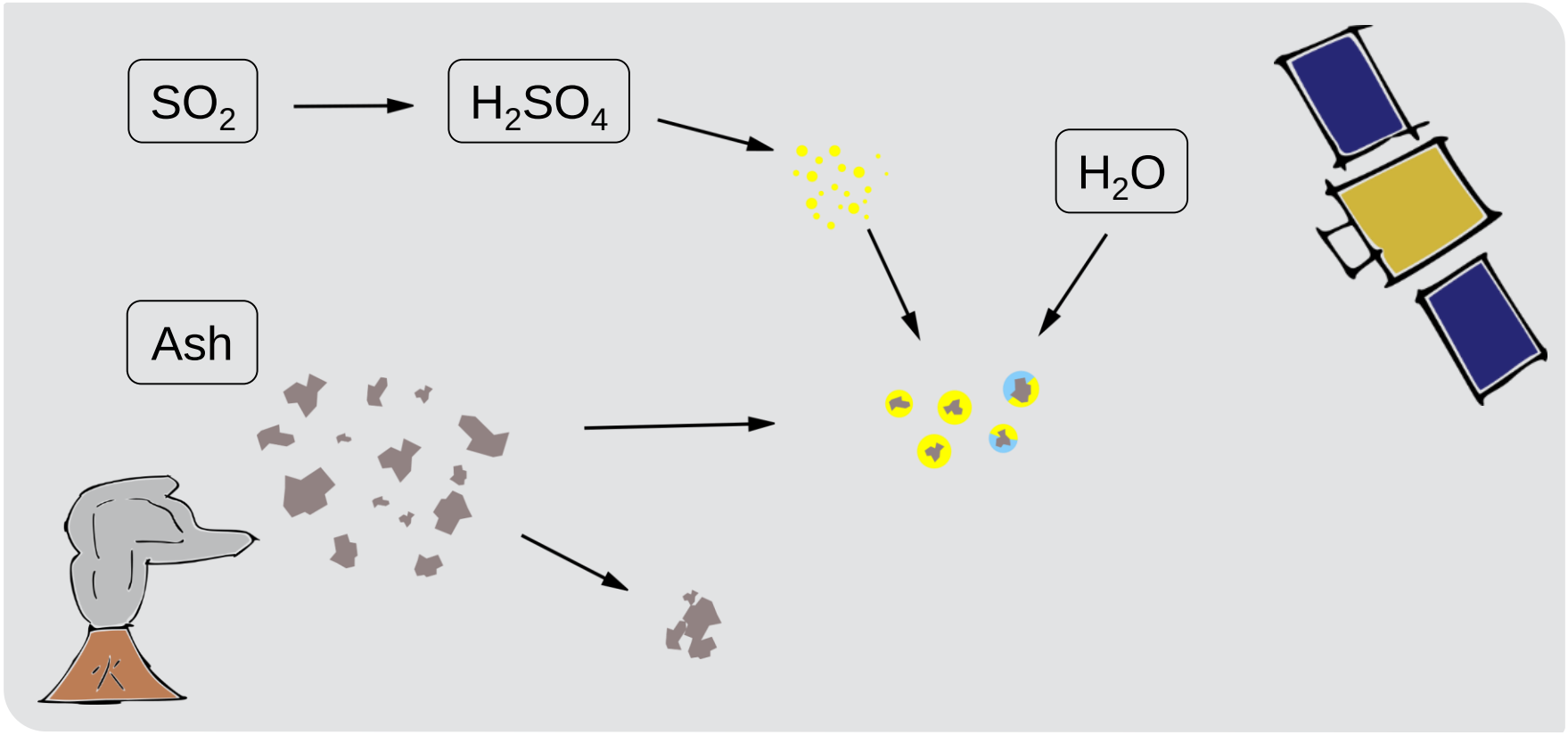
23 June 2019



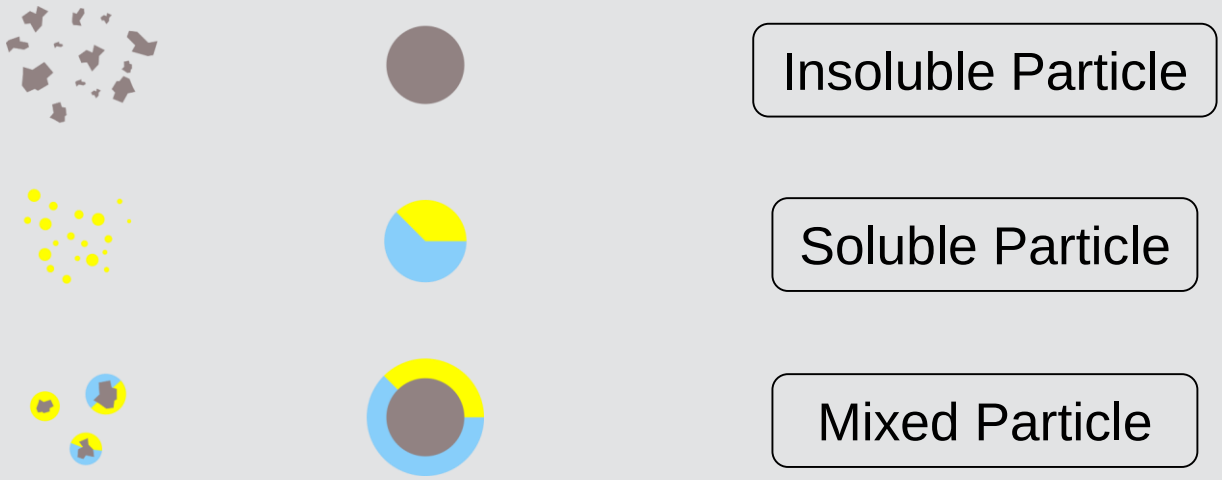
NASA earth observatory

NASA Worldview

