

Supporting Information for

**An investigation on causes of detected surface solar radiation brightening in Europe using satellite data**

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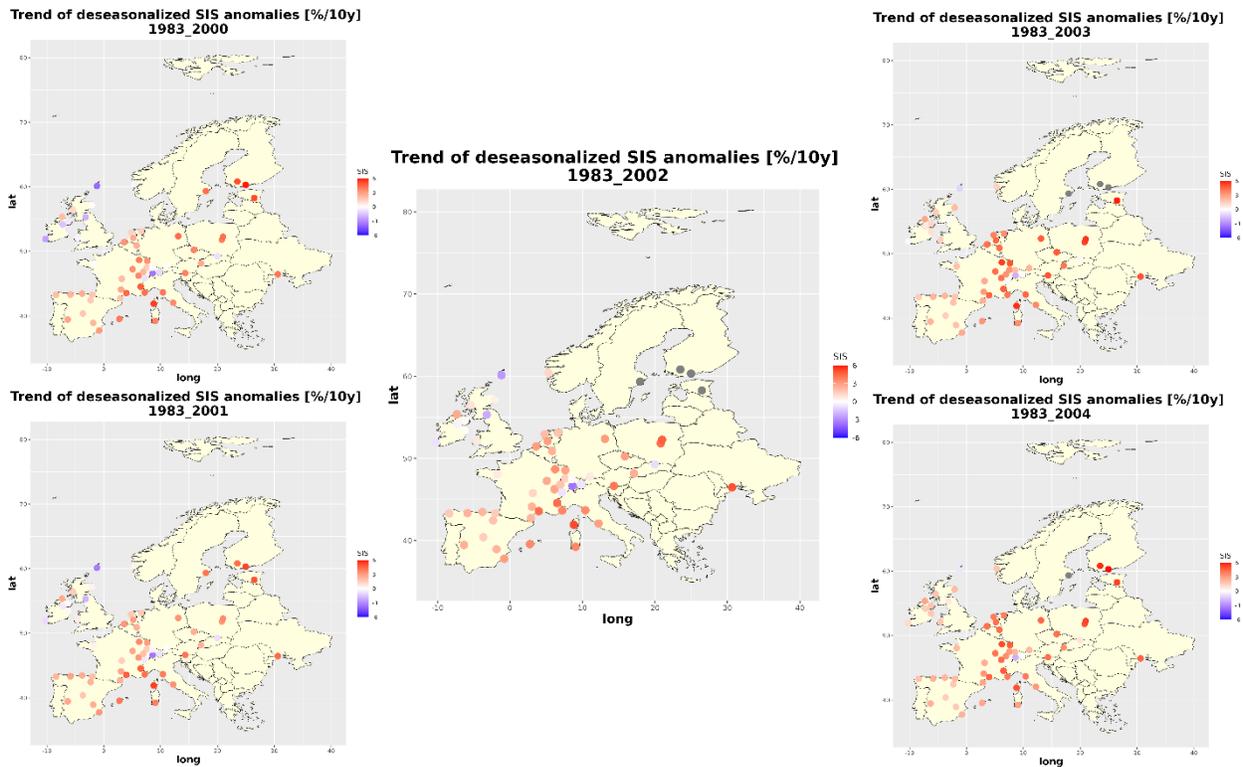
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Figures S1 to S6

