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Supplement of

Measurement Report: Changes in ammonia emissions since the 18th century in south-eastern Europe inferred from an Elbrus (Caucasus, Russia) ice-core record

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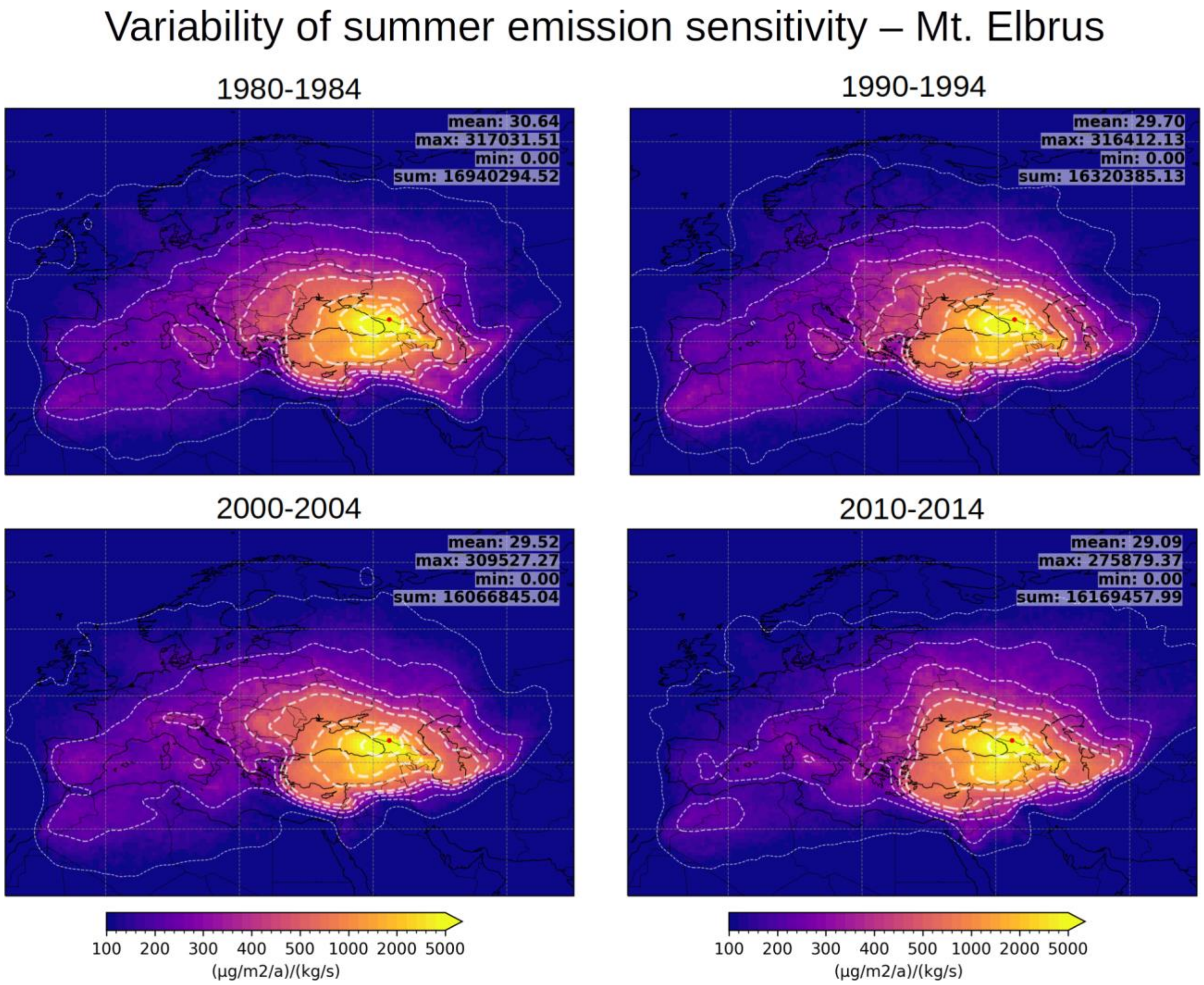

Figure S1: Temporal variability (1980-1984, 1990-1994, 2000-2004, and 2010-2014) of emissions sensitivities in ((mg m^{-2} yr^{-1})/kg s^{-1}) at the ELB ice-core site (red dot) based on FLEXPART model simulations of sulfate aerosol transport and deposition (real elevation).

