



Supplement of

Resolution dependence and biases in cold and warm frontal heavy precipitation over Europe in CMIP6 and EURO-CORDEX models

Armin Schaffer et al.

Correspondence to: Armin Schaffer (armin.schaffer@uni-graz.at)

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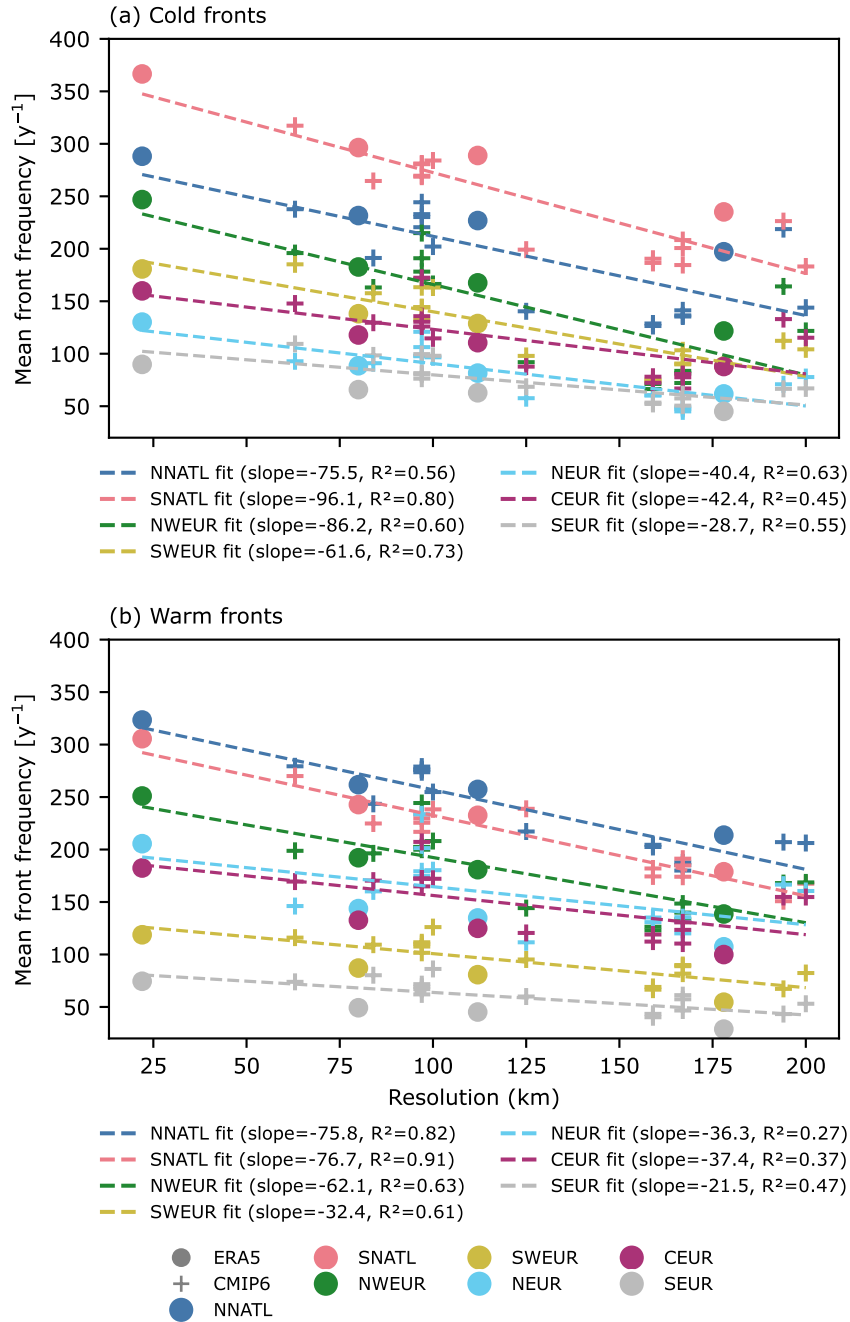


Figure S1. Same as Fig. 3, but without the EURO-CORDEX models.

