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Simulation of ash clouds after a Laacher See-type eruption

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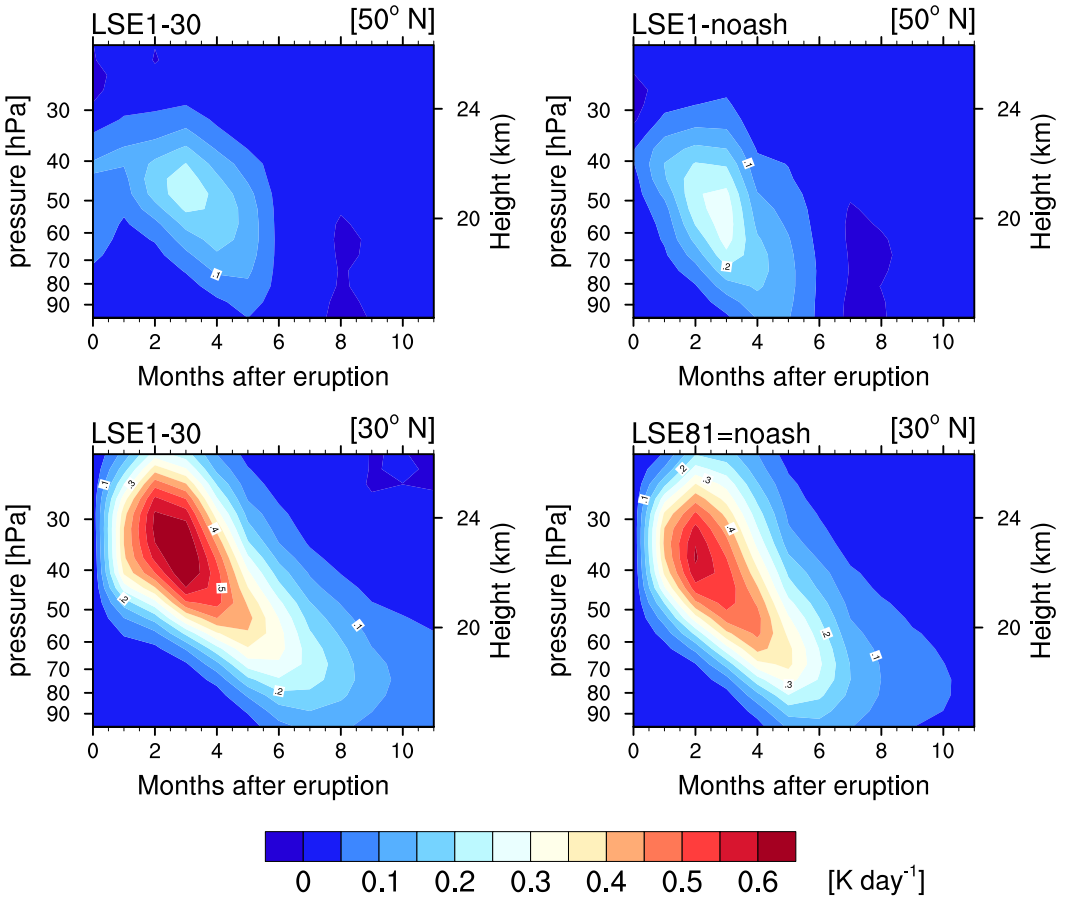

Figure S1: Zonal mean heating rate at 30° N (top) and 50° N (bottom) of LSE-30 (left) and LSE-30-noash (right).

