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Geoscientific Model Development
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Supplement of

ATTRICI v1.1 – counterfactual climate for impact attribution

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Contents

1 Plots for Giorgi regions for GSWP3-W5E5 **1**

1 Plots for Giorgi regions for GSWP3-W5E5

We here present figures for all regions as defined in Giorgi and Francisco (2000) analogous to figure 7 (Northern Europe) in the main text. We cover all variables of the GSWP3-W5E5 dataset.

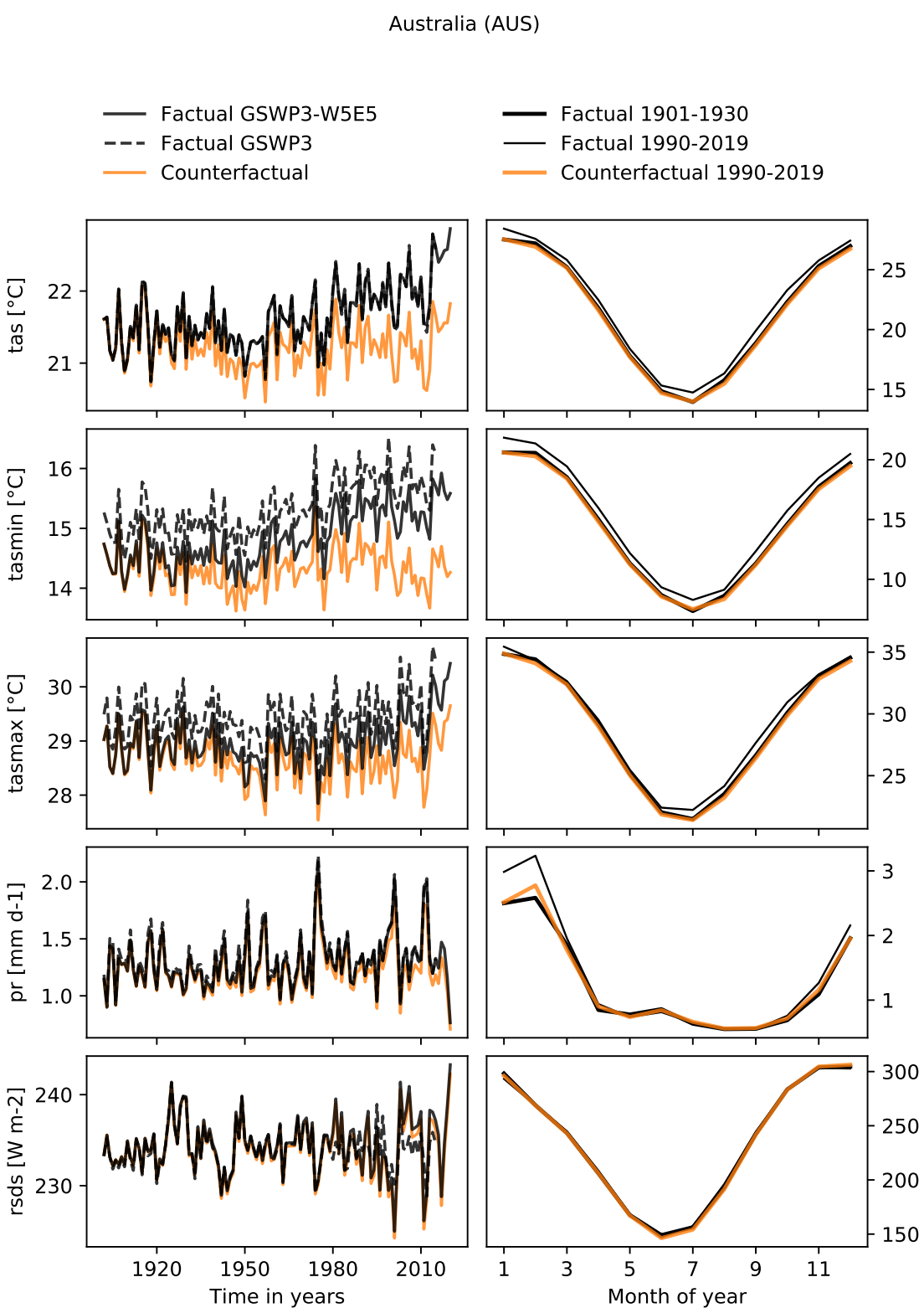

Figure S1: Regional averages for Australia. Left panels show annual regional mean time series of factual GSWP3-W5E5 data (solid black line), factual GWSP3 data (dashed black line) and counterfactual GSWP3-W5E5 data (orange line) for tas, tasmin, tasmax, pr and rsds. Right panels show multi-year regional mean climatologies of factual and counterfactual GSWP3-W5E5 data for the same variables. To obtain the counterfactual annual cycle (orange line), our method aims to map the late factual (thin black line) to the early factual (thick black line) annual cycle. See Table 1 in main text for full names of variables.

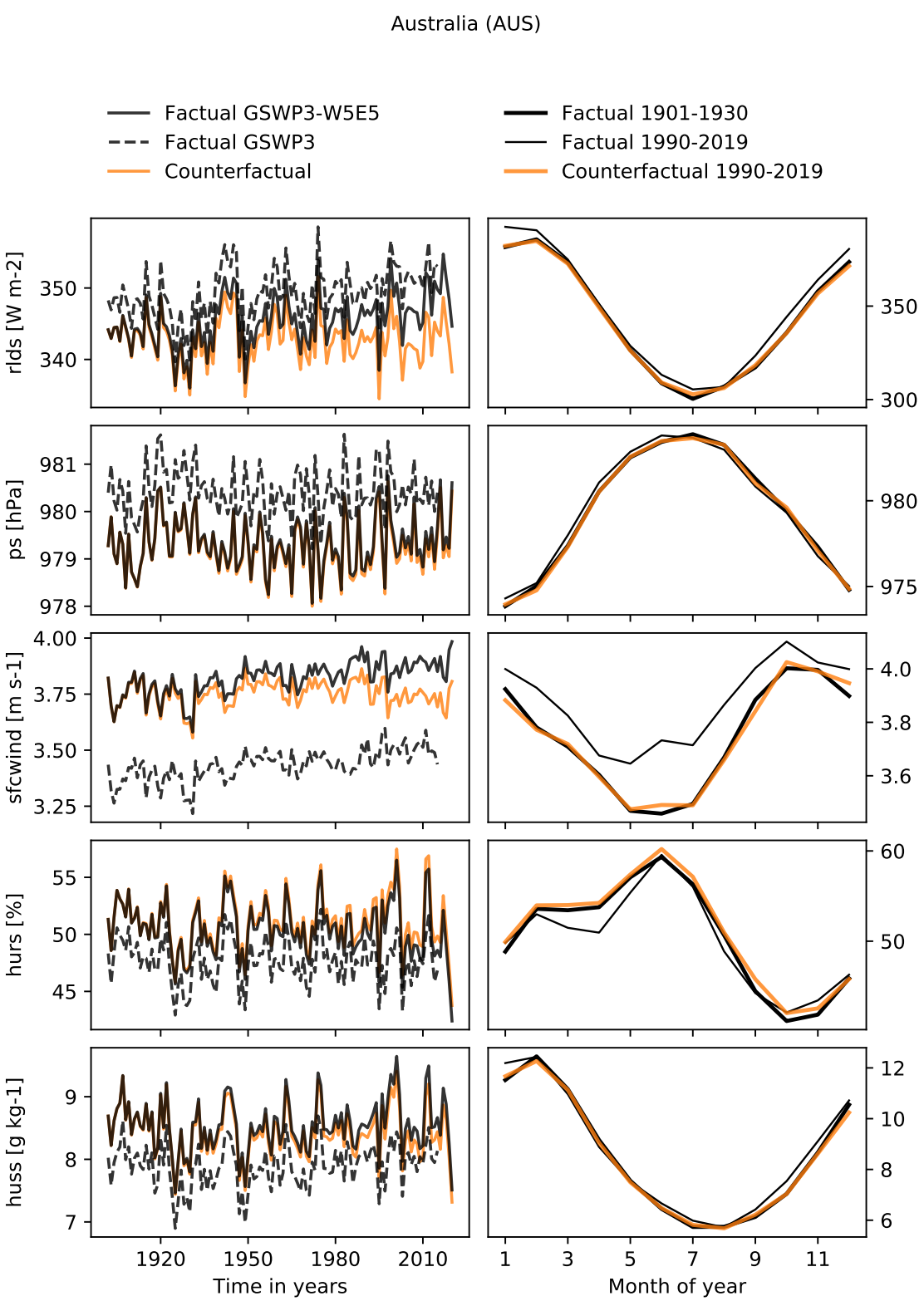

Figure S2: Regional averages for Australia. Left panels show annual regional mean time series of factual GSWP3-W5E5 data (solid black line), factual GWSP3 data (dashed black line) and counterfactual GSWP3-W5E5 data (orange line) for rlds, ps, sfcwind, hurs and huss. Right panels show multi-year regional mean climatologies of factual and counterfactual GSWP3-W5E5 data for the same variables. To obtain the counterfactual annual cycle (orange line), our method aims to map the late factual (thin black line) to the early factual (thick black line) annual cycle.

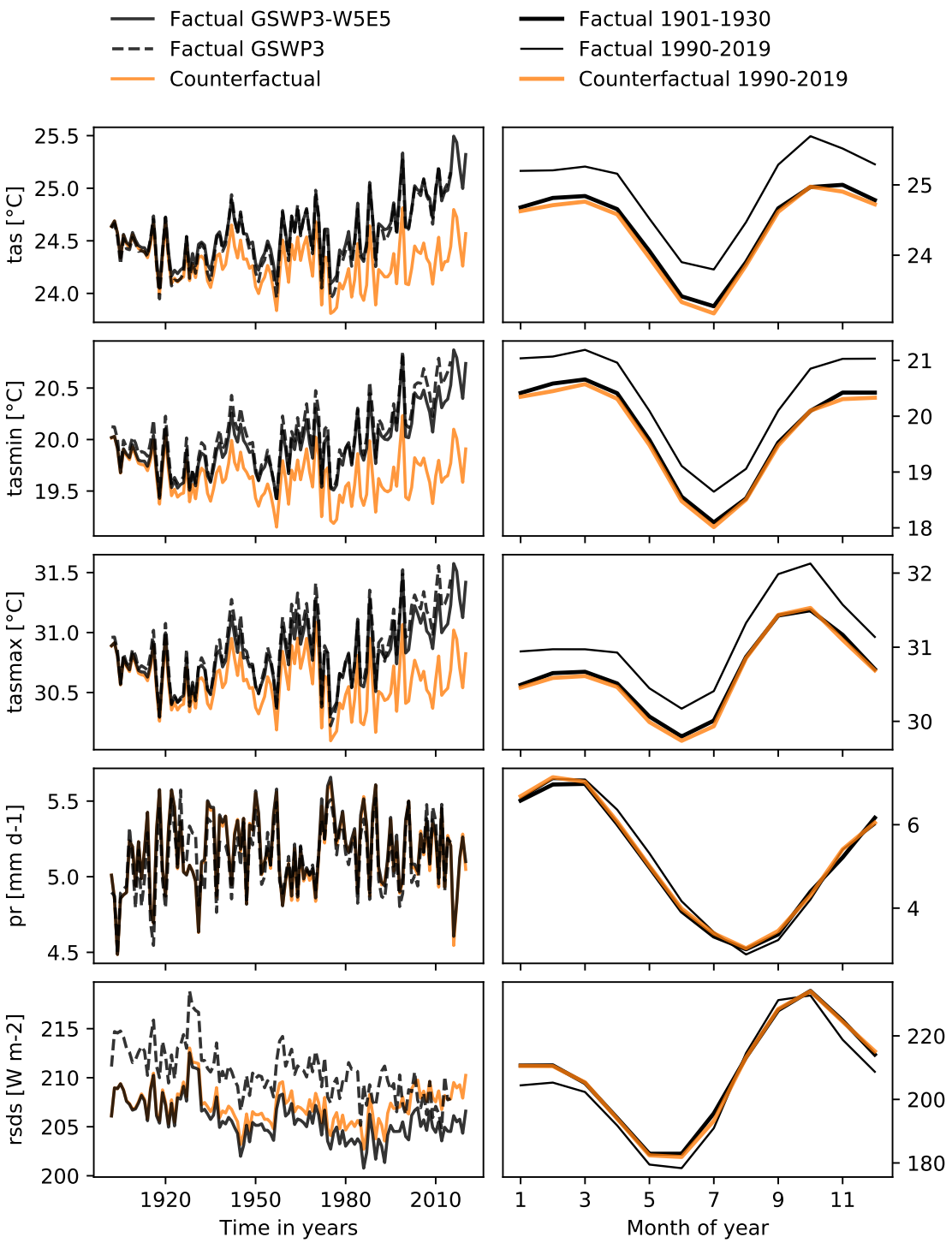

Figure S3: Regional averages for Amazon Basin. Left panels show annual regional mean time series of factual GSWP3-W5E5 data (solid black line), factual GWSP3 data (dashed black line) and counterfactual GSWP3-W5E5 data (orange line) for tas, tasmin, tasmax, pr and rsds. Right panels show multi-year regional mean climatologies of factual and counterfactual GSWP3-W5E5 data for the same variables. To obtain the counterfactual annual cycle (orange line), our method aims to map the late factual (thin black line) to the early factual (thick black line) annual cycle. See Table 1 in main text for full names of variables.

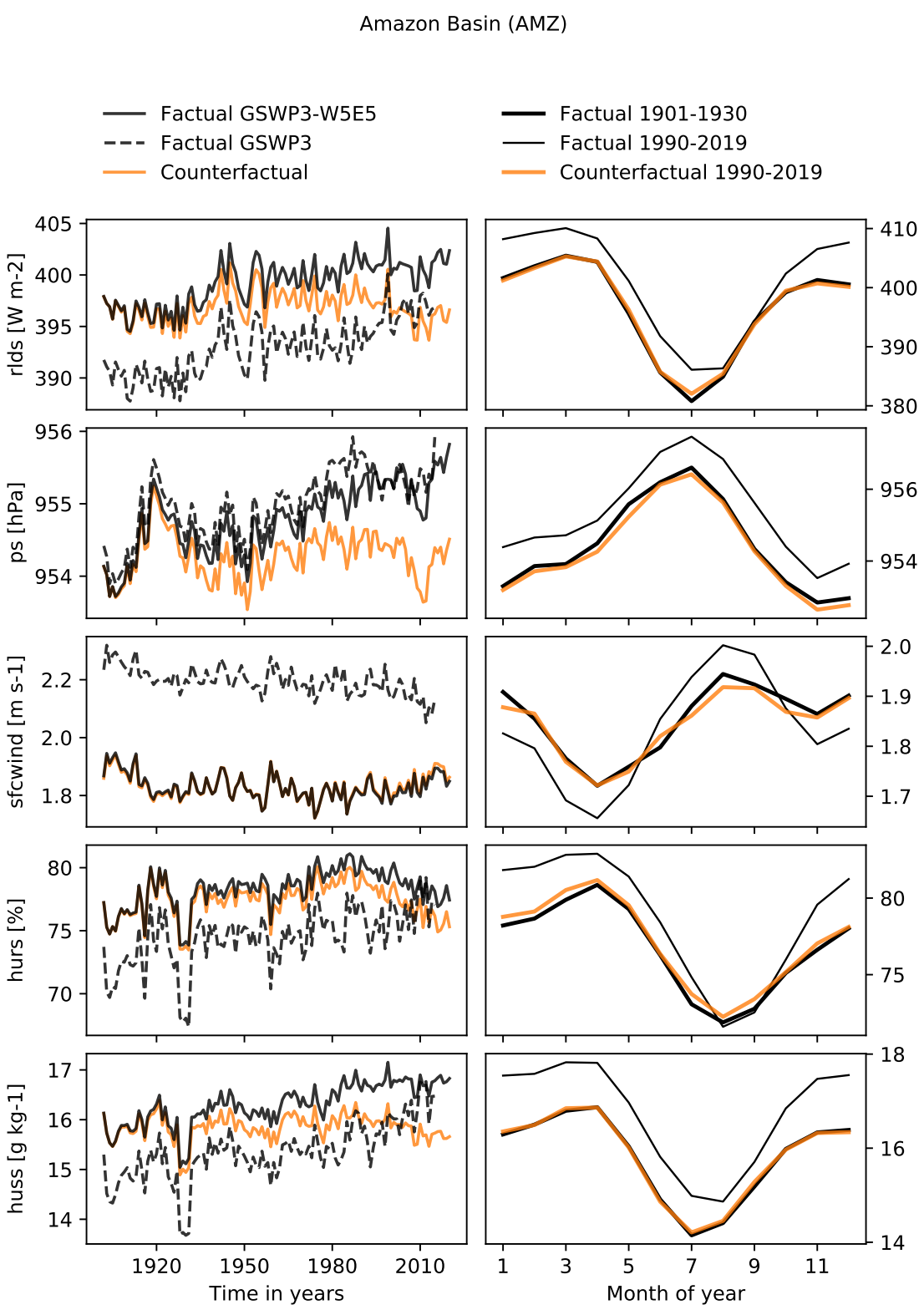

Figure S4: Regional averages for Amazon Basin. Left panels show annual regional mean time series of factual GSWP3-W5E5 data (solid black line), factual GWSP3 data (dashed black line) and counterfactual GSWP3-W5E5 data (orange line) for rlds, ps, sfcwind, hurs and huss. Right panels show multi-year regional mean climatologies of factual and counterfactual GSWP3-W5E5 data for the same variables. To obtain the counterfactual annual cycle (orange line), our method aims to map the late factual (thin black line) to the early factual (thick black line) annual cycle.

