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Supplement of

Smoother versus sharper Gulf Stream and Kuroshio sea surface temperature fronts: effects on cyclones and climatology

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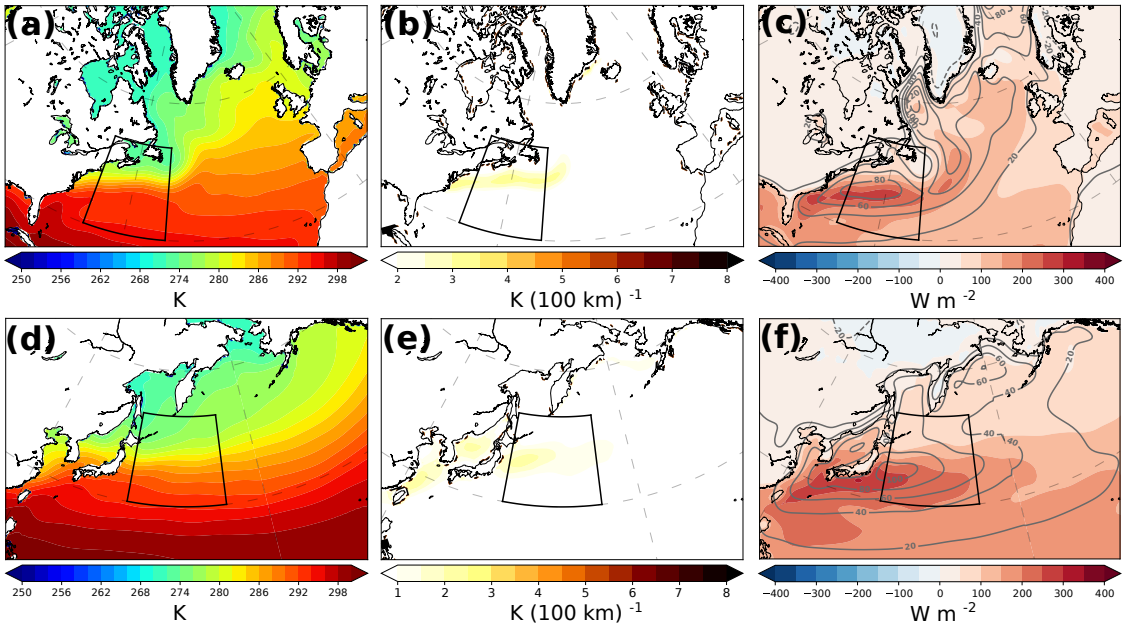

Figure S1: (a) ERA-Interim DJF climatology for the period 1982-2000 for (a) SST (K), (b) SST gradient (K (100 km)$^{-1}$), and (c) latent (shading, W m^{-2}) and sensible heat fluxes (contours, W m^{-2}) for the North Atlantic. (d-f) As (a-c), but for the North Pacific. The Gulf Stream and Kuroshio regions are marked with a black box, respectively.

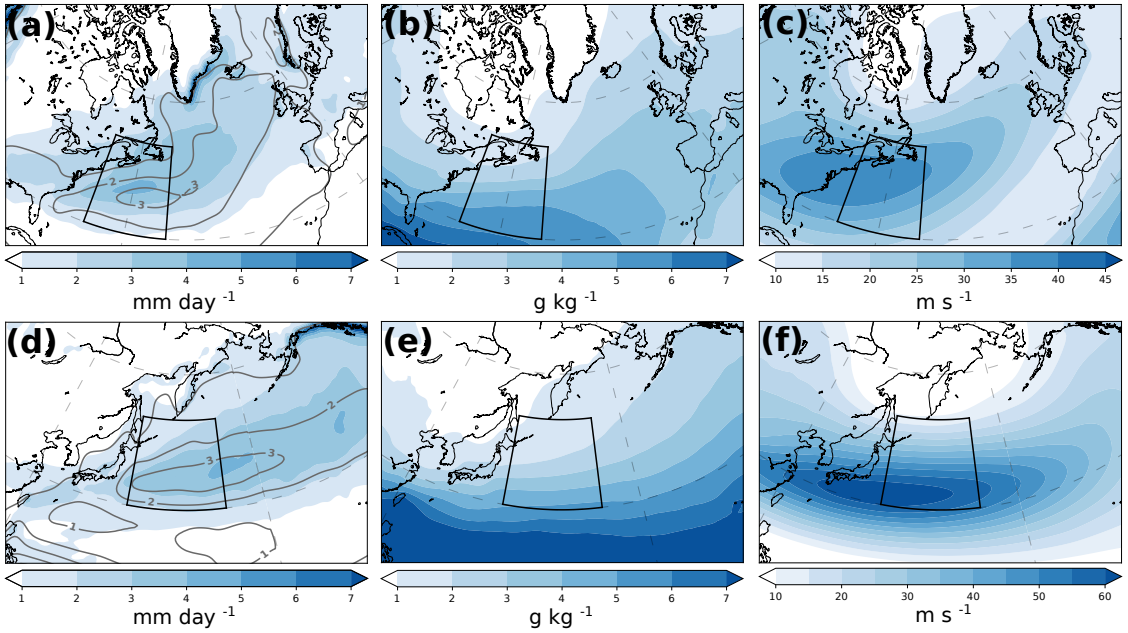

Figure S2: (a) ERA-Interim DJF climatology for the period 1982-2000 for (a) large-scale (shading, mm day^{-1}) and convective precipitation (contours, mm day^{-1}), (b) specific humidity at 850 hPa (g kg^{-1}), and (c) wind speed at 300 hPa (m s^{-1}) for the North Atlantic. (d-f) As (a-c), but for the North Pacific. The Gulf Stream and Kuroshio regions are marked with a black box, respectively.