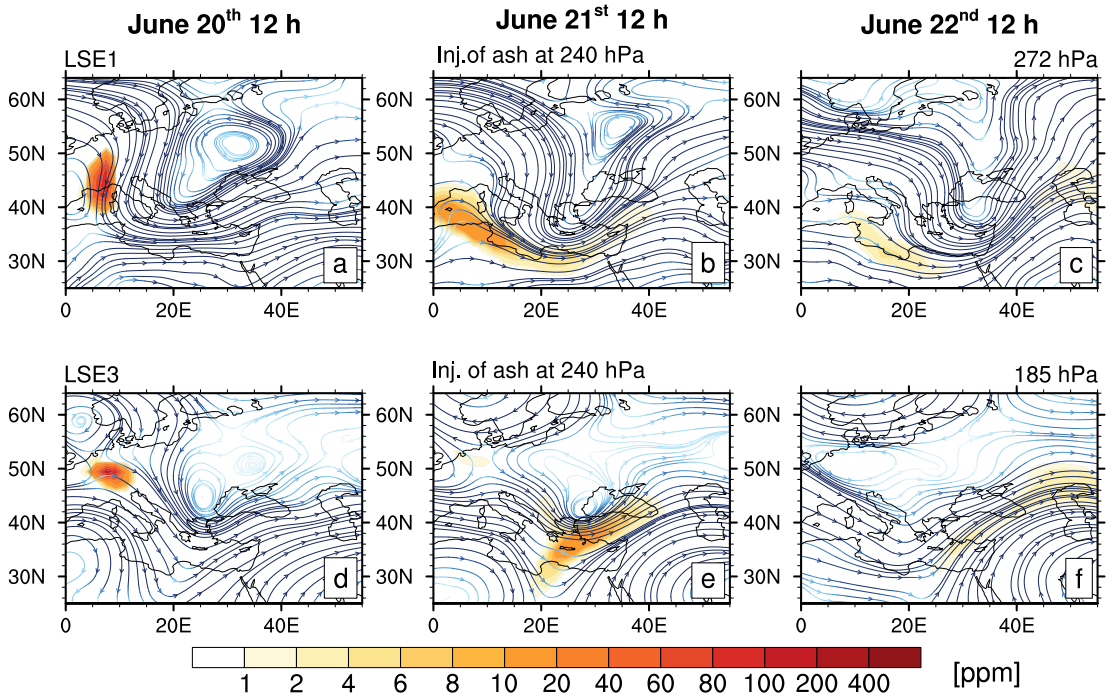

Figure S2: Streamlines of the zonal wind $\mathrm{m\,s^{-1}}$ over Europe for LSE-30 at 272 hPa and LSE-100 at 185 hPa at June 20th, 21st and 22nd right after the second eruption phase. The altitude shown is the level with the highest ash concentration over the three days.