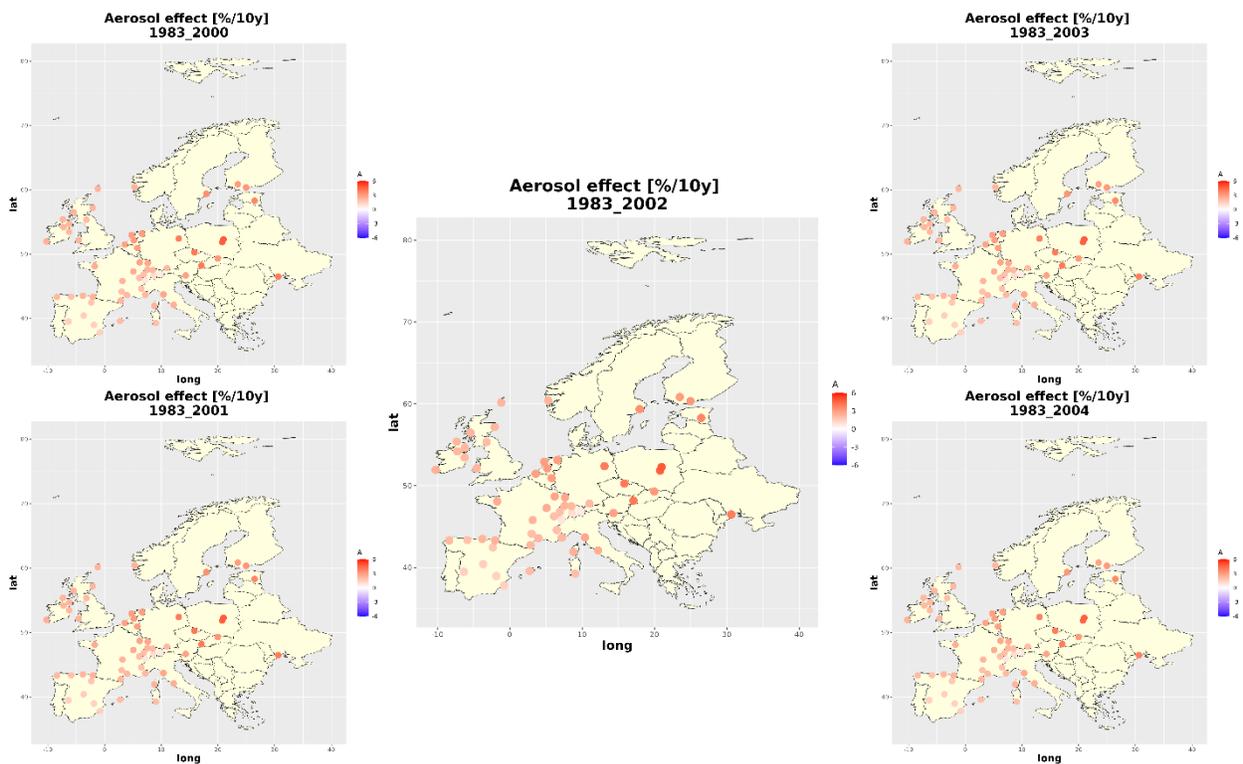
**Introduction**

To corroborate the split of the period into the two sub-periods 1983/01/01 to 2002/12/31 and 2001/01/10 to 2020/12/31, we show for each the relative brightening, the aerosol and the cloud effect two shortened and two elongated periods (by 1 and 2 years each). We see no significant changes, except for the cloud effect in the first sub-period. This is a sign for the robustness of the split. The cloud effect changes in Central Europe, if the year 2003 is included. The single outlier heatwave in 2003 is the reason for this result. Therefore, it makes sense, to start the second sub-period in 2001 and have an overlap of two years, instead of starting with an extreme year such as 2003.