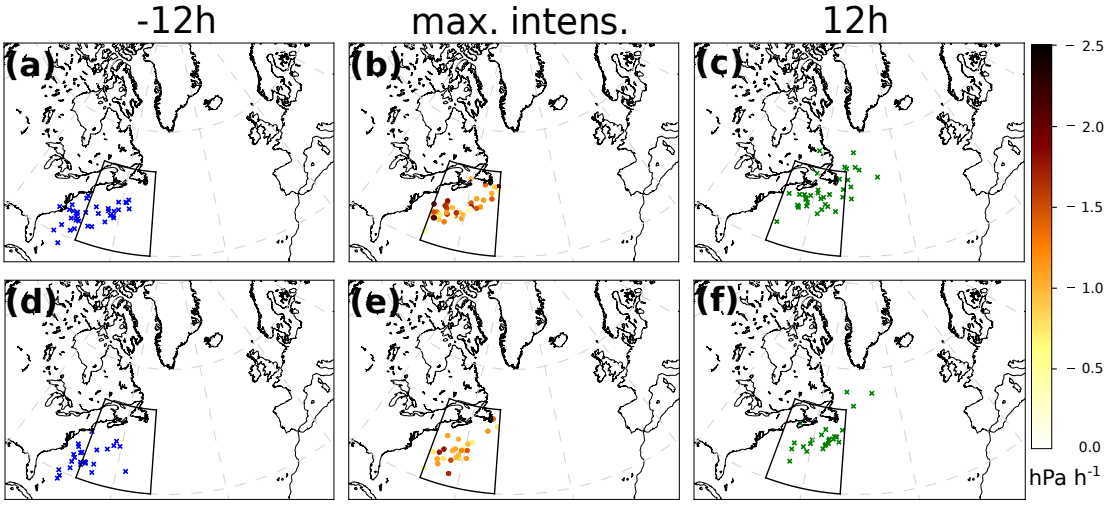

Figure S3: Locations of C3 cyclones in the North Atlantic, (a) 12 hours prior to maximum intensification (blue crosses), (b) at the time of maximum intensification (dots coloured depending on their pressure tendency (hPa h^{-1})), and (c) 12 hours after maximum intensification (green crosses) in the CNTL experiment. (d-f) As (a-c), but for the SMTHG experiment. The Gulf Stream region is marked with a black box.

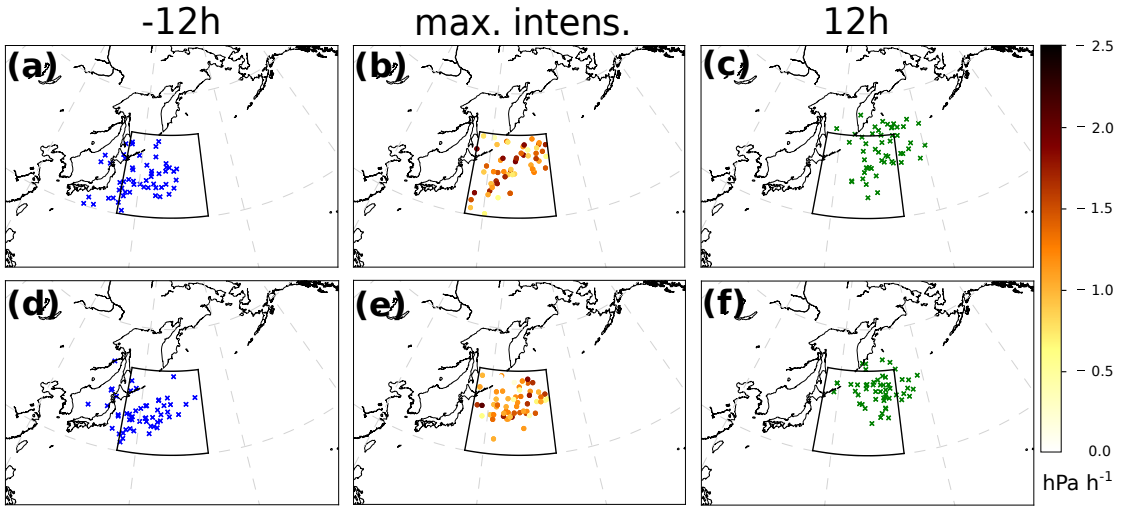

Figure S4: Locations of C3 cyclones in the North Pacific, (a) 12 hours prior to maximum intensification (blue crosses), (b) at the time of maximum intensification (dots coloured depending on their pressure tendency (hPa h^{-1})), and (c) 12 hours after maximum intensification (green crosses) in the CNTL experiment. (d-f) As (a-c), but for the SMTHK experiment. The Kuroshio region is marked with a black box.