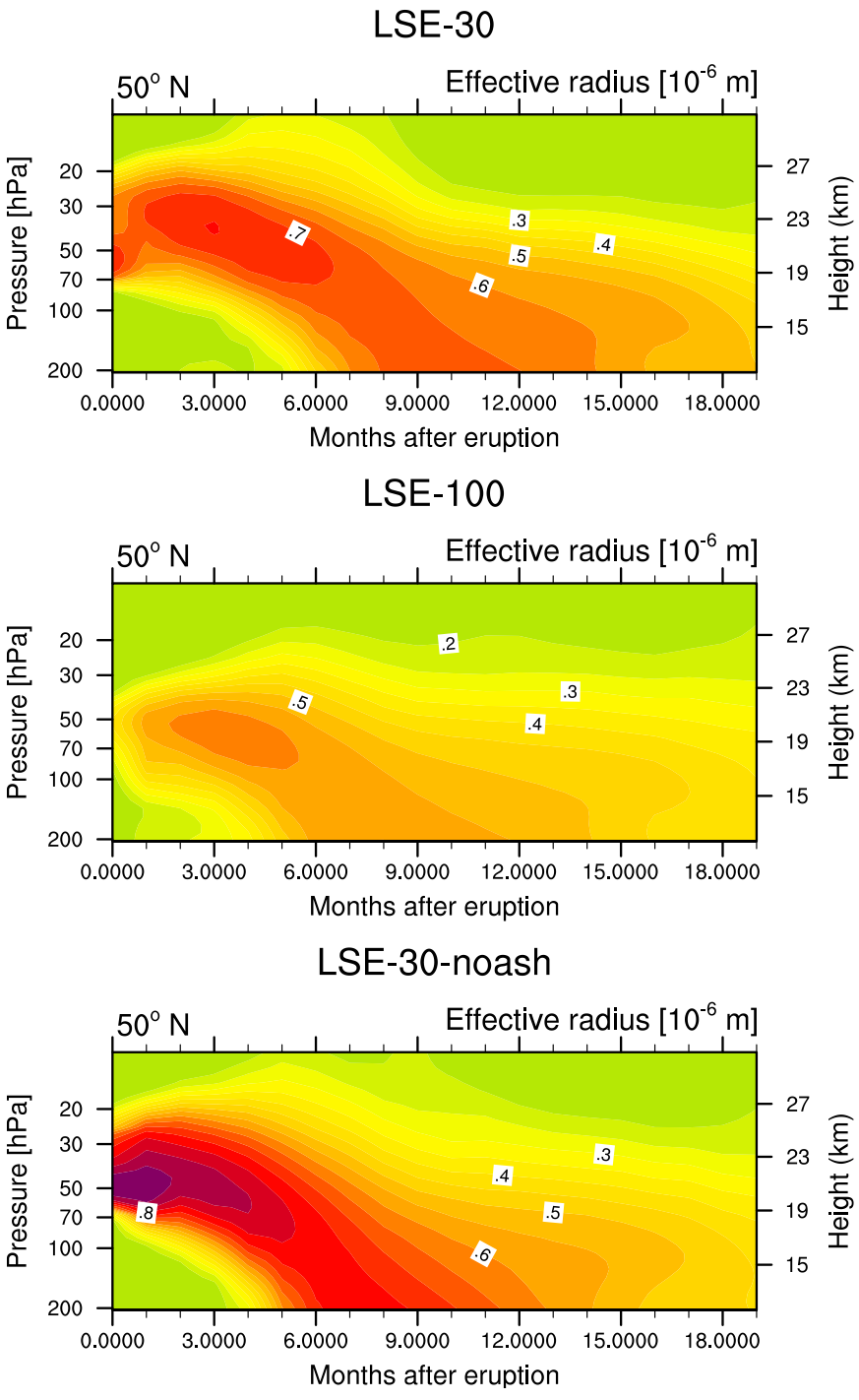

Figure S3: Zonal mean of effective radius μ m of sulfate aerosols over time as cross section at 50° N of LSE-30, LSE-100 and LSE-30-noash. Injection at lower latitude (LSE-100) shows smaller radii and the simulation without fine ash (LSE-30-noash) larger radii than LSE-30

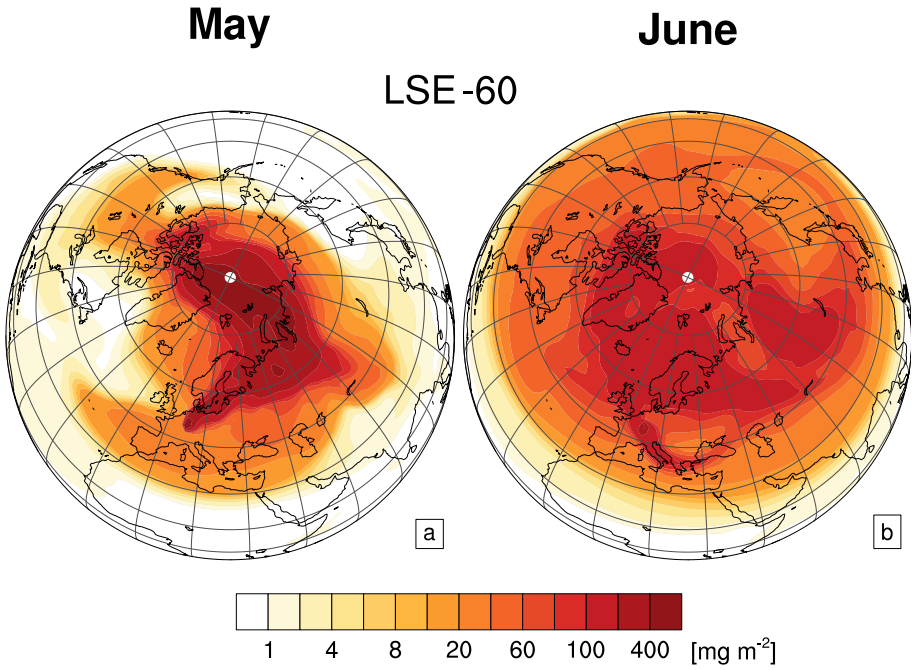

Figure S4: Monthly mean sulfur burden (SO2 plus sulfate) shortly after the eruption (May, left and June, right) for the scenarios LSE-60.