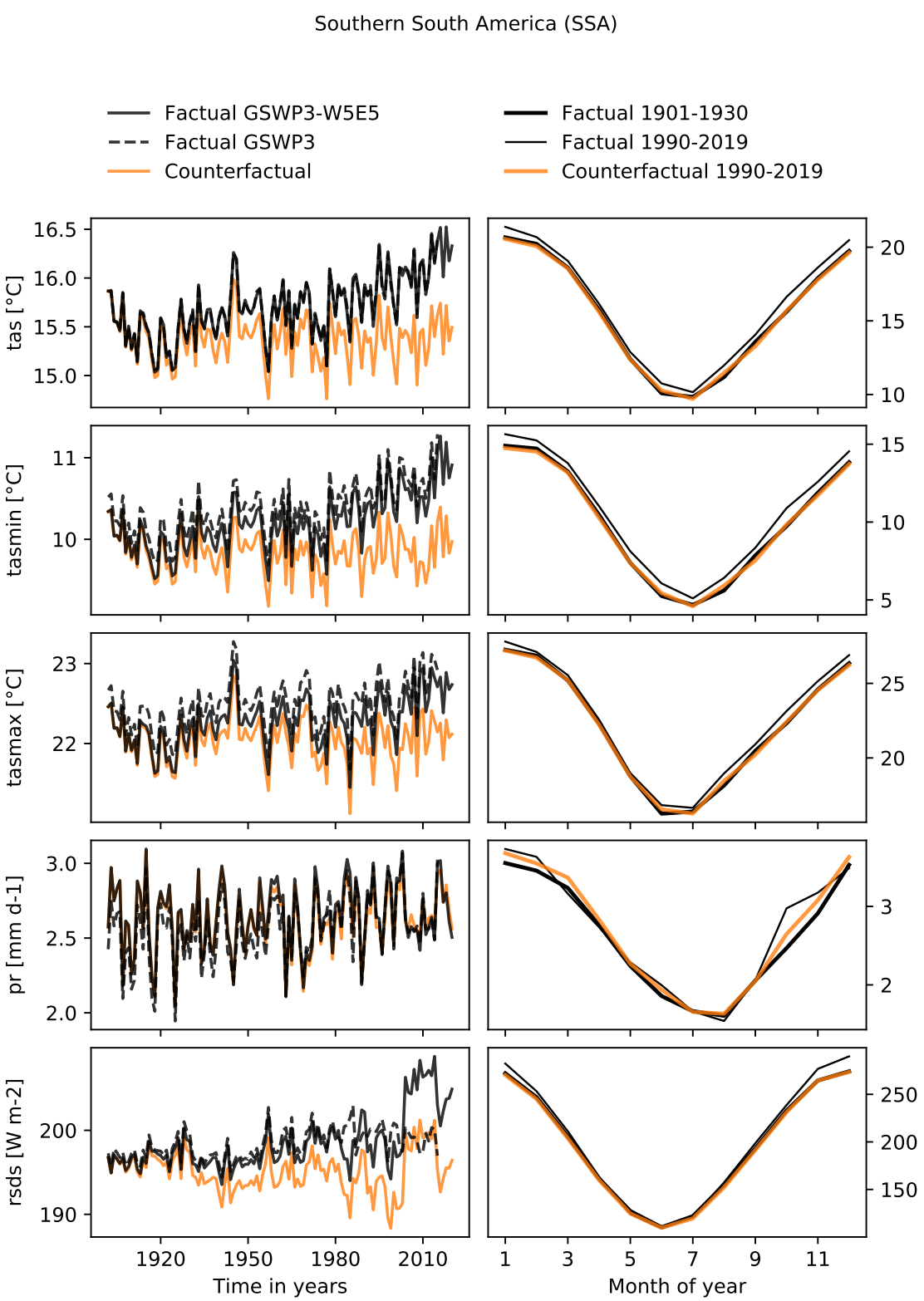

Figure S5: Regional averages for Southern South America. Left panels show annual regional mean time series of factual GSWP3-W5E5 data (solid black line), factual GWSP3 data (dashed black line) and counterfactual GSWP3-W5E5 data (orange line) for tas, tasmin, tasmax, pr and rsds. Right panels show multi-year regional mean climatologies of factual and counterfactual GSWP3-W5E5 data for the same variables. To obtain the counterfactual annual cycle (orange line), our method aims to map the late factual (thin black line) to the early factual (thick black line) annual cycle. See Table 1 in main text for full names of variables.

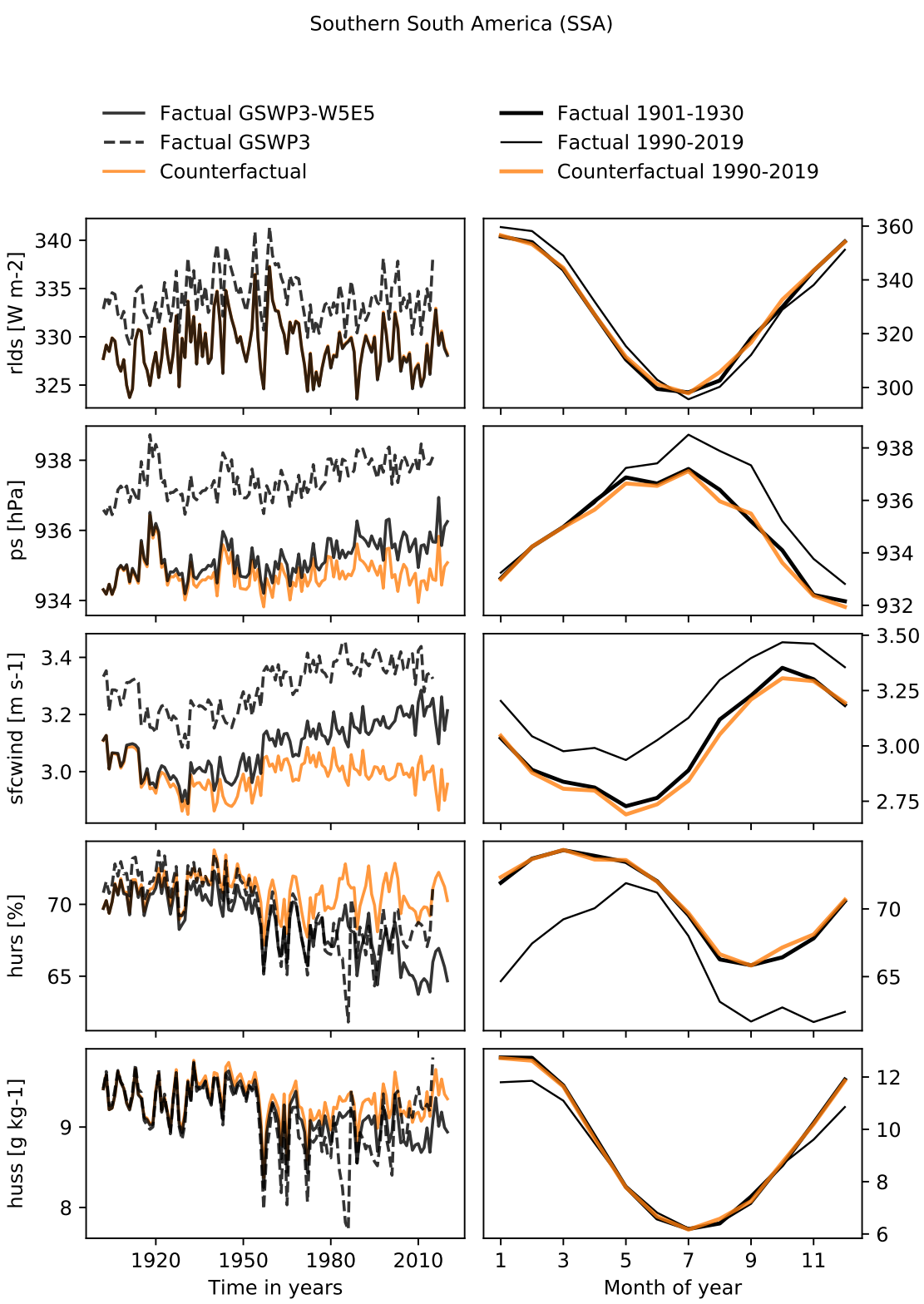

Figure S6: Regional averages for Southern South America. Left panels show annual regional mean time series of factual GSWP3-W5E5 data (solid black line), factual GWSP3 data (dashed black line) and counterfactual GSWP3-W5E5 data (orange line) for rlds, ps, sfcwind, hurs and huss. Right panels show multi-year regional mean climatologies of factual and counterfactual GSWP3-W5E5 data for the same variables. To obtain the counterfactual annual cycle (orange line), our method aims to map the late factual (thin black line) to the early factual (thick black line) annual cycle.

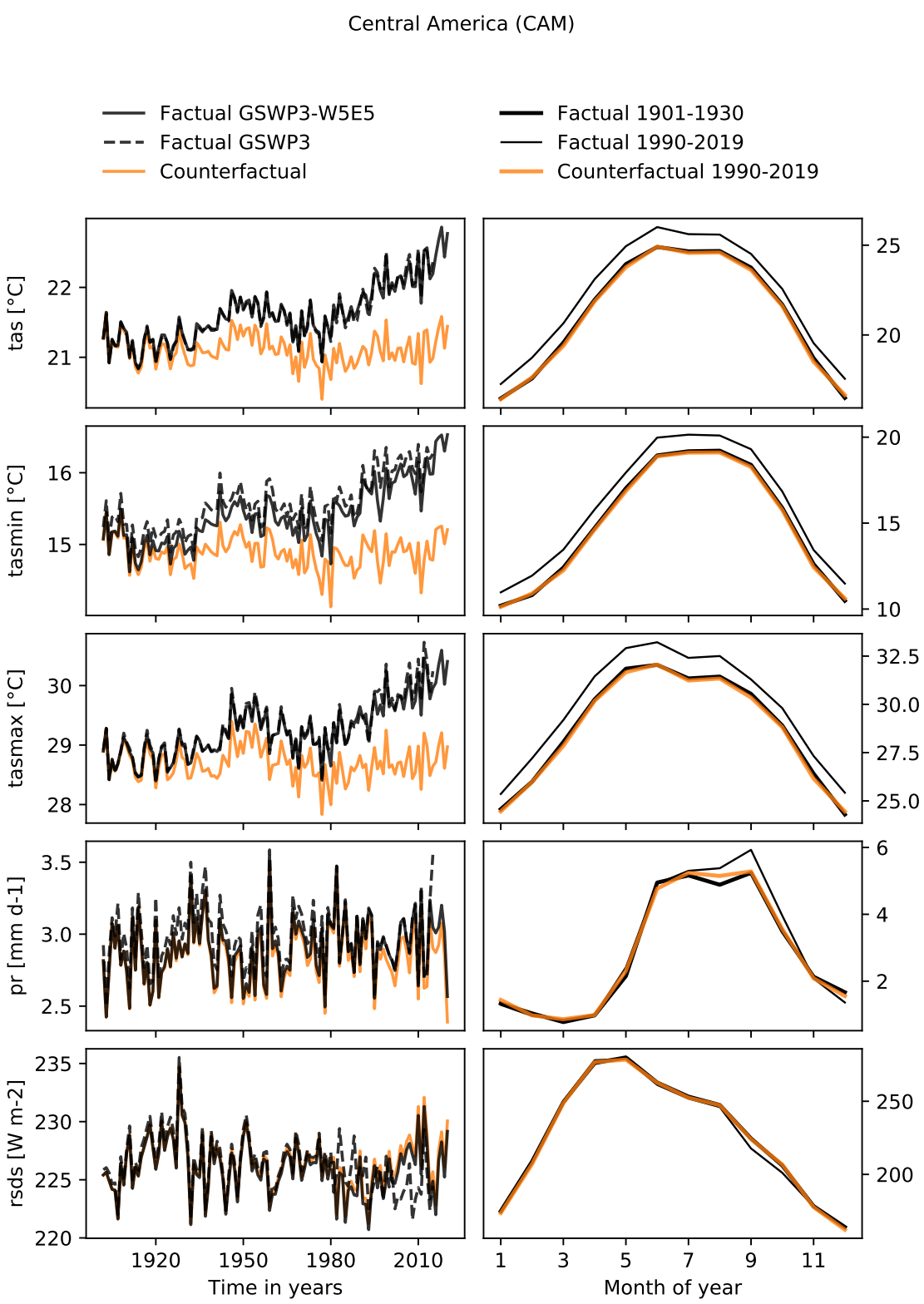

Figure S7: Regional averages for Central America. Left panels show annual regional mean time series of factual GSWP3-W5E5 data (solid black line), factual GWSP3 data (dashed black line) and counterfactual GSWP3-W5E5 data (orange line) for tas, tasmin, tasmax, pr and rsds. Right panels show multi-year regional mean climatologies of factual and counterfactual GSWP3-W5E5 data for the same variables. To obtain the counterfactual annual cycle (orange line), our method aims to map the late factual (thin black line) to the early factual (thick black line) annual cycle. See Table 1 in main text for full names of variables.

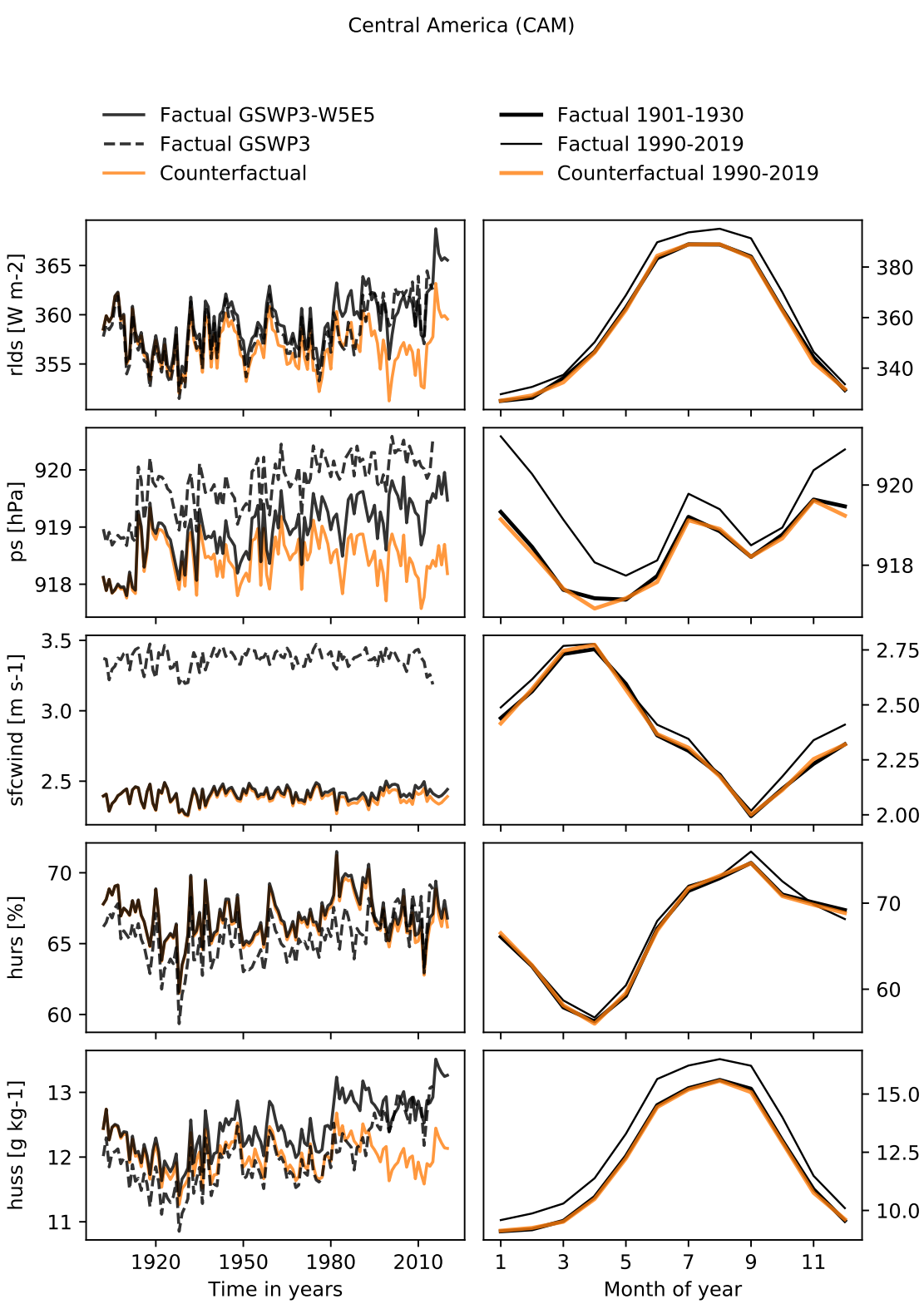

Figure S8: Regional averages for Central America. Left panels show annual regional mean time series of factual GSWP3-W5E5 data (solid black line), factual GWSP3 data (dashed black line) and counterfactual GSWP3-W5E5 data (orange line) for rlds, ps, sfcwind, hurs and huss. Right panels show multi-year regional mean climatologies of factual and counterfactual GSWP3-W5E5 data for the same variables. To obtain the counterfactual annual cycle (orange line), our method aims to map the late factual (thin black line) to the early factual (thick black line) annual cycle.