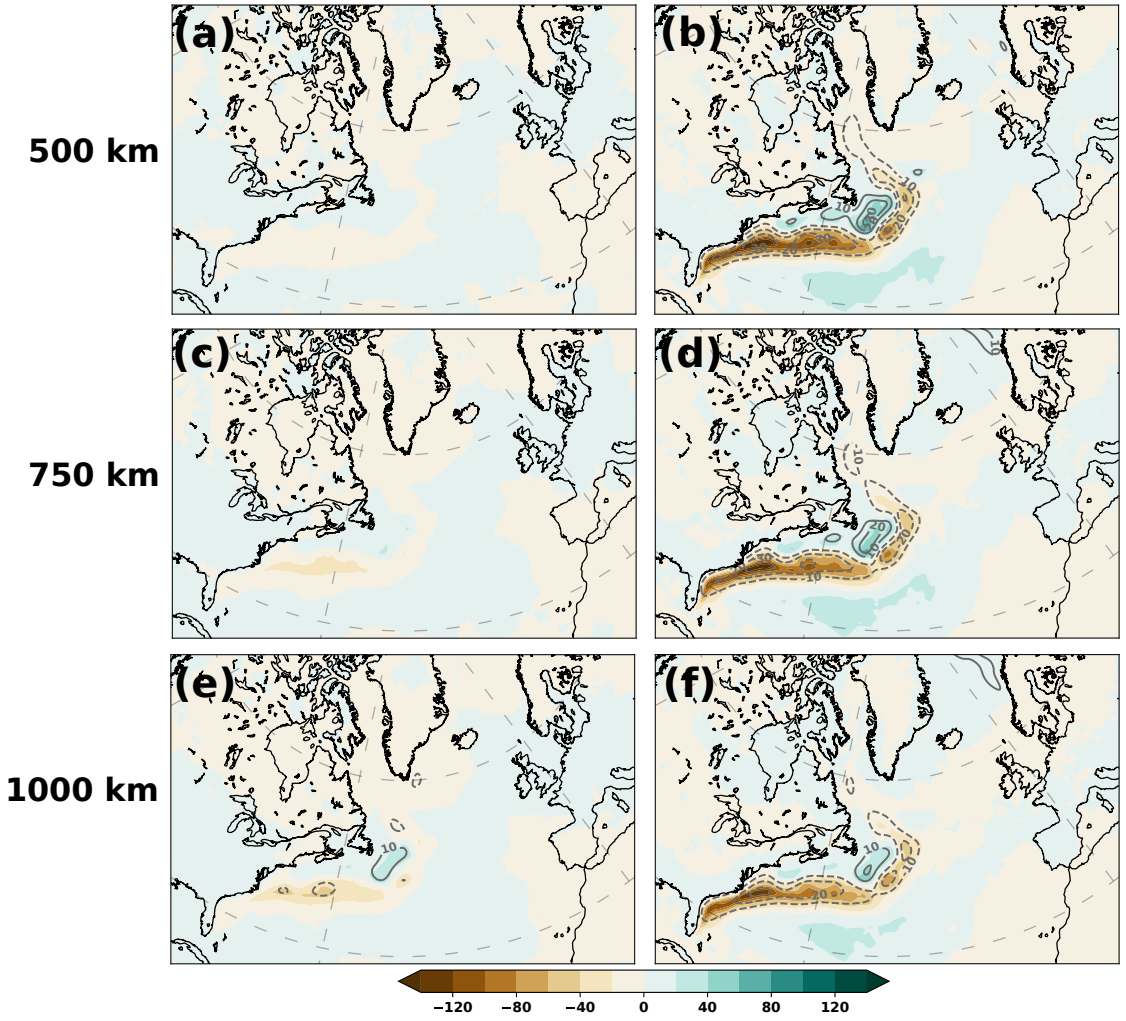

Figure S5: Difference (SMTHG-CNTL) of latent (shading) and sensible heat fluxes (grey contours, interval: 10 W m^{-2}, zero contour omitted) within a radius of 500 km, 750 km, and 1000 km (a,c,e, respectively) and outside of this radius (b,d,f, respectively) for the North Atlantic.

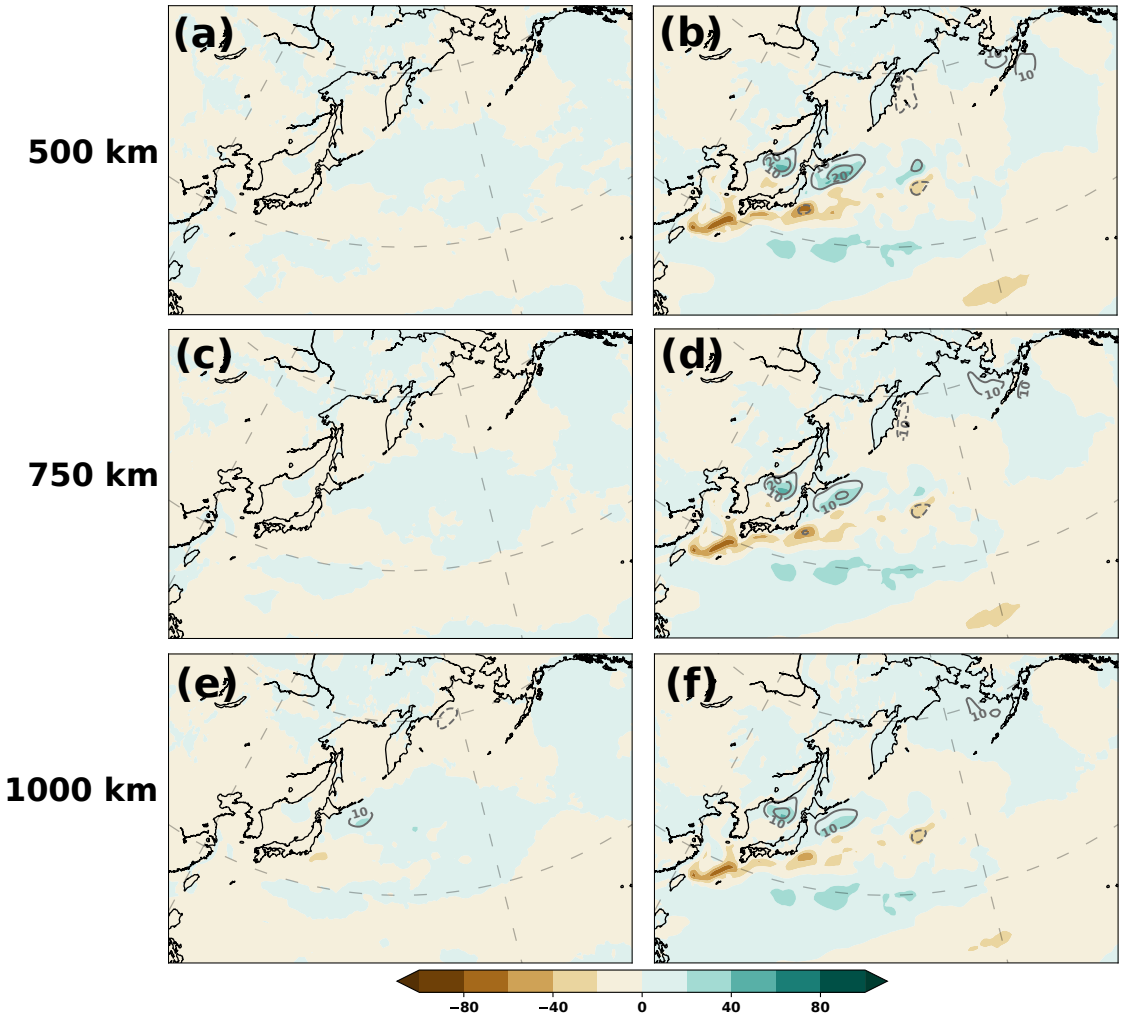

Figure S6: Difference (SMTHK-CNTL) of latent (shading) and sensible heat fluxes (grey contours, interval: 10 W m^{-2}, zero contour omitted) within a radius of 500 km, 750 km, and 1000 km (a,c,e, respectively) and outside of this radius (b,d,f, respectively) for the North Pacific.