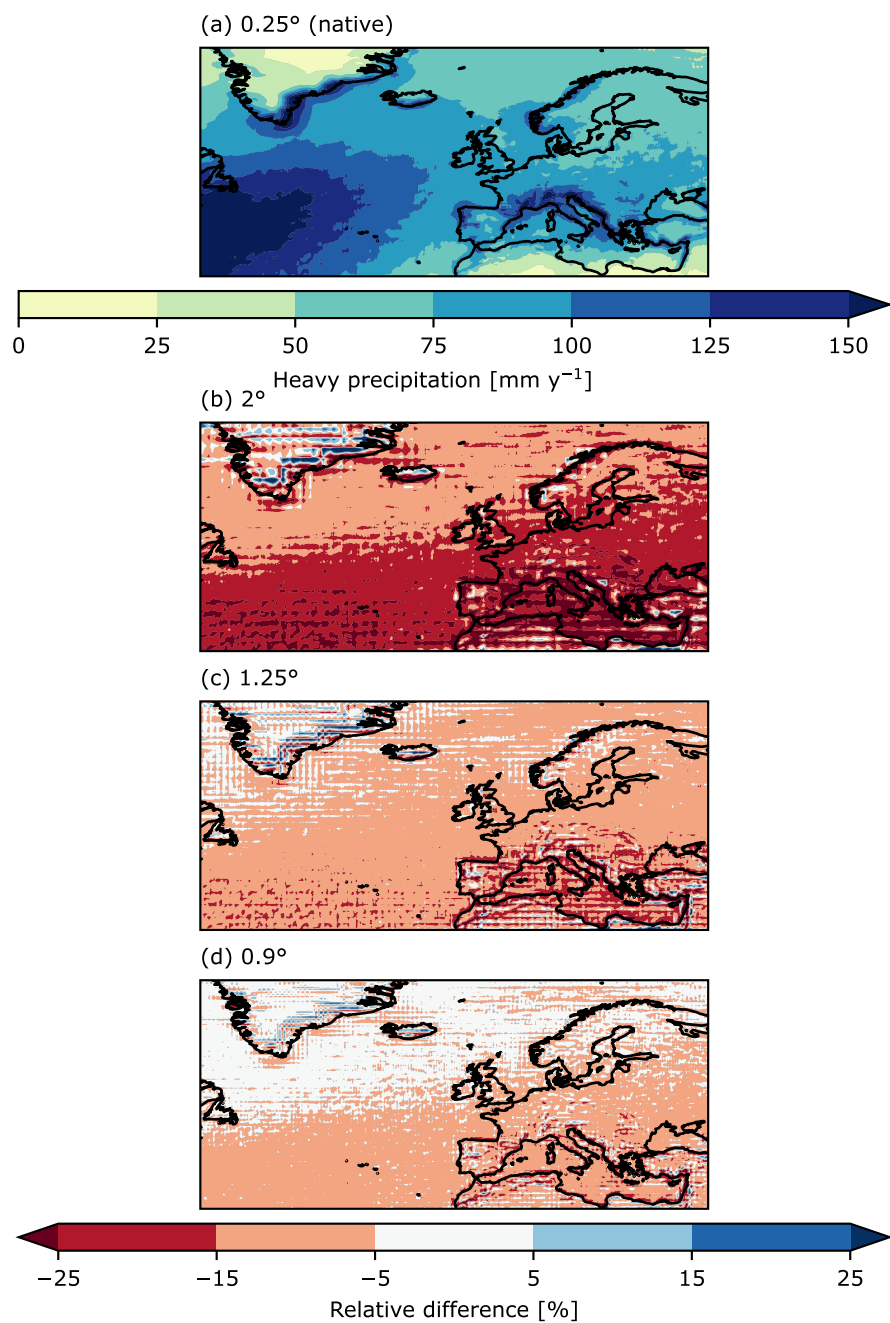


Figure S2. Same as Fig. 4, but for total heavy precipitation.

