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Trends and source apportionment of aerosols in Europe during 1980–2018

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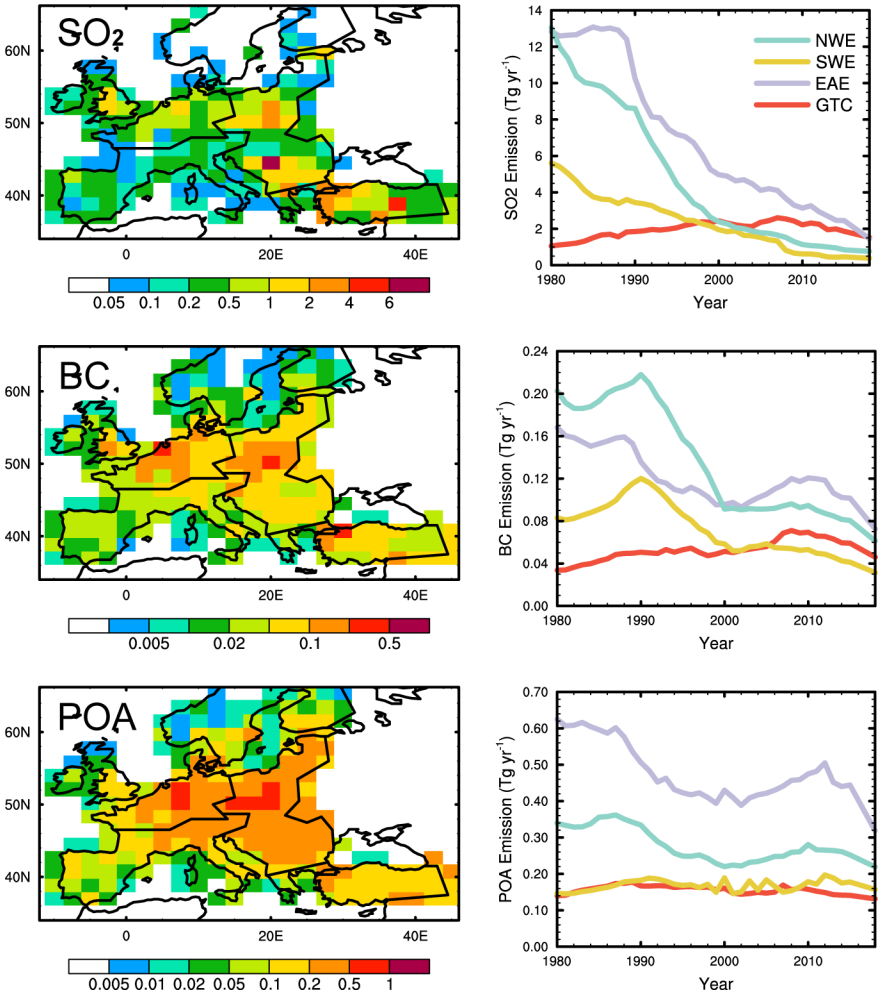

Figure S1. Spatial distribution (left) of annual mean (1980–2018) SO_2 (top), BC (middle) and POA (bottom) emissions (Tg m^{-2} yr^{-1}) over Europe. Time series (1980–2018) of annual total SO_2, BC and POA emissions (Tg yr^{-1}) from the four sub-regions of Europe.

