Supplementary information to *ChAP 1.0: A stationary tropospheric sulphur cycle for Earth system models of intermediate complexity*

Alexey V. Eliseev, Rustam D. Gizatullin, and Alexandr V. Timazhev

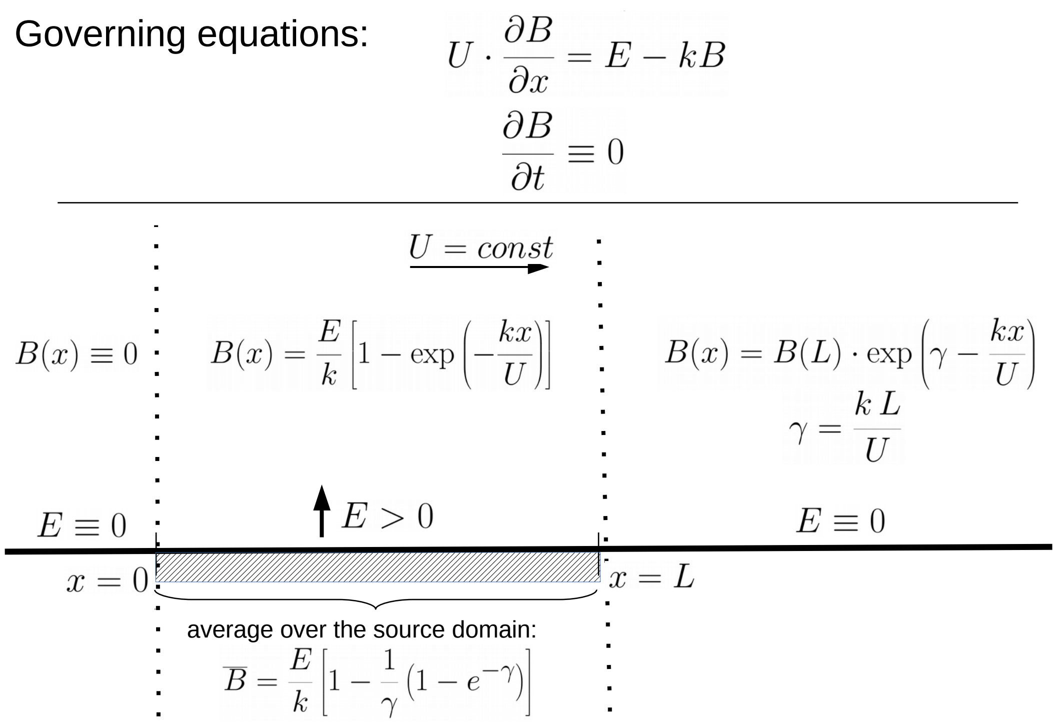

Fig. S1. Solution of the one–dimensional emission–transport problem in three characteristic domains. External emissions with the per-area rate E are applied only in the domain $0 \leq x \leq L$. Notations: B is burden per unit area, k is loss coefficient, U is horizontal wind speed, x is horizontal coordinate. In contrast to Eqs. (5) and (6) of the main text, subscripts indicating chemical substances are dropped for simplicity.