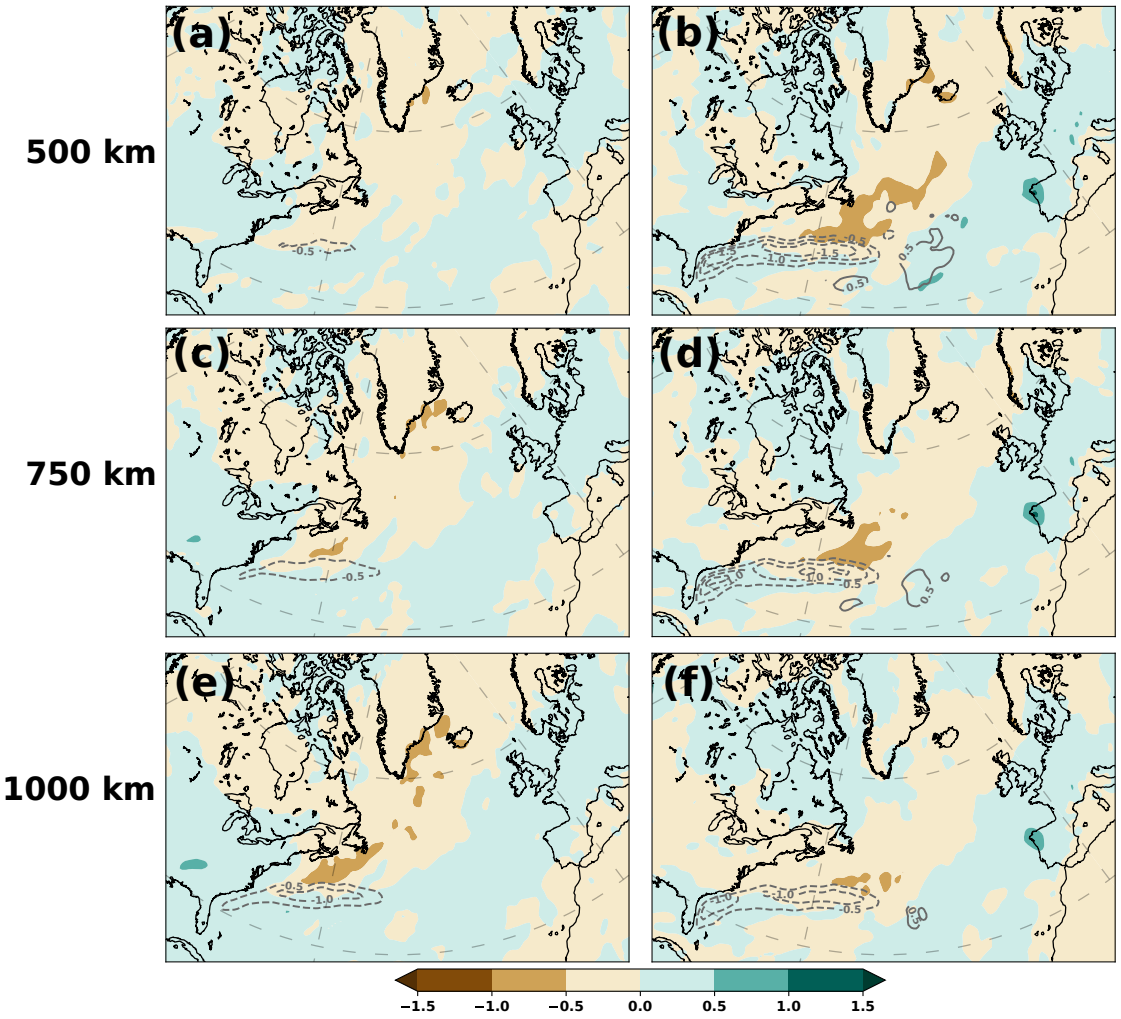

Figure S7: Difference (SMTHG-CNTL) of large-scale precipitation (shading, mm day^{-1}) and convective precipitation (grey contours, interval: 0.5, mm day^{-1}, zero contour omitted) within a radius of 500 km, 750 km, and 1000 km (a,c,e, respectively) and outside of this radius (b,d,f, respectively) for the North Atlantic.

