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Supplement of

Changes in black carbon emissions over Europe due to COVID-19 lockdowns

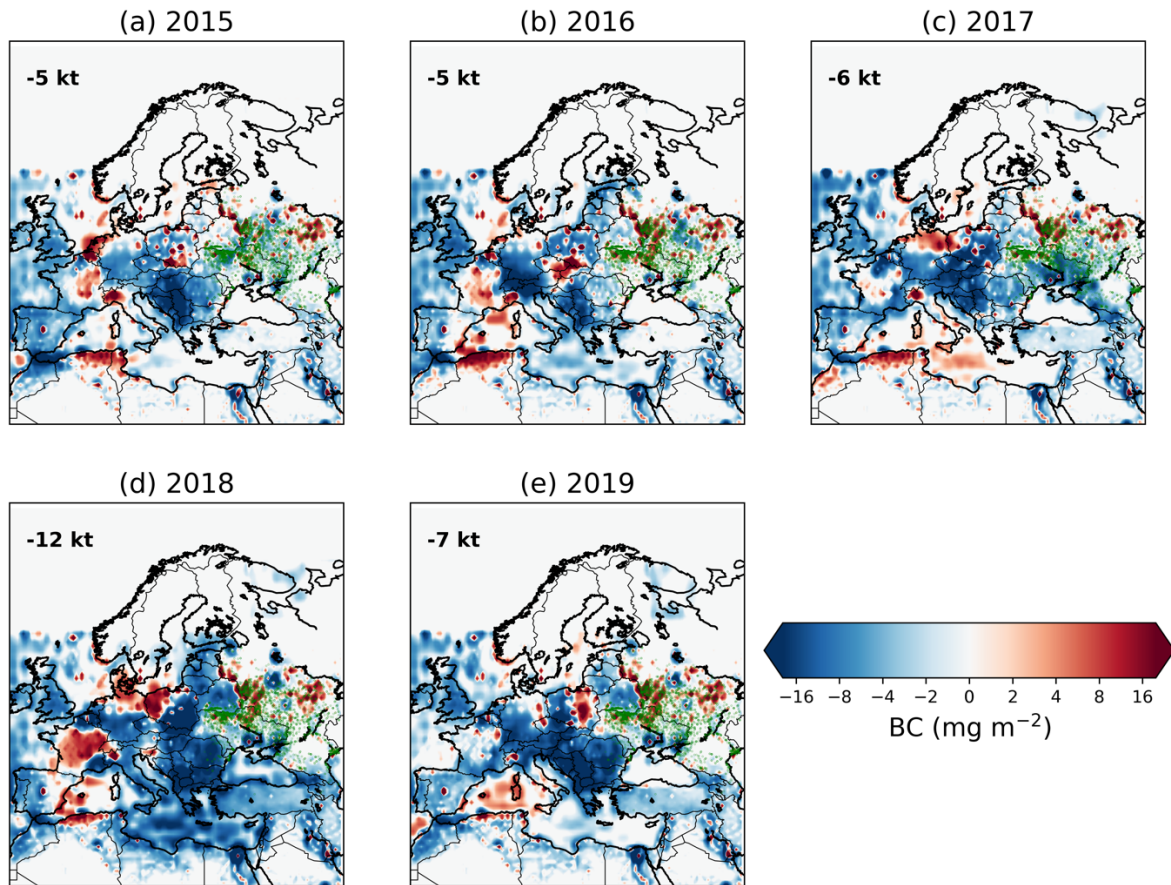
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9 Supplementary figures

