

Figure S1: Cloud fraction vertical profiles for DJF (a) and JJA (b). The period covered is 2000-2009, except for the European domain (MED, WCE and NEU regions): 1980-2010.

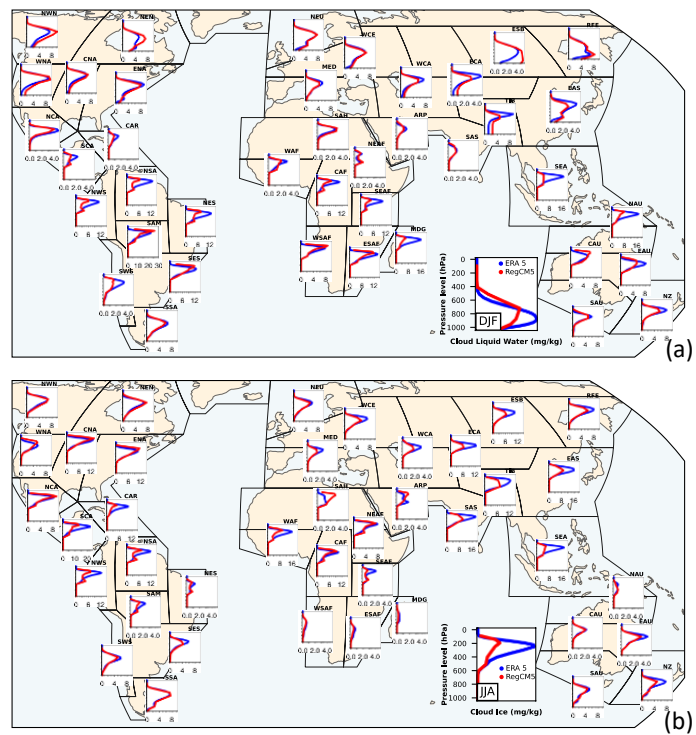


Figure S2: Cloud ice vertical profiles for DJF (a) and JJA (b). The period covered is 2000-2009, except for the European domain (MED, WCE and NEU regions): 1980-2010.