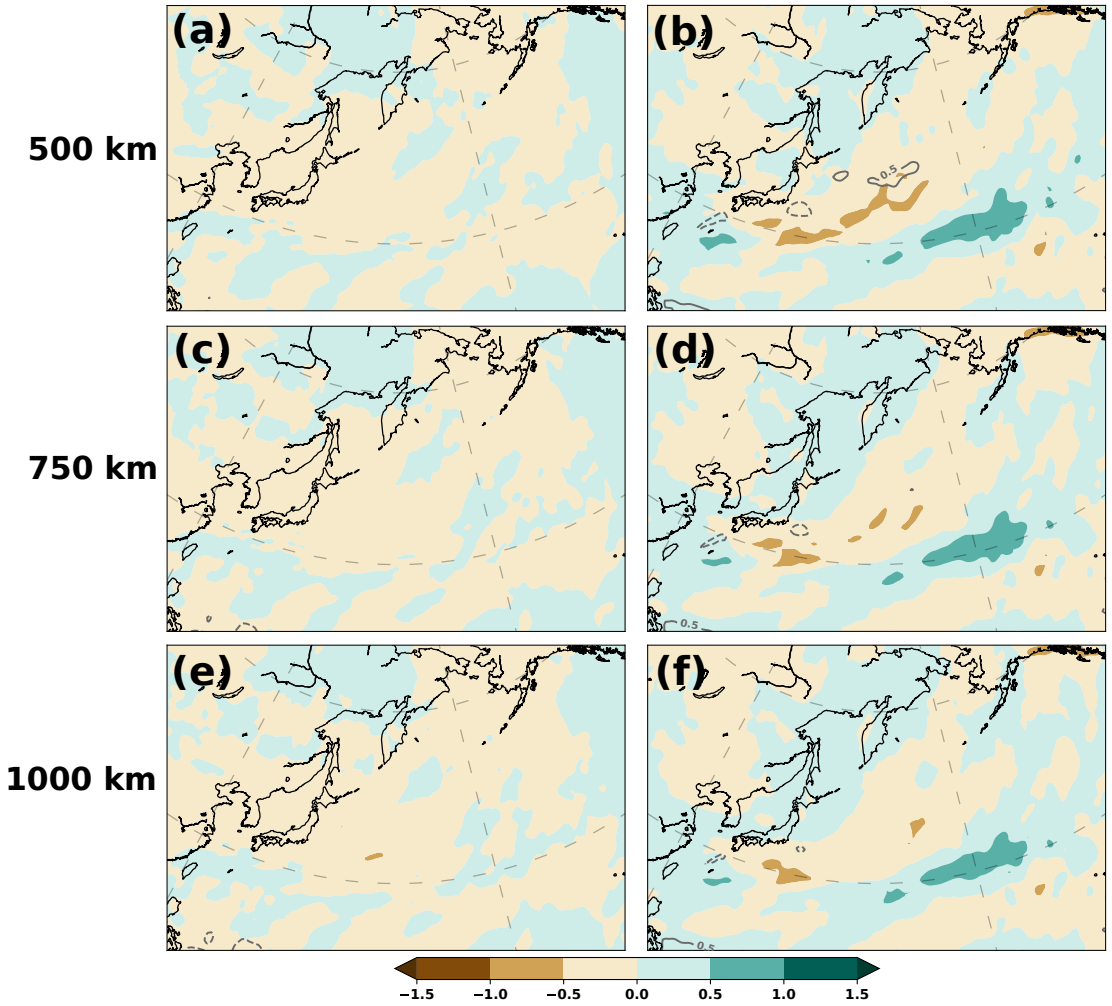

Figure S8: Difference (SMTHK-CNTL) of large-scale precipitation (shading, mm day^{-1}) and convective precipitation (grey contours, interval: 0.5, mm day^{-1}, zero contour omitted) within a radius of 500 km, 750 km, and 1000 km (a,c,e, respectively) and outside of this radius (b,d,f, respectively) for the North Pacific.