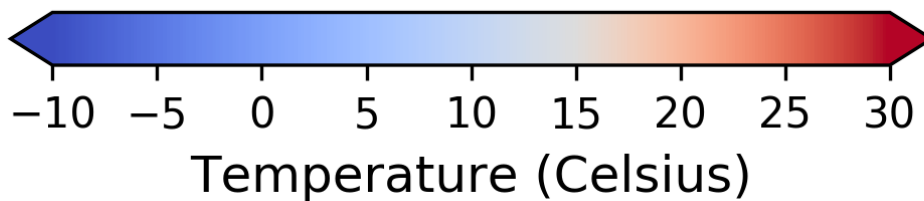
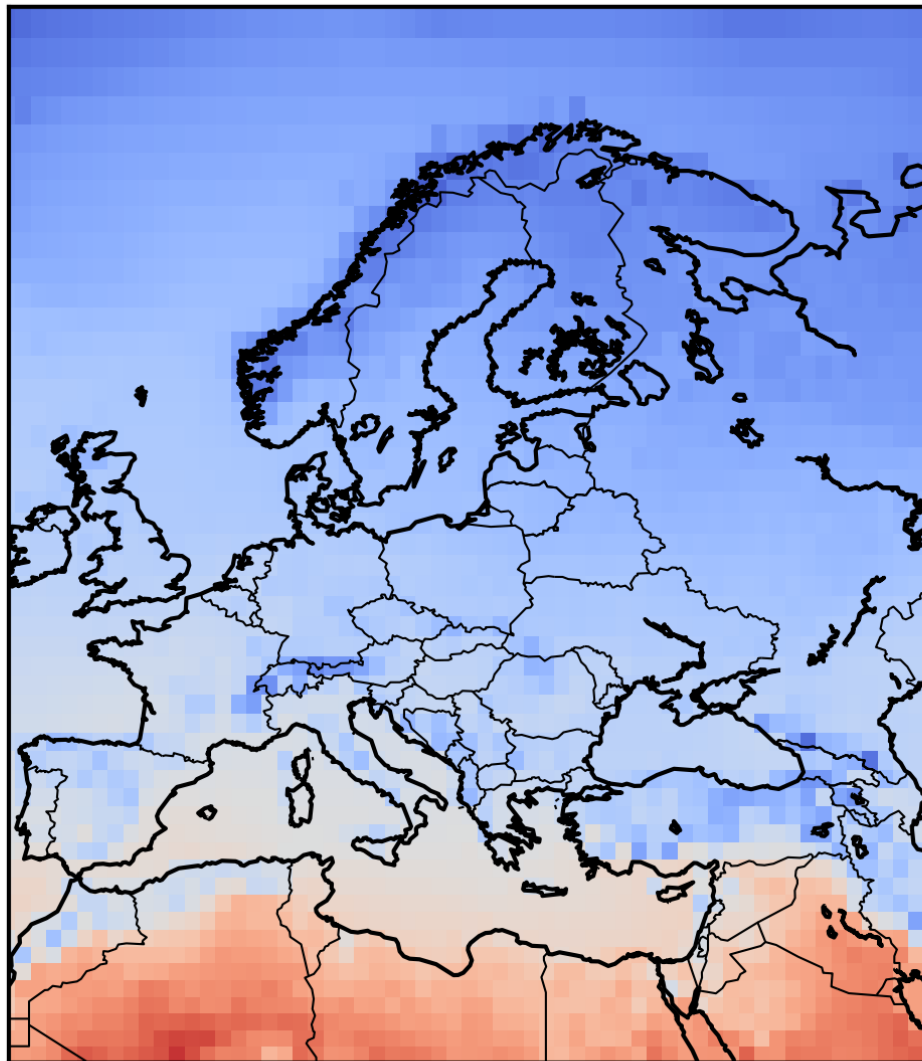
DIFFERENCE IN BC EMISSIONS FROM PREVIOUS YEARS