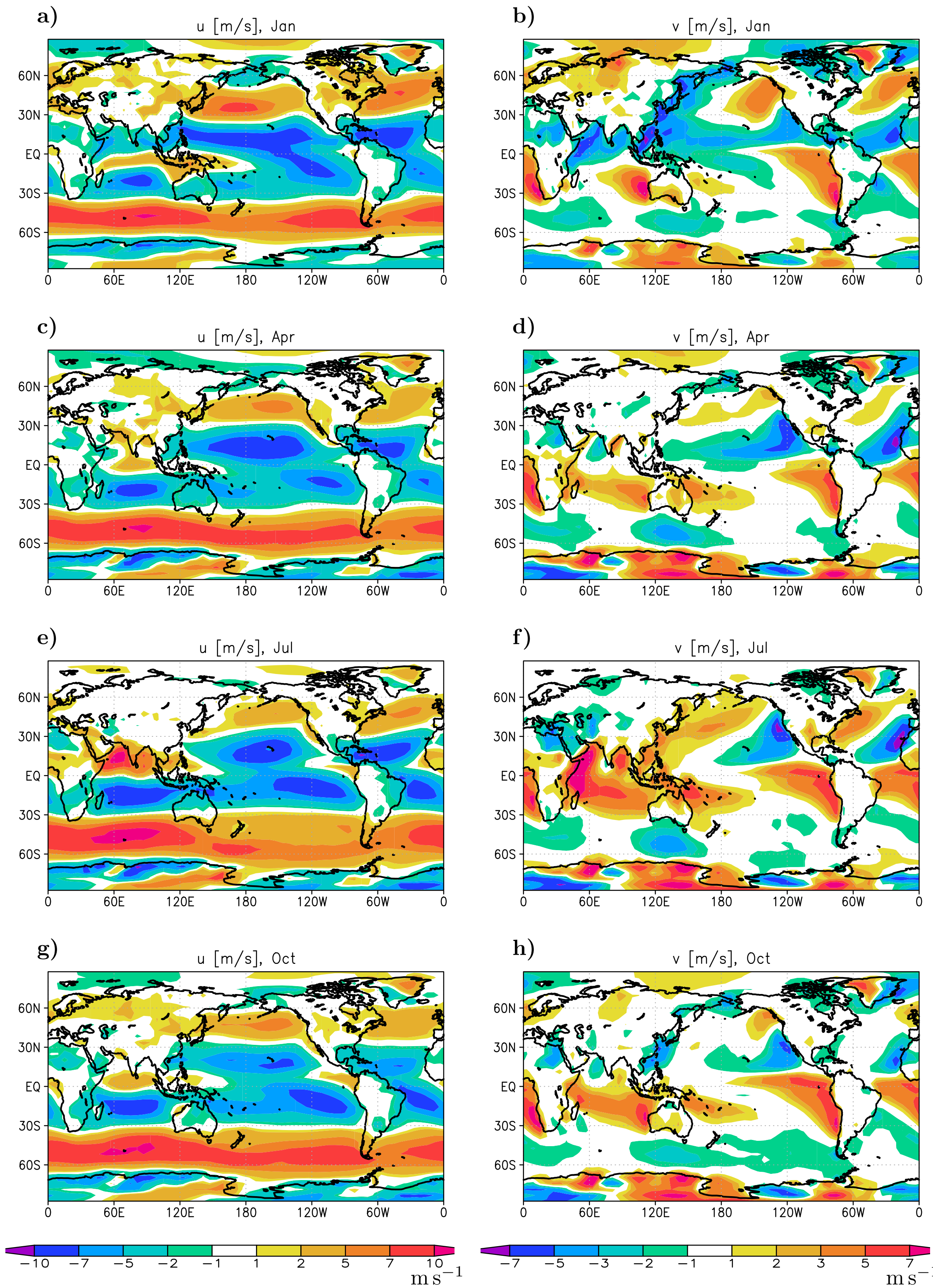

Fig. S2. ERA–Interim horizontal wind components averaged over years 1979–2015 at the 850 hPa isobaric level.