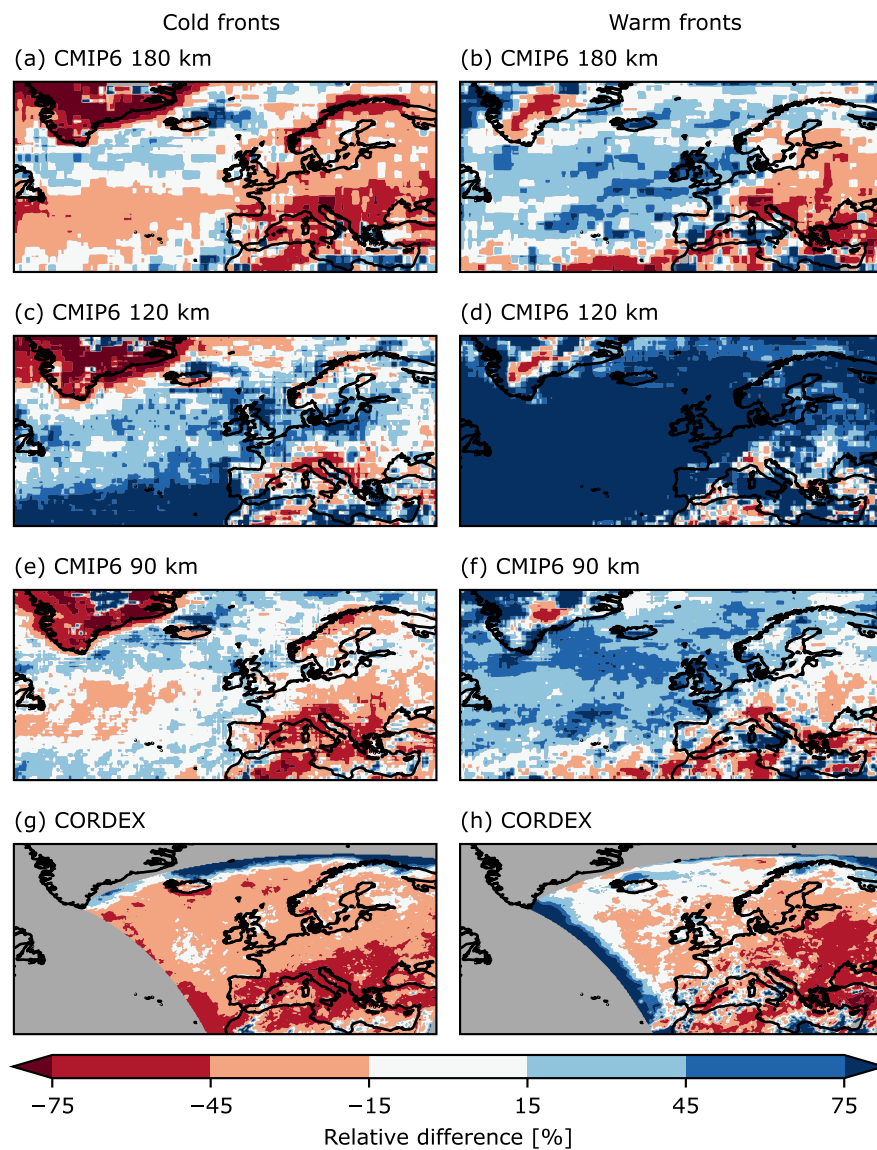


Figure S3. Same as Fig. 4, but for heavy precipitation per front.

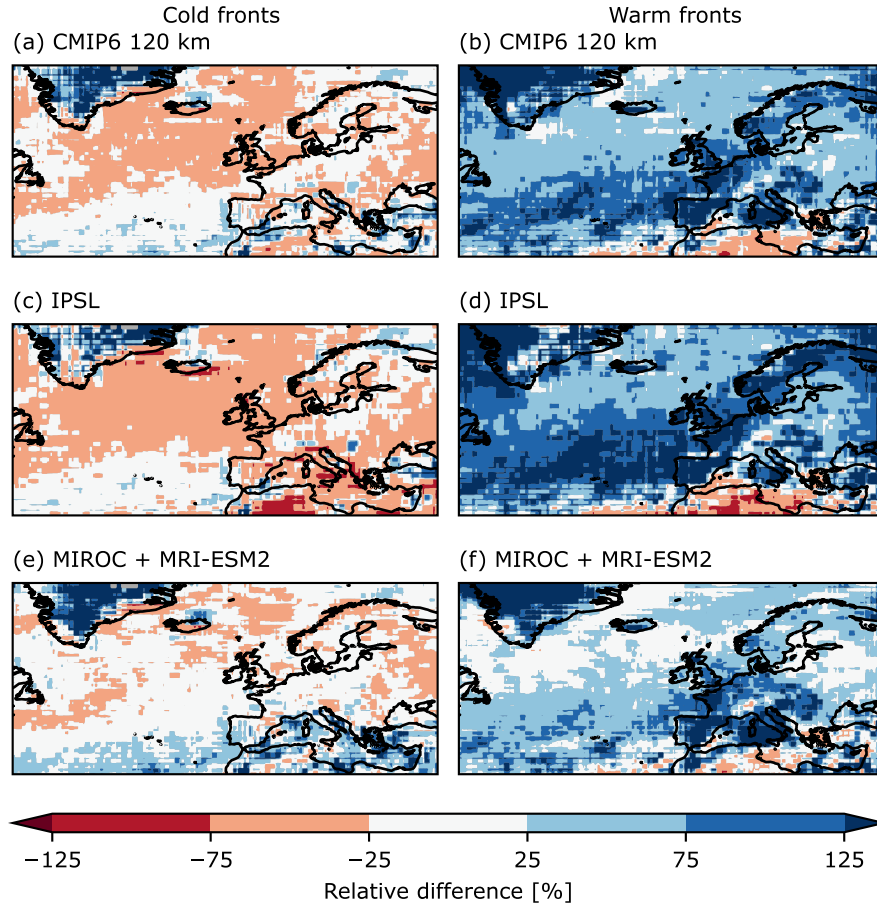


Figure S4. Same as Fig. 4, but for (a–b) CMIP6 120 km sub-ensemble and the contributing models of (c–d) IPSL and (e–f) MIROC and MRI-ESM2. The IPSL models have high latitudinal but low longitudinal resolution. This configuration may favor the representation of warm fronts, which tend to extend zonally and propagate more meridionally than cold fronts. On average the warm frontal cross-section may thus be better resolved, leading to a higher fraction of total heavy precipitation. This is supported by the fact that the IPSL models produce less cold frontal heavy precipitation and substantially more warm frontal precipitation than the rest of the sub-ensemble.