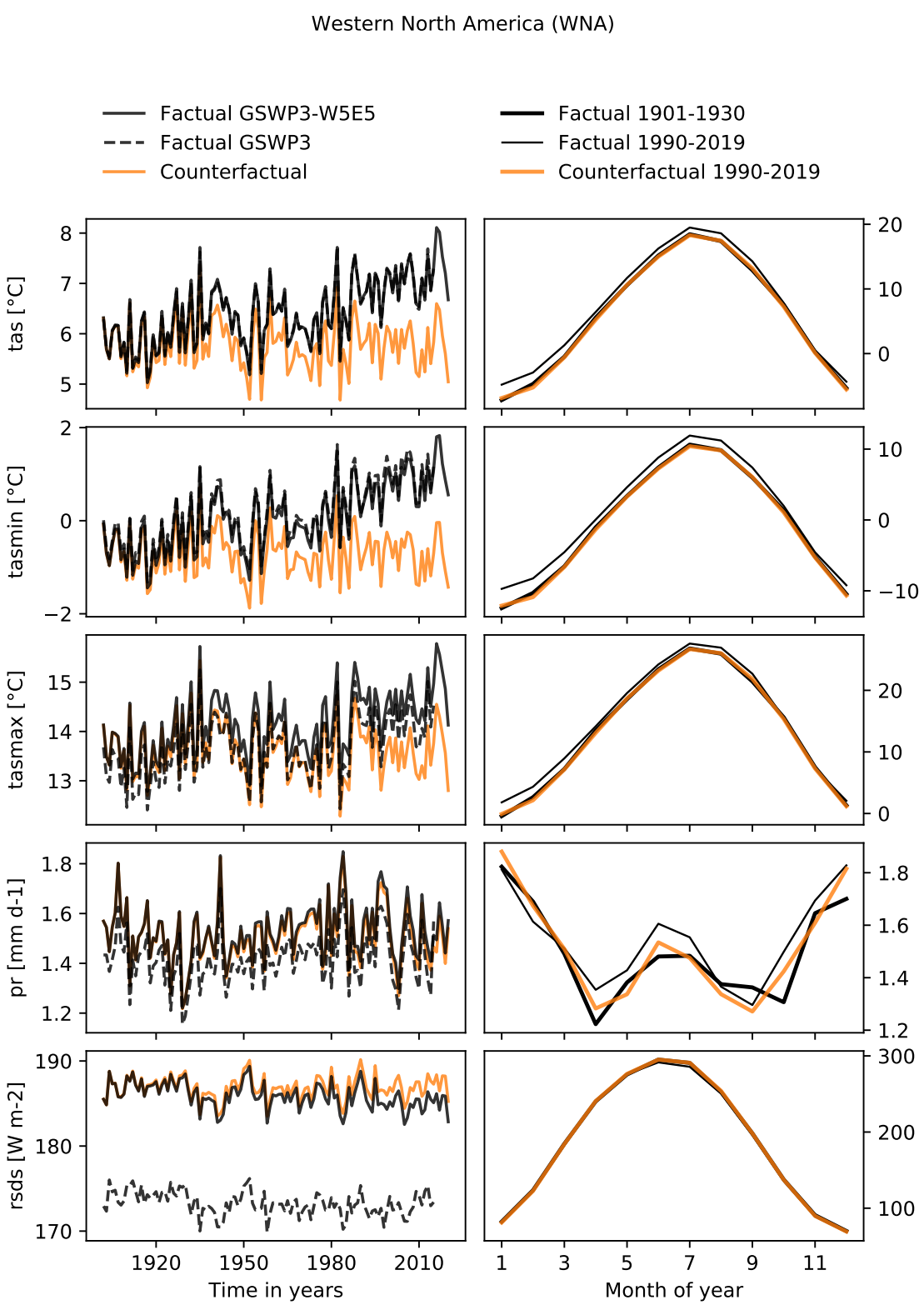

Figure S9: Regional averages for Western North America. Left panels show annual regional mean time series of factual GSWP3-W5E5 data (solid black line), factual GWSP3 data (dashed black line) and counterfactual GSWP3-W5E5 data (orange line) for tas, tasmin, tasmax, pr and rsds. Right panels show multi-year regional mean climatologies of factual and counterfactual GSWP3-W5E5 data for the same variables. To obtain the counterfactual annual cycle (orange line), our method aims to map the late factual (thin black line) to the early factual (thick black line) annual cycle. See Table 1 in main text for full names of variables.

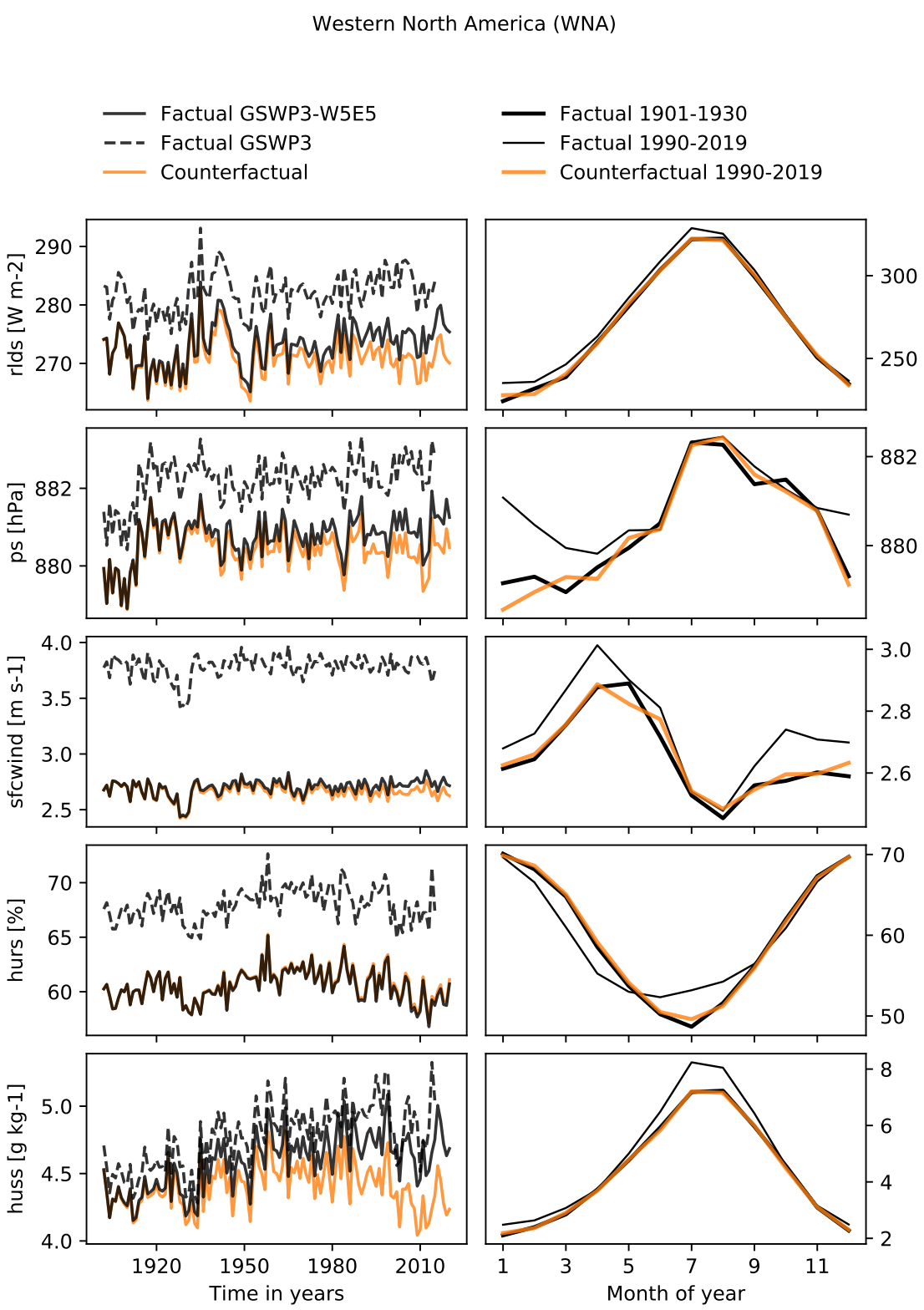

Figure S10: Regional averages for Western North America. Left panels show annual regional mean time series of factual GSWP3-W5E5 data (solid black line), factual GWSP3 data (dashed black line) and counterfactual GSWP3-W5E5 data (orange line) for rlds, ps, sfcwind, hurs and huss. Right panels show multi-year regional mean climatologies of factual and counterfactual GSWP3-W5E5 data for the same variables. To obtain the counterfactual annual cycle (orange line), our method aims to map the late factual (thin black line) to the early factual (thick black line) annual cycle.

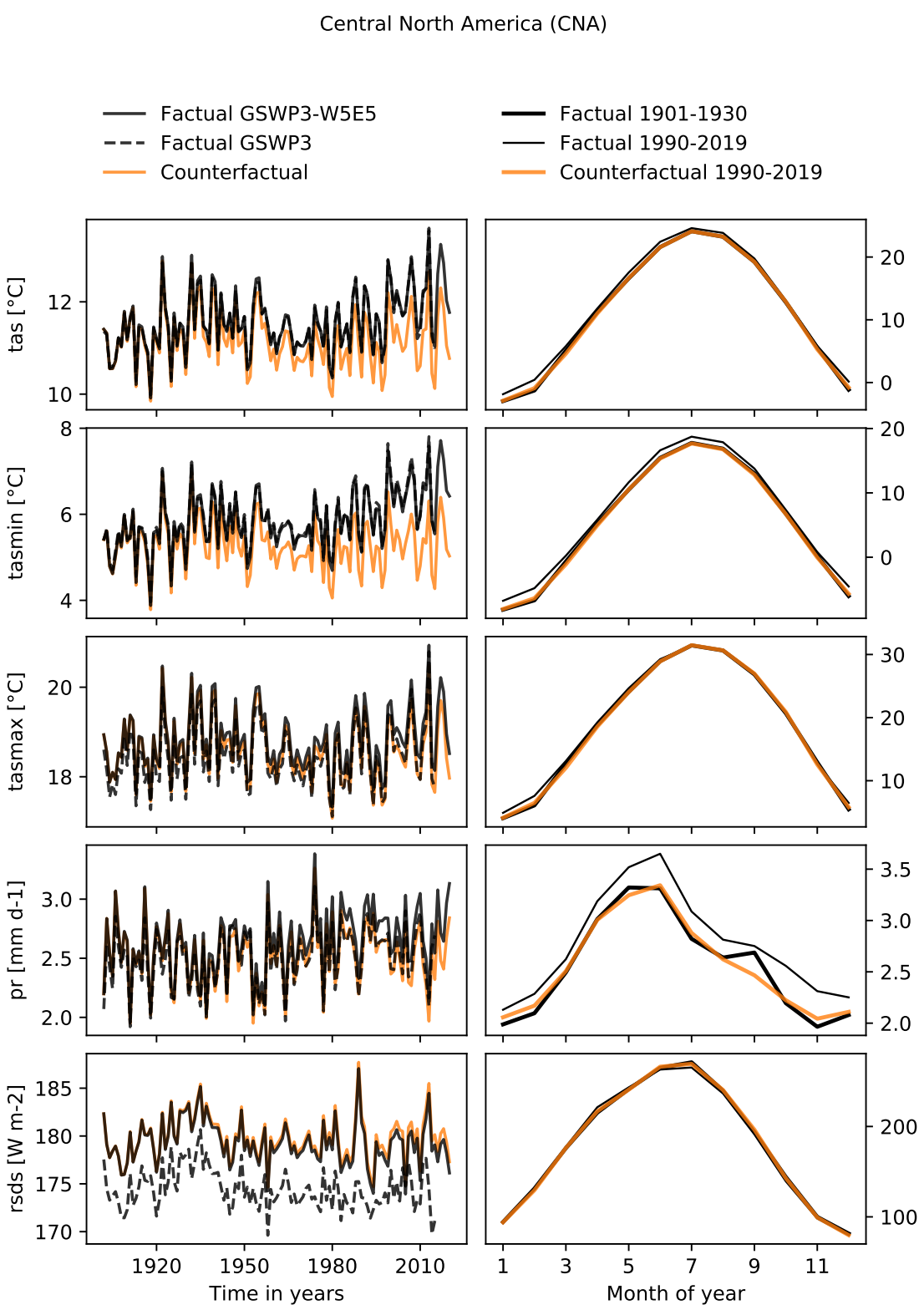

Figure S11: Regional averages for Central North America. Left panels show annual regional mean time series of factual GSWP3-W5E5 data (solid black line), factual GWSP3 data (dashed black line) and counterfactual GSWP3-W5E5 data (orange line) for tas, tasmin, tasmax, pr and rsds. Right panels show multi-year regional mean climatologies of factual and counterfactual GSWP3-W5E5 data for the same variables. To obtain the counterfactual annual cycle (orange line), our method aims to map the late factual (thin black line) to the early factual (thick black line) annual cycle. See Table 1 in main text for full names of variables.

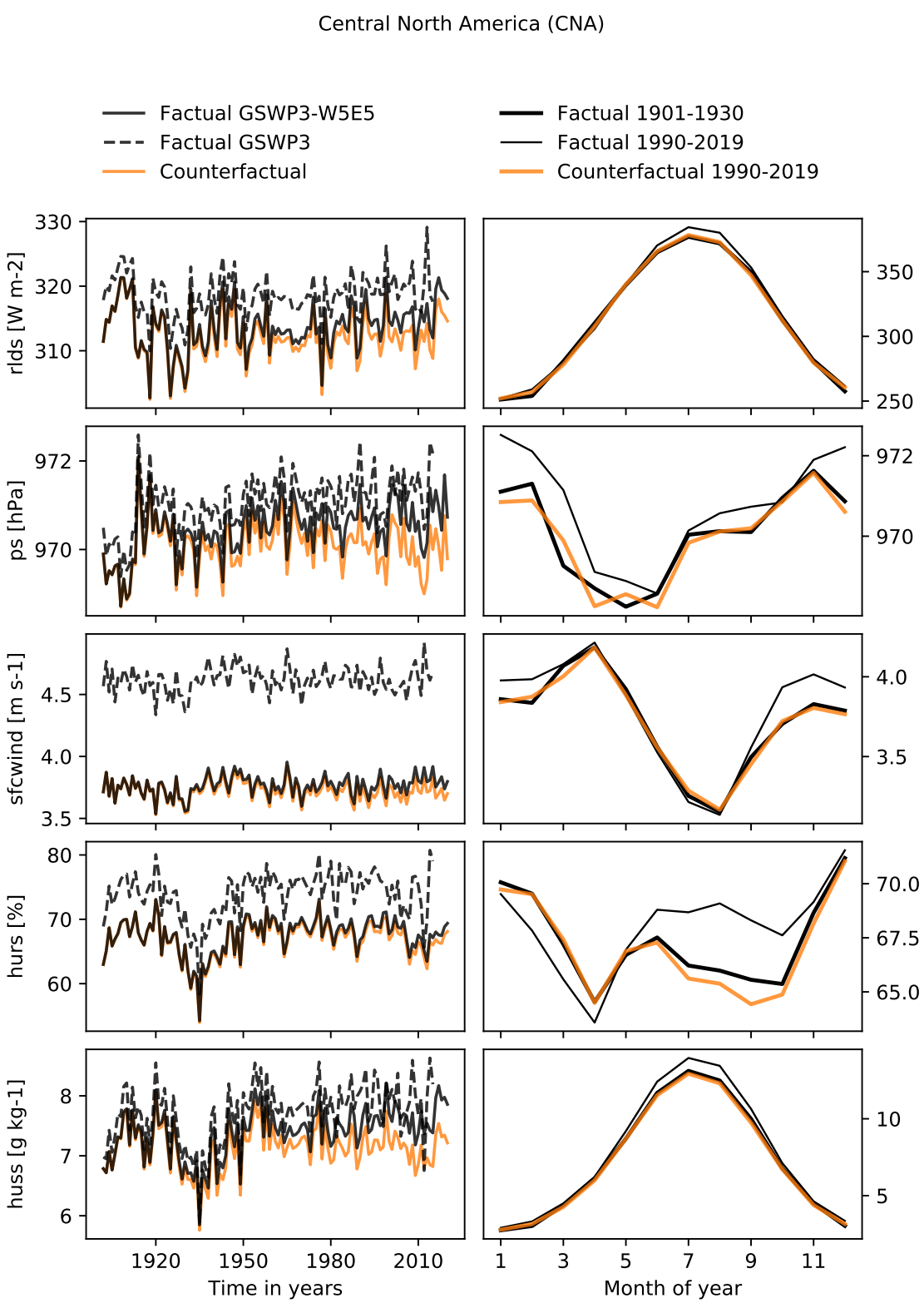

Figure S12: Regional averages for Central North America. Left panels show annual regional mean time series of factual GSWP3-W5E5 data (solid black line), factual GWSP3 data (dashed black line) and counterfactual GSWP3-W5E5 data (orange line) for rlds, ps, sfcwind, hurs and huss. Right panels show multi-year regional mean climatologies of factual and counterfactual GSWP3-W5E5 data for the same variables. To obtain the counterfactual annual cycle (orange line), our method aims to map the late factual (thin black line) to the early factual (thick black line) annual cycle.