Aerosol Dynamic Processes

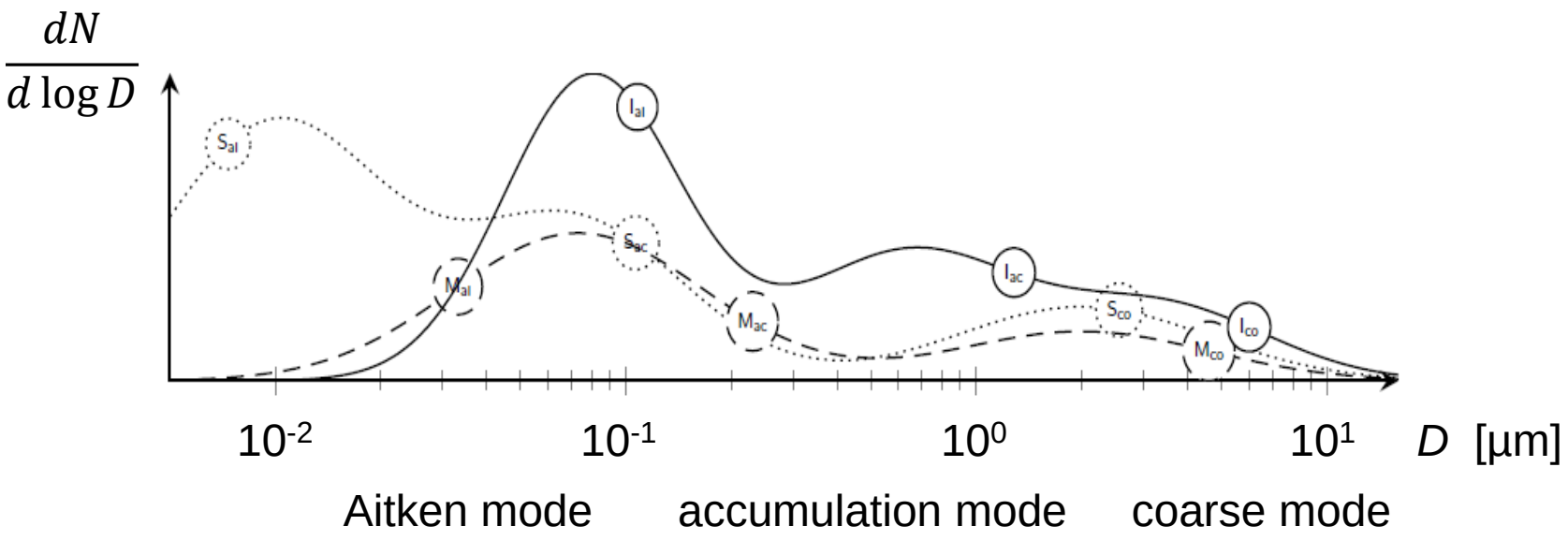


Aerosol Modal Description

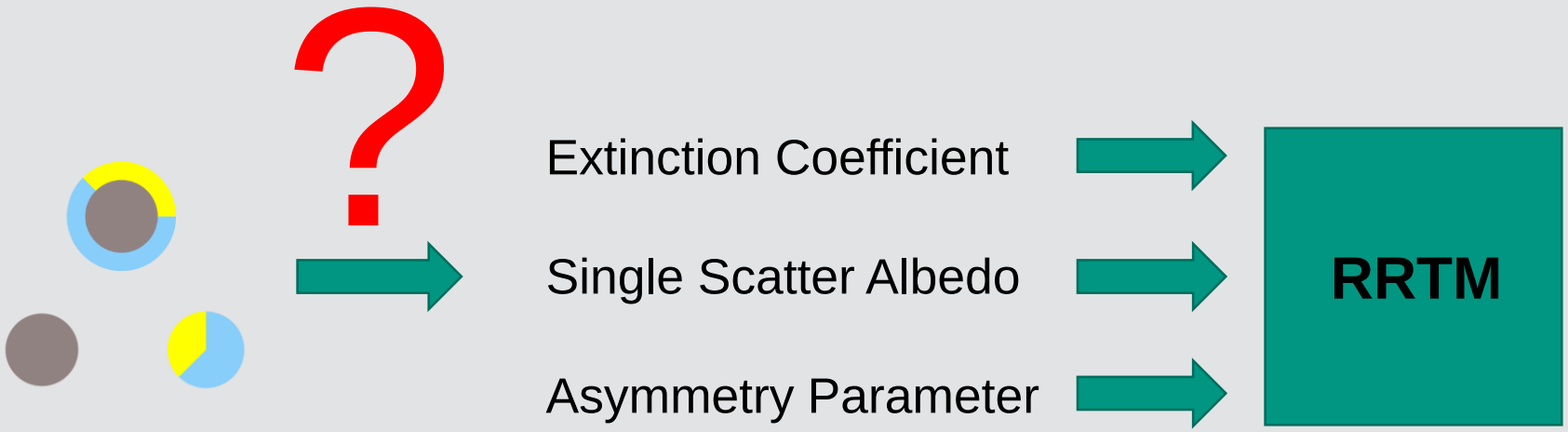