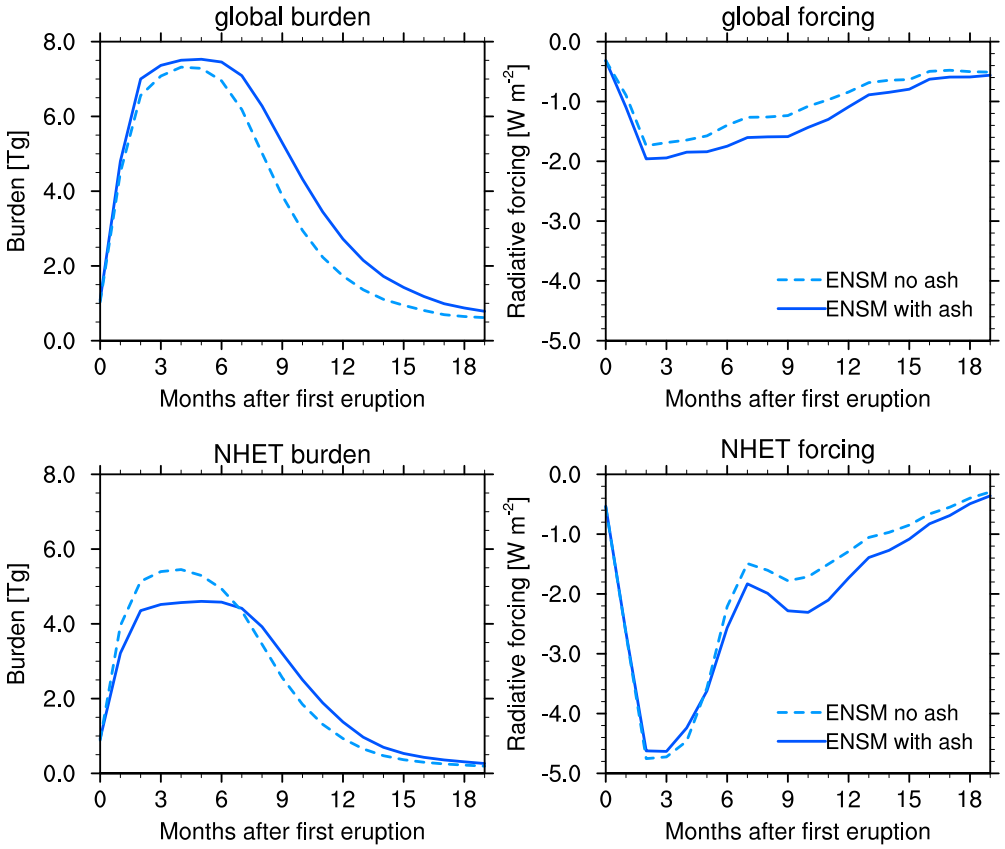

Figure S5: Area average of the ensemble mean of sulfate burden (left) and net radiative forcing (right, all sky, top of atmosphere) of sulfate aerosols over time. Top: Global average. Bottom: averaged over the northern hemisphere extratropics (30° to 90°N). The ensemble mean was calculated of of simulations with an initial injection of 15 Tg SO2 at different eruption days, with injection of fine ash (solid, LSE-30, LSE-30-May15, LSE-30-May22) and without (dashed, LSE-30-noash, LSE-30-May15-noash, LSE-30-May22-noash).

