- 1 Differences between recent emission inventories strongly affect anthropogenic aerosol
- 2 evolution from 1990 to 2019
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6 Supplementary material

Table S1: Global, annual mean burdens [mg m^{-2}] of BC, primary and secondary organic aerosol (POA,

11 SOA), sulfate, fine mode nitrate and fine mode ammonium aerosol from simulations with the CEDS,

12 ECLv6, CEDS inventories. Also shown is the BC and POA burden originating from fossil and biofuel

combustion only.

| | | BC | BC (fossil+biofuel) | POA | POA (fossil+biofuel) | SOA | Sulfate | Nitrate (fine) | NH4 (fine) |
|--------|------|-------|------------------------|-------|-------------------------|-------|---------|-------------------|---------------|
| CEDS | 2014 | 0.223 | 0.166 | 2.002 | 0.628 | 1.110 | 5.390 | 0.155 | 0.690 |
| | | | | | | | | | |
| ECLv6 | 2014 | 0.206 | 0.148 | 1.714 | 0.374 | 1.064 | 4.585 | 0.192 | 0.642 |
| | 2016 | 0.200 | 0.144 | 1.576 | 0.374 | 1.054 | 4.431 | 0.201 | 0.624 |
| | | | | | | | | | |
| CEDS21 | 2014 | 0.214 | 0.156 | 1.787 | 0.444 | 1.079 | 4.944 | 0.178 | 0.681 |
| | 2016 | 0.207 | 0.151 | 1.644 | 0.443 | 1.066 | 4.769 | 0.186 | 0.663 |
| | 2019 | 0.214 | 0.150 | 2.028 | 0.439 | 1.080 | 4.717 | 0.213 | 0.691 |



Figure S1: Regional anthropogenic emissions of SO₂, BC, OC, and NOx in the CEDS21, ECLv6,
CEDS17 inventories, for the period 1990 to the most recent inventory year (2019, 2016 and 2014,
respectively). Dotted lines show emissions from the SSP2-4.5 scenario, linearly interpolated from 2015

34 to 2019. Regions follow the naming and geographical definition of the HTAP2: NAM = North America, 54. EVID 54. South Arise SAE 5. South Arise SAE 5. South America, SAE 5

EUR = Europe, SAS = South Asia, SAF = Sub-Saharan Africa.

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40 Figure S2: Percentage difference in regional mean burden of the key anthropogenic aerosol species

41 between simulations with CEDS21 and CEDS emissions (upper bar) and ECLv6 and CEDS (lower

42 bar). Regions are: EAS = East Asia, SAS = South Asia, SAF = Sub-Saharan Africa, NAM = North
43 America, SAM = South America, NAF = North Africa and the Middle East, EUR = Europe, SEA =

44 South East Asia, RBU = Russia.

a) CESDS21



47 Figure S3: RFnet, RFari and RFaci in 2014 relative to 1990 from simulation with a) CEDS21
48 emissions, b) ECLv6 emissions, and c) CEDS emissions.



Figure S4: Annual AOD averaged from 2005 to 2017 as a) simulated by the OsloCTM3 and b)

retrieved from MODIS-Aqua.





58 Figure S5: Scatter density plots of year 2014 AERONET versus OsloCTM3 AOD with the emission

inventories and fixed meteorology (top) or actual meteorology (bottom).