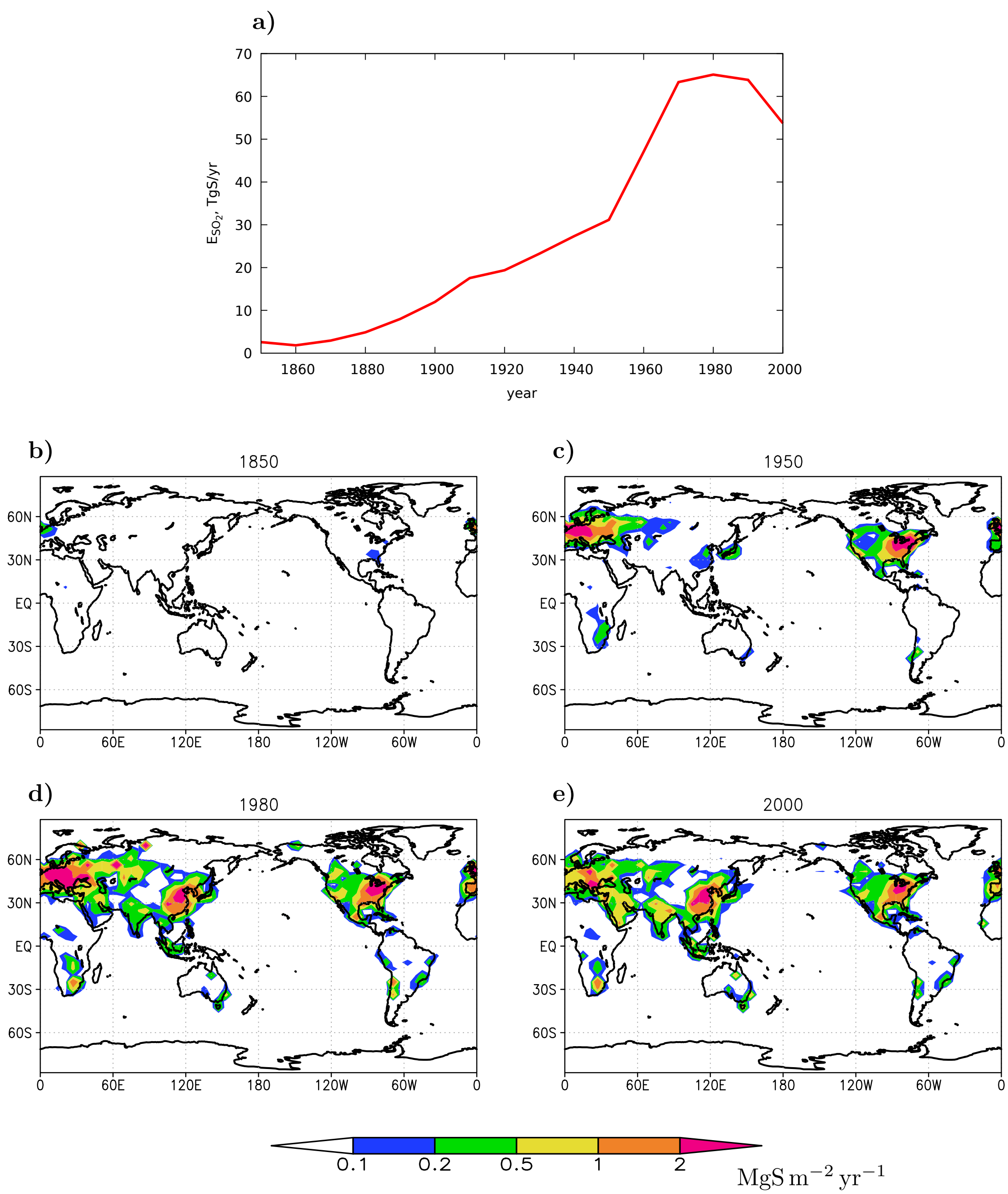

Fig. S3. Annual sulphur dioxide emissions for the CMIP5 'historical' database. Shown are the globally averaged time series (a) and the maps for the selected time slices (b–e).