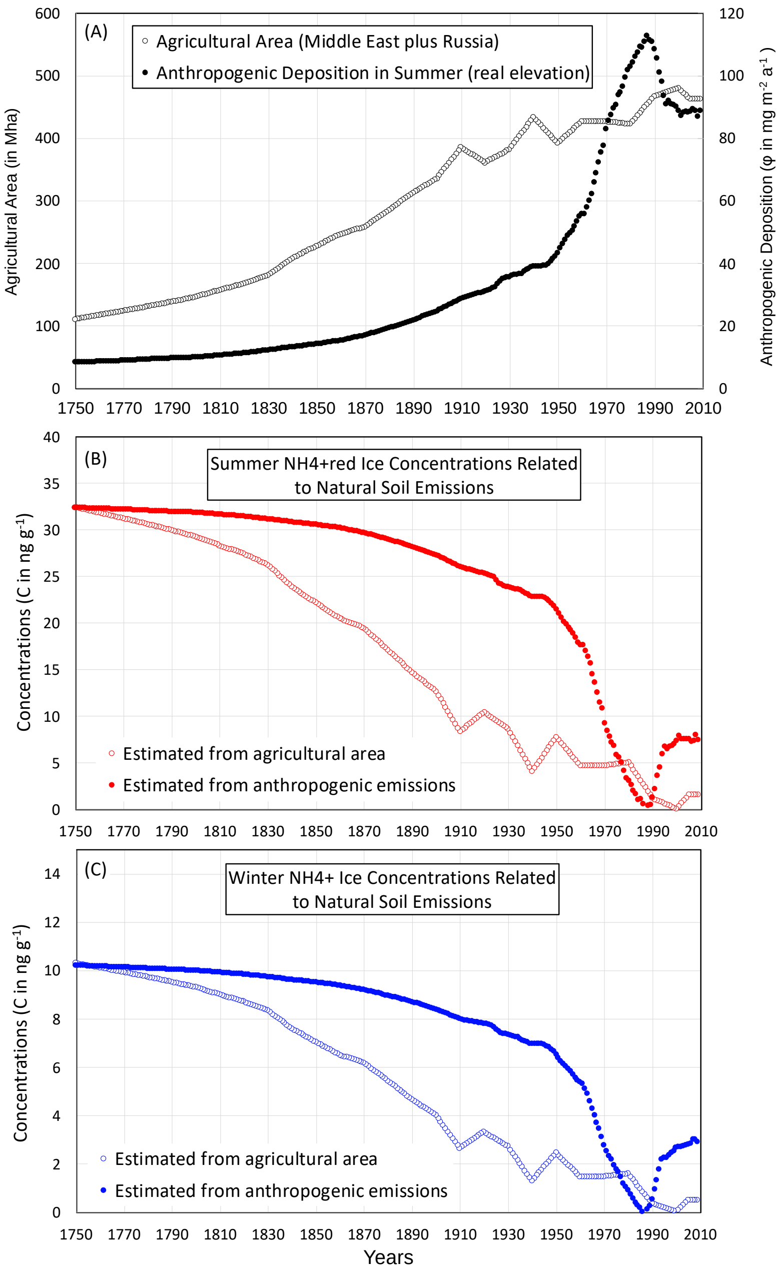

Figure S2: Past changes of the agricultural area of the Middle East and Russia (A) (https://ourworldindata.org/grapher/total-agricultural-area-over-the-long-term) and of the contribution of ammonium concentrations in the ELB ice (B for summer, C for winter) related to emissions from natural soils (section 5). Concentrations related to natural soils emissions were estimated from changes of agricultural soils and anthropogenic emissions to calculate the anthropogenic fractions, denoted anthropogenic-1 and anthropogenic-2, respectively, in Figure 7 and 8.

