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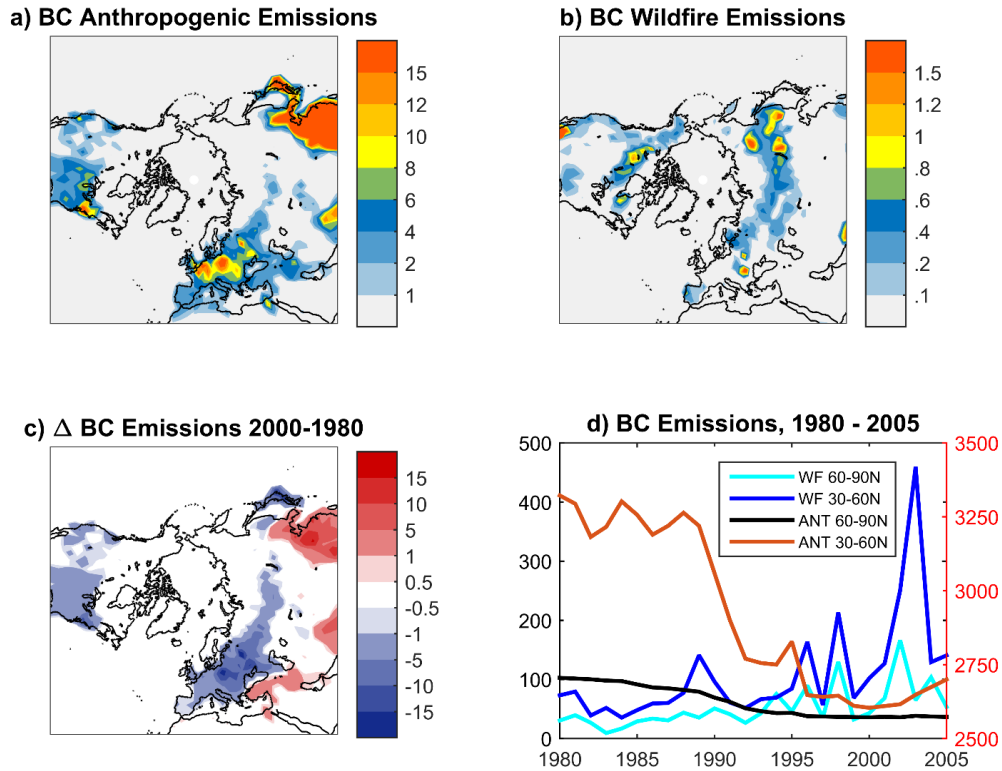
*Supplement of*

## **Impacts of large-scale atmospheric circulation changes in winter on black carbon transport and deposition to the Arctic**

**Luca Pozzoli et al.**

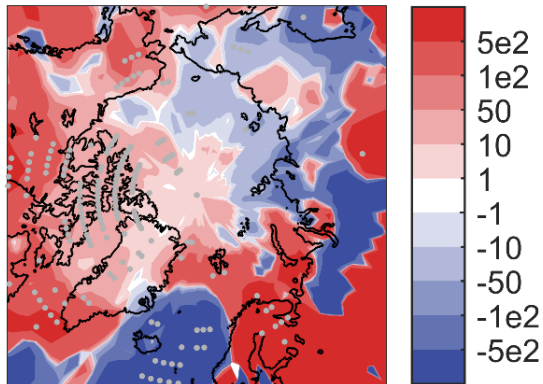
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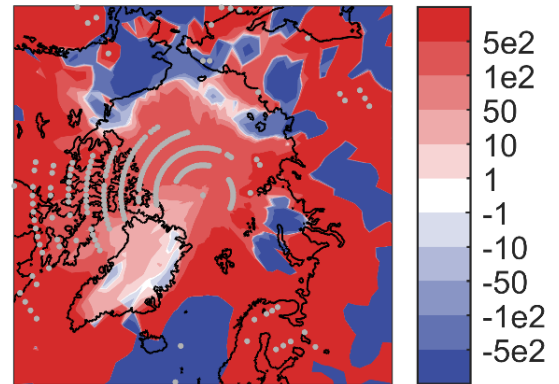