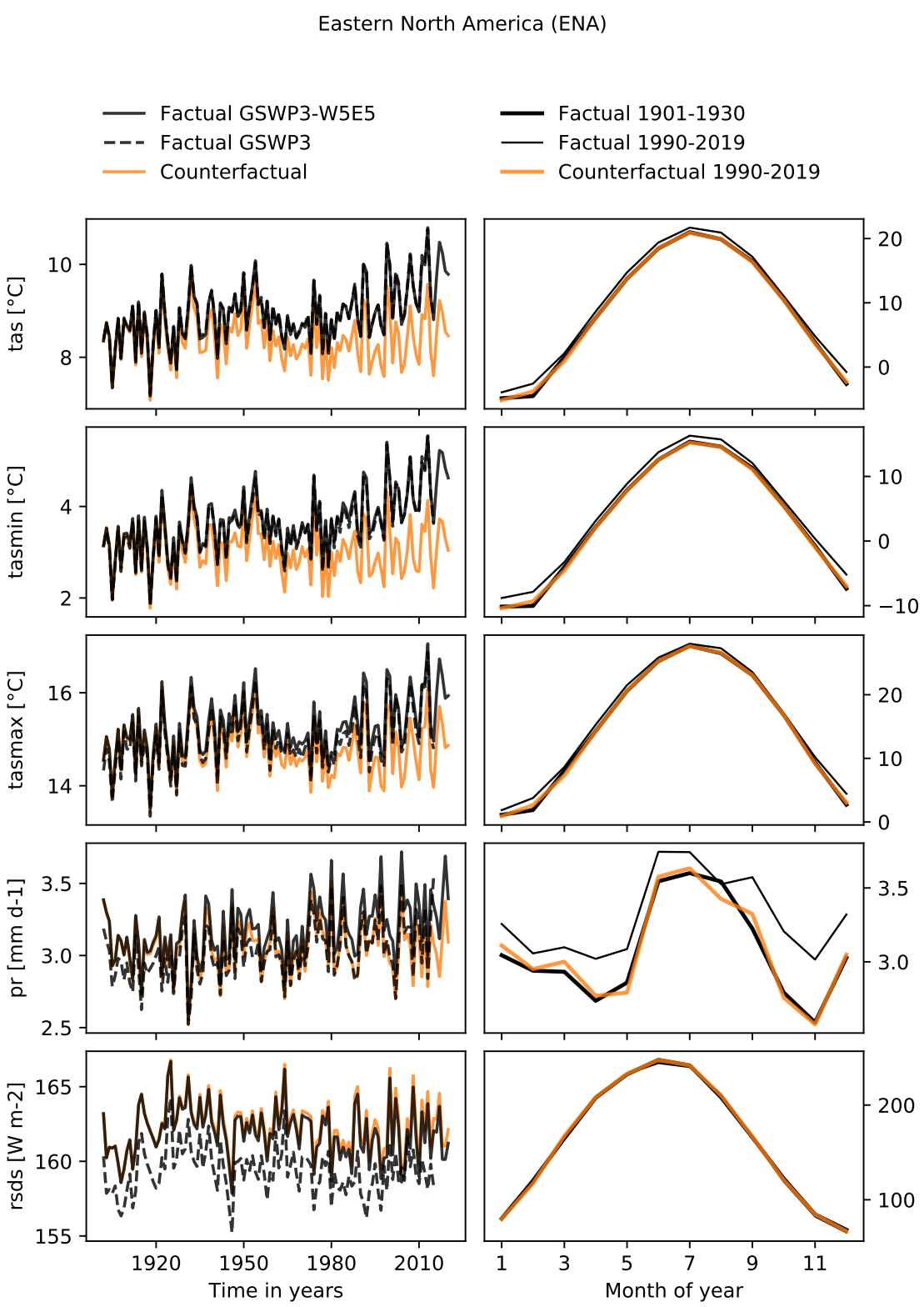

Figure S13: Regional averages for Eastern North America. Left panels show annual regional mean time series of factual GSWP3-W5E5 data (solid black line), factual GWSP3 data (dashed black line) and counterfactual GSWP3-W5E5 data (orange line) for tas, tasmin, tasmax, pr and rsds. Right panels show multi-year regional mean climatologies of factual and counterfactual GSWP3-W5E5 data for the same variables. To obtain the counterfactual annual cycle (orange line), our method aims to map the late factual (thin black line) to the early factual (thick black line) annual cycle. See Table 1 in main text for full names of variables.

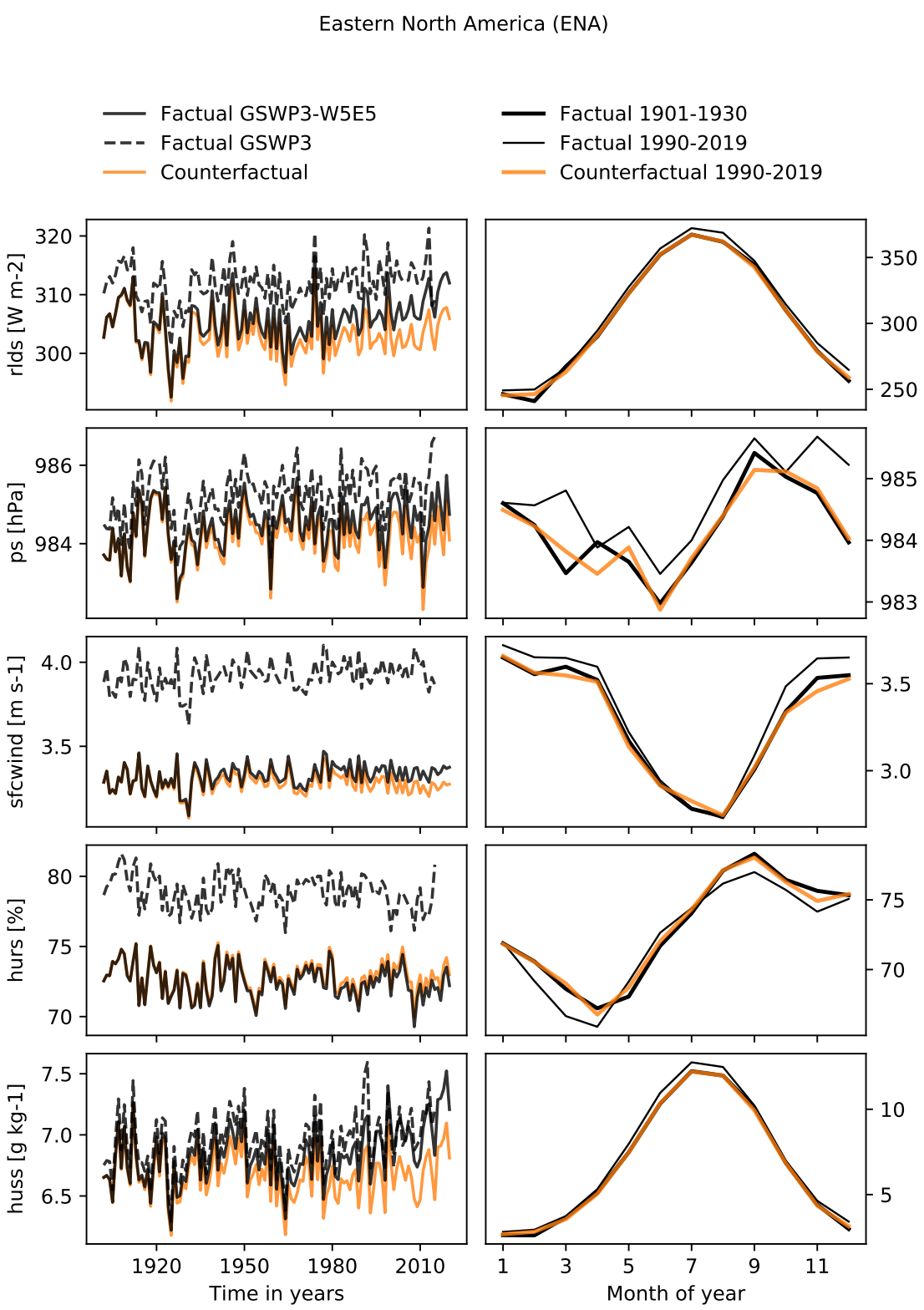

Figure S14: Regional averages for Eastern North America. Left panels show annual regional mean time series of factual GSWP3-W5E5 data (solid black line), factual GWSP3 data (dashed black line) and counterfactual GSWP3-W5E5 data (orange line) for rlds, ps, sfcwind, hurs and huss. Right panels show multi-year regional mean climatologies of factual and counterfactual GSWP3-W5E5 data for the same variables. To obtain the counterfactual annual cycle (orange line), our method aims to map the late factual (thin black line) to the early factual (thick black line) annual cycle.

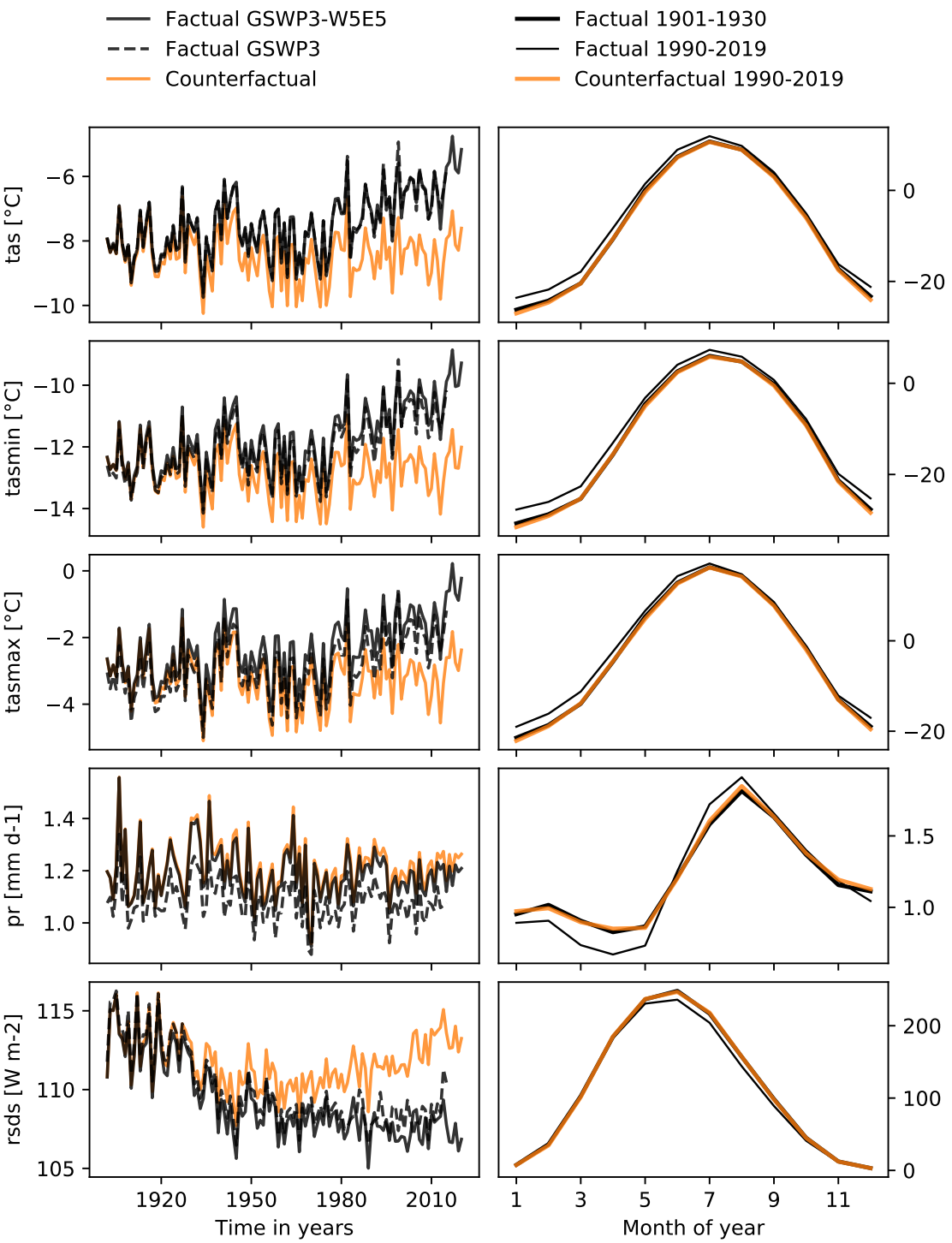

Figure S15: Regional averages for Alaska. Left panels show annual regional mean time series of factual GSWP3-W5E5 data (solid black line), factual GWSP3 data (dashed black line) and counterfactual GSWP3-W5E5 data (orange line) for tas, tasmin, tasmax, pr and rsds. Right panels show multi-year regional mean climatologies of factual and counterfactual GSWP3-W5E5 data for the same variables. To obtain the counterfactual annual cycle (orange line), our method aims to map the late factual (thin black line) to the early factual (thick black line) annual cycle. See Table 1 in main text for full names of variables.

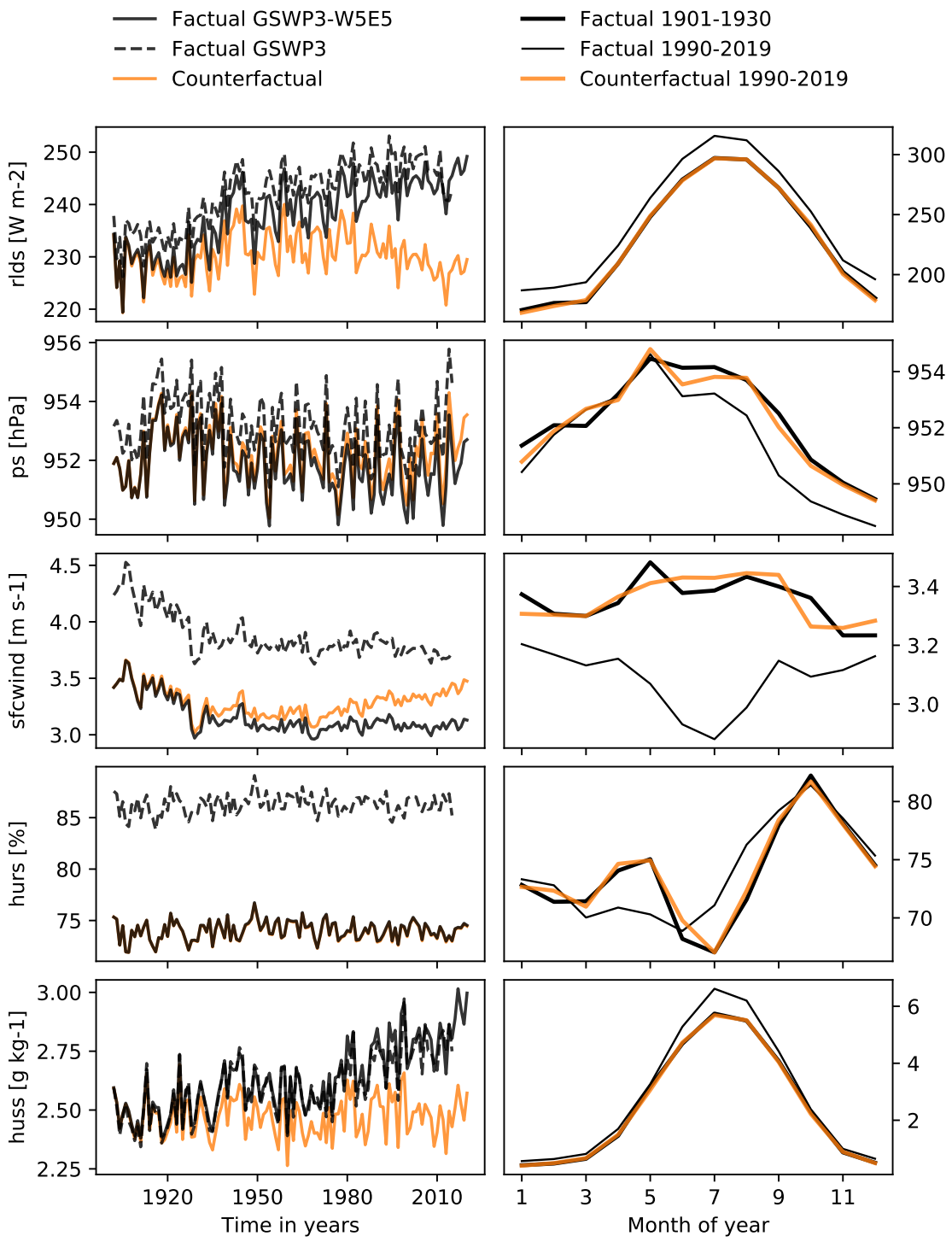

Figure S16: Regional averages for Alaska. Left panels show annual regional mean time series of factual GSWP3-W5E5 data (solid black line), factual GWSP3 data (dashed black line) and counterfactual GSWP3-W5E5 data (orange line) for rlds, ps, sfcwind, hurs and huss. Right panels show multi-year regional mean climatologies of factual and counterfactual GSWP3-W5E5 data for the same variables. To obtain the counterfactual annual cycle (orange line), our method aims to map the late factual (thin black line) to the early factual (thick black line) annual cycle.