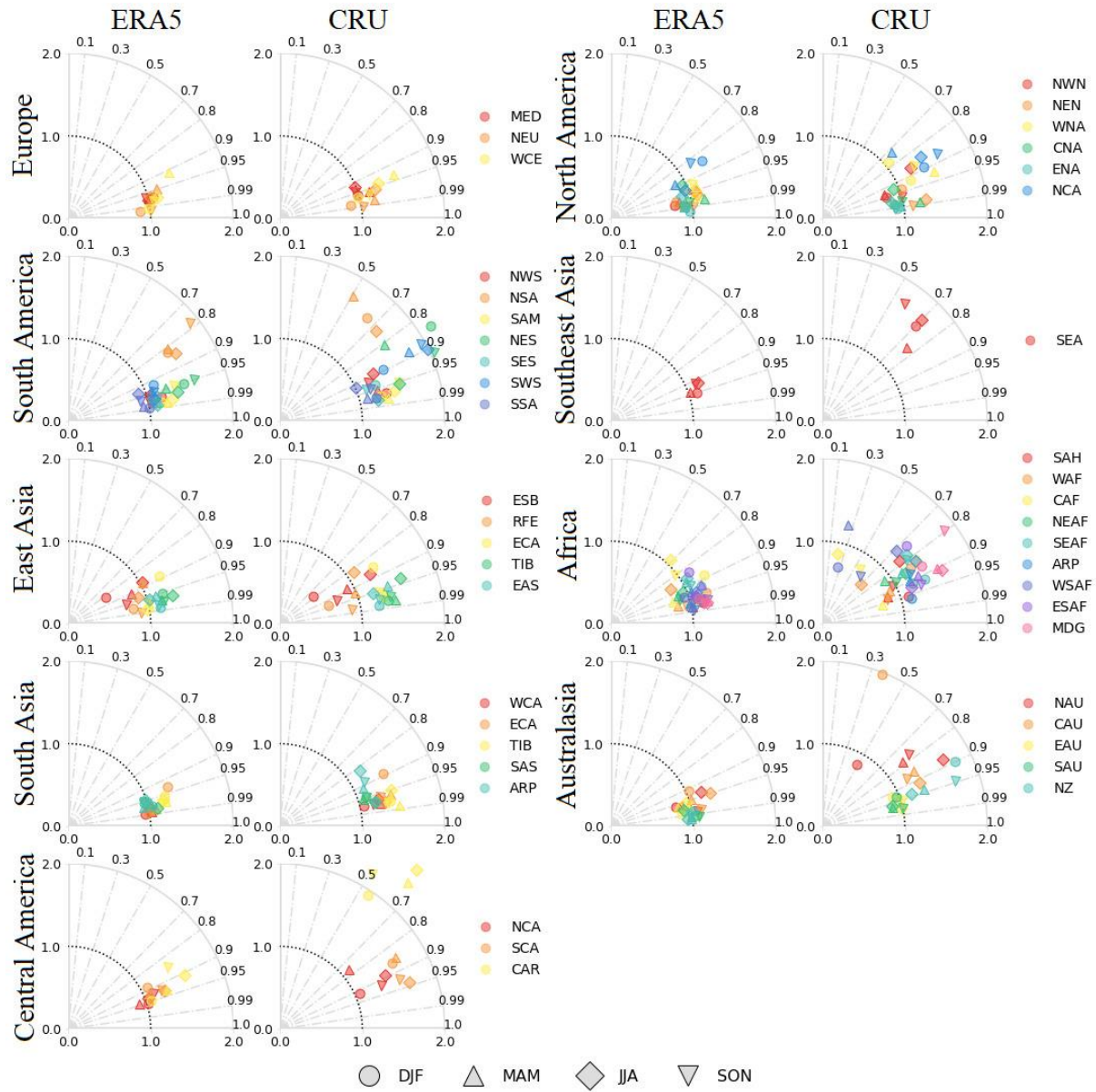


Figure S3: Taylor diagrams for the maximum temperature. Symbols represent seasons and colors are the subregions of a specific domain.