5 **Figure S1** Overview of BC emissions above 30°N as used in the ECHAM5-HAMMOZ simulations: a) multi-annual mean (1980-2005) of total BC anthropogenic emissions (Gg year<sup>-1</sup>); b) multi-annual mean (1980-2005) of total BC wild fire emissions (Gg year<sup>-1</sup>); c) difference of BC total emissions (Gg year<sup>-1</sup>) between years 2000 and 1980; d) annual variability of BC total anthropogenic (ANT) and wild fire (WF) emissions (Gg year<sup>-1</sup>) at mid- (30°N-60°N) and high-latitudes (60°N-90°N) [ANT 30-60N emissions are displayed on the right y-axis].

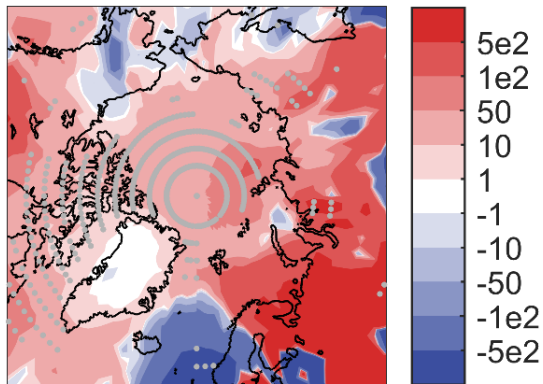
a) Wet Dep. [kg/year] FIX1980



b) Dry Dep. [ $10^{-3}$  kg/year] FIX1980



c) Srf.Conc. [ $10^{-3}$  ng/kg/year] FIX1980



d) Load [ $10^{-2}$  kg/year] FIX1980

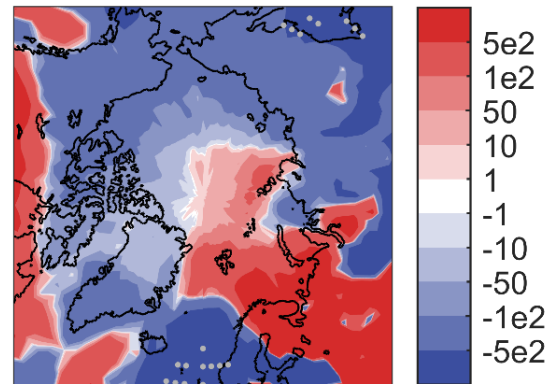


Figure S2 Winter (DJF) trends of BC wet deposition (a), dry deposition (b), surface concentration (d), and total load (d) for the ECHAM5-HAMMOZ FIX1980 simulation. Grey dots represent the grid points with trend significant at 5% level.

BC Load [ $10^{-2}$  kg/year]