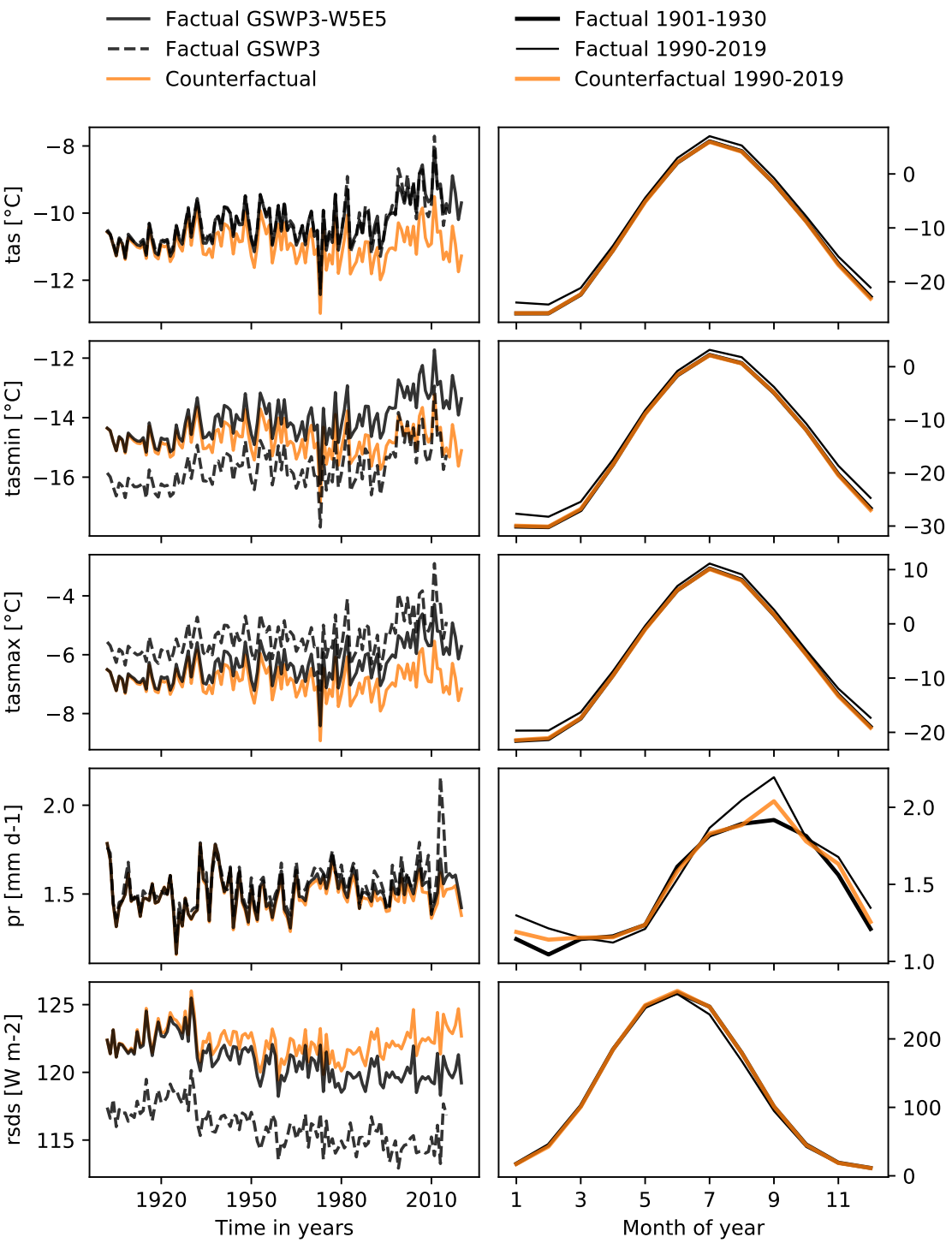

Figure S17: Regional averages for Greenland. Left panels show annual regional mean time series of factual GSWP3-W5E5 data (solid black line), factual GWSP3 data (dashed black line) and counterfactual GSWP3-W5E5 data (orange line) for tas, tasmin, tasmax, pr and rsds. Right panels show multi-year regional mean climatologies of factual and counterfactual GSWP3-W5E5 data for the same variables. To obtain the counterfactual annual cycle (orange line), our method aims to map the late factual (thin black line) to the early factual (thick black line) annual cycle. See Table 1 in main text for full names of variables.

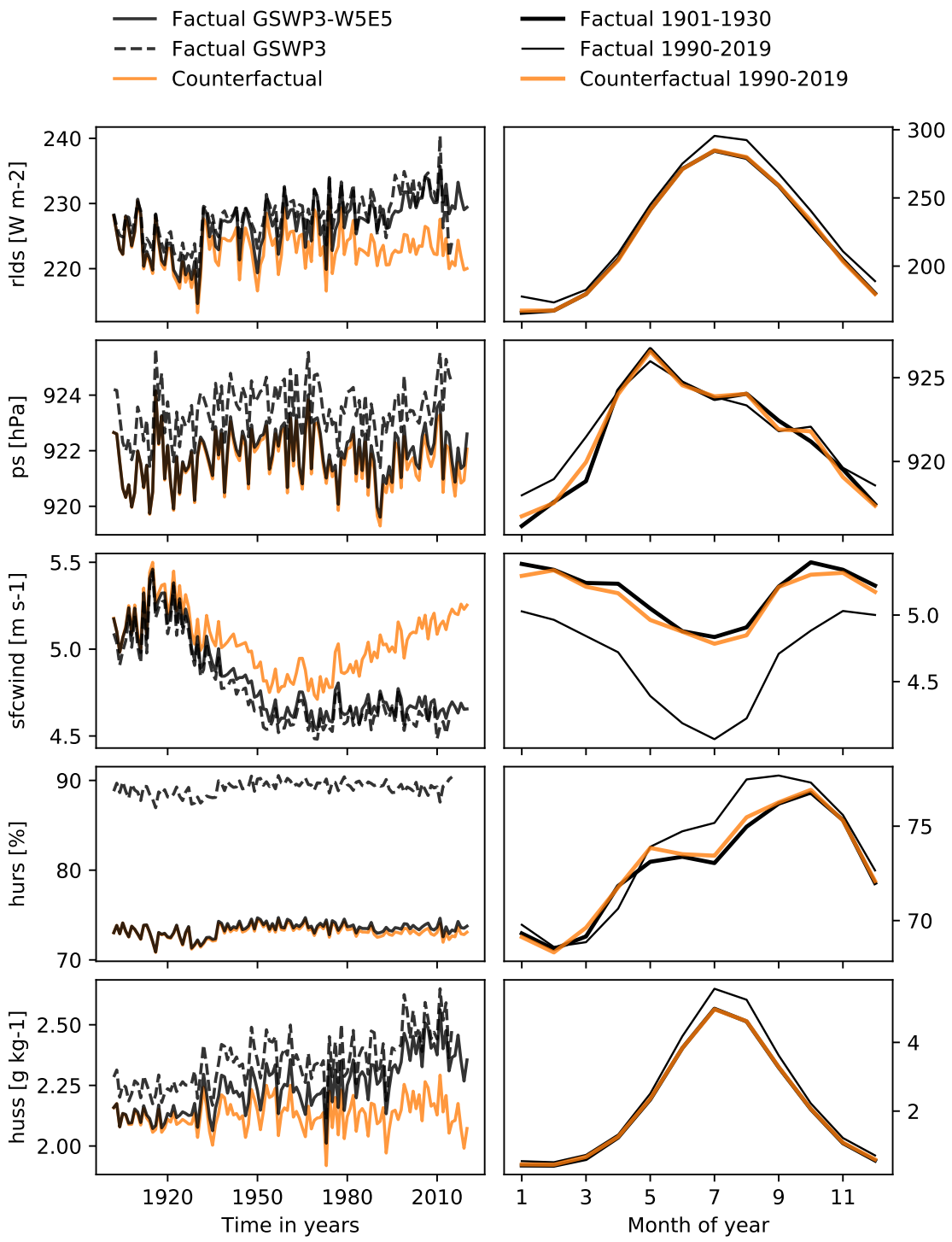

Figure S18: Regional averages for Greenland. Left panels show annual regional mean time series of factual GSWP3-W5E5 data (solid black line), factual GWSP3 data (dashed black line) and counterfactual GSWP3-W5E5 data (orange line) for rlds, ps, sfcwind, hurs and huss. Right panels show multi-year regional mean climatologies of factual and counterfactual GSWP3-W5E5 data for the same variables. To obtain the counterfactual annual cycle (orange line), our method aims to map the late factual (thin black line) to the early factual (thick black line) annual cycle.

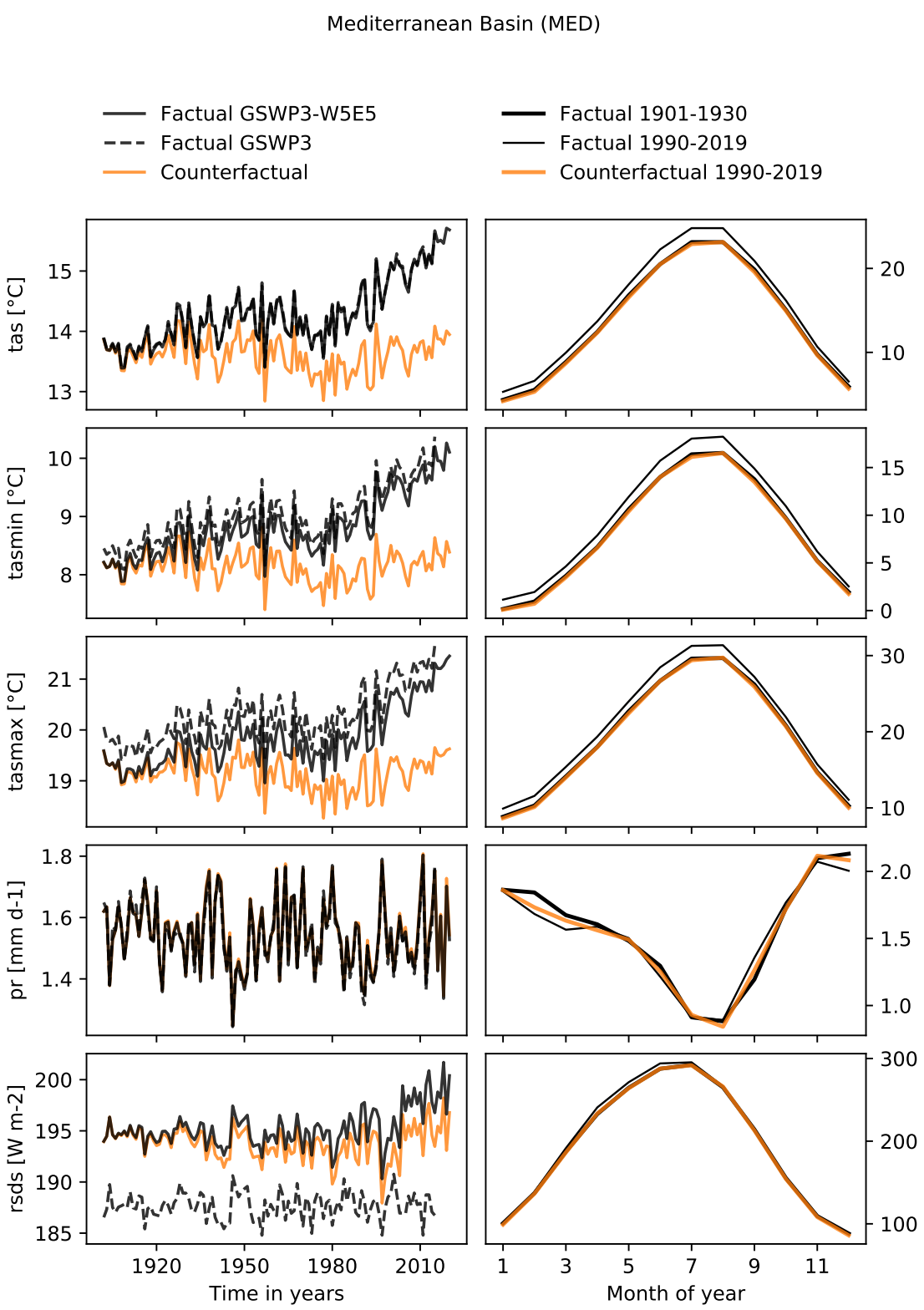

Figure S19: Regional averages for Mediterranean Basin. Left panels show annual regional mean time series of factual GSWP3-W5E5 data (solid black line), factual GWSP3 data (dashed black line) and counterfactual GSWP3-W5E5 data (orange line) for tas, tasmin, tasmax, pr and rsds. Right panels show multi-year regional mean climatologies of factual and counterfactual GSWP3-W5E5 data for the same variables. To obtain the counterfactual annual cycle (orange line), our method aims to map the late factual (thin black line) to the early factual (thick black line) annual cycle. See Table 1 in main text for full names of variables.

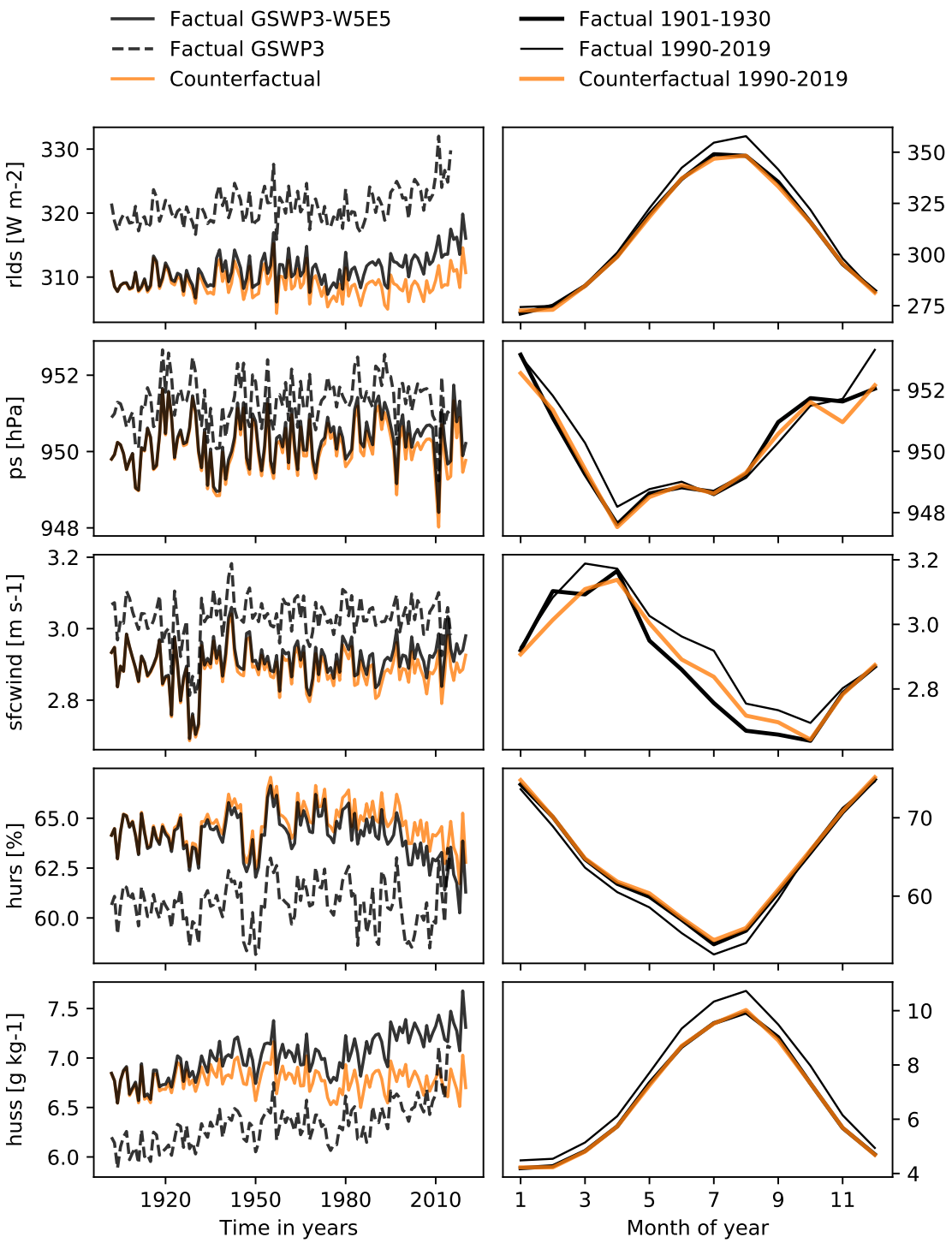

Figure S20: Regional averages for Mediterranean Basin. Left panels show annual regional mean time series of factual GSWP3-W5E5 data (solid black line), factual GWSP3 data (dashed black line) and counterfactual GSWP3-W5E5 data (orange line) for rlds, ps, sfcwind, hurs and huss. Right panels show multi-year regional mean climatologies of factual and counterfactual GSWP3-W5E5 data for the same variables. To obtain the counterfactual annual cycle (orange line), our method aims to map the late factual (thin black line) to the early factual (thick black line) annual cycle.

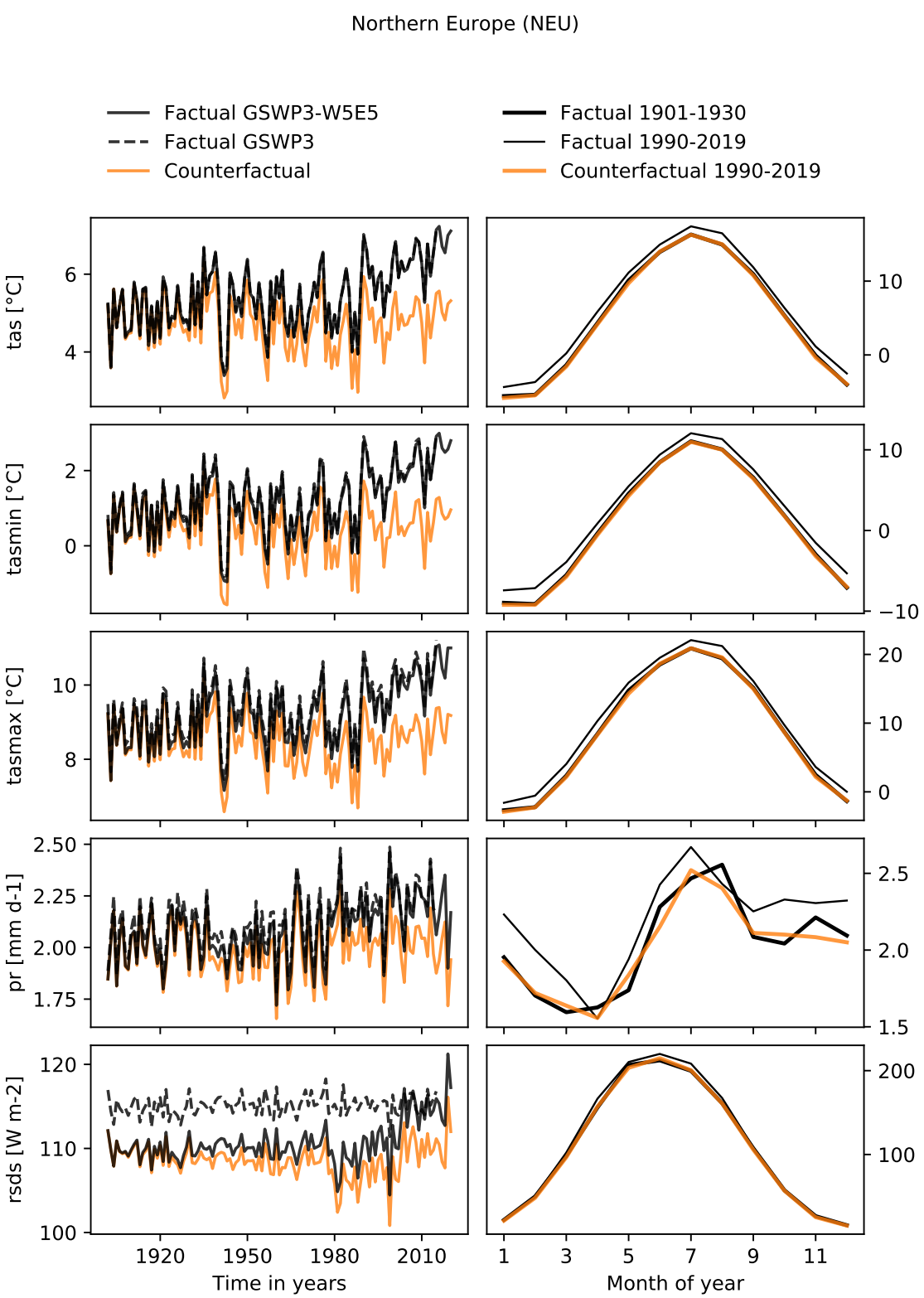

Figure S21: Regional averages for Northern Europe. Left panels show annual regional mean time series of factual GSWP3-W5E5 data (solid black line), factual GWSP3 data (dashed black line) and counterfactual GSWP3-W5E5 data (orange line) for tas, tasmin, tasmax, pr and rsds. Right panels show multi-year regional mean climatologies of factual and counterfactual GSWP3-W5E5 data for the same variables. To obtain the counterfactual annual cycle (orange line), our method aims to map the late factual (thin black line) to the early factual (thick black line) annual cycle. See Table 1 in main text for full names of variables.