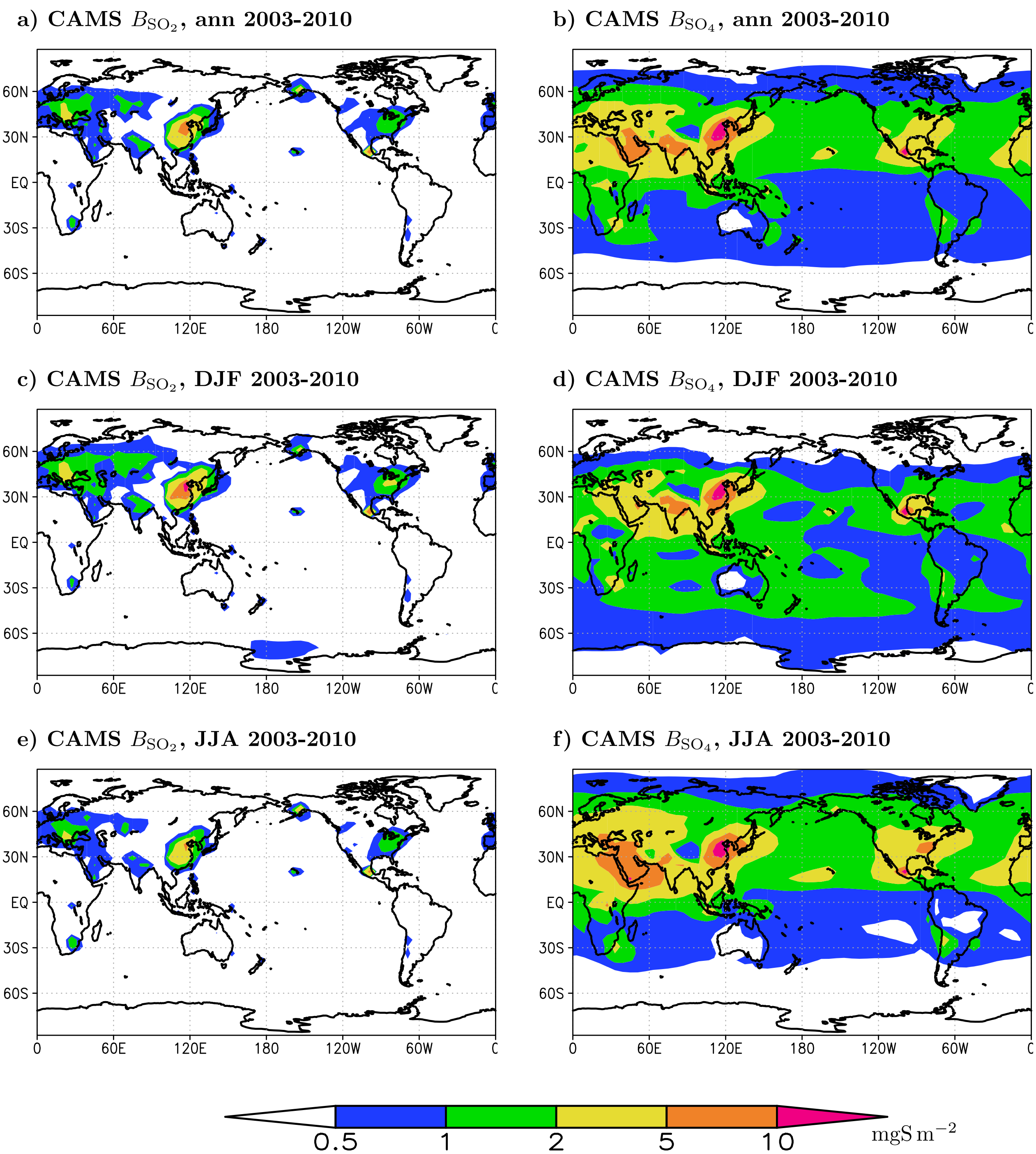

Fig. S4. Annual means (a, b) and boreal winter (c, d) and boreal summer (e, f) means for SO_2 (a, c, e) and SO_4 (b, d, f) burdens per unit area based on the CAMS data (Inness et al., 2019) for for 2003–2010 interpolated to the 40 × 60 regular global latitude–longitude grid.