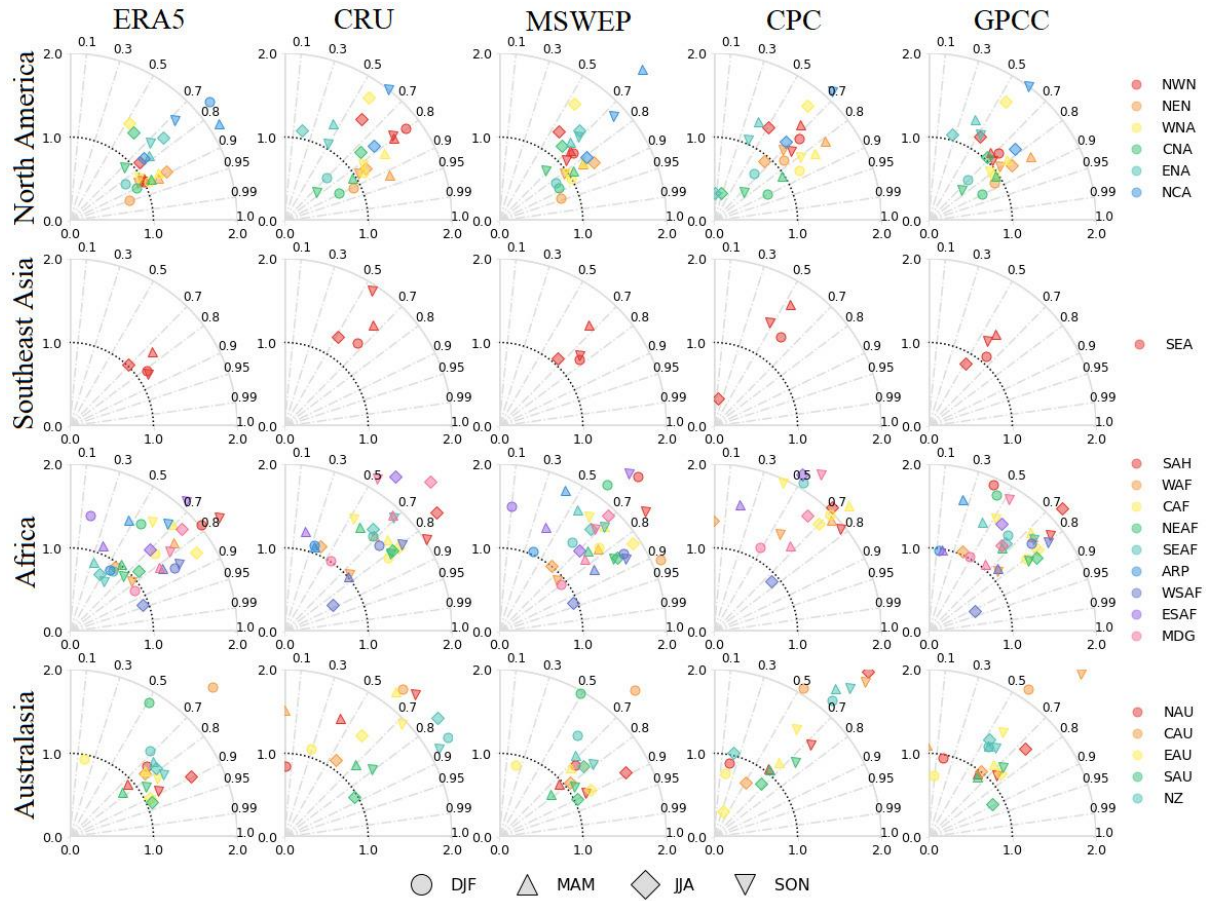


Figure S5: Taylor diagrams for precipitation for the remaining domains. Symbols represent seasons and colors are the subregions of a specific domain.

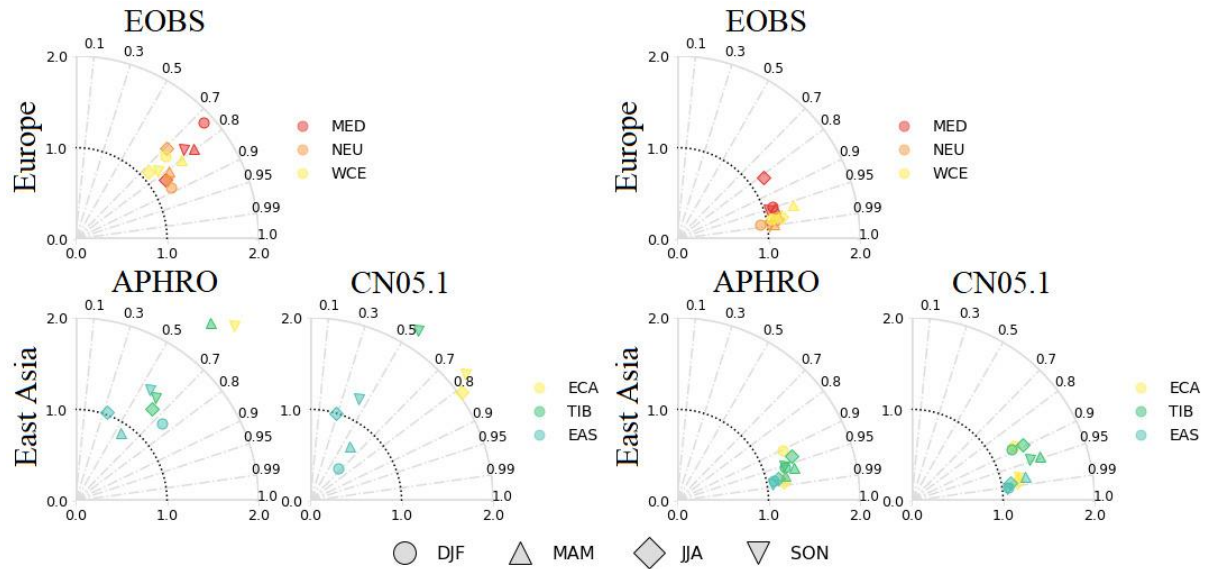


Figure S6: Taylor diagrams for precipitation (left panel) and temperature (right panel) with available regional datasets. (Note: For East Asia, results for RFE and ESB are not shown since APHORO and CN05.1 only cover a small portion of these subregions). Symbols represent seasons and colors are the subregions of a specific domain.