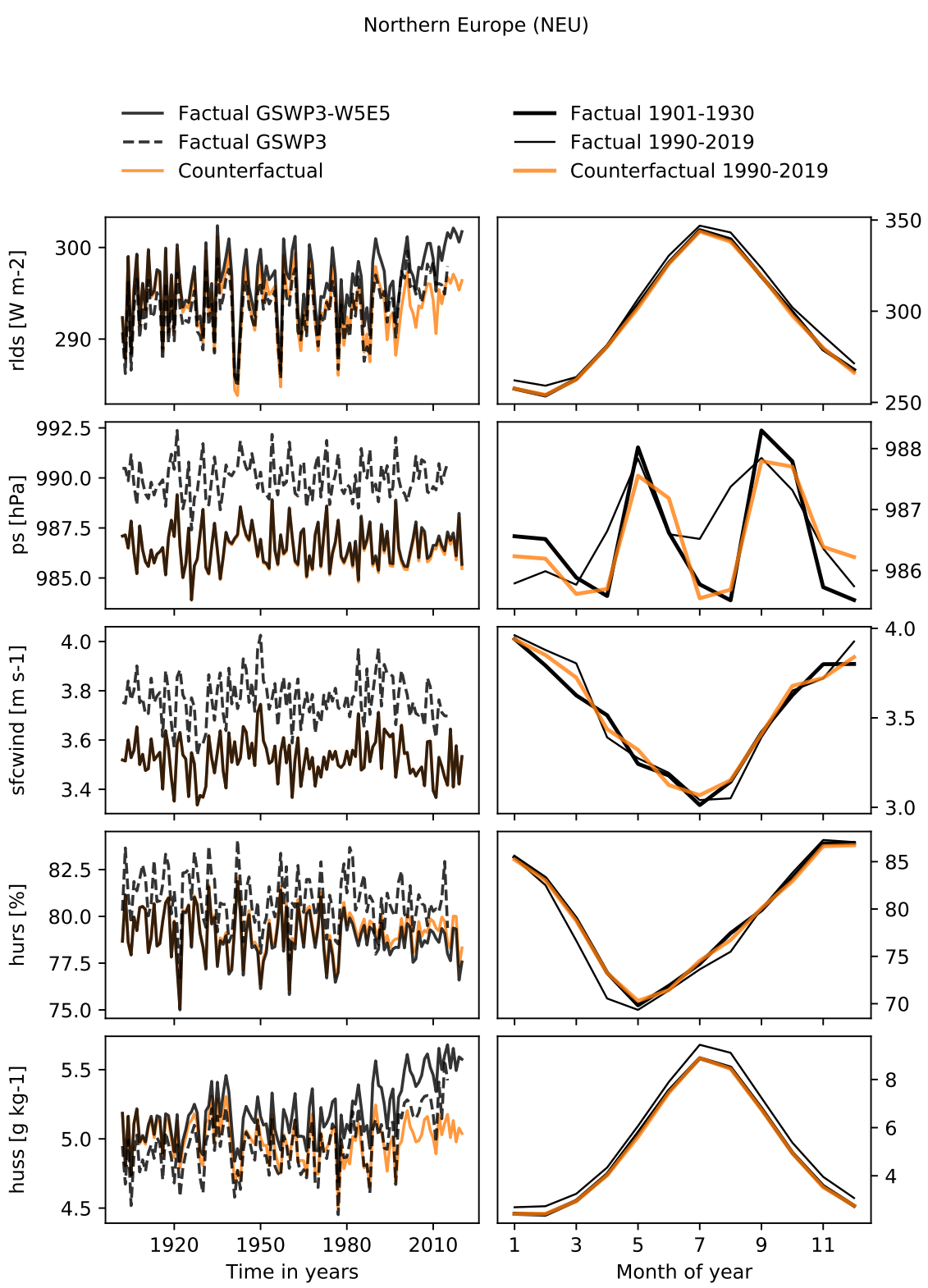

Figure S22: Regional averages for Northern Europe. Left panels show annual regional mean time series of factual GSWP3-W5E5 data (solid black line), factual GWSP3 data (dashed black line) and counterfactual GSWP3-W5E5 data (orange line) for rlds, ps, sfcwind, hurs and huss. Right panels show multi-year regional mean climatologies of factual and counterfactual GSWP3-W5E5 data for the same variables. To obtain the counterfactual annual cycle (orange line), our method aims to map the late factual (thin black line) to the early factual (thick black line) annual cycle.

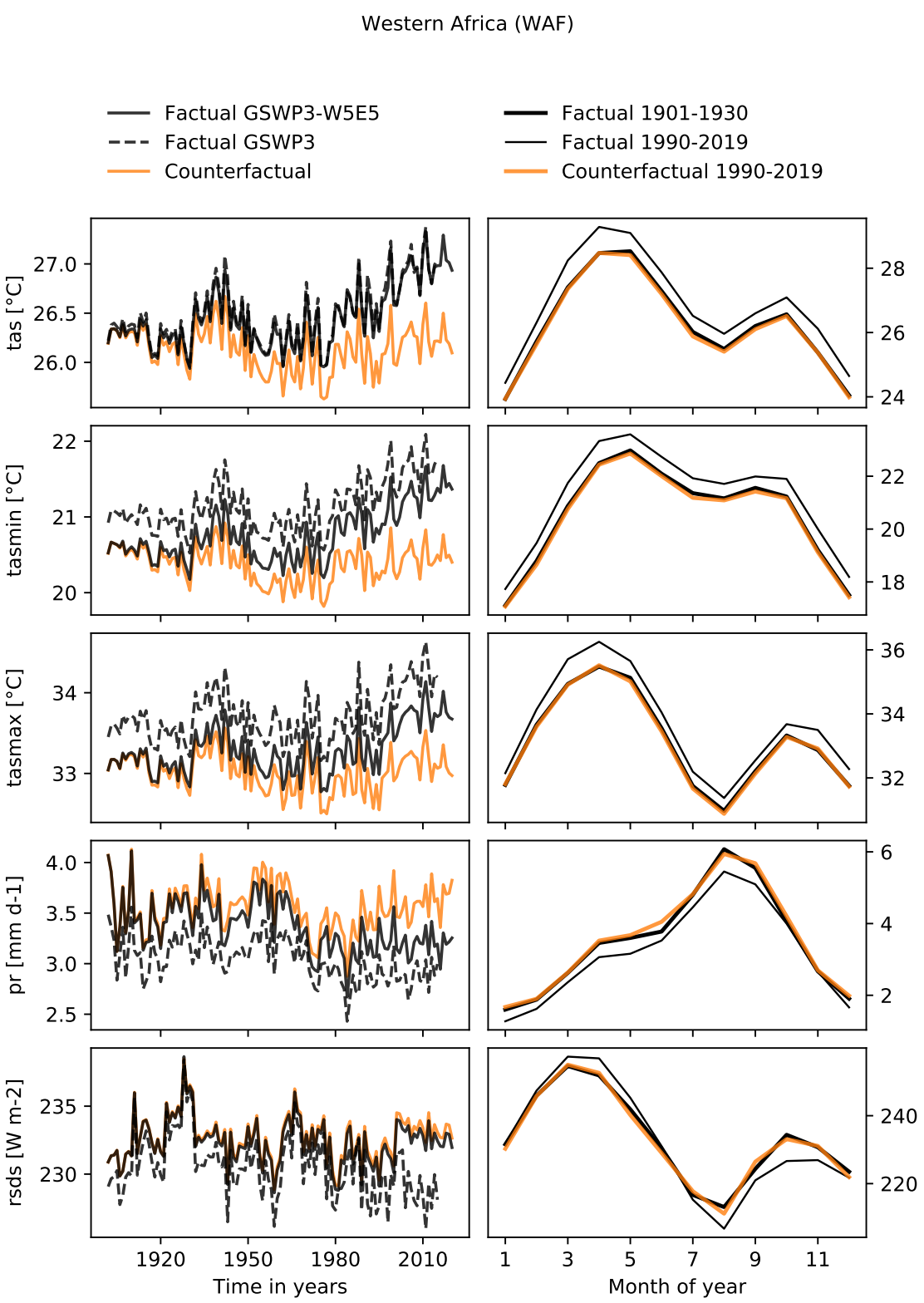

Figure S23: Regional averages for Western Africa. Left panels show annual regional mean time series of factual GSWP3-W5E5 data (solid black line), factual GWSP3 data (dashed black line) and counterfactual GSWP3-W5E5 data (orange line) for tas, tasmin, tasmax, pr and rsds. Right panels show multi-year regional mean climatologies of factual and counterfactual GSWP3-W5E5 data for the same variables. To obtain the counterfactual annual cycle (orange line), our method aims to map the late factual (thin black line) to the early factual (thick black line) annual cycle. See Table 1 in main text for full names of variables.

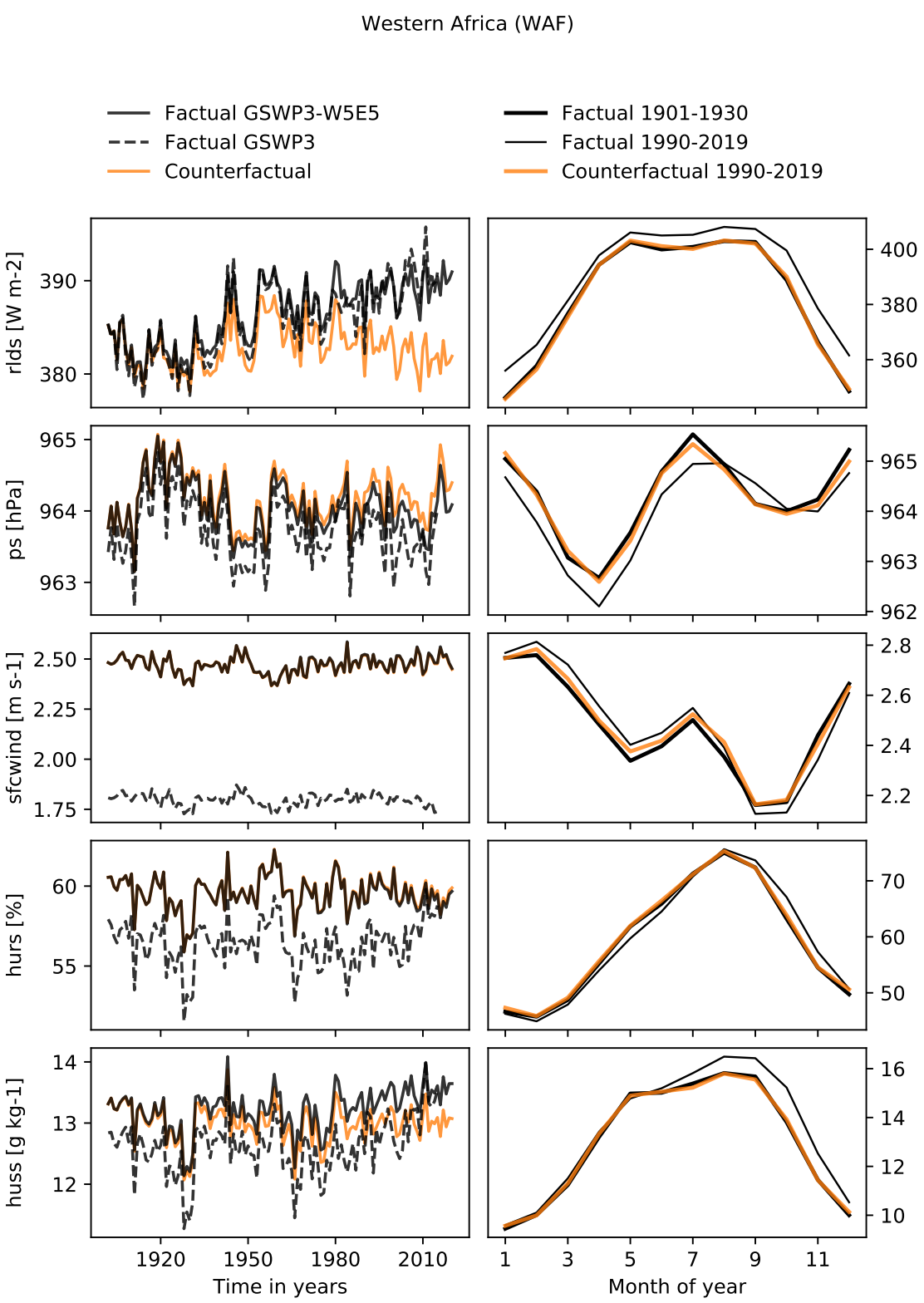

Figure S24: Regional averages for Western Africa. Left panels show annual regional mean time series of factual GSWP3-W5E5 data (solid black line), factual GWSP3 data (dashed black line) and counterfactual GSWP3-W5E5 data (orange line) for rlds, ps, sfcwind, hurs and huss. Right panels show multi-year regional mean climatologies of factual and counterfactual GSWP3-W5E5 data for the same variables. To obtain the counterfactual annual cycle (orange line), our method aims to map the late factual (thin black line) to the early factual (thick black line) annual cycle.

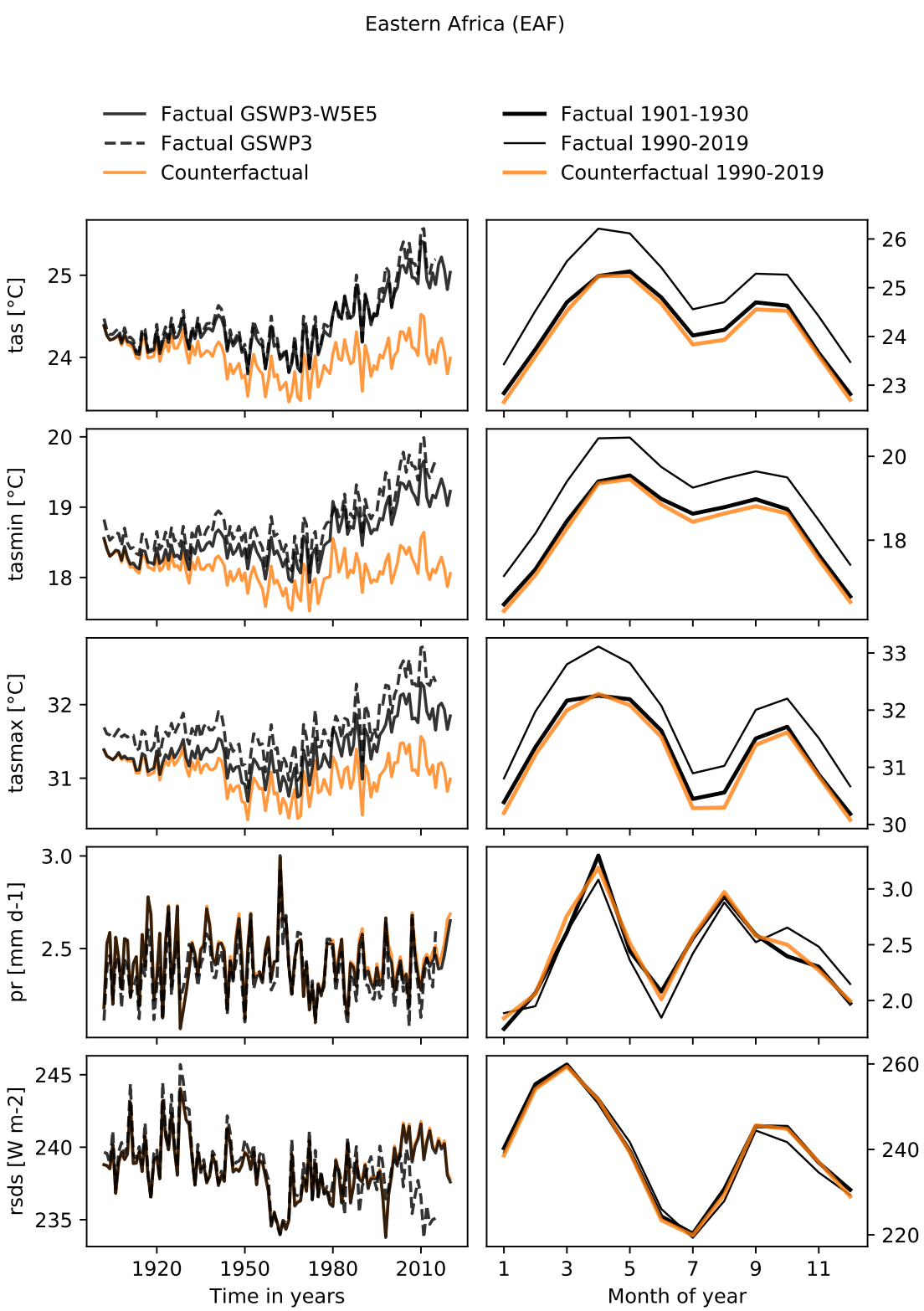

Figure S25: Regional averages for Eastern Africa. Left panels show annual regional mean time series of factual GSWP3-W5E5 data (solid black line), factual GWSP3 data (dashed black line) and counterfactual GSWP3-W5E5 data (orange line) for tas, tasmin, tasmax, pr and rsds. Right panels show multi-year regional mean climatologies of factual and counterfactual GSWP3-W5E5 data for the same variables. To obtain the counterfactual annual cycle (orange line), our method aims to map the late factual (thin black line) to the early factual (thick black line) annual cycle. See Table 1 in main text for full names of variables.