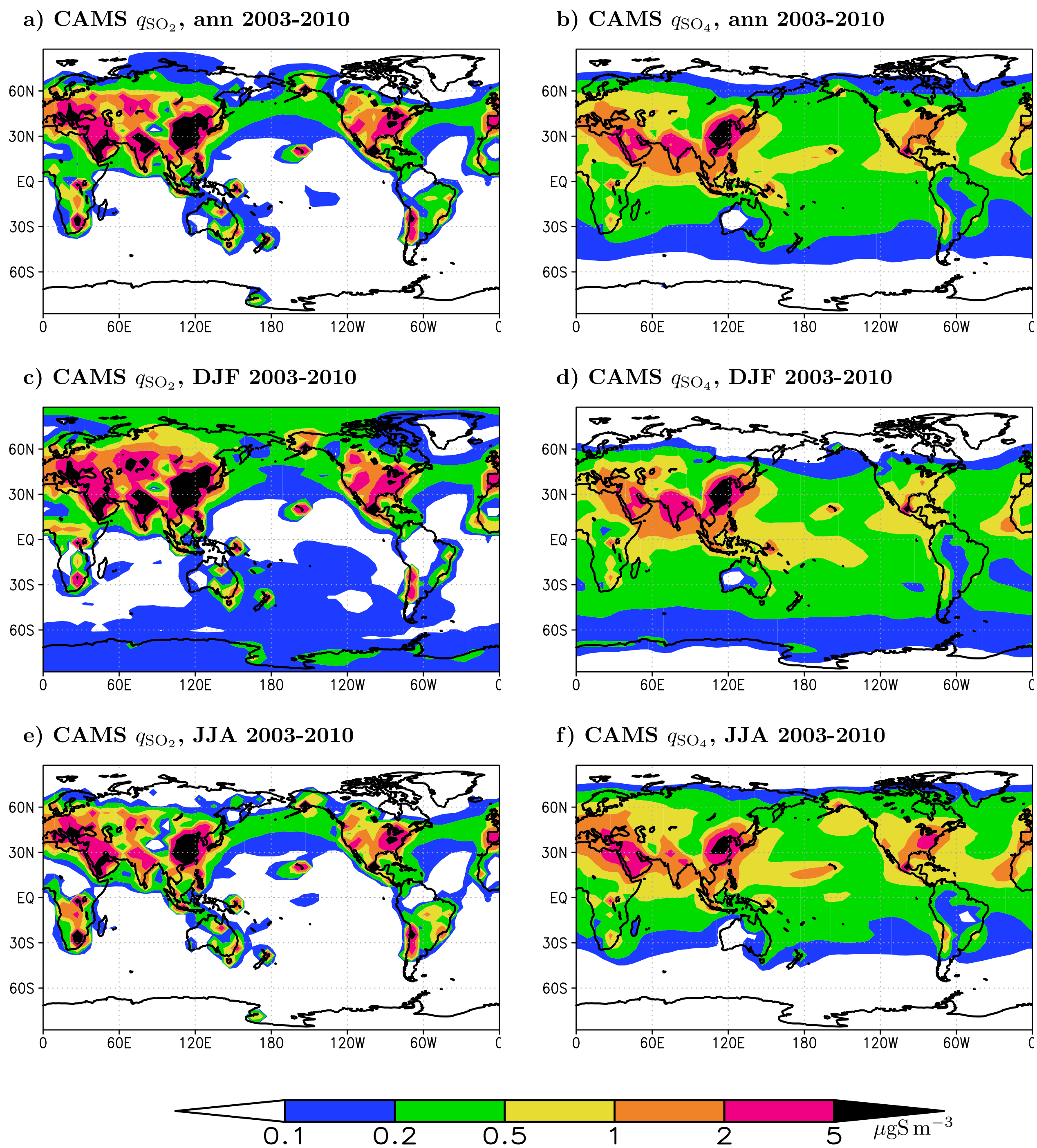

Fig. S5. Similar to Fig. S4, but for near–surface concentrations of SO_2 and SO_4.