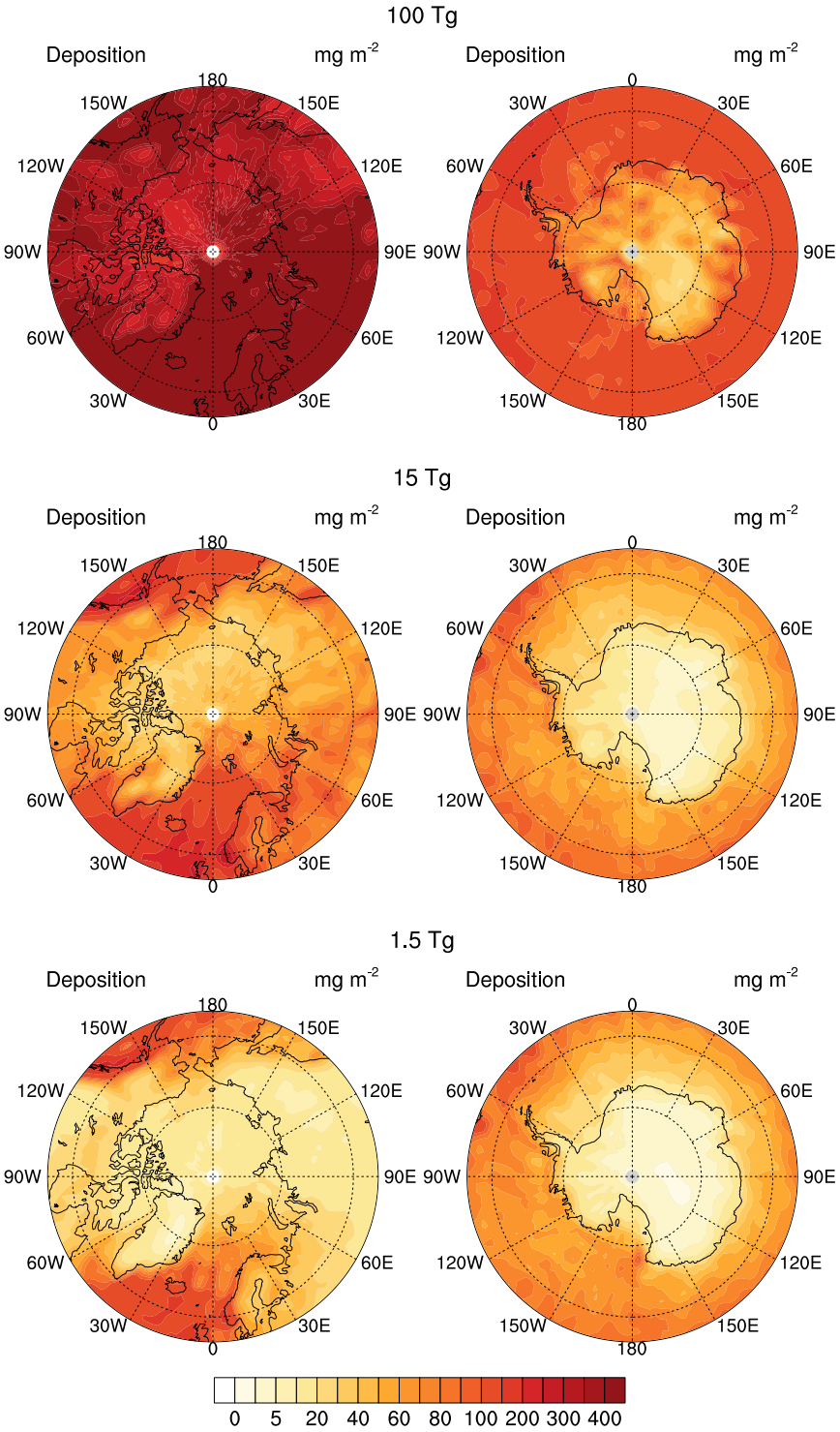

Figure S6: Deposition of simulations with 1.5, 15 and 100 Tg SO2. Deposition over central Greenland (70° N to 80° N, 30° W to 50° W) 6.7 mg m^{-2}, 40. mg m^{-2}, and 300. mg m^{-2}. Over Antarctica (75° S to 85° S , 0° to 60° E) roughly 1.8 mg m^{-2}, 6. mg,m^{-2} and, up to 54 mg m^{-2}.