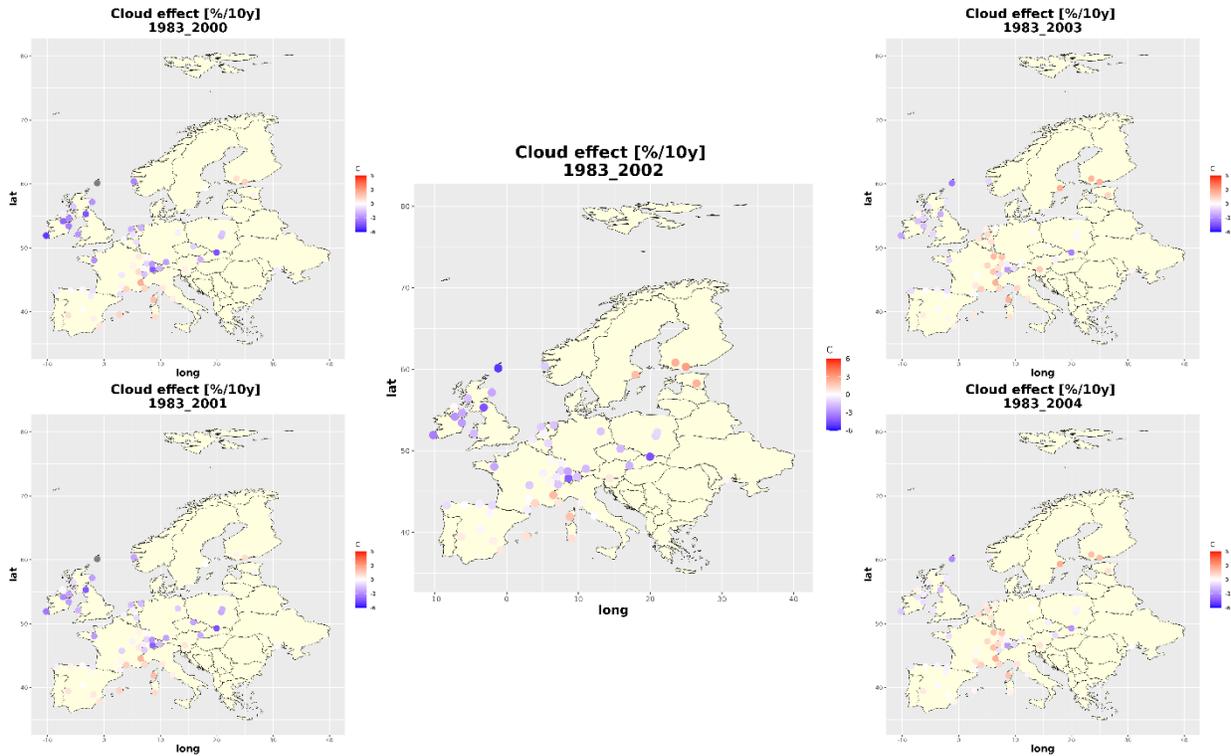
Figures S1 to S3 show the respective plots for the first sub-period and Figures S4 to S6 show the plots for the second sub-period.



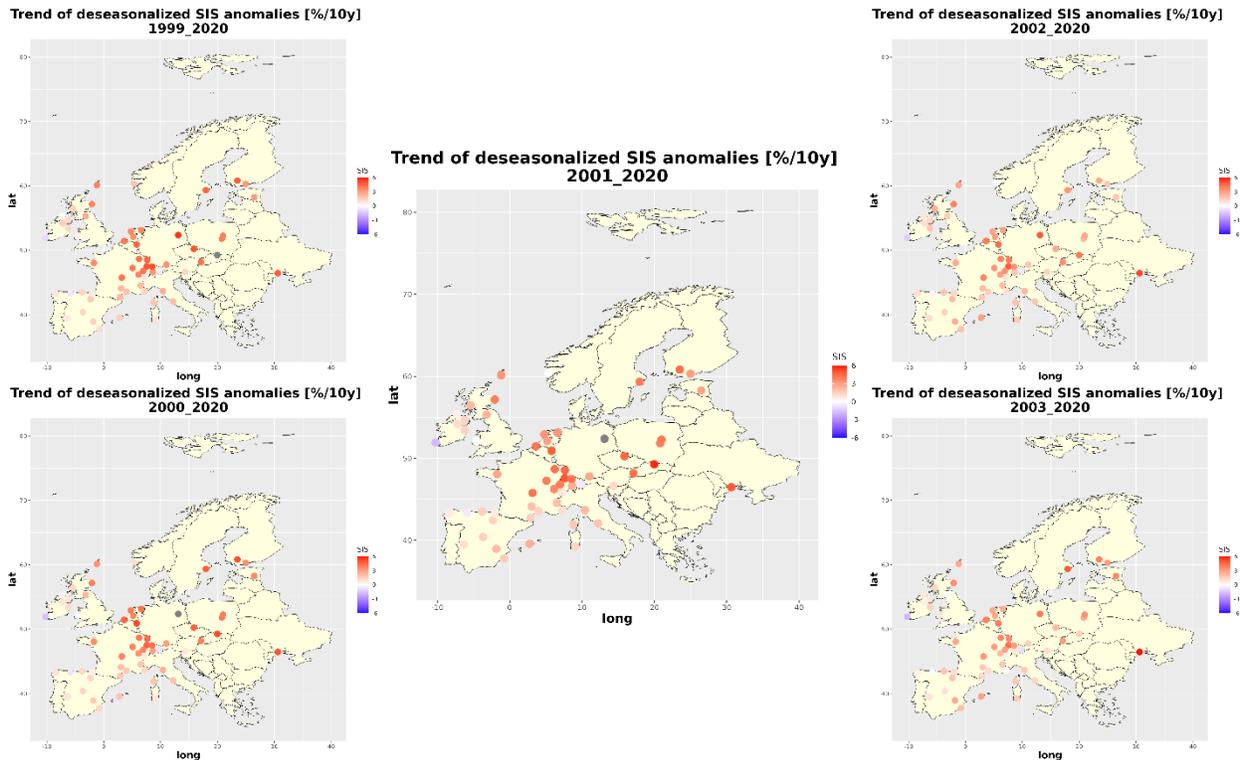
**Figure S1.** Relative changes in SIS (brightening) per decade (%/dec), averaged over all months of the year and weighted according to their climatological mean surface solar radiation over different periods. The original period is 1983/01/01 to 2002/12/3.