- Log – normal distribution

Aerosol Size Distribution

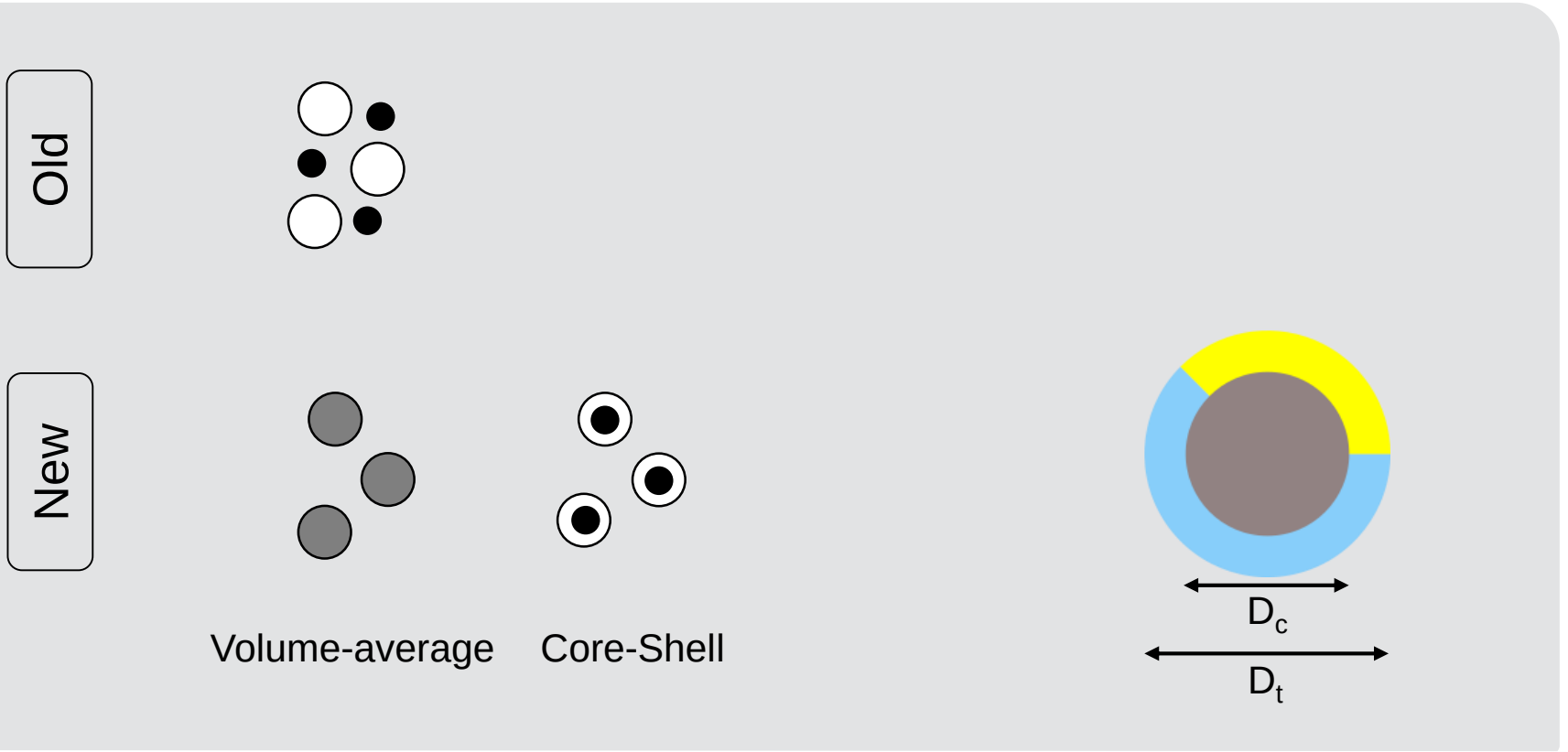


Radiation Module in ICON

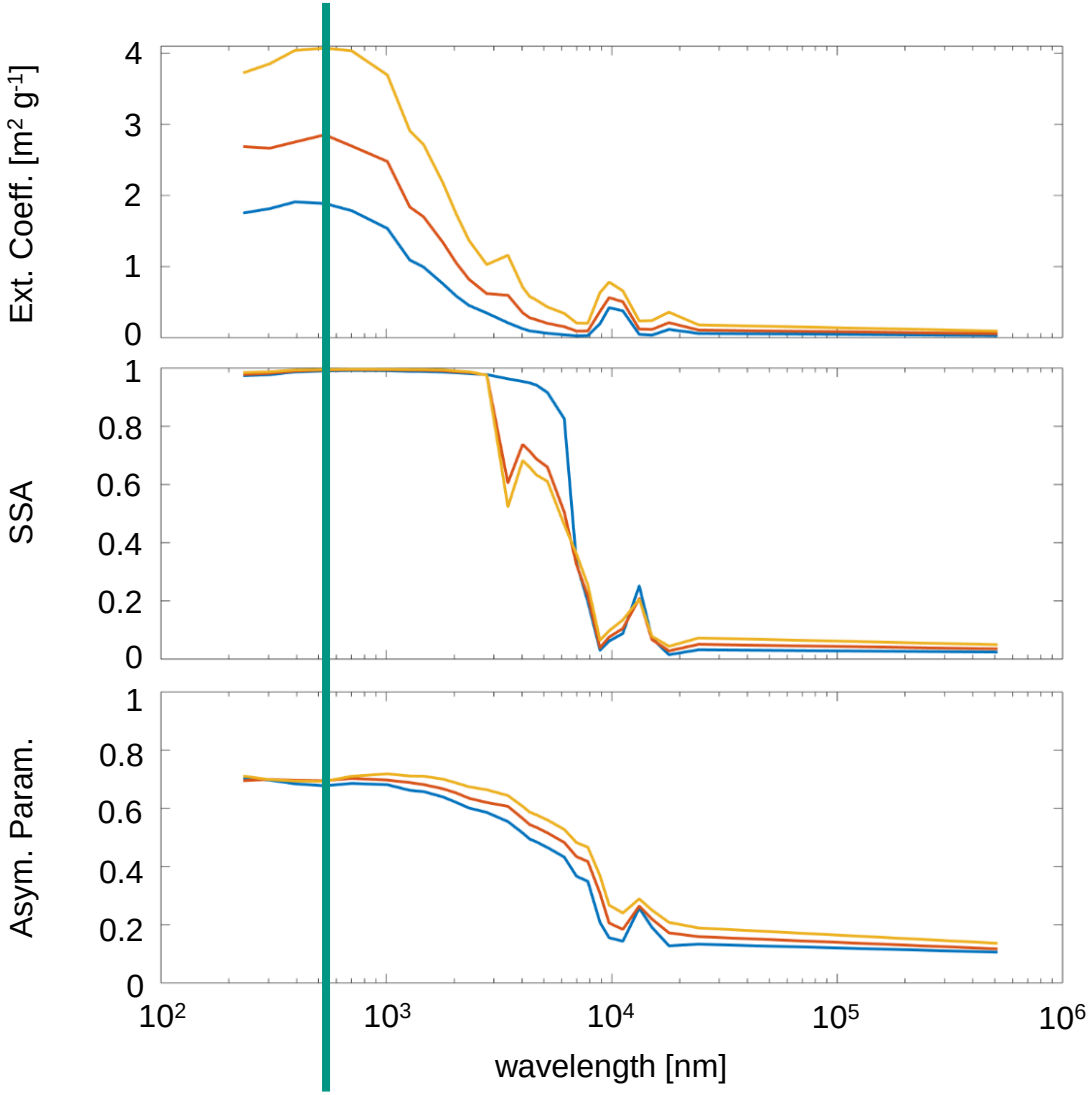


Ext. Coeff.	SSA	Asym. Param.
$\beta_e = \beta_s + \beta_a$ [m^{-1}]	$\omega = \frac{\beta_s}{\beta_e}$	$-1 \leq g \leq 1$