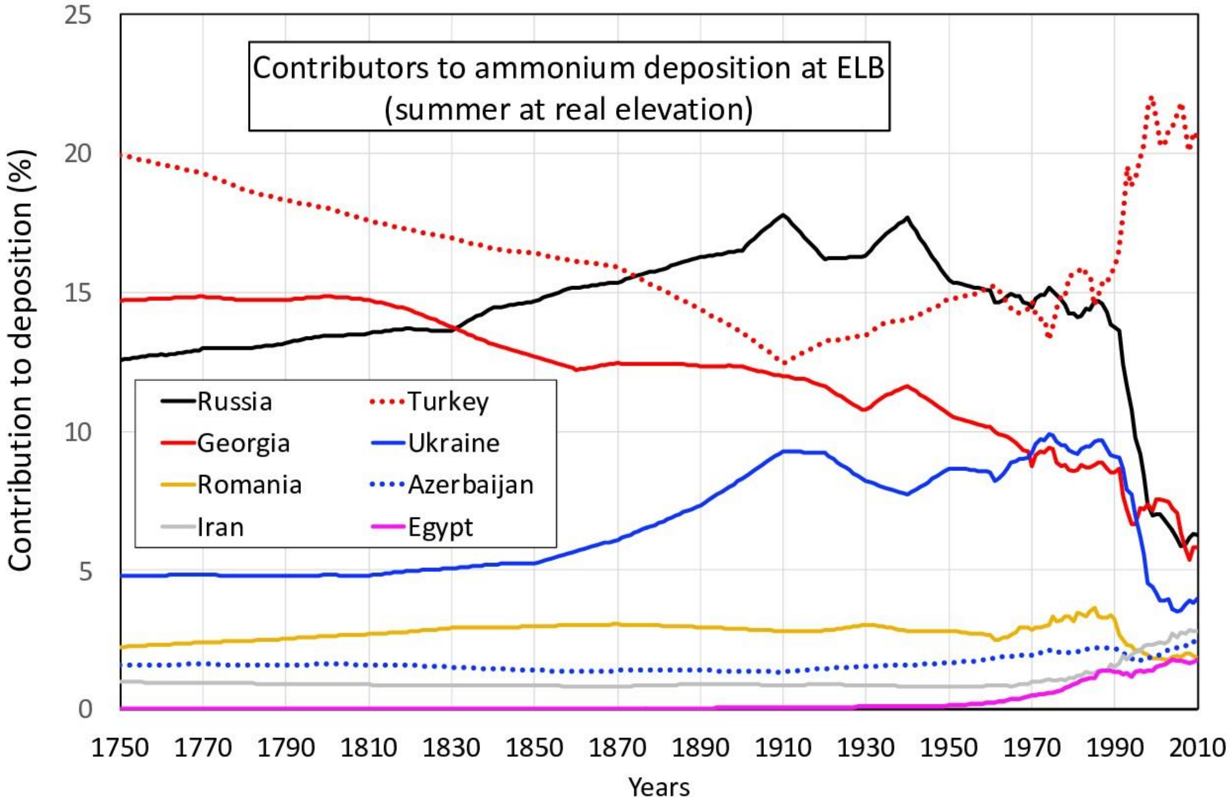

Figure S3: Sources of ammonium deposition at the Elbrus site at the real elevation in summer using the summer CEDS inventories.

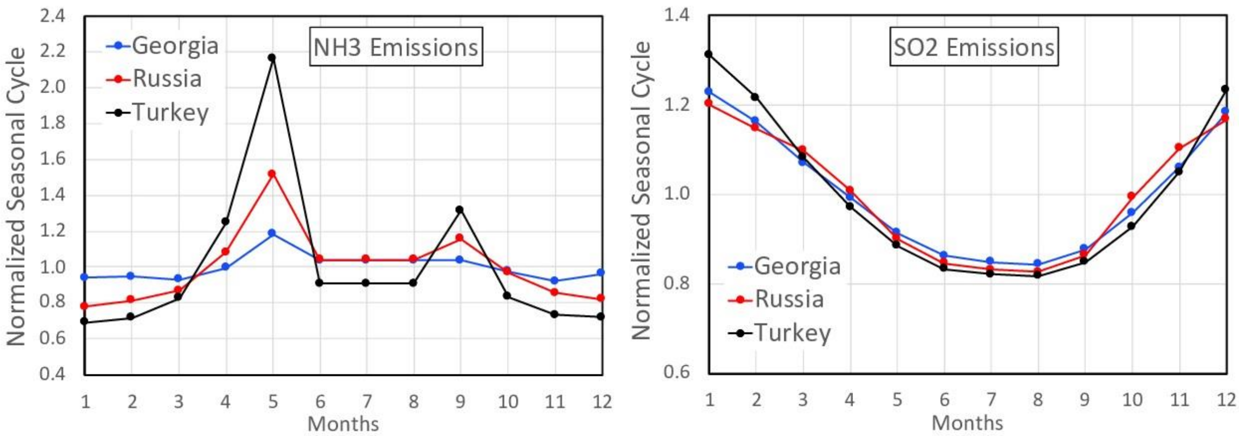

Figure S4: Normalized seasonal changes of emissions for NH_3 and SO_2 in countries located around the ELB site.