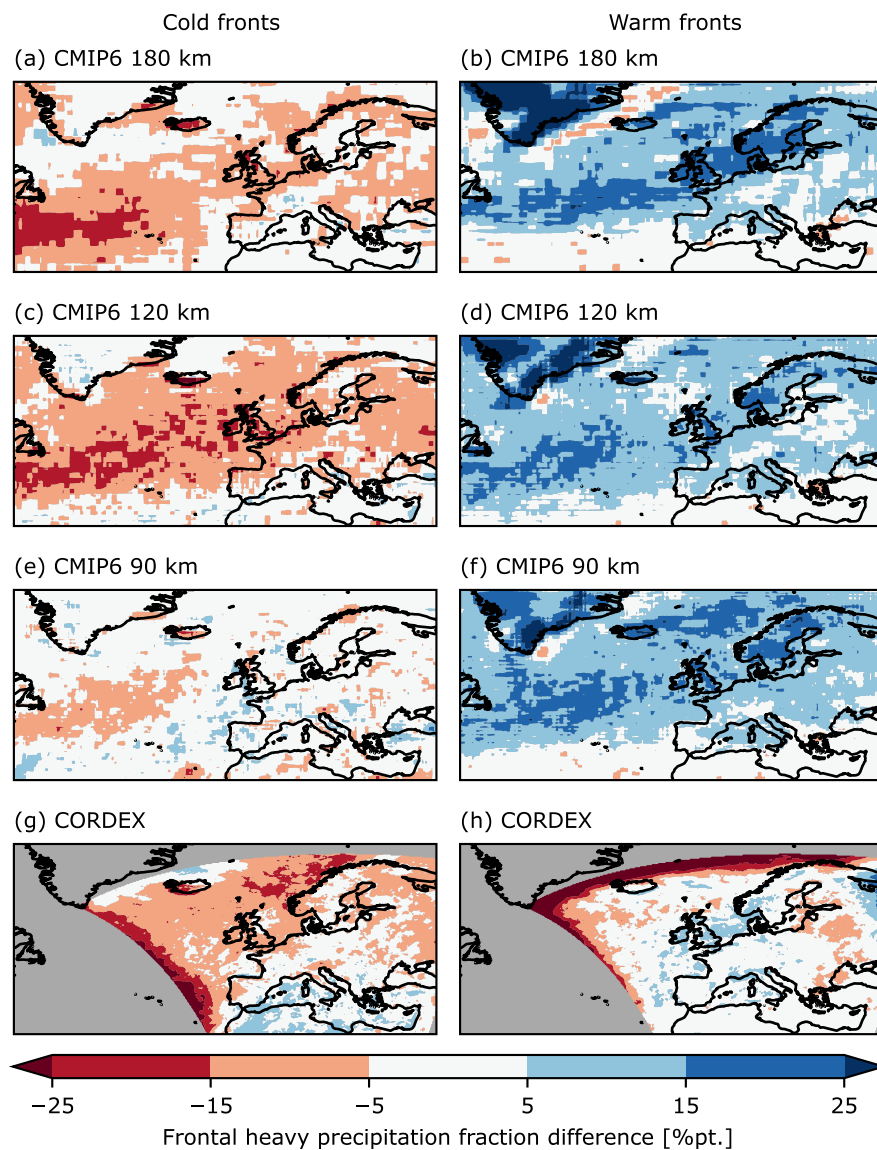


Figure S5. Same as Fig. 5, but percentage point difference of frontal heavy precipitation fraction.