Mie Calculation

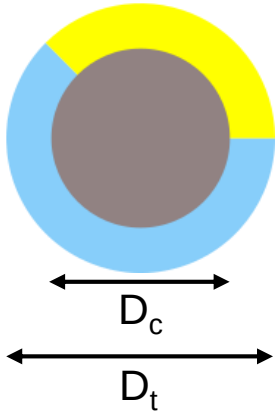


Optical Properties: Internally Mixed Aerosols



$\frac{D_s}{D_t}$ 0.0 0.25 0.50

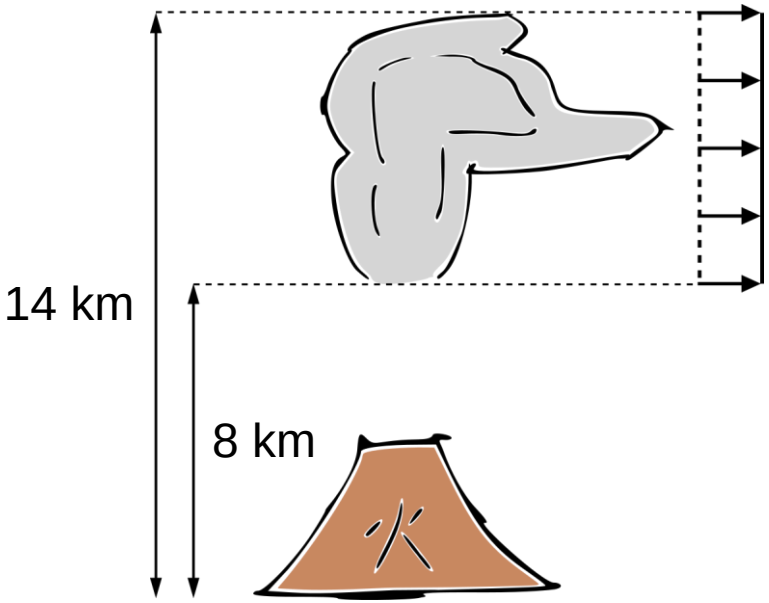
$D_s = D_t - D_c$



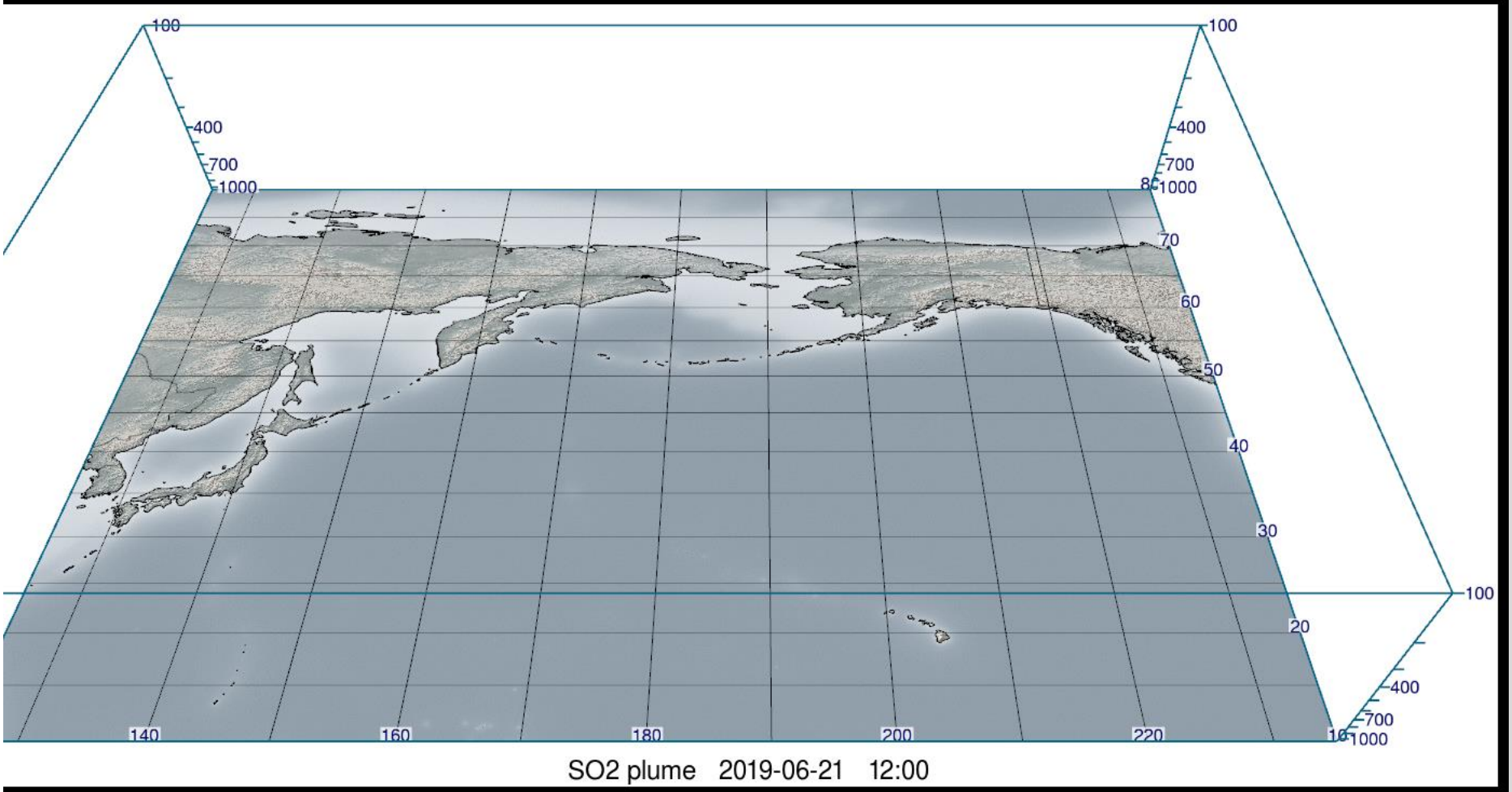
Special thanks to Ali H.