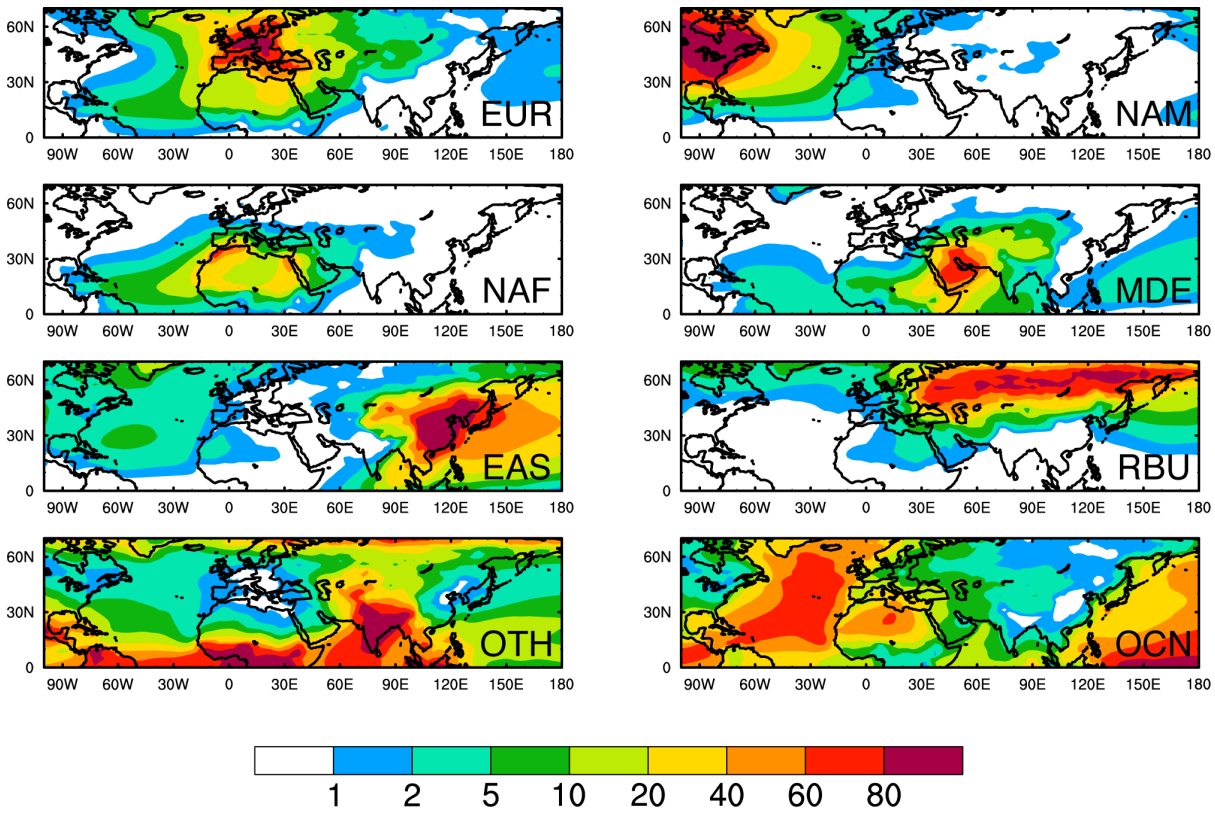

Figure S2. Relative contributions (%) to annual mean near-surface concentrations of sulfate-BC-POA from the major tagged source regions including Europe (EUR), North America (NAM), North Africa (NAF), the Middle East (MDE), East Asia (EAS), Russia-Belarus-Ukraine (RBU), Non-Arctic/Antarctic Ocean (OCN) and other (OTH) regions averaged over 2010–2018.

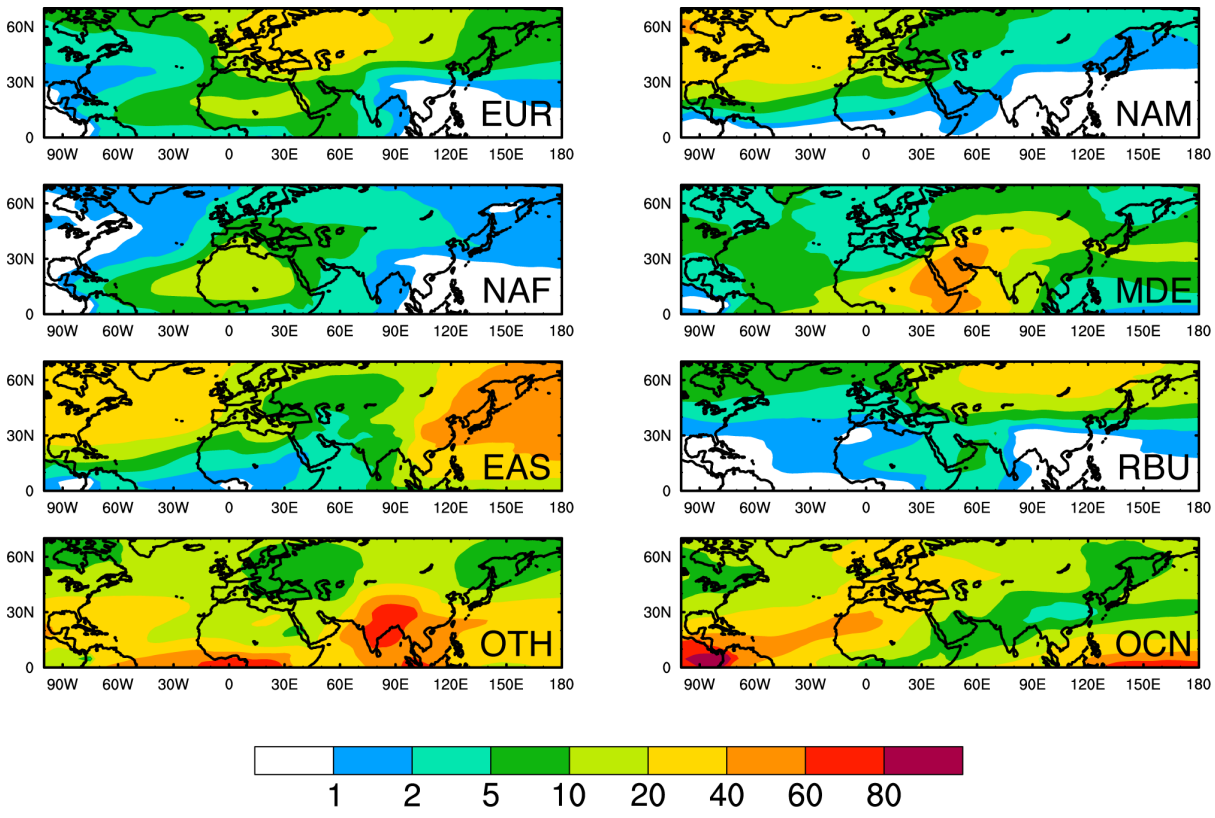

Figure S3. Relative contributions (%) to annual mean concentrations of sulfate-BC-POA at 500 hPa from the major tagged source regions including Europe (EUR), North America (NAM), North Africa (NAF), the Middle East (MDE), East Asia (EAS), Russia-Belarus-Ukraine (RBU), Non-Arctic/Antarctic Ocean (OCN) and other (OTH) regions averaged over 2010–2018.

