Supplementary material to:

Injection strategy - a driver of atmospheric circulation and ozone response to stratospheric aerosol geoengineering

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**Figure S1.** (Top) Yearly mean changes in sulfate mass mixing ratios, (middle) yearly mean changes in sulfate surface area density, and (bottom) spatiotemporal evolution of simulated AOD changes in EQ, 15N+15S, 30N+30S and POLAR strategy compared to the baseline period.
(2008-2027). Hatching indicate regions where the response is not statistically significant, taken as smaller than \( \pm 2 \) standard errors of the difference in means.

**Figure S2.** Shading: yearly mean changes in (top) temperatures and (bottom) water vapour for (left to right) EQ, 15N+15S, 30N+30S and POLAR strategy compared to the baseline period (2008-2027). Contours show the corresponding values in the baseline period for reference (in units of K and ppm for temperature and water vapour respectively). Hatching indicate regions where the response is not statistically significant, taken as smaller than \( \pm 2 \) standard errors of the difference in means.
Figure S3. Shading: yearly mean changes in (top) zonal winds and (bottom) northward meridional eddy heat flux for (left to right) EQ, 15N+15S, 30N+30S and POLAR strategy compared to the baseline period (2008-2027). Contours show the corresponding values in the baseline period for reference. Hatching as in Fig. S2.
Figure S4. Shading: Seasonal mean (top to bottom: DJF, MAM, JJA and SON) changes in zonal winds for (left to right) EQ, 15N+15S, 30N+30S and POLAR strategy compared to the baseline period (2008-2027). Contours show the corresponding values in the baseline period for reference. Hatching as in Fig. S2.

Figure S5. Yearly mean changes in the Arctic sea-ice extent for each of the injection strategy compared to the baseline period. The errorbars denote ±2 standard errors of the mean of each SAI strategy.
**Figure S6.** As in Fig. S2 but for the changes in TEM (top) vertical and (bottom) meridional velocities. Hatching as in Fig. S2.
Figure S7. Shading: DJF mean changes in (top) sea-level pressure, (middle) zonal wind at 850 hPa and (bottom) near-surface atmospheric temperatures northward from 30°N for (left to right) EQ, 15N+15S, 30N+30S and POLAR strategy compared to the baseline period (2008-
Contours in (middle) show the corresponding values in the baseline period for reference and denote the position of the climatological jet. Hatching as in Fig. S2.

**Figure S8.** DJF mean changes in (left) near-surface atmospheric temperature over the western Europe (defined as the area spanning 10°W-10°E, 30°N-50°N) and (right) position of the NH eddy-driven jet over Europe (defined as 10°W-30°E) for each of the four strategies compared to the baseline period. The errorbars denote ±2 standard error of the difference in means.
Figure S9. DJF mean changes in total precipitation northward from 30°N for (left to right) EQ, 15N+15S, 30N+30S and POLAR strategy compared to the baseline period (2008-2027). Hatching as in Fig. S2.
Figure S10. Shading: DJF mean changes in (top) sea-level pressure, and (bottom) zonal wind at 850 hPa southward from 30°S for (left to right) EQ, 15N+15S, 30N+30S and POLAR strategy compared to the baseline period (2008-2027). Contours in (bottom) show the corresponding values in the baseline period for reference and denote the position of the climatological jet. Hatching as in Fig. S2.
Figure S11. Shading: Yearly mean changes in (top) precipitation, (middle) meridional mass stream function, and (bottom) zonal mass stream function for (left to right) EQ, 15N+15S, 30N+30S and POLAR strategy compared to the baseline period (2008-2027). Contours show the corresponding values in the baseline period for reference. Hatching as in Fig. S2.
Figure S12. Yearly mean changes in near-surface air temperatures for (left to right) EQ, 15N+15S, 30N+30S and POLAR strategy compared to the baseline period. Hatching as in Fig. S2.
Figure S13. Shading: Seasonal mean (top to bottom: DJF, MAM, JJA and SON) changes in ozone mixing ratios (left to right) EQ, 15N+15S, 30N+30S and POLAR strategy compared to the same period (i.e. 2050-2069) of the control SSP2-4.5 simulation. Contours show the corresponding values in SSP2-4.5 for reference (in the units of ppm). Hatching as in Fig. S2.