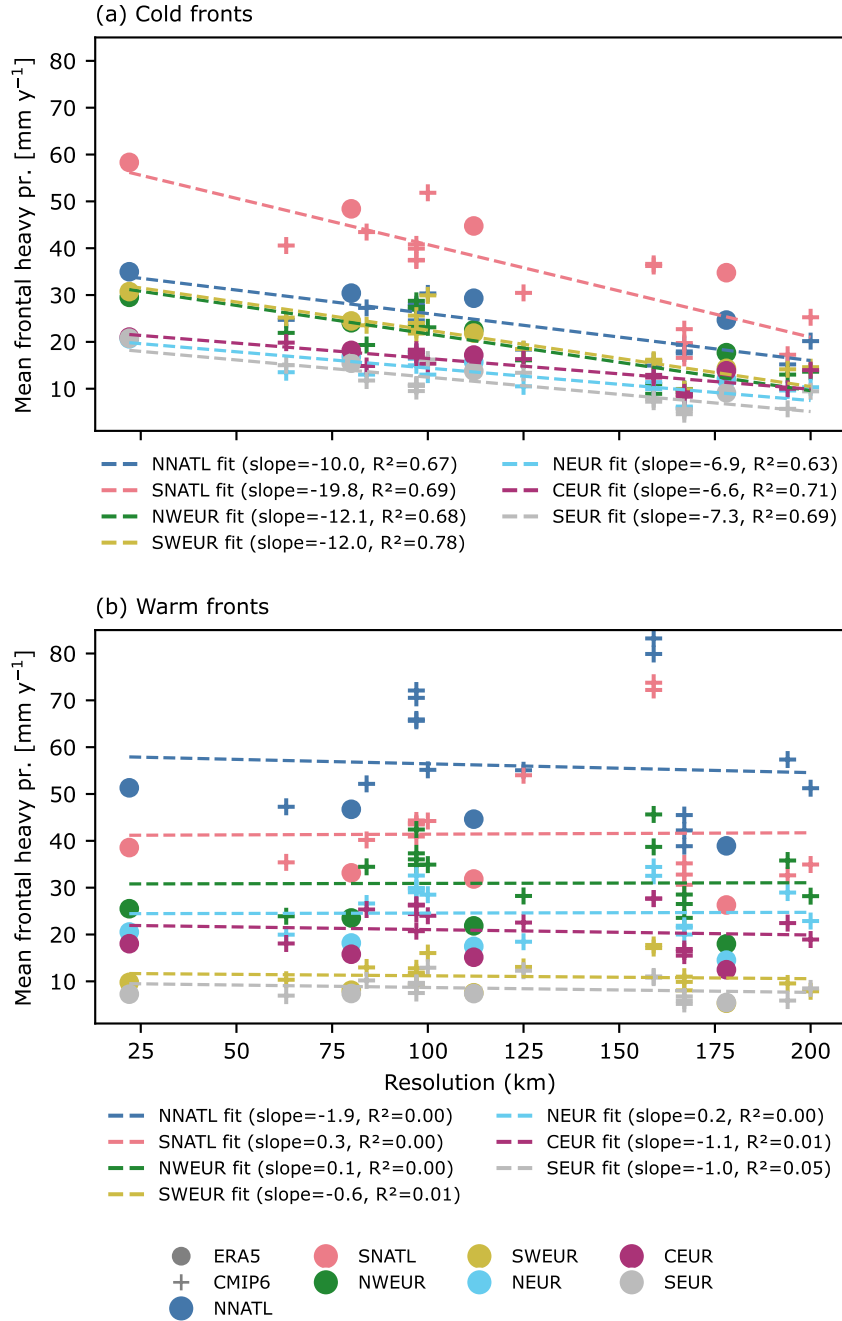


Figure S6. Same as Fig. 6, but without the EURO-CORDEX models. For warm fronts, the regression does not capture the behavior of the ERA5 data, which shows a weak negative relation. If the IPSL models ($x = 159$ km), which exhibit the highest values, are excluded, the regression aligns more with the ERA5 data, again highlighting the effect of higher latitudinal resolution on warm frontal heavy precipitation.