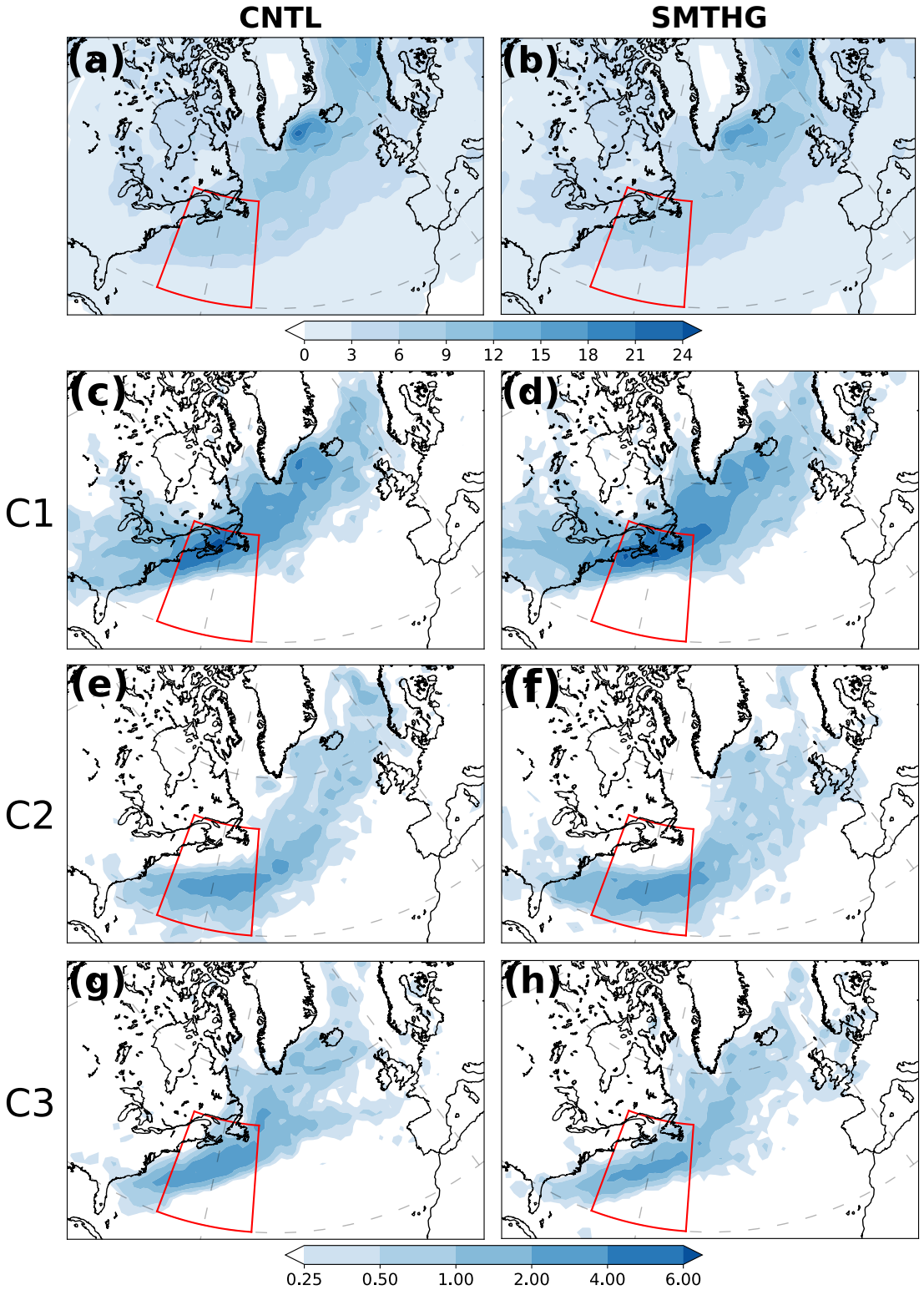

Figure S9: (a) Cyclone density (10^{-6} km^{-2}) for DJF in 1982-2000 for the North Atlantic for the CNTL experiment. (b) As (a) but for the SMTHG experiment. (c,e,g) As (a) but for cyclones with maximum intensification in the Gulf Stream region in categories C1, C2, and C3, respectively. (d,f,h) As (c,e,g) but for the SMTHG experiment. See main text for more details on the cyclone detection and categorisation.

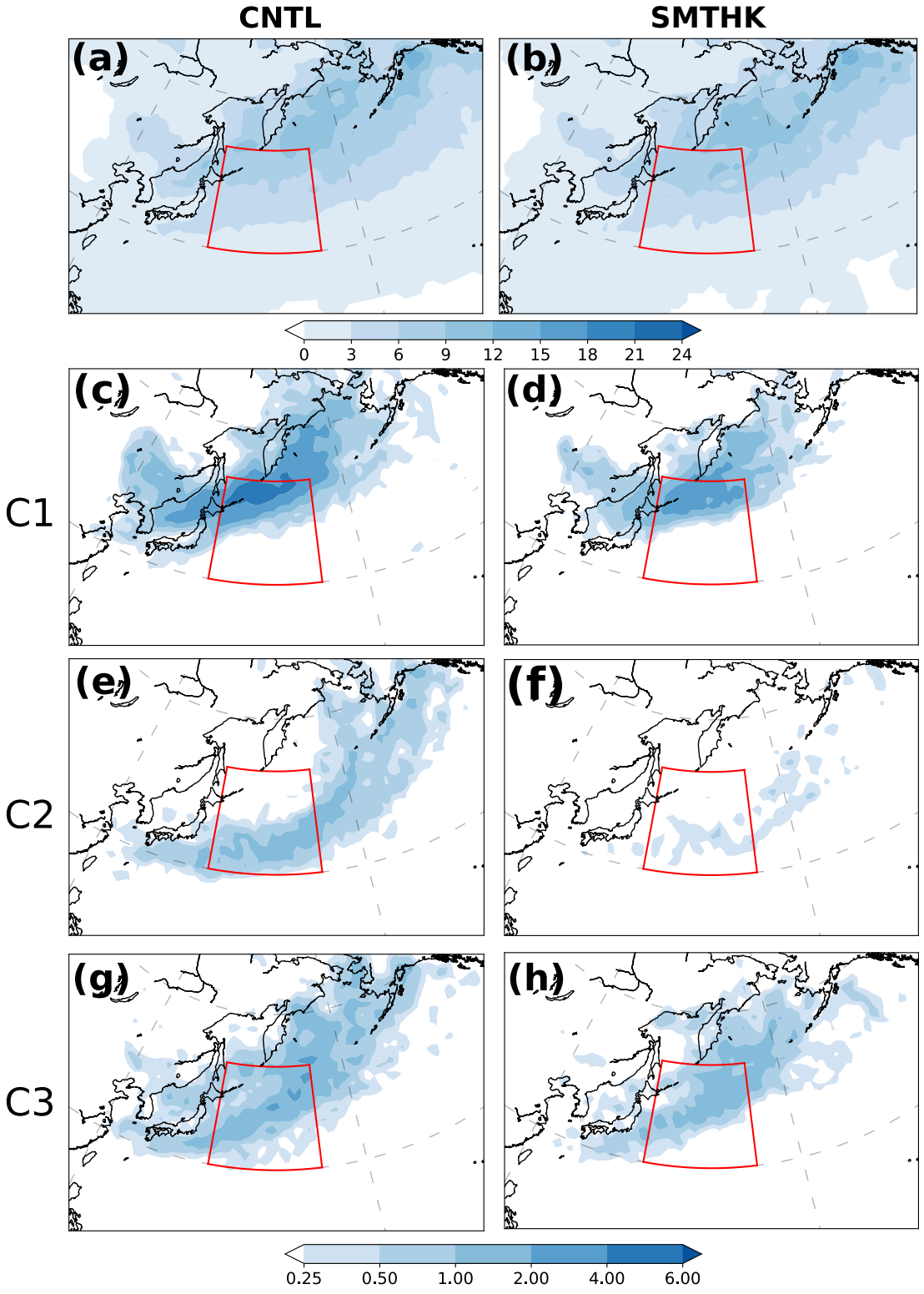

Figure S10: (a) Cyclone density (10^{-6} km^{-2}) for DJF in 1982-2000 for the North Pacific for the CNTL experiment. (b) As (a) but for the SMTHK experiment. (c,e,g) As (a) but for cyclones with maximum intensification in the Kuroshio region in categories C1, C2, and C3, respectively. (d,f,h) As (c,e,g) but for the SMTHK experiment. See main text for more details on the cyclone detection and categorisation.

