Figure S1. Boxplot of SSW onset days for the different model experiments on the y-axis. dSSWs (blue) and nSSWs (orange) are considered separately. Dots show the individual events that were considered for the statistics, while diamonds show outliers. The box represents the quartiles, the whiskers the spread of the distribution (excluding outliers). The median is indicated by a solid line.
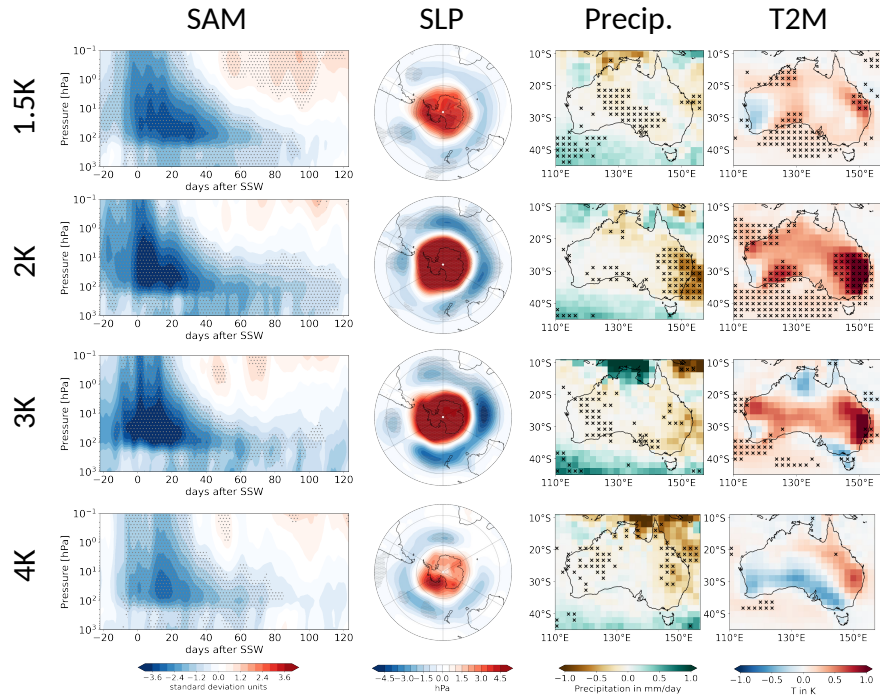
Figure S2. dSSW composites for the different global warming levels: 1.5 K, 2 K, 3 K, and 4 K (top to bottom) showing anomalies of the SAM with respect to the central day of the dSSWs, as well as of SLP, precipitation (Precip.) and 2 m air temperature (T2M) averaged over OND for years with dSSWs (left to right). Stippling indicates statistical significance ($p-value \leq 0.05$).
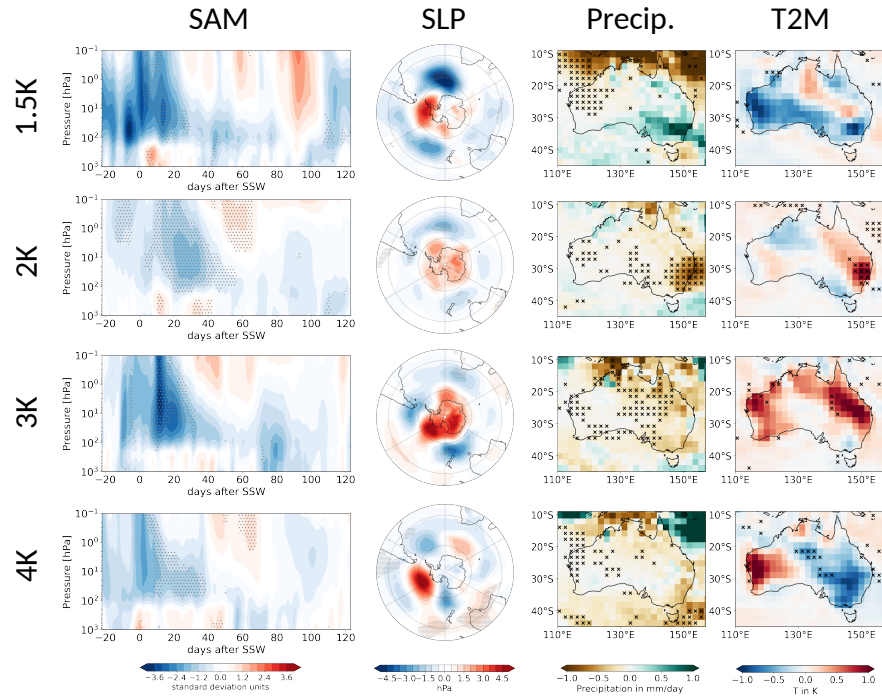
Figure S3. nSSW composites for the different global warming levels: 1.5 K, 2 K, 3 K, and 4 K (top to bottom) showing anomalies of the SAM with respect to the central day of the nSSWs, as well as of SLP, precipitation (Precip.) and 2 m air temperature (T2M) averaged over OND for years with nSSWs (left to right). Stippling indicates statistical significance ($p - value \leq 0.05$).