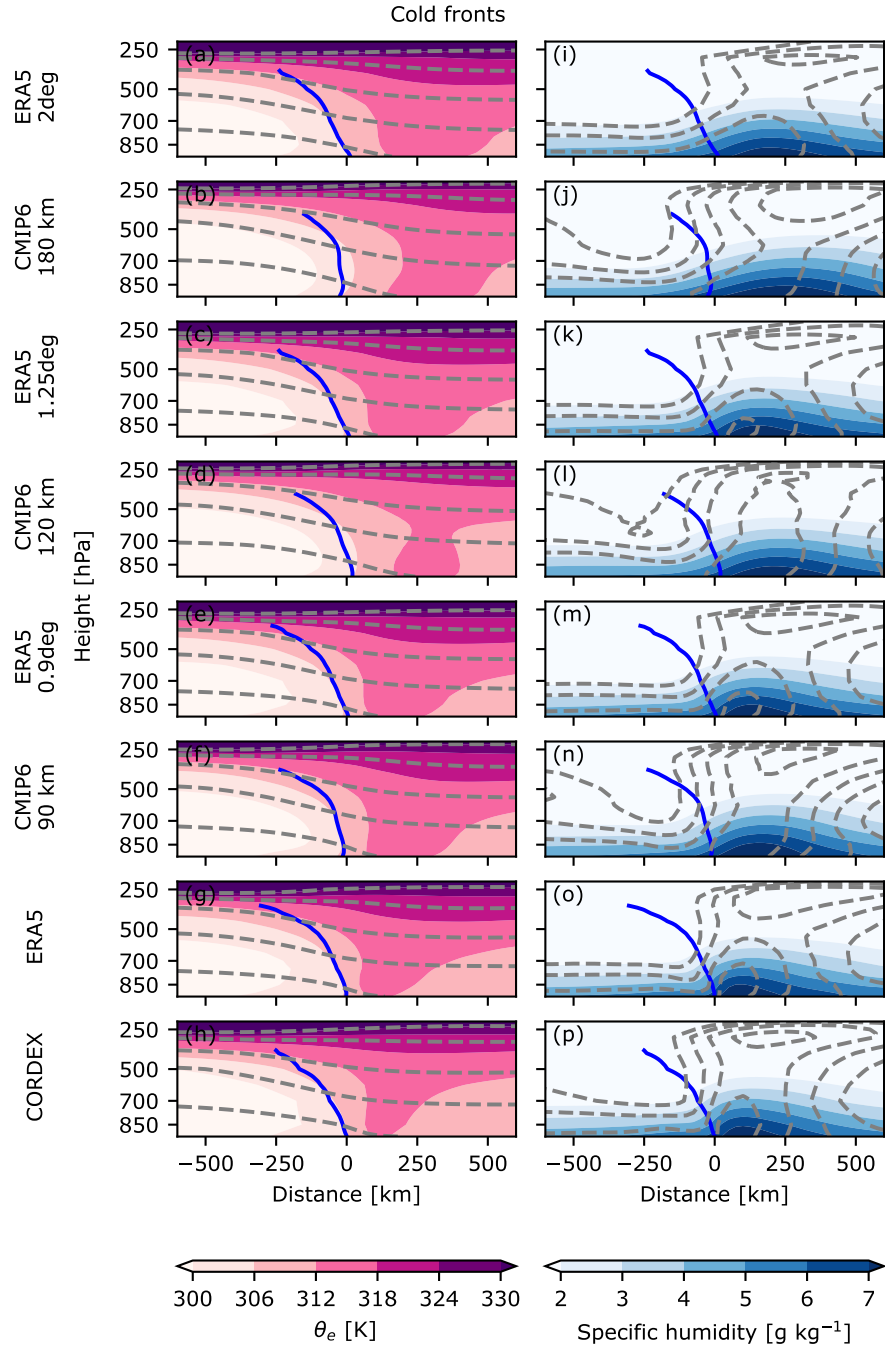


Figure S7. Same as Fig. 7, but colored contours display (a–h) θ_e and (i–p) specific humidity. Contours indicate (a–h) θ from 290–330 K in 10 K steps and (i–p) relative humidity from 60–100 % in 10 % steps.

