Aerosol Life Cycle

remaining issues

recommendations for modelling

evaluation issues

proposed AeroCom activities

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AeroCom phase III multi-model evaluation of the aerosol lifecycle and optical properties using ground and space based remote sensing as well as surface in situ observations

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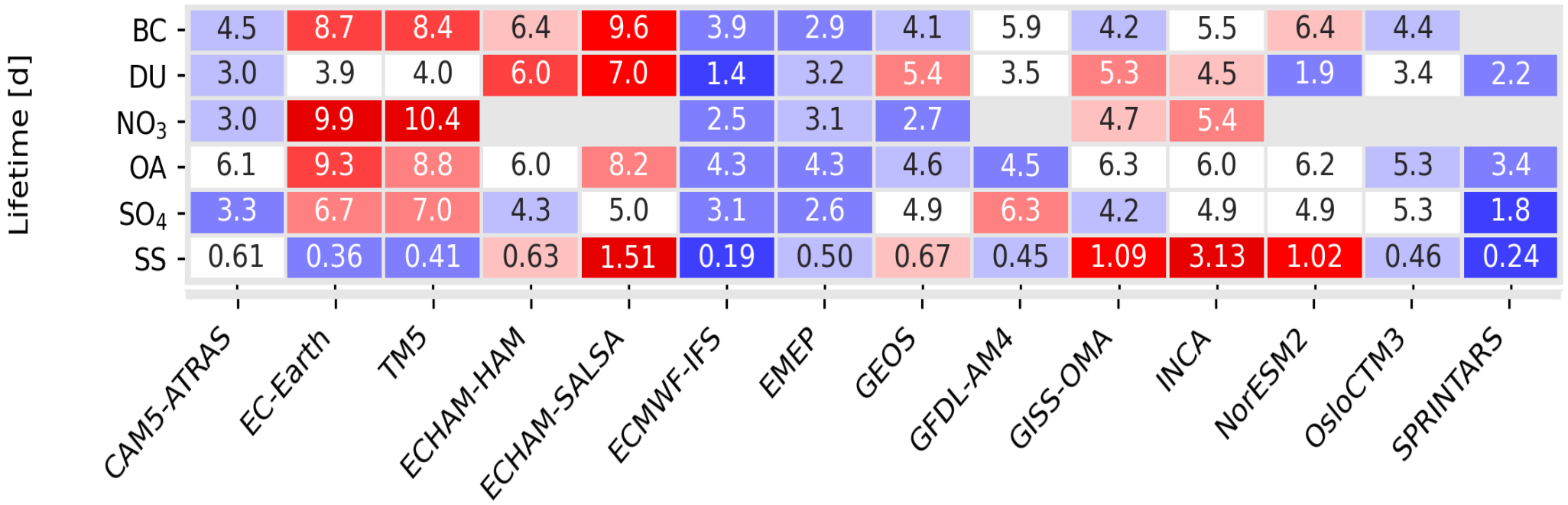
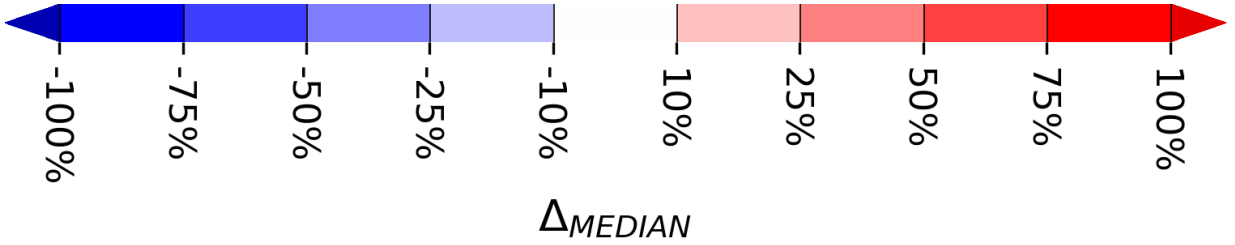
Lifetime = Load / Total Deposition (annual averages)



AeroCom Median PIII	Inter quartal range	Standard Deviaion
5.5	41%	35%
3.7	56%	39%
3.9	94%	58%
6.0	29%	29%
4.9	36%	32%
0.56	92%	91%



Remaining issues

Lifetimes are (just) similar for a given model
(blue and red models…)

Host model meteorology&code influences
(ECHAM-HAM and ECHAM-SALSA…)

Inter model variation SS = NO3 > DU > BC > SO4 > OA

Diagnostic errors ???

Are we capturing the true uncertainty?

Are short life times realistic?
(IFS assimilation always adds AOD)

Consistent explanation across species&models ??
f(size, scavenging, meteo, resolution..)

Gliss et al, revision for ACPD 2020

“Evaluation” issues

- Errors in output (all components in load and deposition?) (units)
- Aerosol size diagnosis
- Emission and Deposition functions
- Vertical mixing, eg transport into upper layers
- Uncertainty in component contributions to emissions
  - Eg DMS, volcanic SO2,
  - Biogenic SOA, BB-OA, anthropogenic SOA, OA/OC factors
  - Road dust, agricultural dust, dusty region extension,
    - Component mixture can also impact on life time
- Atmospheric chemistry impact on OA, SO4, NO3 formation
- Dependence on host model (resolution, nudging, CMIP6 vs AeroCom, etc)

Recommendations for modelling / proposed AeroCom activities

- Remove errors in output (all components in load and deposition) (units)
- Add aerosol size diagnosis
- Code exchange on Emission and Deposition functions
- Evaluate vertical mixing, eg transport into upper layers, test impact on lifetime
- Diagnose component contributions to emissions and loads
  - Eg DMS, volcanic SO2,
  - Biogenic SOA, BB-OA, anthropogenic SOA, OA/OC factors
  - Road dust, agricultural dust, dusty region extension,
    - Component mixture can also impact on life time
  - BB BC, brown carbon
  - NO3 on seasalt and dust
- Diagnose atmospheric chemistry impact on OA, SO4, NO3 formation
- Test dependence on host model (resolution, nudging, CMIP6 vs AeroCom, etc)
- ***Provide a consistent explanation of differences between models***