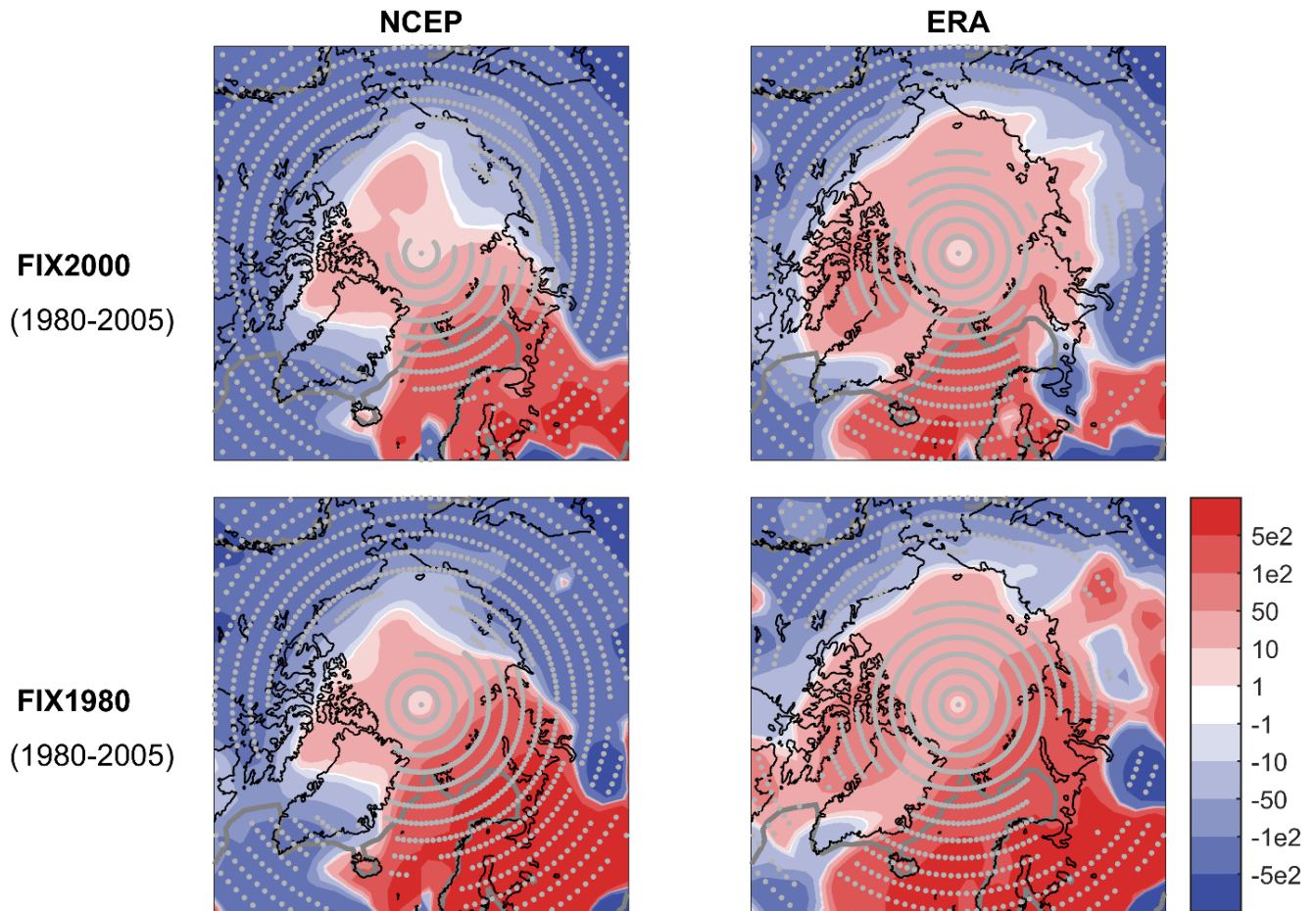