Simulation Setup

- June 21, 2019
  12 UTC
- Global Grid
  $\Delta\bar{x} = 13.2$ km



- 1.5 Tg SO_2
- 1.9 Tg Ash
  (D < 30 µm)

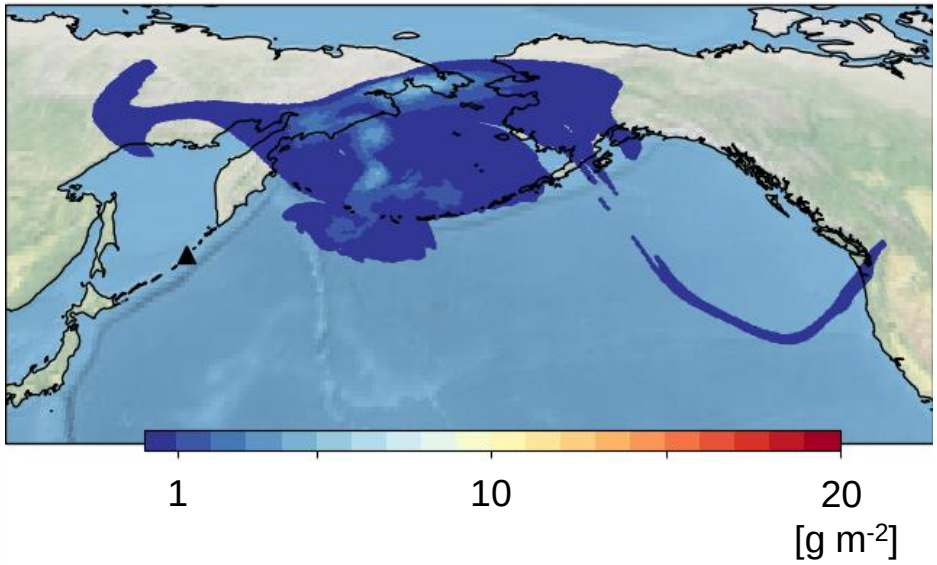


SO2 plume 2019-06-21 12:00

SO_2 Mass Loading

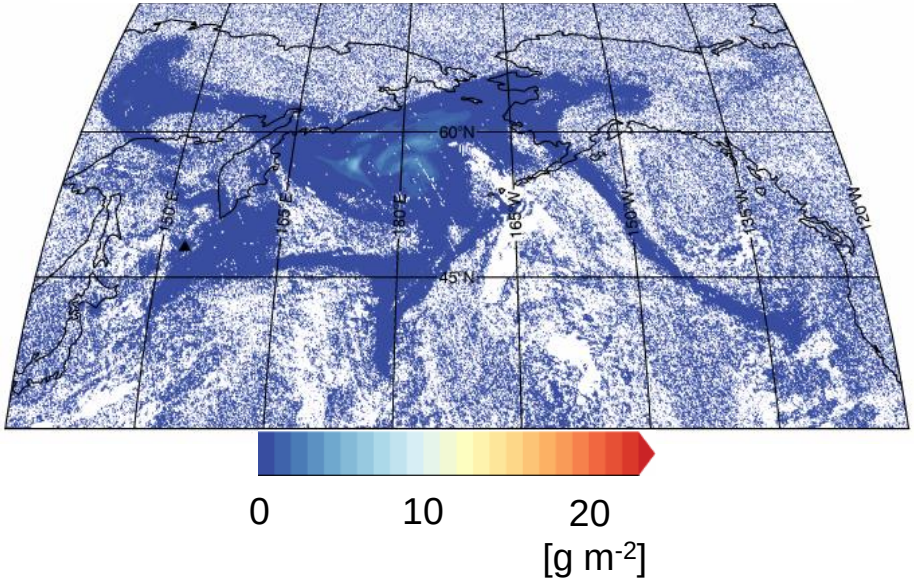
ICON-ART

June 25, 01:00 UTC



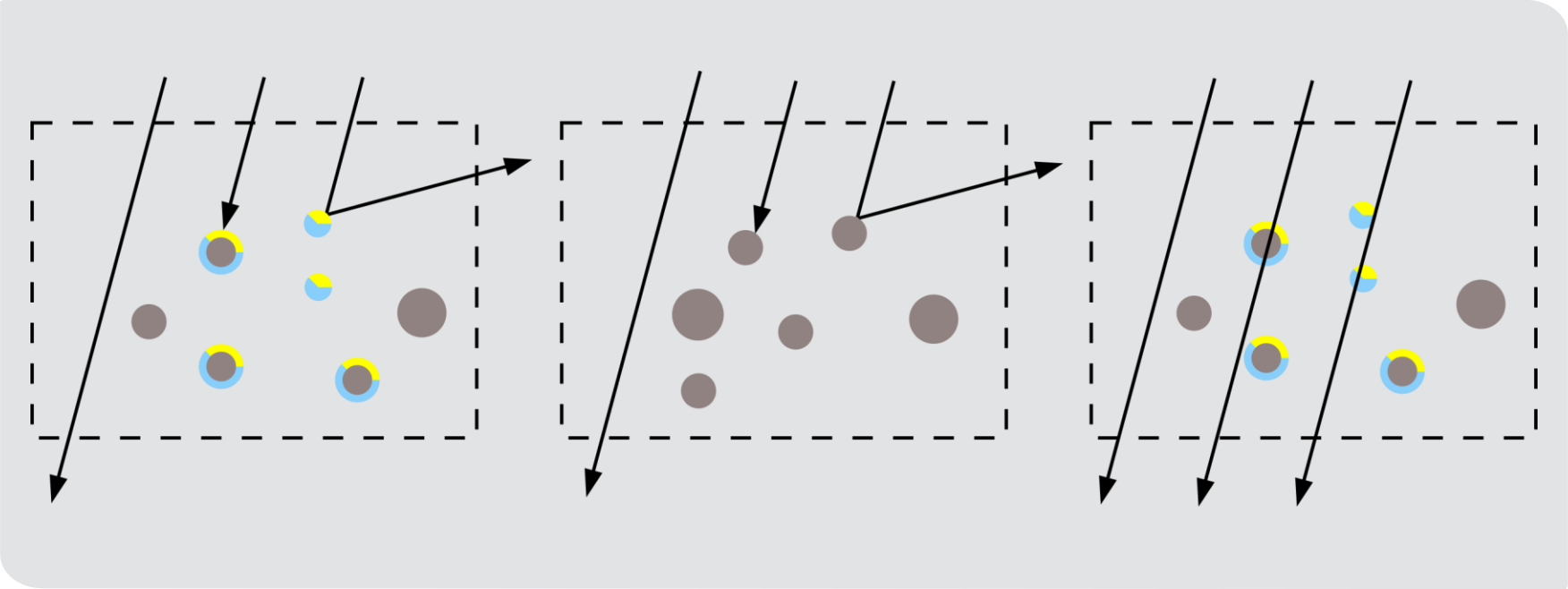