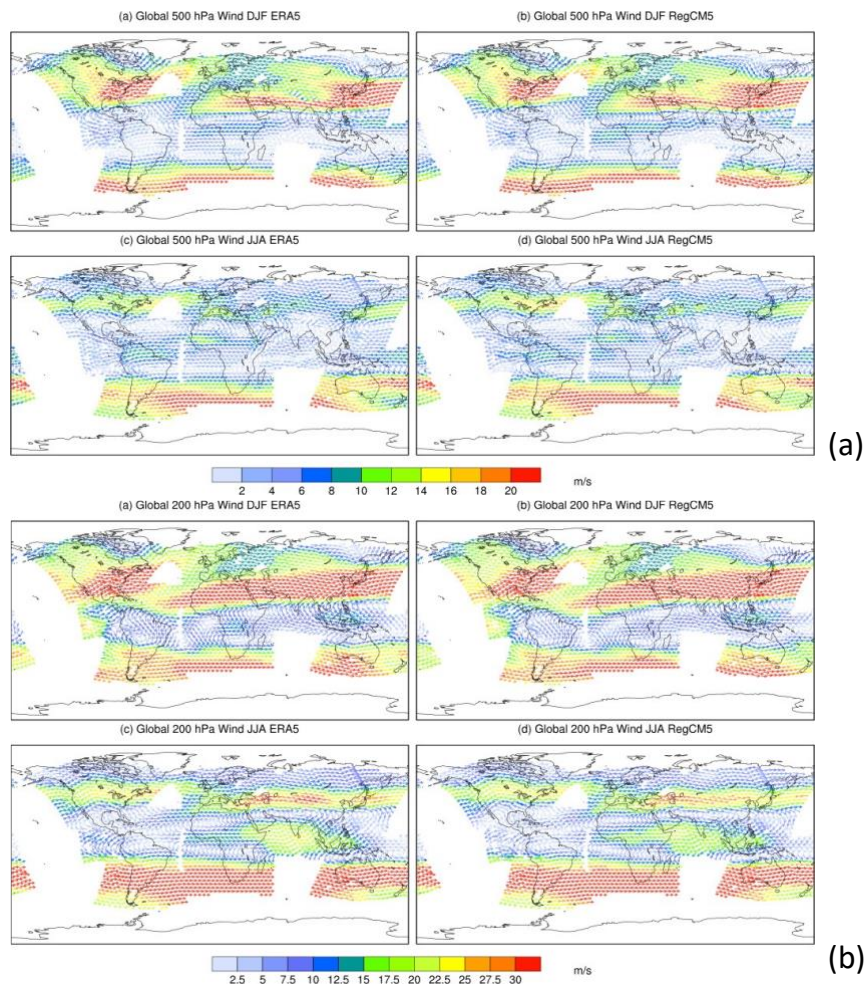


Figure S7: Wind field at 500 hPa (upper panel) and 200 hPa (lower panel).