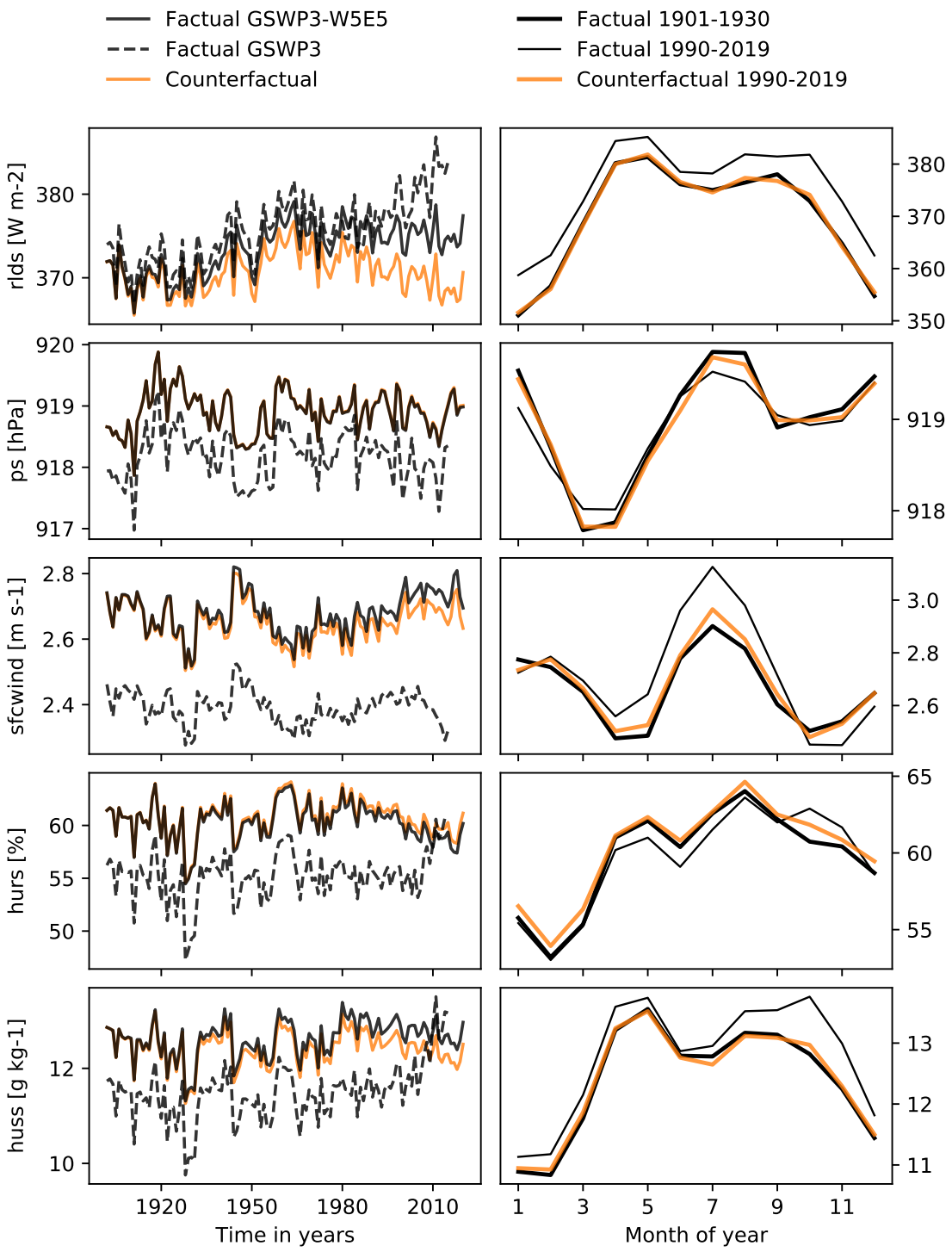

Figure S26: Regional averages for Eastern Africa. Left panels show annual regional mean time series of factual GSWP3-W5E5 data (solid black line), factual GWSP3 data (dashed black line) and counterfactual GSWP3-W5E5 data (orange line) for rlds, ps, sfcwind, hurs and huss. Right panels show multi-year regional mean climatologies of factual and counterfactual GSWP3-W5E5 data for the same variables. To obtain the counterfactual annual cycle (orange line), our method aims to map the late factual (thin black line) to the early factual (thick black line) annual cycle.

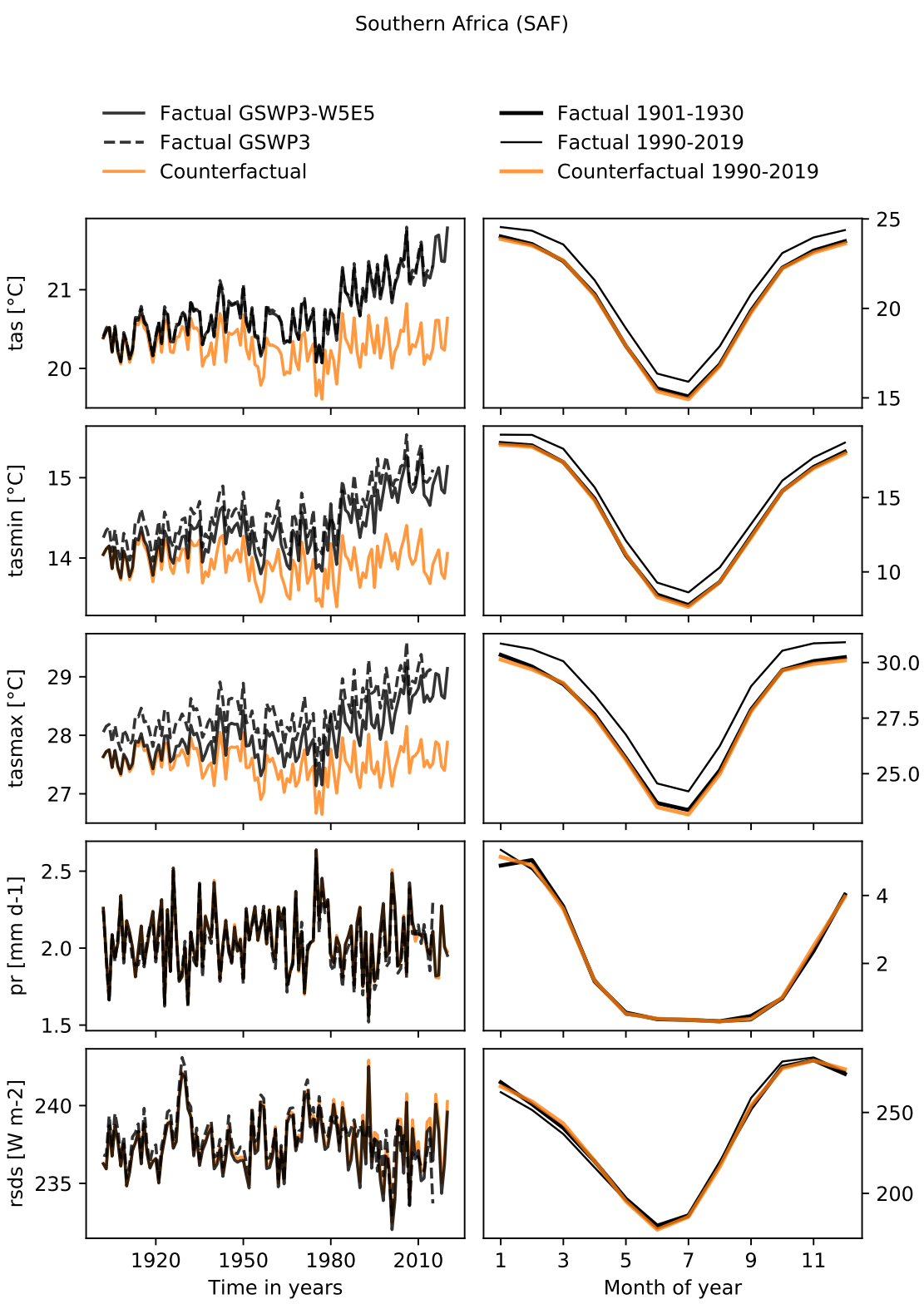

Figure S27: Regional averages for Southern Africa. Left panels show annual regional mean time series of factual GSWP3-W5E5 data (solid black line), factual GWSP3 data (dashed black line) and counterfactual GSWP3-W5E5 data (orange line) for tas, tasmin, tasmax, pr and rsds. Right panels show multi-year regional mean climatologies of factual and counterfactual GSWP3-W5E5 data for the same variables. To obtain the counterfactual annual cycle (orange line), our method aims to map the late factual (thin black line) to the early factual (thick black line) annual cycle. See Table 1 in main text for full names of variables.

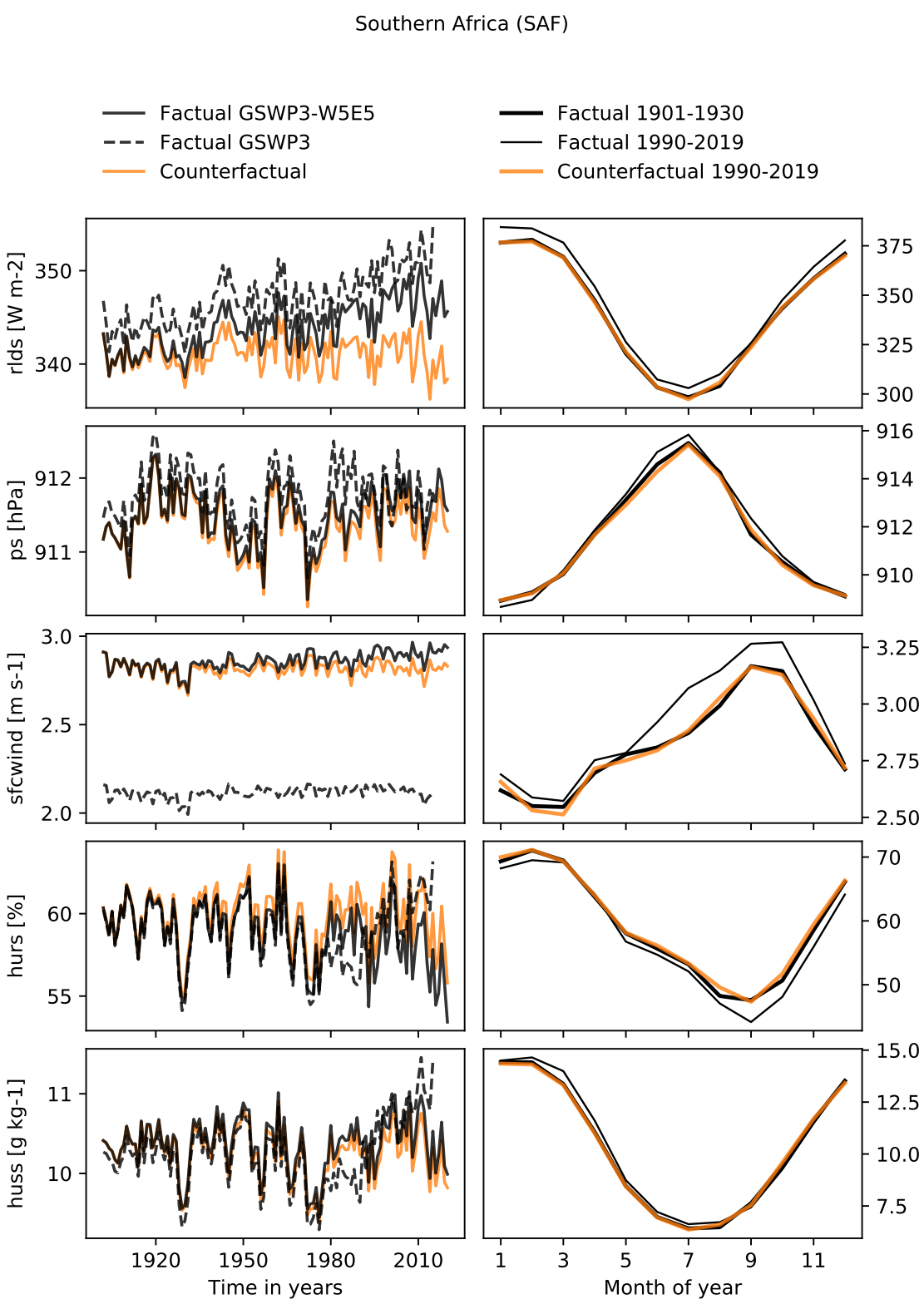

Figure S28: Regional averages for Southern Africa. Left panels show annual regional mean time series of factual GSWP3-W5E5 data (solid black line), factual GWSP3 data (dashed black line) and counterfactual GSWP3-W5E5 data (orange line) for rlds, ps, sfcwind, hurs and huss. Right panels show multi-year regional mean climatologies of factual and counterfactual GSWP3-W5E5 data for the same variables. To obtain the counterfactual annual cycle (orange line), our method aims to map the late factual (thin black line) to the early factual (thick black line) annual cycle.

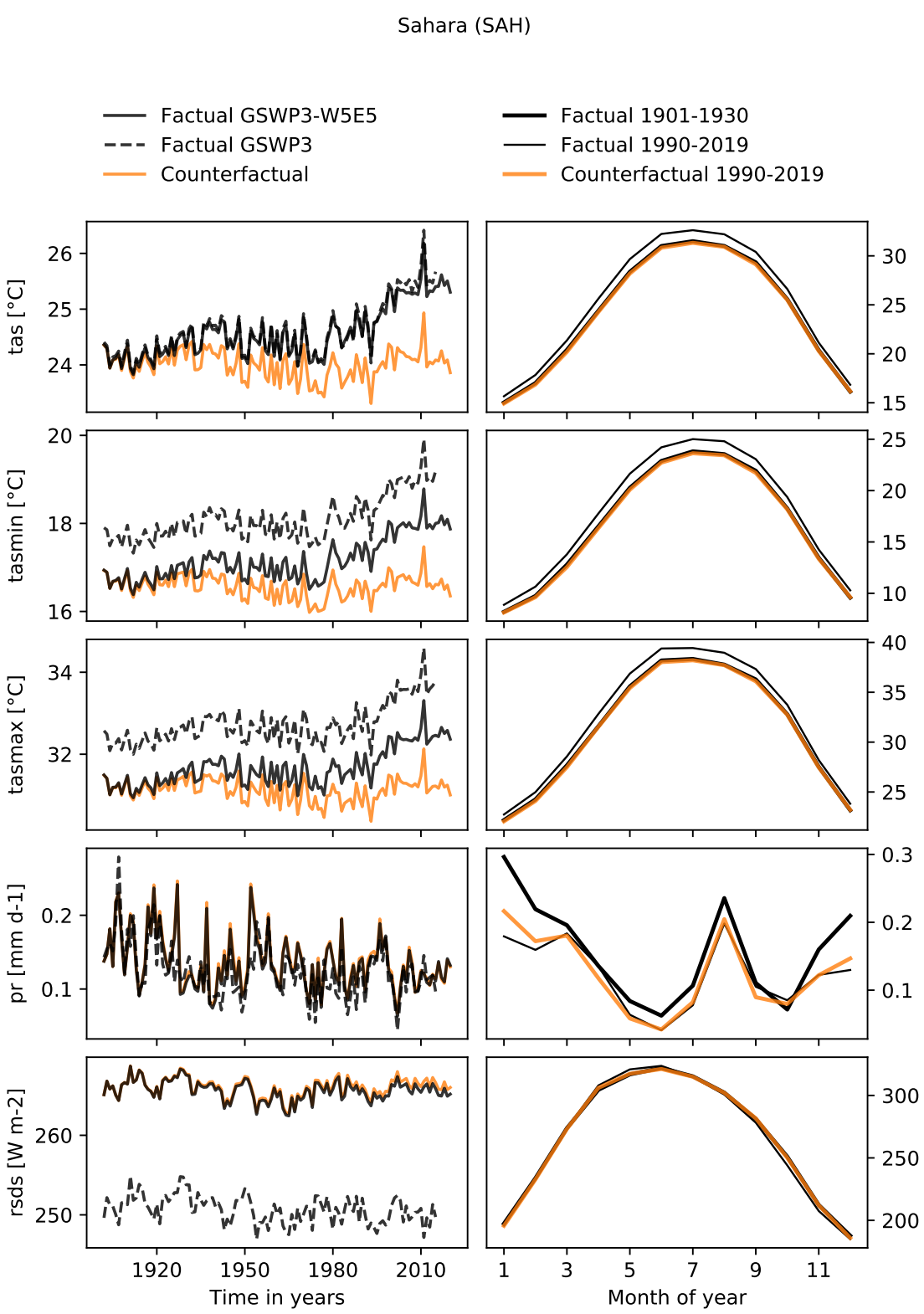

Figure S29: Regional averages for Sahara. Left panels show annual regional mean time series of factual GSWP3-W5E5 data (solid black line), factual GWSP3 data (dashed black line) and counterfactual GSWP3-W5E5 data (orange line) for tas, tasmin, tasmax, pr and rsds. Right panels show multi-year regional mean climatologies of factual and counterfactual GSWP3-W5E5 data for the same variables. To obtain the counterfactual annual cycle (orange line), our method aims to map the late factual (thin black line) to the early factual (thick black line) annual cycle. See Table 1 in main text for full names of variables.