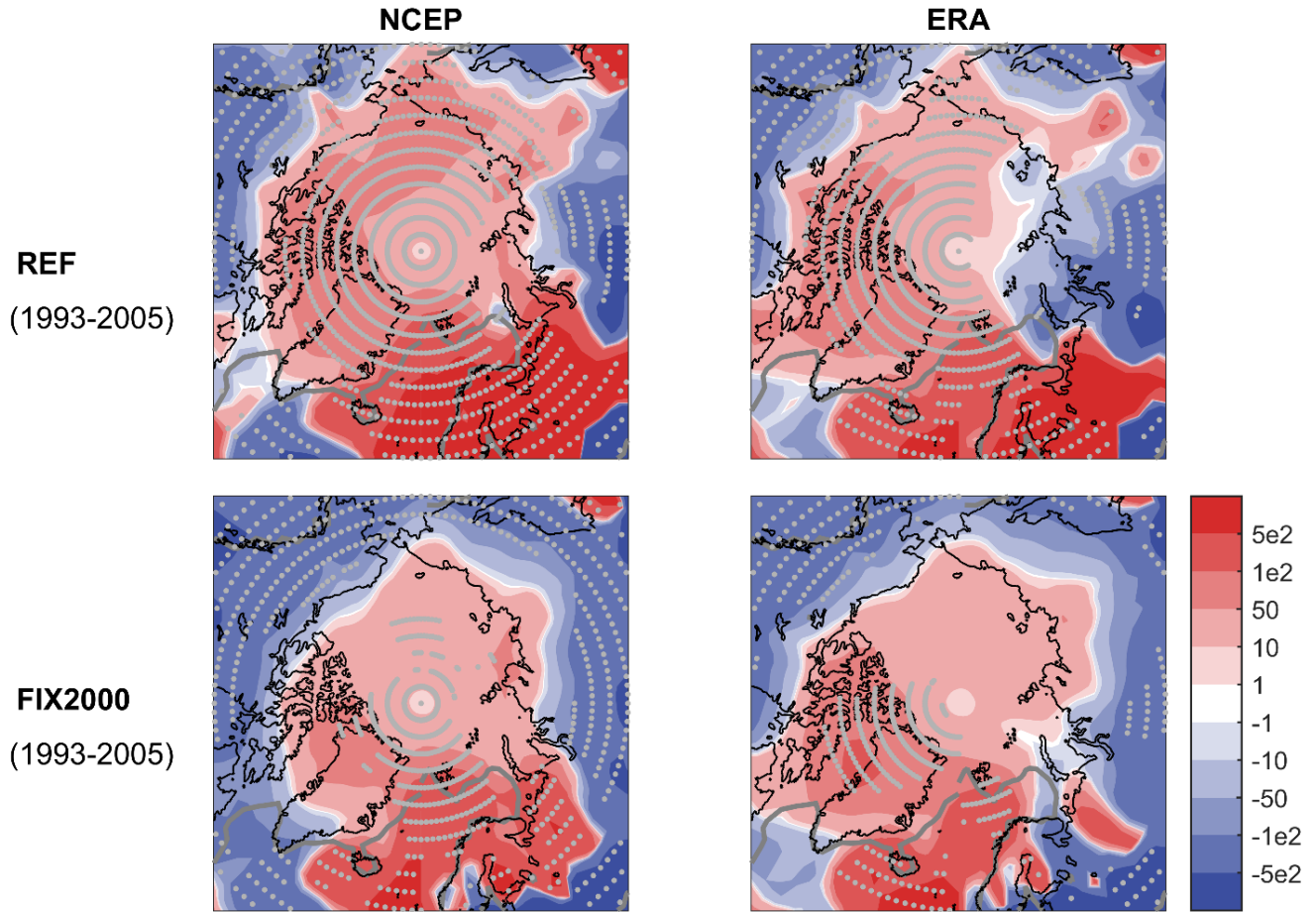