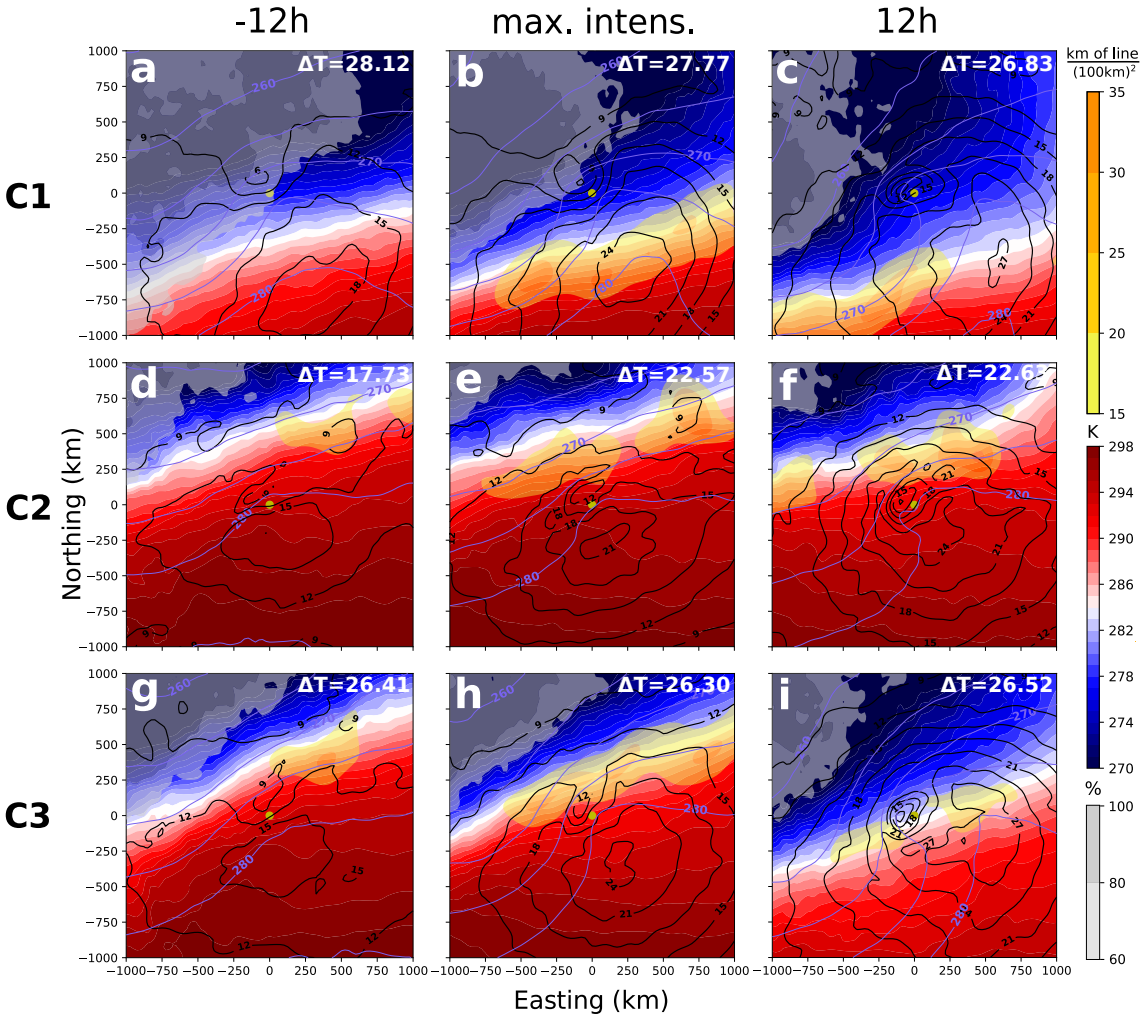

Figure S11: Composite evolution of cyclone-centred SST (blue-red shading, K), temperature at 850 hPa (purple contours, interval: 5 K), wind speed at 925 hPa (black contours, interval: 3 m s^{-1}), SST front density (yellow shading, in 10^{-5} km $^{-1}$), and probability of being over land (grey shading, 60-100%) for the CNTL experiment. Left, middle, and right panels at 12 h prior to maximum intensification, maximum intensification, and 12 h after maximum intensification, respectively. Top, middle, and bottom panels show the categories C1, C2, and C3, respectively. Numbers in the top right of each panel represent the temperature difference at 850 hPa in the composite domain.