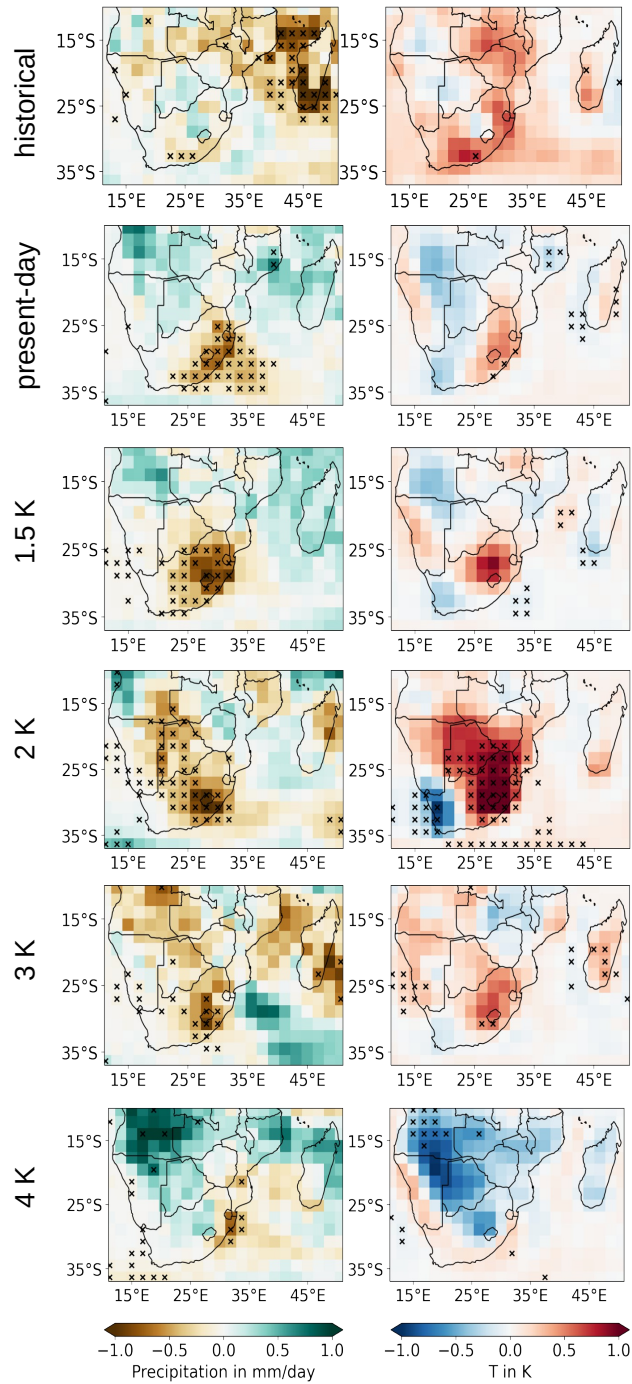
Figure S4. dSSW composites for South Africa in all model experiments: historical, present-day, 1.5K, 2K, 3K, and 4K (top to bottom) showing anomalies in precipitation (left column) and 2 m air temperature (right column) averaged over OND for years with dSSWs. Stippling indicates statistical significance ($p - value \leq 0.05$).