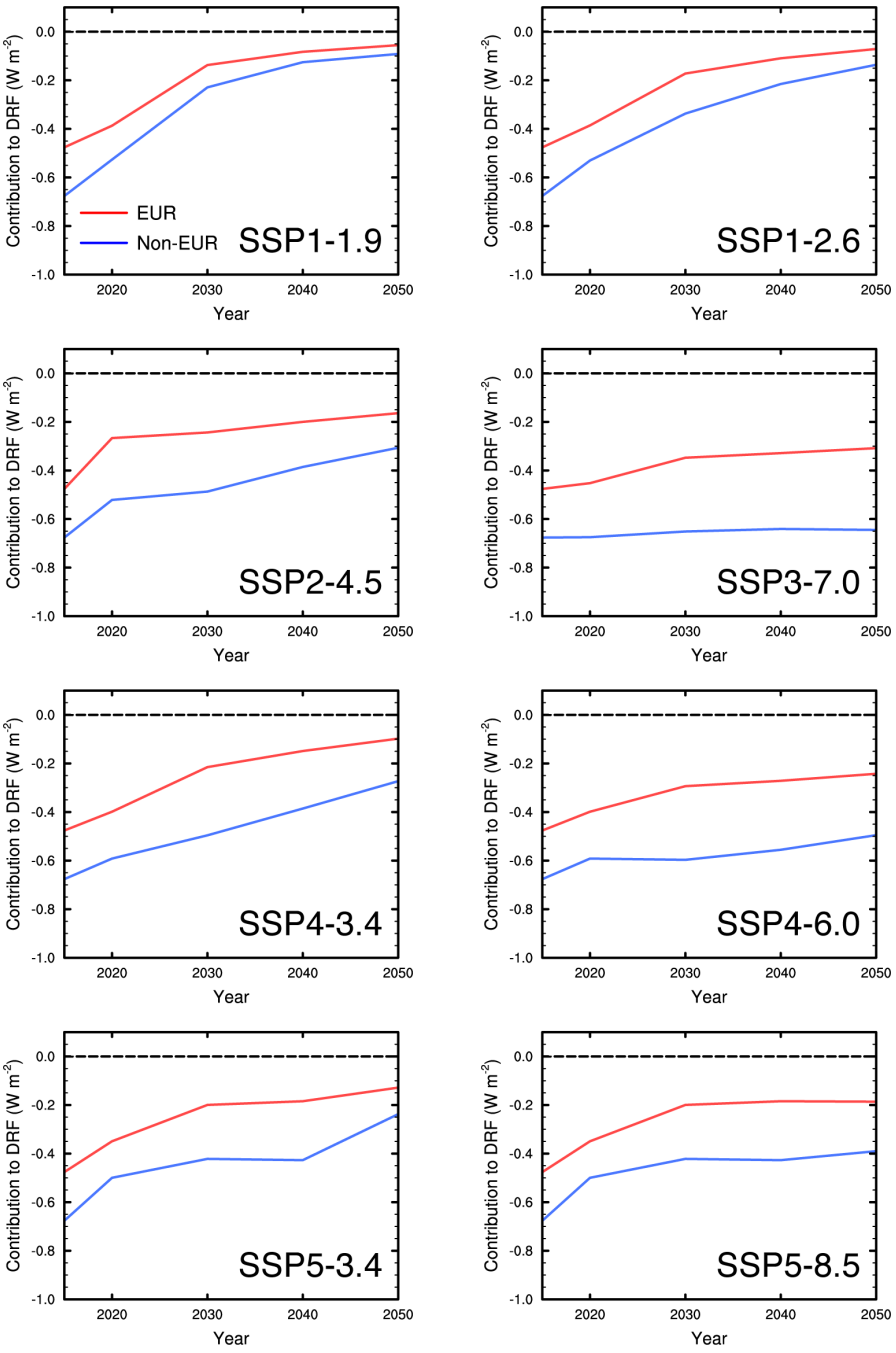

Figure S4. Time series (2015–2050) of estimated annual mean sulfate DRF over Europe contributed by European and non-European emissions from eight SSP scenarios, including SSP1-1.9, SSP1-2.6, SSP2-4.5, SSP3-7.0, SSP4-3.4, SSP4-6.0, SSP5-3.4, and SSP5-8.5. Future DRF of sulfate aerosol over Europe is estimated by scaling historical mean (1980–2018) sulfate DRF using the ratio of SSPs future SO_2 emissions to historical emissions assuming a linear response of DRF to regional emissions.