TROPOMI

June 24 – 25, 21:56 – 03:13



Special thanks to S. Peglow

Three Different Cases



- AERODYN
- rad

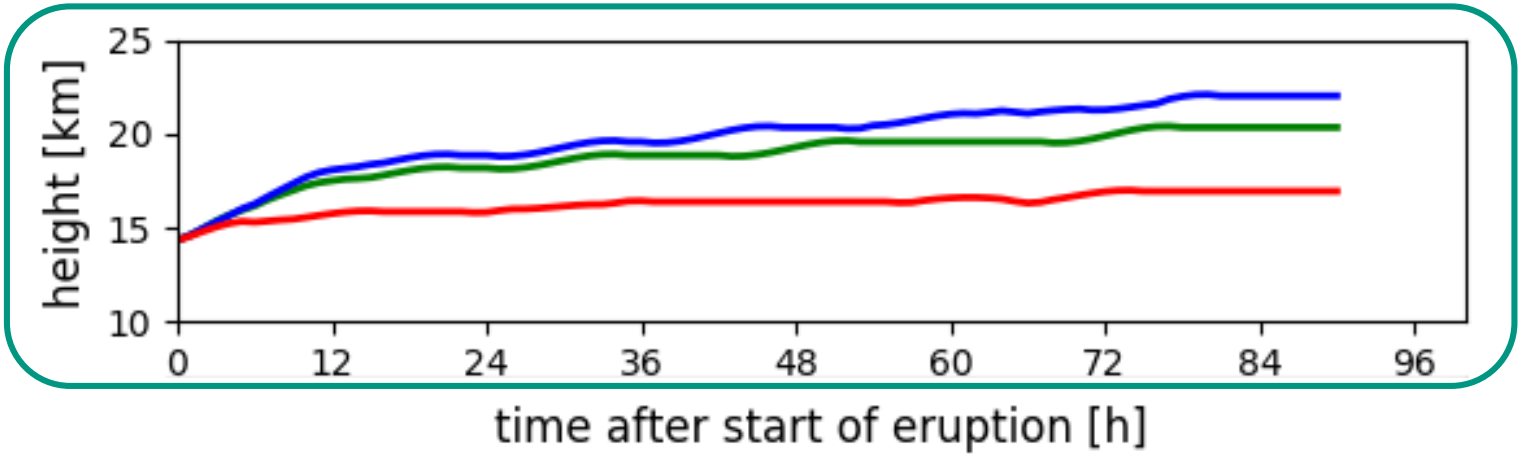
- no AERODYN
- rad

- AERODYN
- no rad

Maximum Plume Top

Accumulation Mode

AERODYN, rad
no AERODYN, rad
AERODYN, no rad



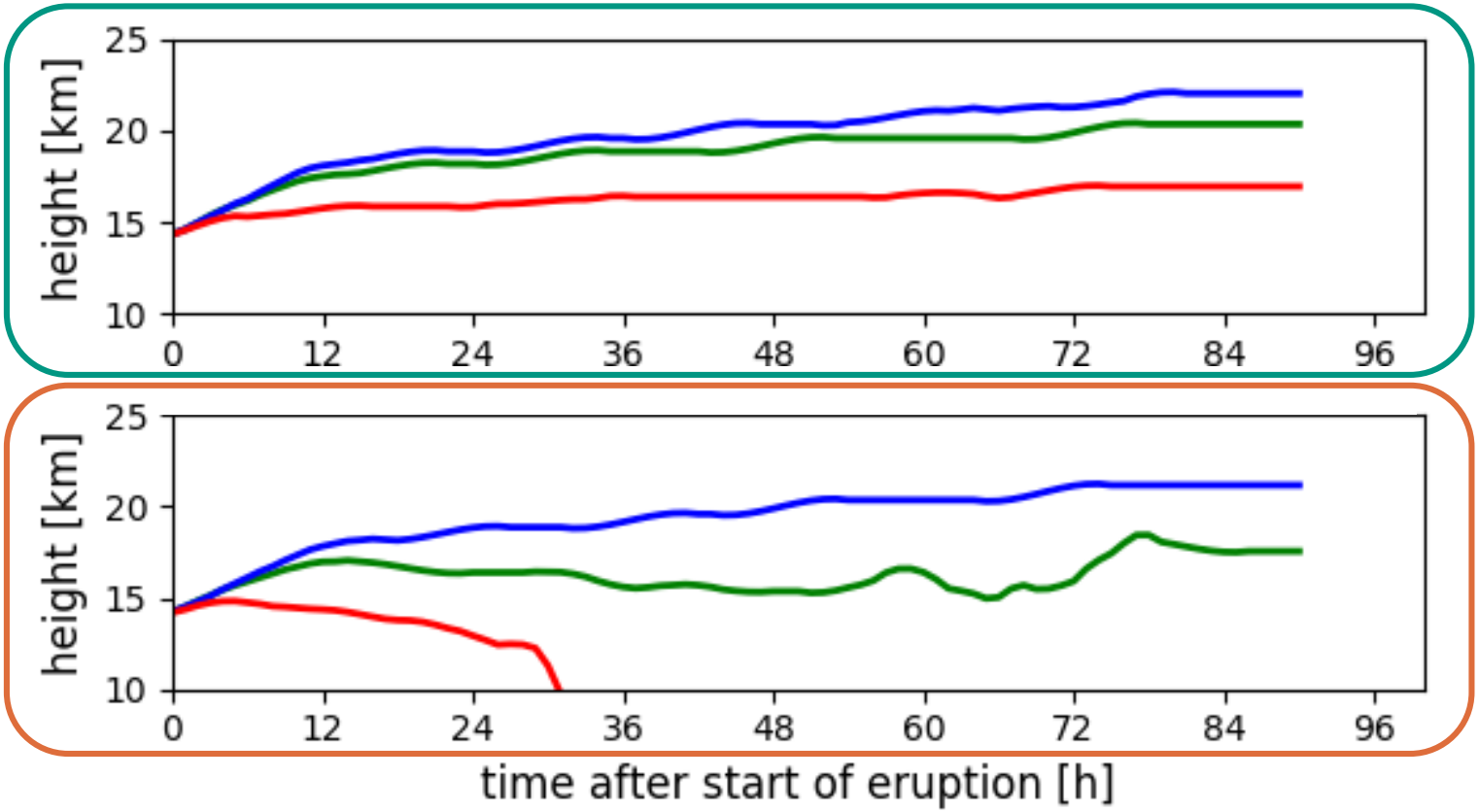
Muser et al., 2020
[in preparation]

Maximum Plume Top

Accumulation Mode

Coarse Mode

AERODYN, rad
no AERODYN, rad
AERODYN, no rad



Muser et al., 2020
[in preparation]

Summary

- ✓ Implement aerosol dynamic processes
- ✓ Model radiative feedback of mixed particles
  - ➡ Affects lifetime of particles