Figure S3 Four different estimates (see also Table 1) of total trends of maximum likelihood BC load associated to three atmospheric circulation patterns (Total=NAO+SB+ENSO). The grey line represents the mean winter sea-ice and snow cover larger than 50% since 1980 to now. Grey dots represent the grid points with trend significant at 5% level.

BC Load [ $10^{-2}$  kg/year]



**Figure S4** Four different estimates (see also Table 1) of total trends of maximum likelihood BC load associated to three atmospheric circulation patterns (Total=NAO+SB+ENSO). The grey line represents the mean winter sea-ice and snow cover larger than 50% since 1980 to now. Grey dots represent the grid points with trend significant at 5% level.

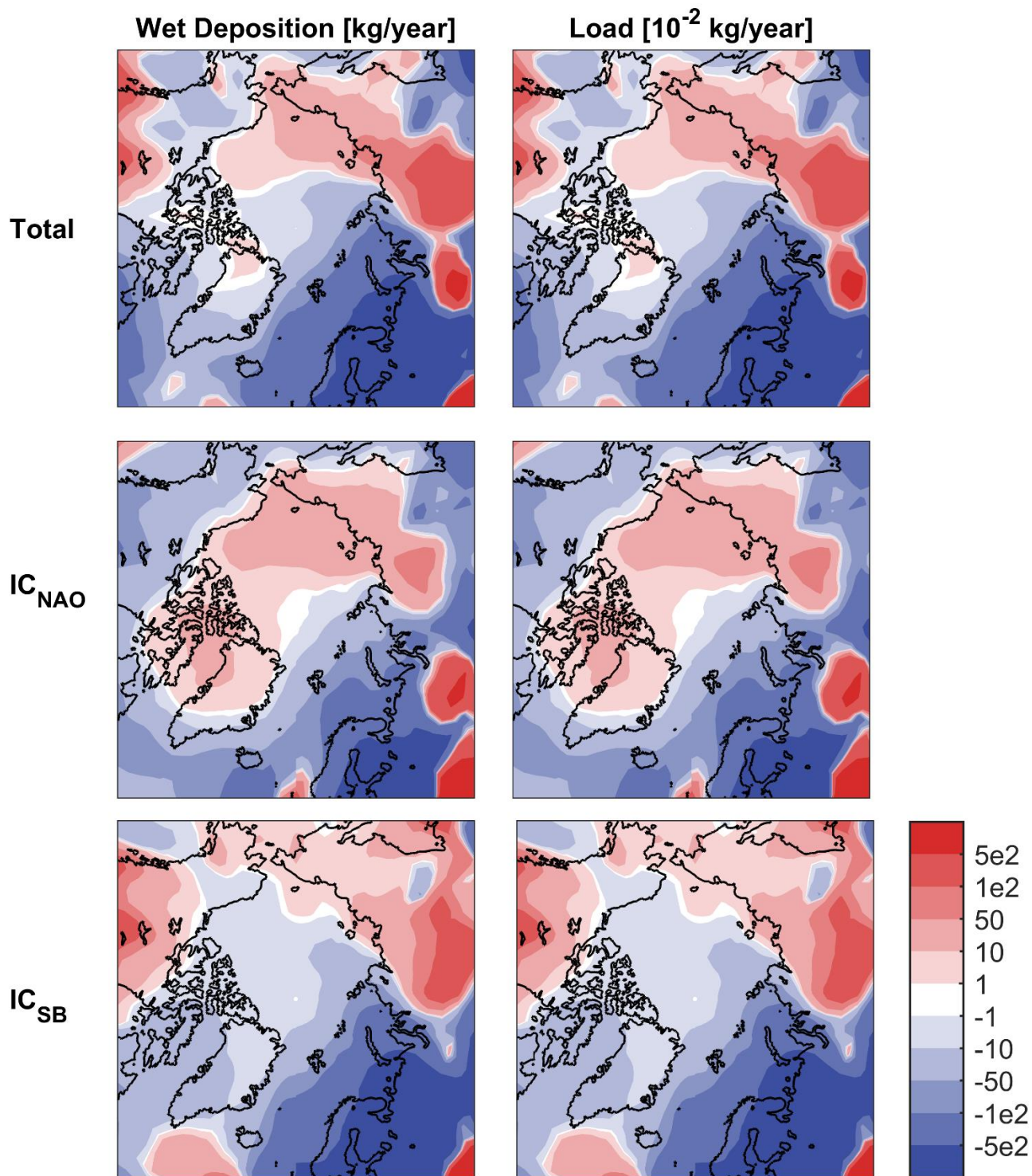


Figure S5 Differences between winter (DJF) trends (1980-2015) of MLE of BC wet deposition and load from the FIX2000 and FIX1980 chemistry-climate model simulations.