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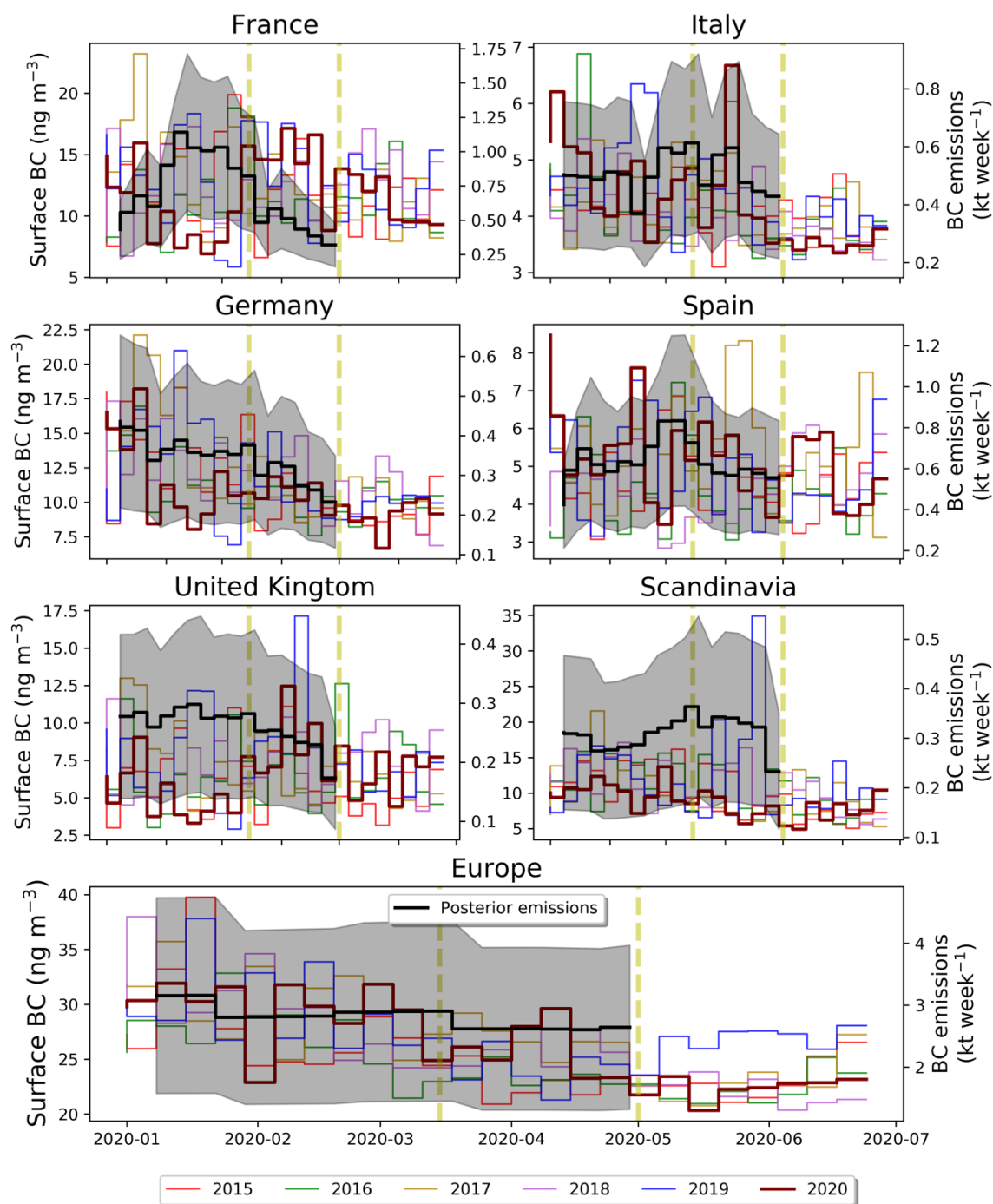
11 **Fig. S1.** Comparison with BC emissions in previous years. Difference of optimised (posterior)
12 BC emissions over Europe during the 2020 lockdown (14 March to 30 April) from respective
13 BC emissions in previous years (same period) constrained with the same inversion algorithm
14 and the same settings. Active fires from MODIS are plotted together with emission anomaly
15 (green dots).

Mean temperature at 2 m (ECMWF) during lockdown (14 March - 30 April)



16

17 **Fig. S2.** Surface temperature during the 2020 lockdown. Average surface temperature at 2 m
18 over Europe during the COVID-19 lockdown (14 March to 30 April) from ERA-5 (ECMWF)
19 (Copernicus Climate Change Service (C3S), n.d.). Note that prevailing average temperatures
20 over Europe during the lockdown were below 15°C. This temperature has been used as the
21 basis temperature, below which residential combustion has been found to increase (Quayle and
22 Diaz, 1980; Stohl et al., 2013).



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 24 **Fig. S3.** Weekly posterior BC emissions against MERRA-2 concentrations. Average surface
 25 BC concentrations from MERRA-2 (left axis) since 2015 in the most highly affected European
 26 countries (France, Italy, Germany, Spain and UK), Scandinavia and Europe from the pandemic,
 27 in contrast to the calculated optimized BC emissions (right axis). The grey shaded area
 28 corresponds to the BC emission uncertainty calculated as described in the Results section. The
 29 vertical yellow dashed lines correspond to the beginning and end of the COVID-19 lockdown
 30 (14 March to 30 April 2020).

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33 **References**

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