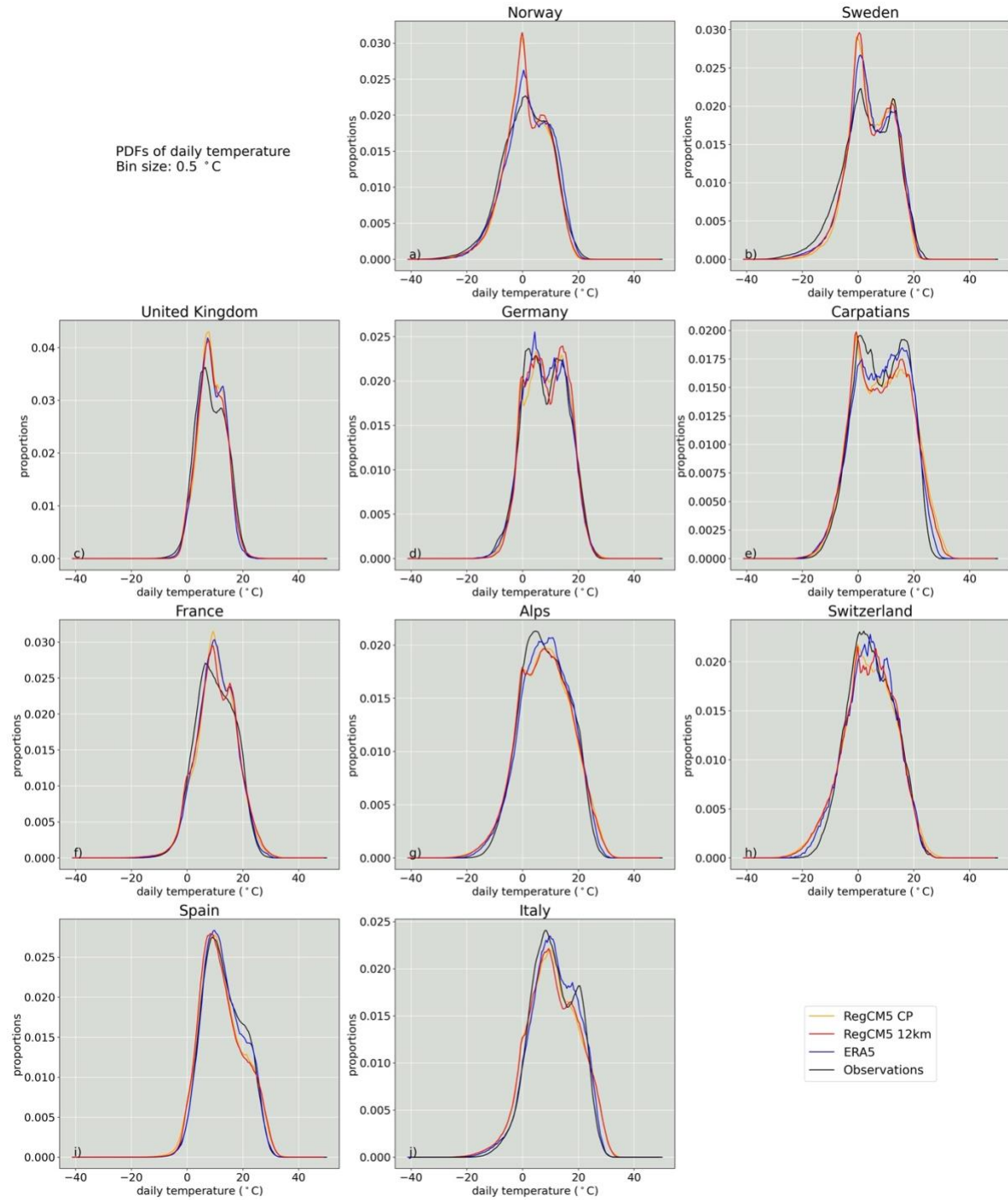


Figure S8: Probability density function distributions of the daily temperature [°C] for the 10 regions investigated in the European domain. Each panel shows the distribution estimated from combining all available data for the years 2000-2004 for RegCM5 CP (orange), RegCM5 12km (red), ERA5 (blue) and observations (black). Details about the observational datasets for each region can be found in table 2.

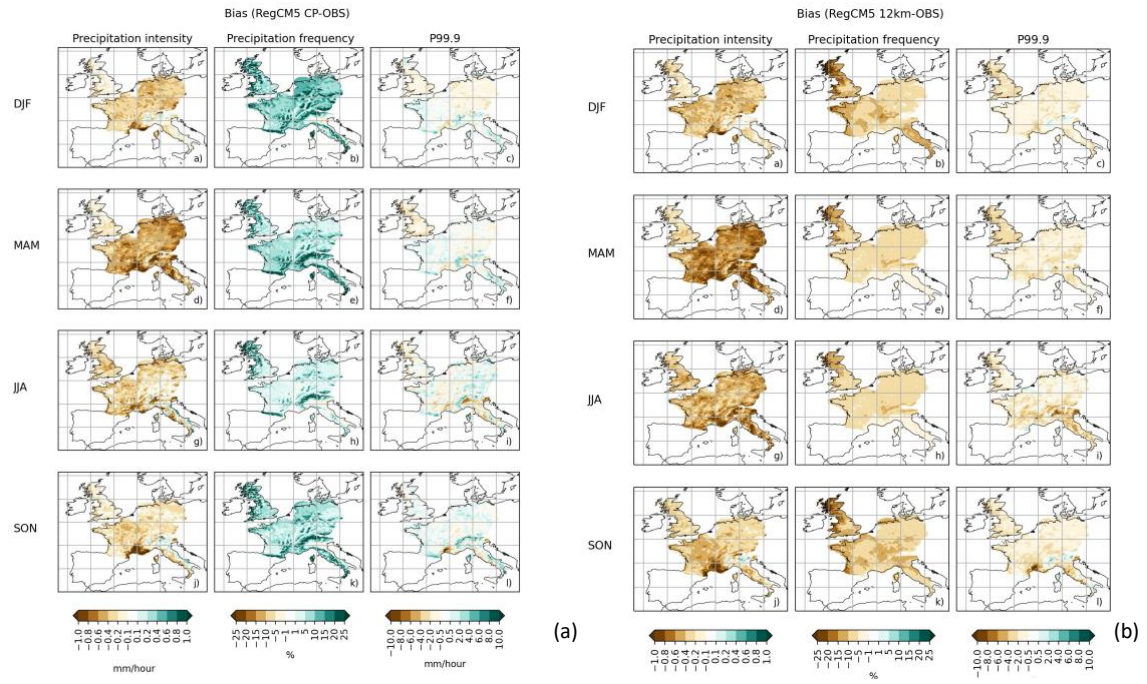


Figure S9: Precipitation intensity, wet frequency and P99.9 seasonal bias for hourly REGCM5 CP (panel a) and REGCM5 12km (panel b) versus high resolution observations. The seasonal biases are the same as in Figure 10, but using 0.1 mm/hr as threshold for the minimum precipitation in the REGCM5 simulations.