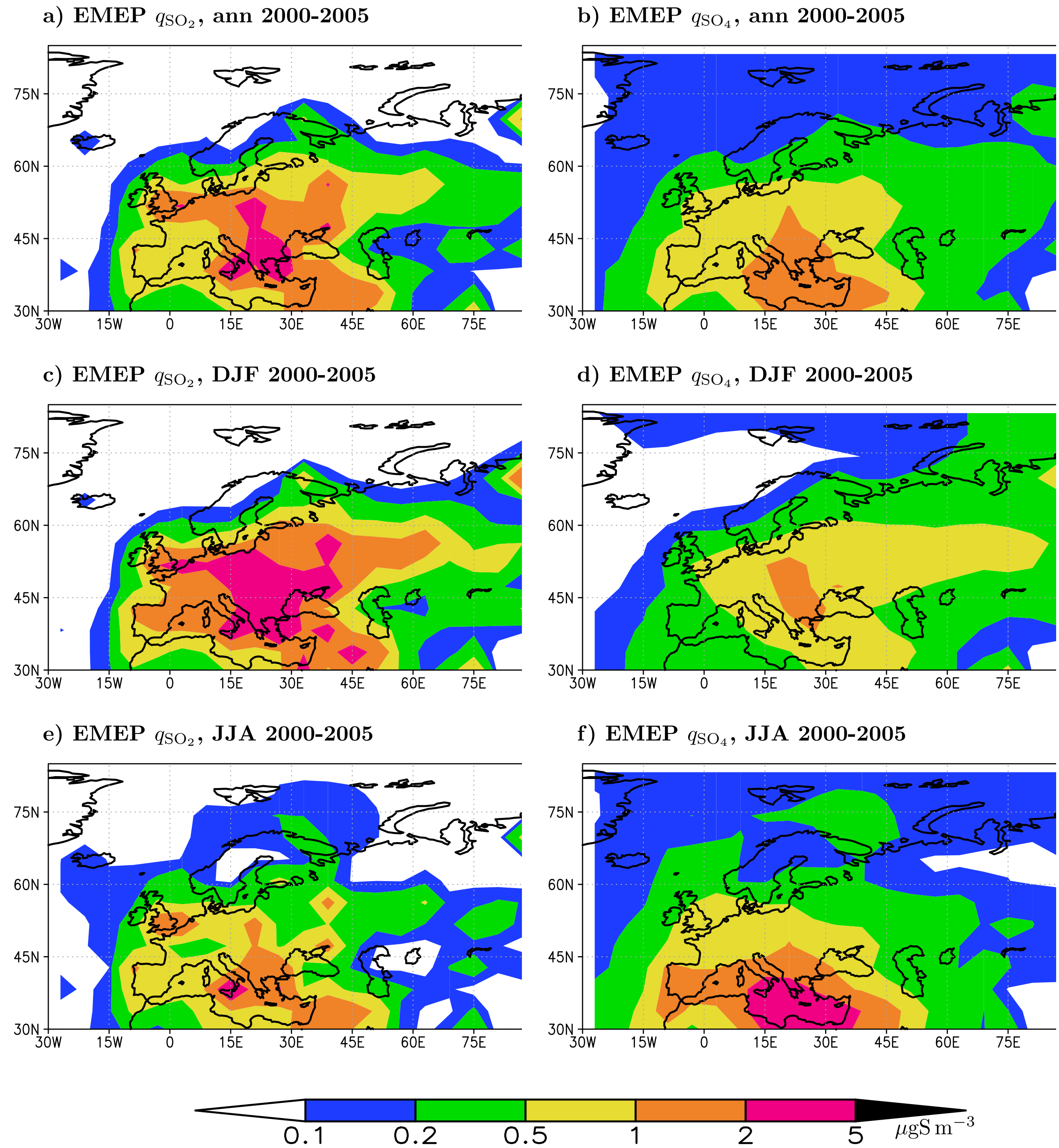

Fig. S6. Similar to Fig. S5, but based on the EMEP MSC–W data (Simpson et al., 2012) for 2000–2005 in their computational domain.