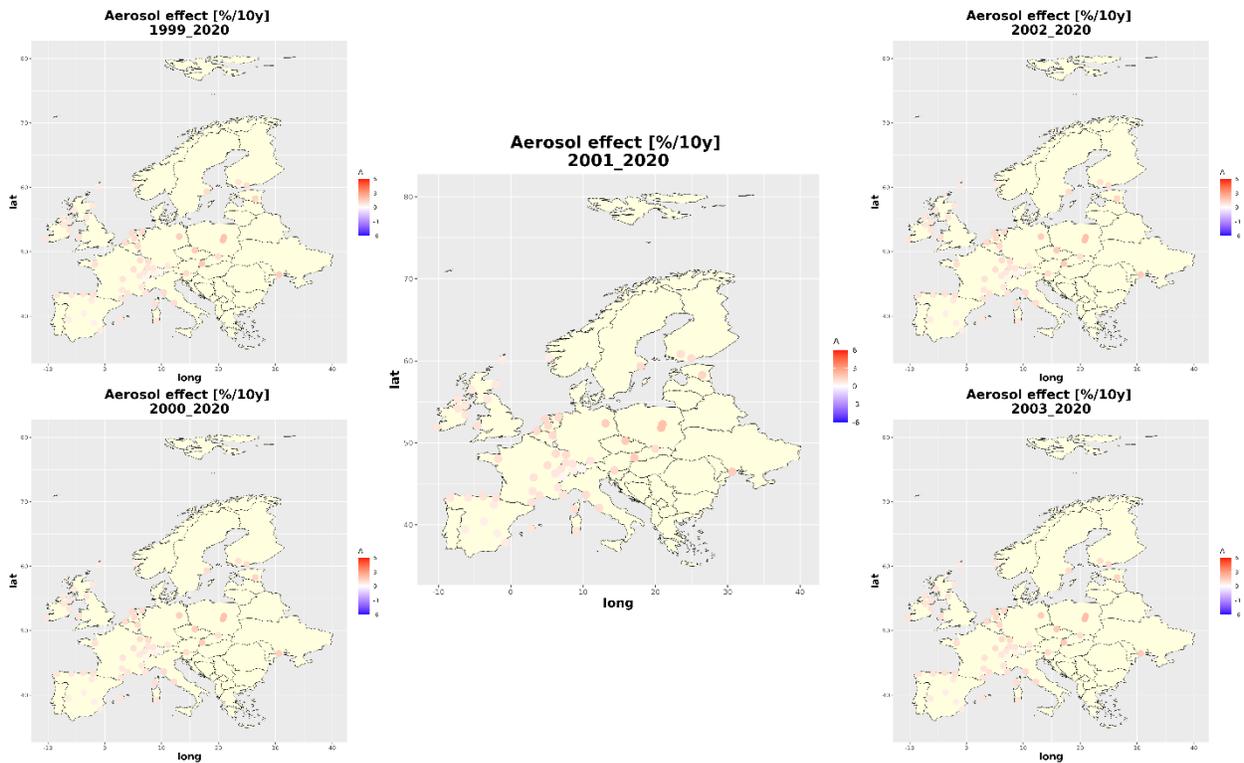
**Figure S2.** Aerosol effects as factorial changes per decade (%/dec), averaged over all months of the year and weighted according to their climatological mean surface solar radiation over different periods. The original period is 1983/01/01 to 2002/12/31.