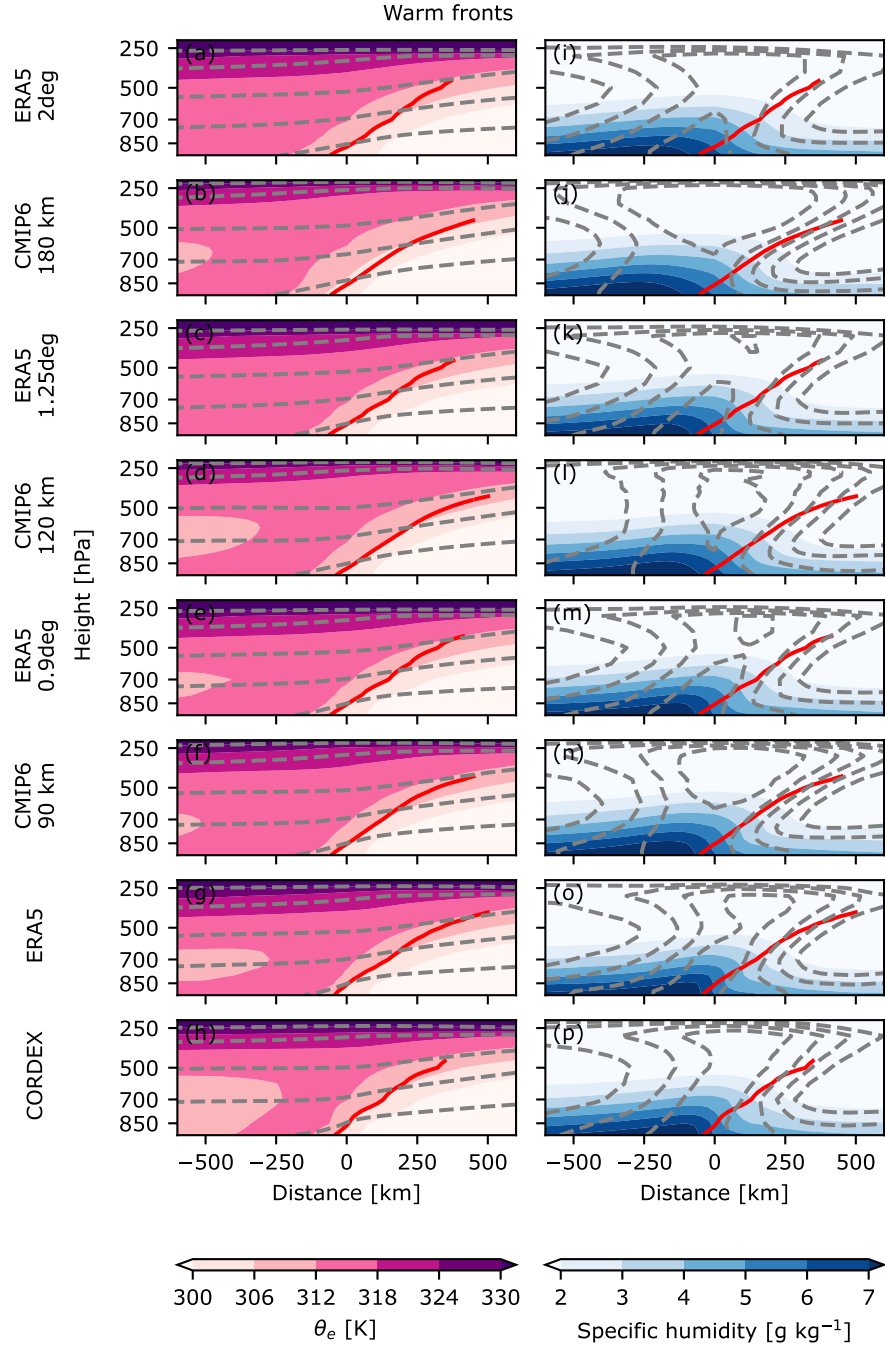


Figure S8. Same as Fig. S7, but for warm frontal cross-sections.