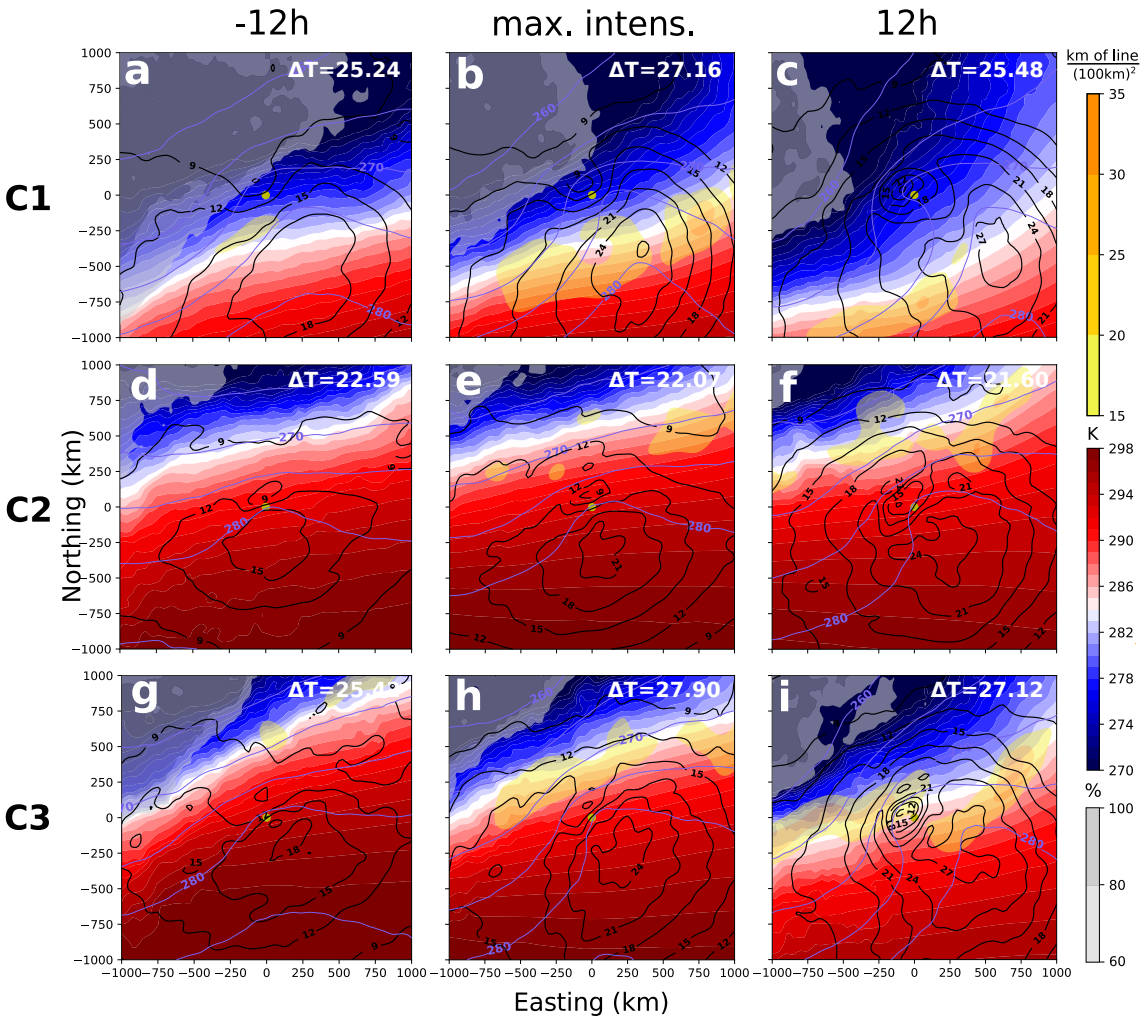

Figure S12: Composite evolution of cyclone-centred SST (blue-red shading, K), temperature at 850 hPa (purple contours, interval: 5 K), wind speed at 925 hPa (black contours, interval: 3 m s^{-1}), SST front density (yellow shading, in 10^{-5} km $^{-1}$) and probability of being over land (grey shading, 60-100%) for the SMTHG experiment. Left, middle, and right panels at 12 h prior to maximum intensification, maximum intensification, and 12 h after maximum intensification, respectively. Top, middle, and bottom panels show the categories C1, C2, and C3, respectively. Numbers in the top right of each panel represent the temperature difference at 850 hPa in the composite domain.

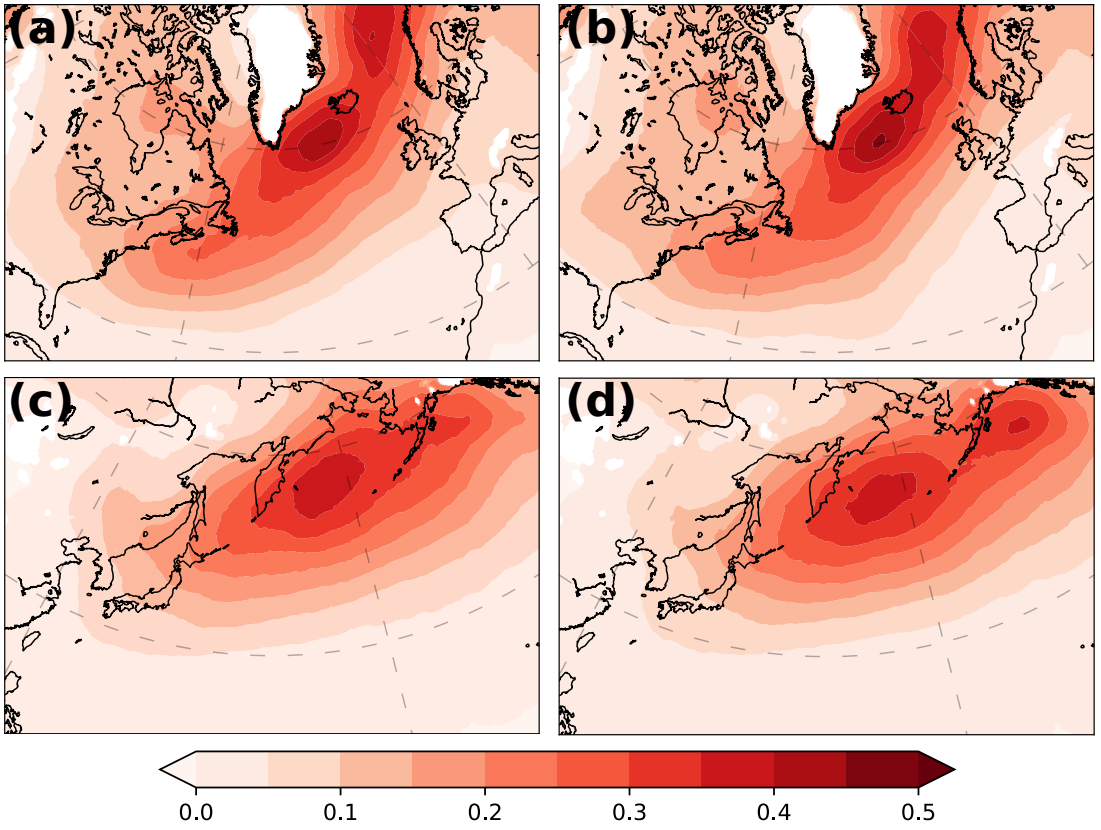

Figure S13: (a) Cyclone frequency (% of time) within a radius of 750 km around a cyclone centre for the winter seasons in 1982-2000 for the North Atlantic for the CNTL experiment, (b), as (a) but for the SMTHG experiment. (c) As (a) but for the North Pacific, (d) as (b) but for the SMTHK experiment.