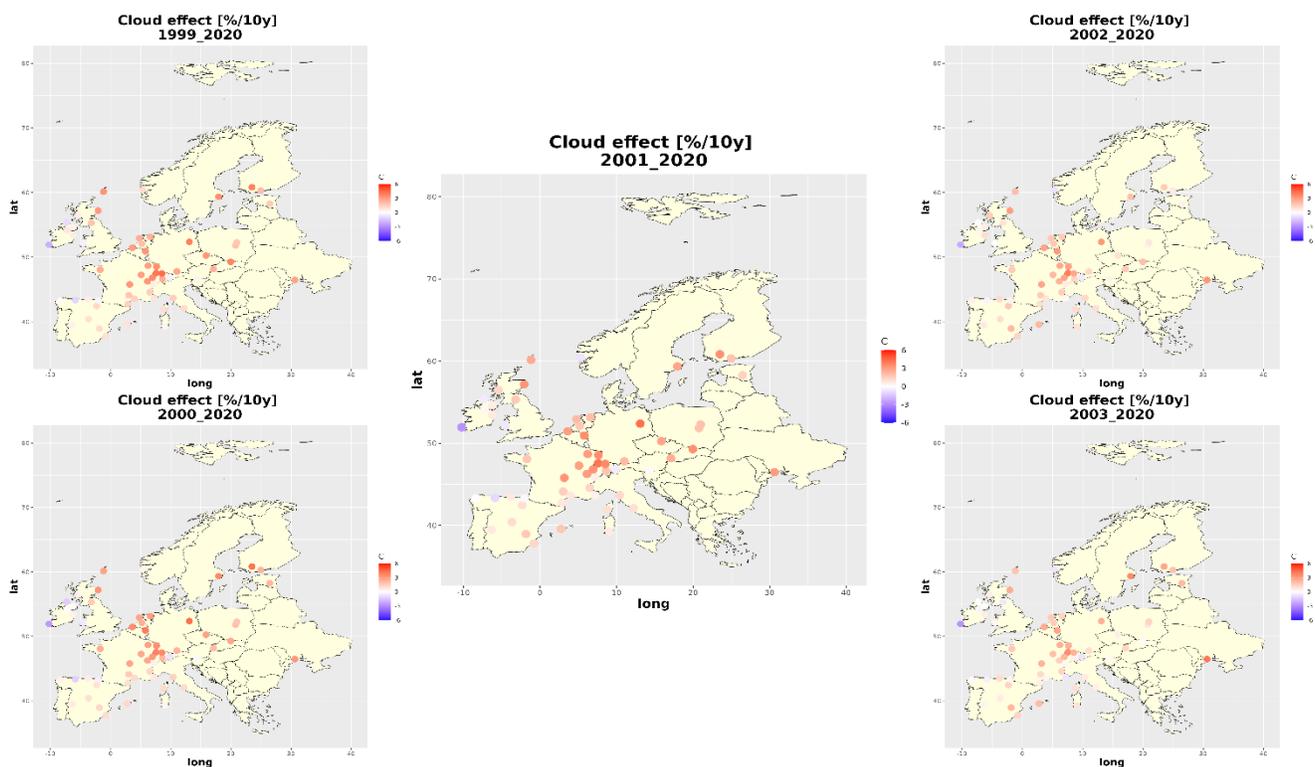
**Figure S3.** Cloud effects as factorial changes per decade (%/dec), averaged over all months of the year and weighted according to their climatological mean surface solar radiation over different periods. The original period is 1983/01/01 to 2002/12/31.



**Figure S4.** Relative changes in SIS (brightening) per decade (%/dec), averaged over all months of the year and weighted according to their climatological mean surface solar radiation over different periods. The original period is 2001/01/01 to 2020/12/31.



**Figure S5.** Aerosol effects as factorial changes per decade (%/dec), averaged over all months of the year and weighted according to their climatological mean surface solar radiation over different periods. The original period is 2001/01/01 to 2020/12/31.



**Figure S6.** Cloud effects as factorial changes per decade (%/dec), averaged over all months of the year and weighted according to their climatological mean surface solar radiation over different periods. The original period is 2001/01/01 to 2020/12/31.