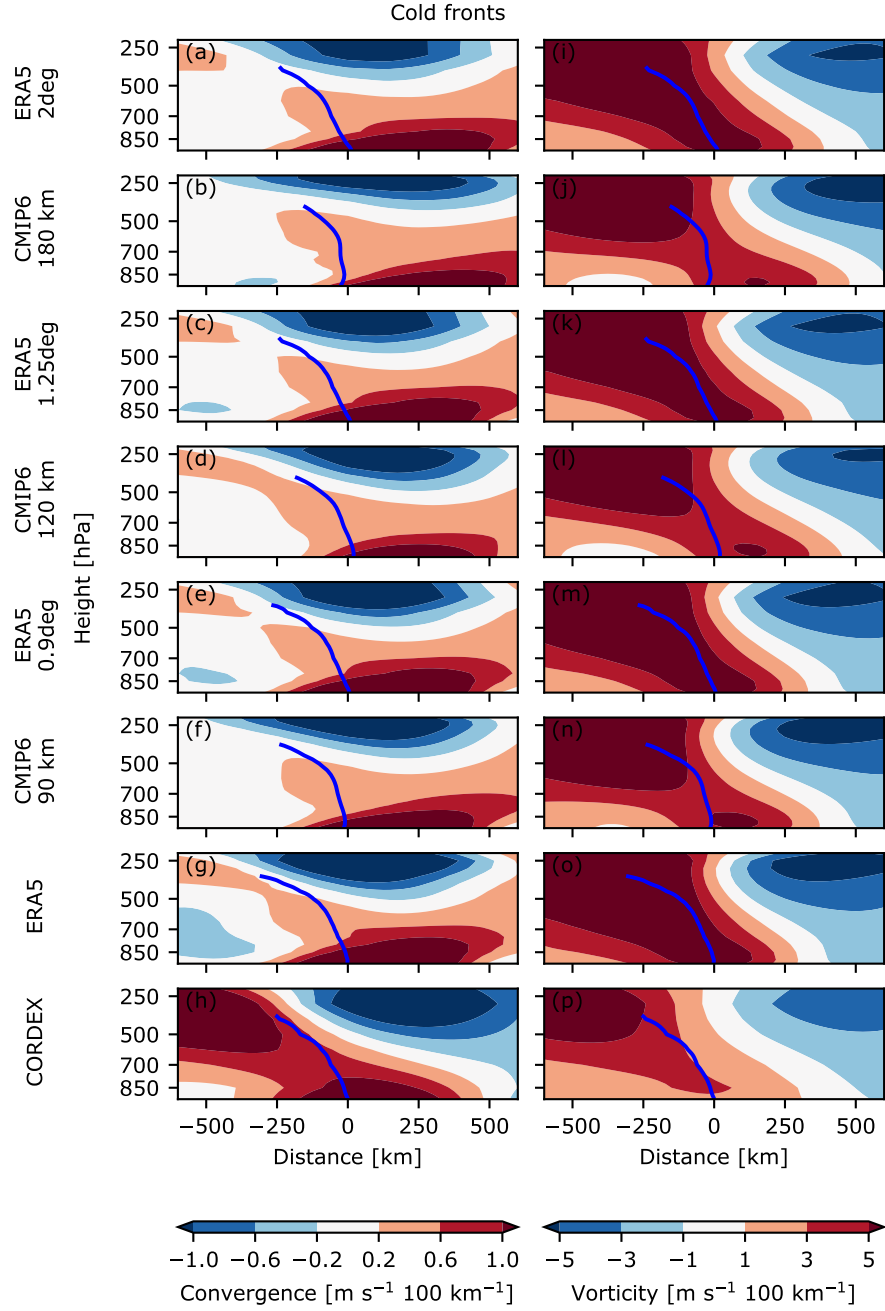


Figure S9. Same as Fig. 7, but colored contours display synoptic (a–h) convergence and (i–p) vorticity.

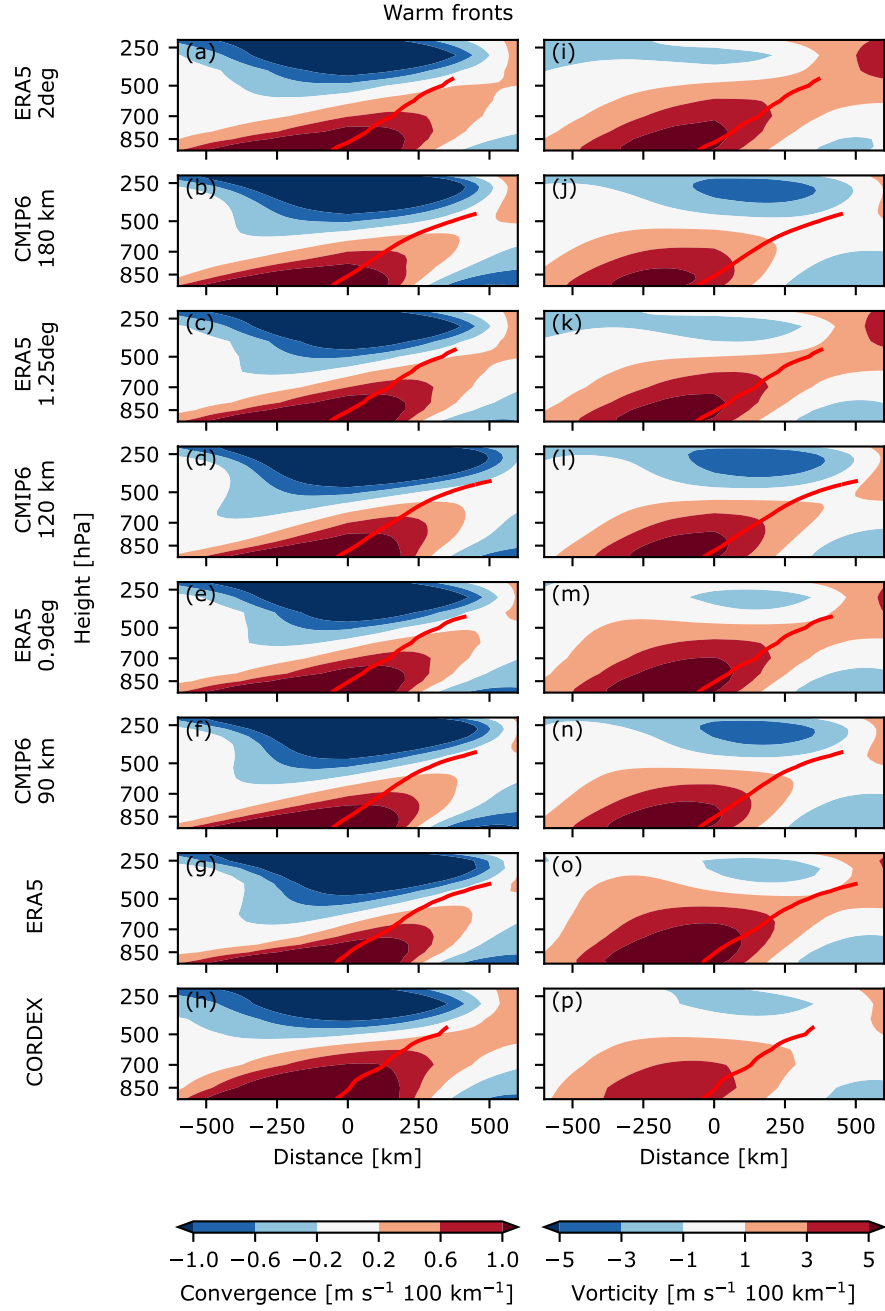


Figure S10. Same as Fig. S9, but for warm frontal cross-sections.