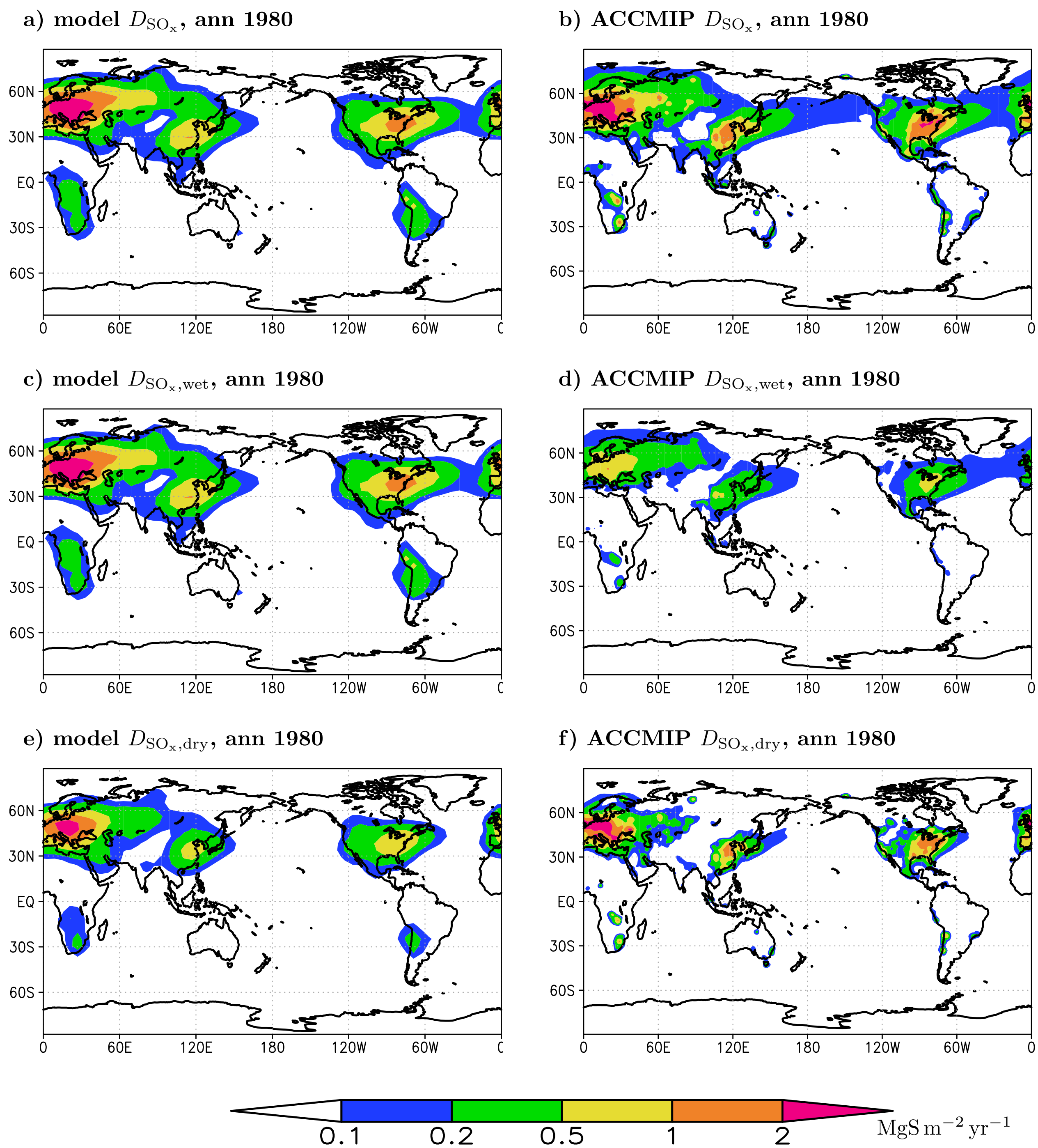

Fig. S7. Total (a, b), wet (c, d), and dry (e, f) SO_x depositions per unit area in the model (a, c, e) and in the ACCMIP simulations (b, d, f) for year 1980. The ACCMIP data are from (Lamarque et al., 2013). These plots are similar to the plots in panels b–g in Fig. 9 of the main text correspondingly.

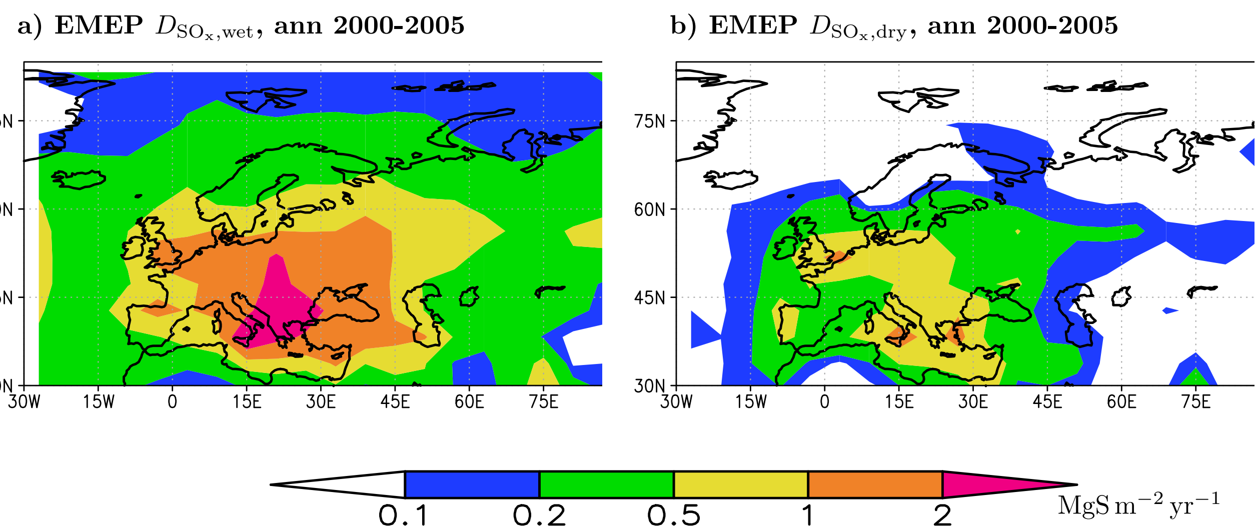

Fig. S8. Annual wet (a) and dry (b) SO_x depositions based on the EMEP data for 2000–2005 interpolated to the 40 × 60 regular latitude–longitude grid.

References

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Simpson, D., Benedictow, A., Berge, H., Bergström, R., Emberson, L., Fagerli, H., Flechard, C., Hayman, G., Gauss, M., Jonson, J., Jenkin, M., Nyíri, A., Richter, C., Semeena, V., Tsyro, S., Tuovinen, J.-P., Valdebenito, Á., and Wind, P.: The EMEP MSC-W chemical transport model – technical description, Atmos. Chem. Phys., 12, 7825–7865, https://doi.org/10.5194/acp-12-7825-2012, 2012.