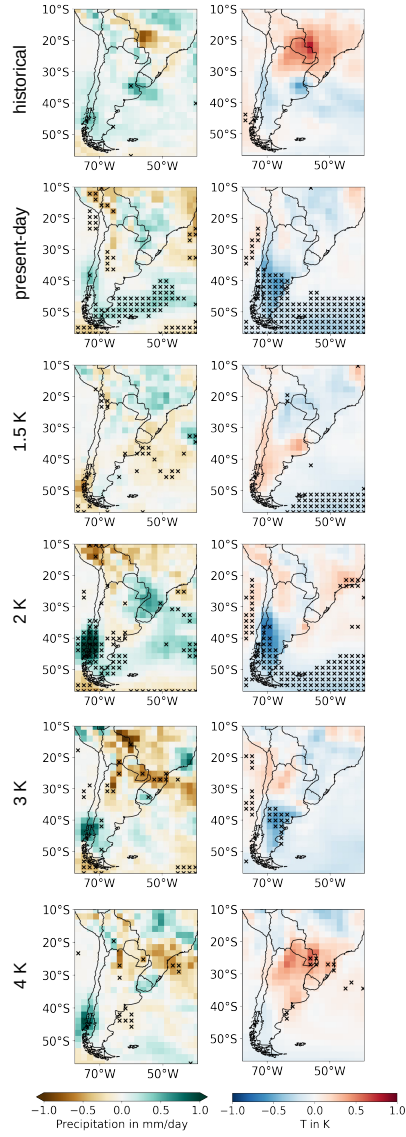
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Figure S5. SSW composites for South America in all model experiments: historical, present-day, 1.5K, 2K, 3K, and 4K (top to bottom) showing anomalies in precipitation (left column) and 2 m air temperature (right column) averaged over OND for years with SSWs. Stippling indicates statistical significance ($p - value \leq 0.05$).
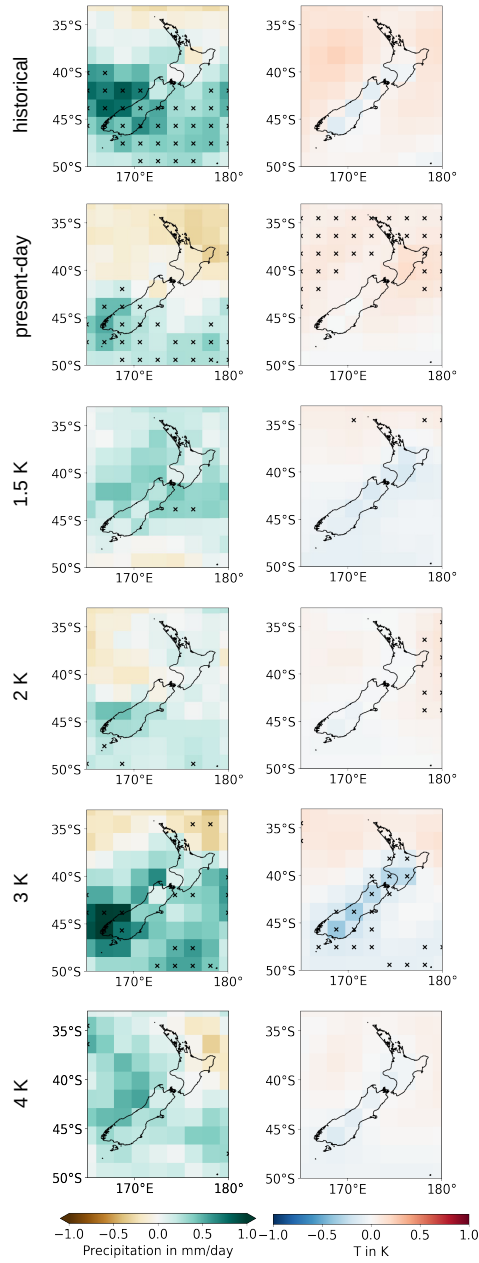
Figure S6. SSW composites for New Zealand in all model experiments: historical, present-day, 1.5K, 2K, 3K, and 4K (top to bottom) showing anomalies in precipitation (left column) and 2 m air temperature (right column) averaged over OND for years with SSWs. Stippling indicates statistical significance ($p-value \leq 0.05$).
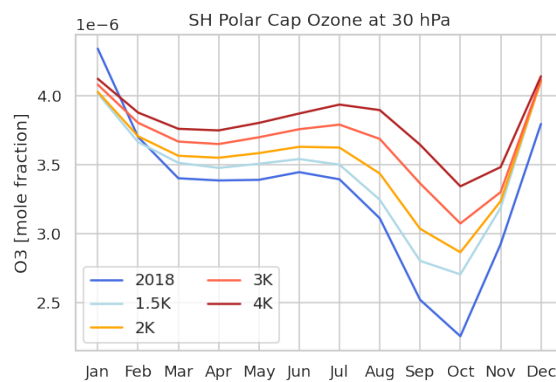
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Figure S7. Seasonal cycle of polar cap ozone concentrations at 30 hPa for the different time slice experiments: 2018 (dark blue), 1.5K (light blue), 2K (yellow), 3K (orange), and 4K (red).