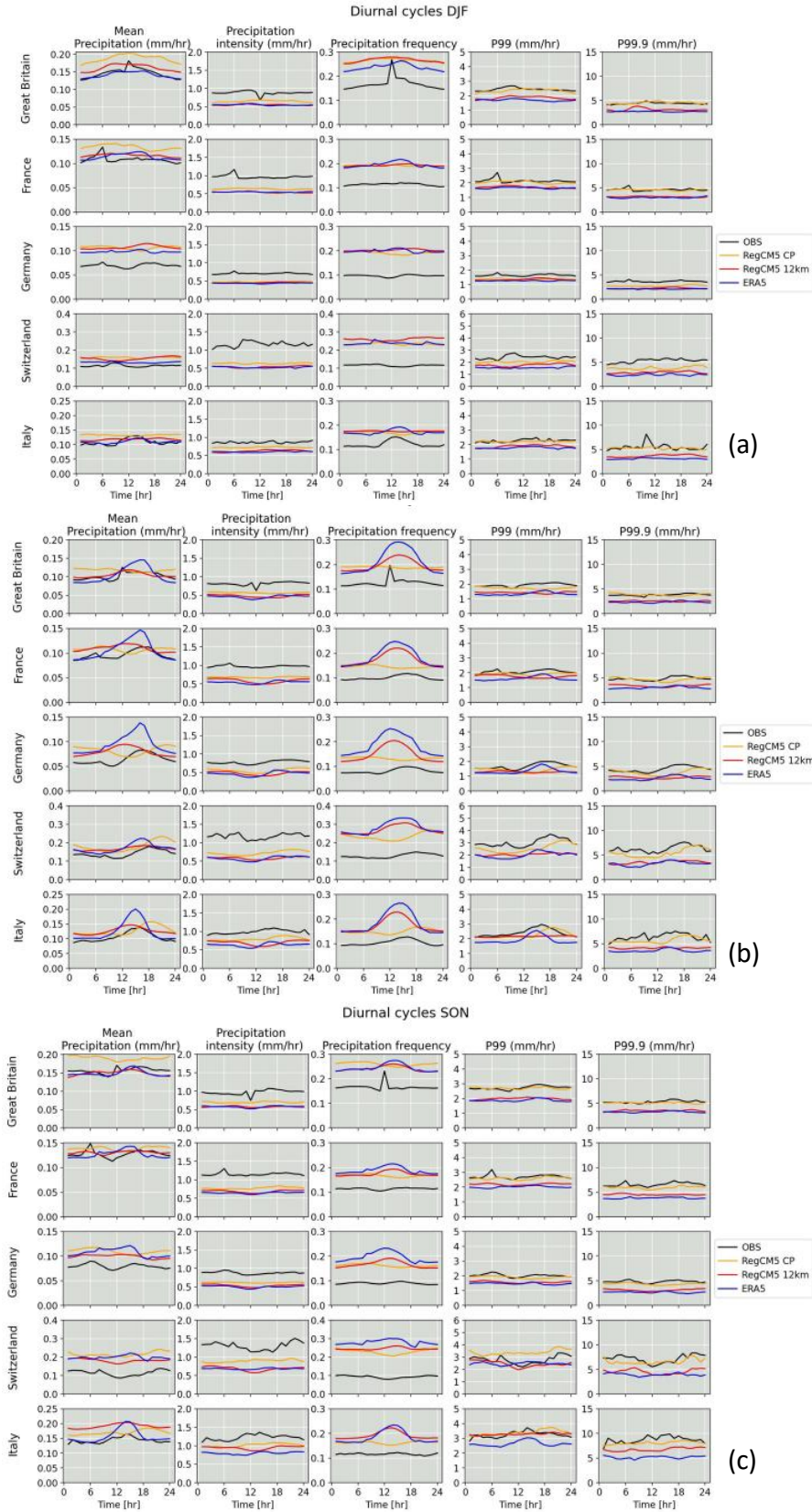


Figure S10: Diurnal cycles for mean precipitation (first column), precipitation intensity (second column), precipitation frequency (third column), p99 (fourth column) and p99.9 (fifth column) in DJF (panel a), MAM (panel b) and SON (panel c). In each panel, the results are shown for the following 5 regions in Europe: Great Britain (top row), France (second row), Germany (third row), Switzerland (fourth row) and Italy (bottom row).