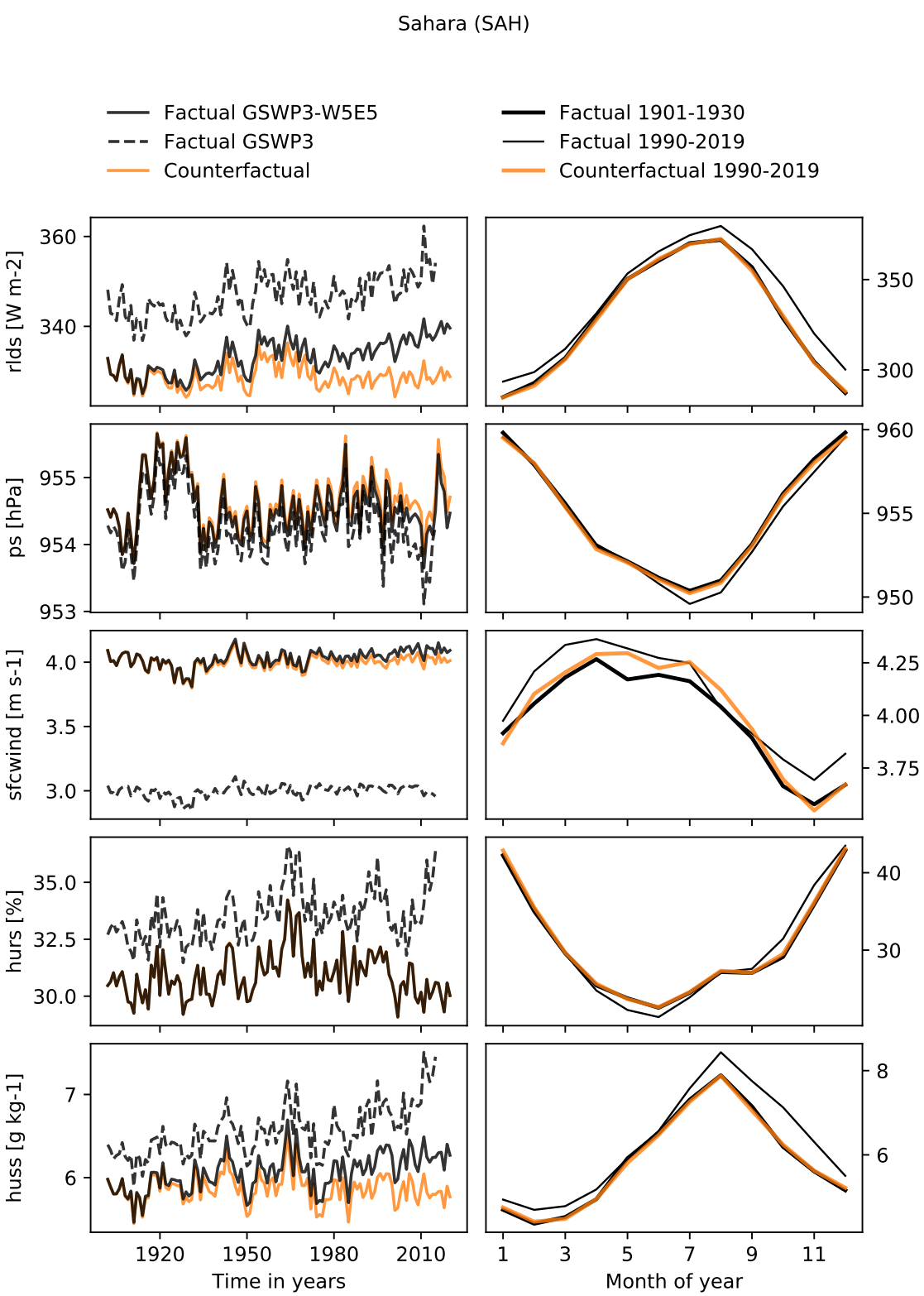

Figure S30: Regional averages for Sahara. Left panels show annual regional mean time series of factual GSWP3-W5E5 data (solid black line), factual GWSP3 data (dashed black line) and counterfactual GSWP3-W5E5 data (orange line) for rlds, ps, sfcwind, hurs and huss. Right panels show multi-year regional mean climatologies of factual and counterfactual GSWP3-W5E5 data for the same variables. To obtain the counterfactual annual cycle (orange line), our method aims to map the late factual (thin black line) to the early factual (thick black line) annual cycle.

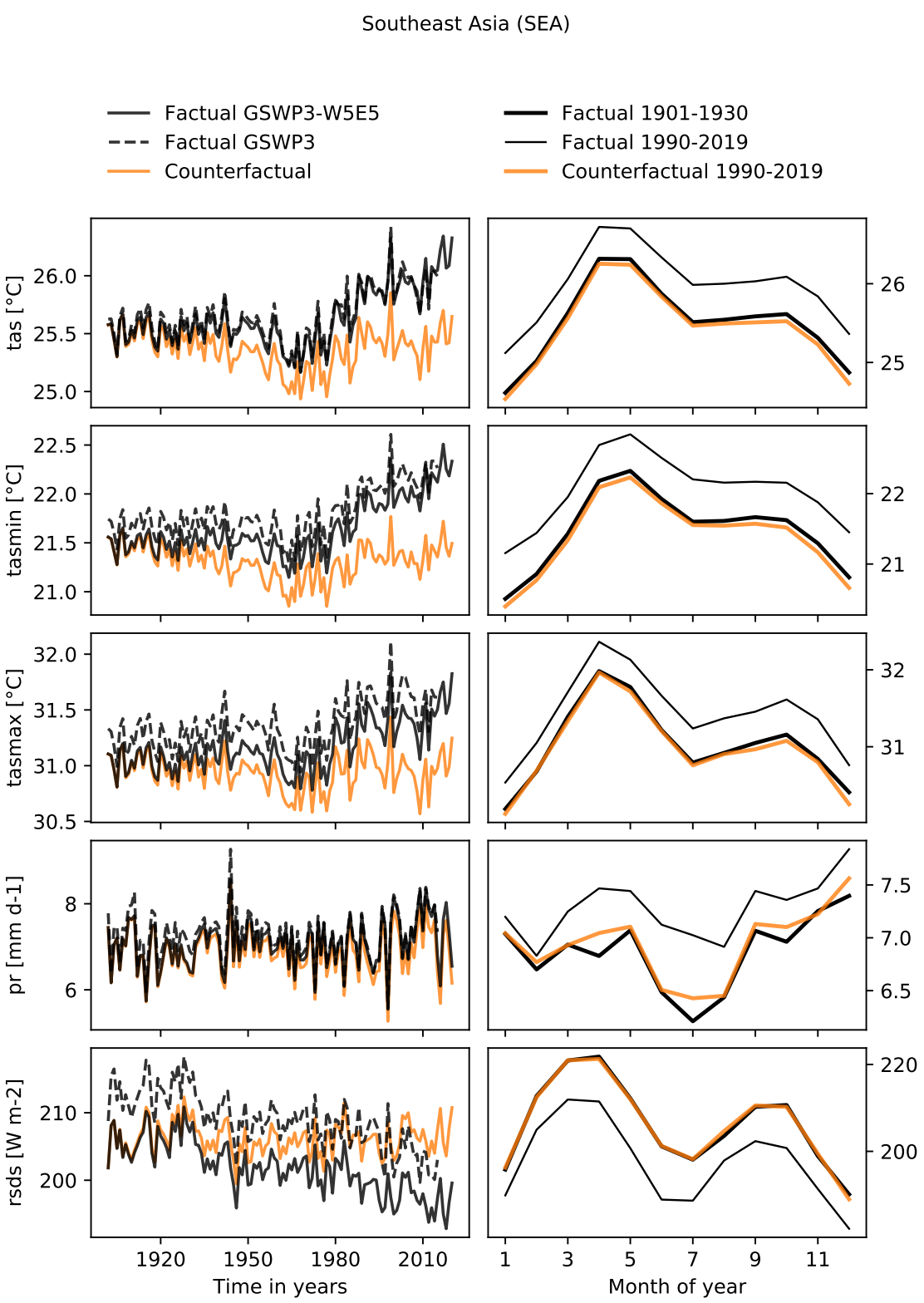

Figure S31: Regional averages for Southeast Asia. Left panels show annual regional mean time series of factual GSWP3-W5E5 data (solid black line), factual GWSP3 data (dashed black line) and counterfactual GSWP3-W5E5 data (orange line) for tas, tasmin, tasmax, pr and rsds. Right panels show multi-year regional mean climatologies of factual and counterfactual GSWP3-W5E5 data for the same variables. To obtain the counterfactual annual cycle (orange line), our method aims to map the late factual (thin black line) to the early factual (thick black line) annual cycle. See Table 1 in main text for full names of variables.

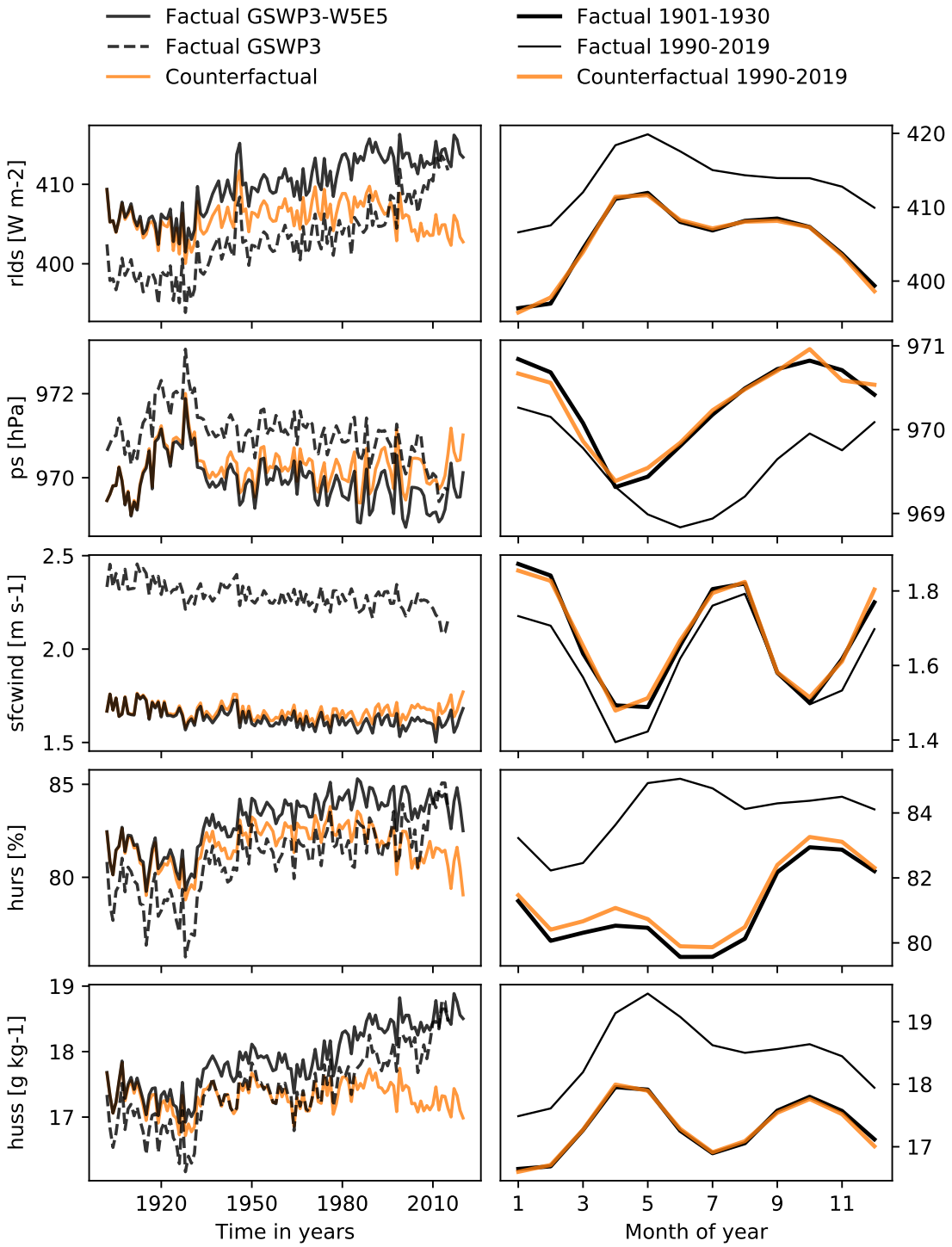

Figure S32: Regional averages for Southeast Asia. Left panels show annual regional mean time series of factual GSWP3-W5E5 data (solid black line), factual GWSP3 data (dashed black line) and counterfactual GSWP3-W5E5 data (orange line) for rlds, ps, sfcwind, hurs and huss. Right panels show multi-year regional mean climatologies of factual and counterfactual GSWP3-W5E5 data for the same variables. To obtain the counterfactual annual cycle (orange line), our method aims to map the late factual (thin black line) to the early factual (thick black line) annual cycle.

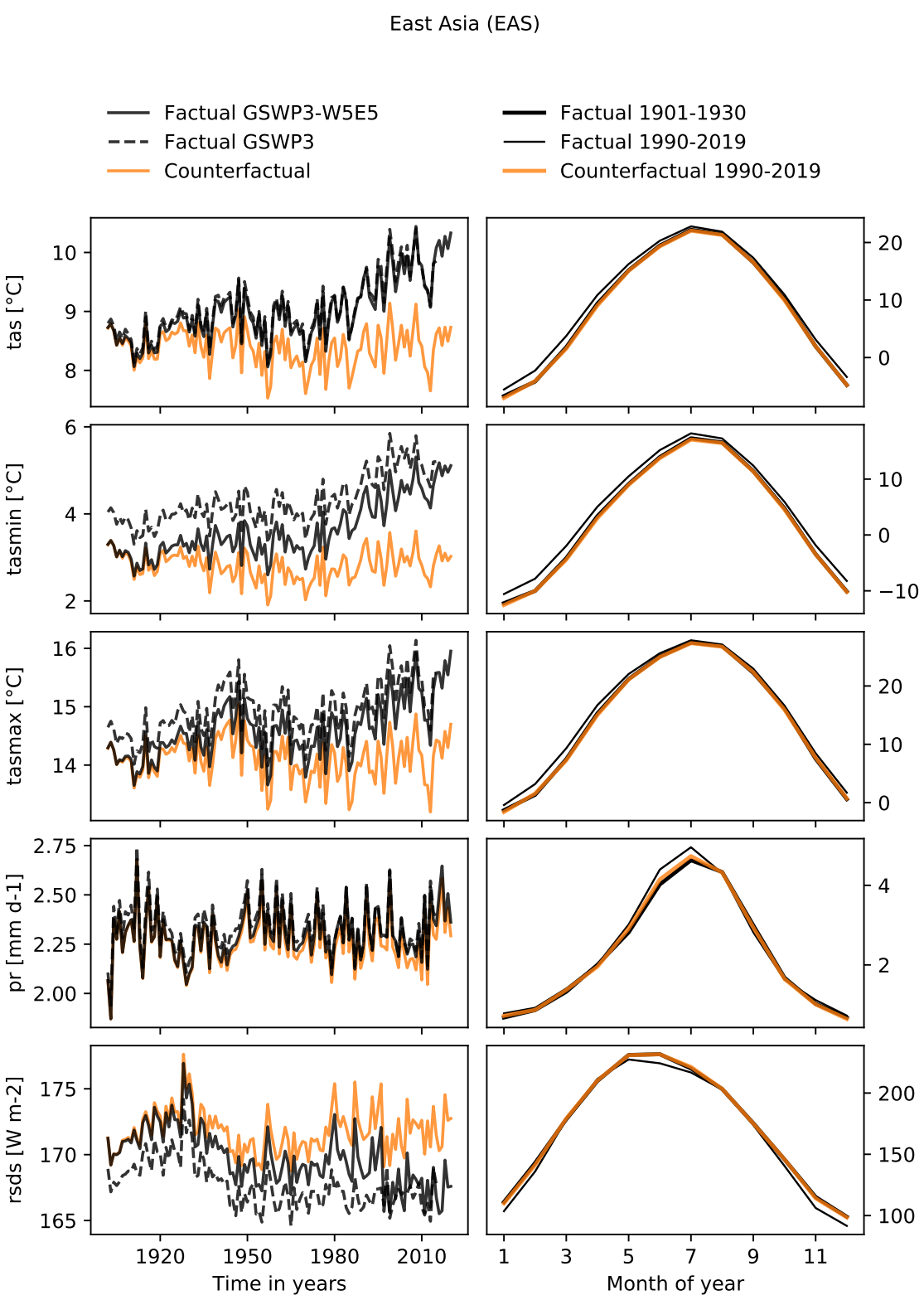

Figure S33: Regional averages for East Asia. Left panels show annual regional mean time series of factual GSWP3-W5E5 data (solid black line), factual GWSP3 data (dashed black line) and counterfactual GSWP3-W5E5 data (orange line) for tas, tasmin, tasmax, pr and rsds. Right panels show multi-year regional mean climatologies of factual and counterfactual GSWP3-W5E5 data for the same variables. To obtain the counterfactual annual cycle (orange line), our method aims to map the late factual (thin black line) to the early factual (thick black line) annual cycle. See Table 1 in main text for full names of variables.

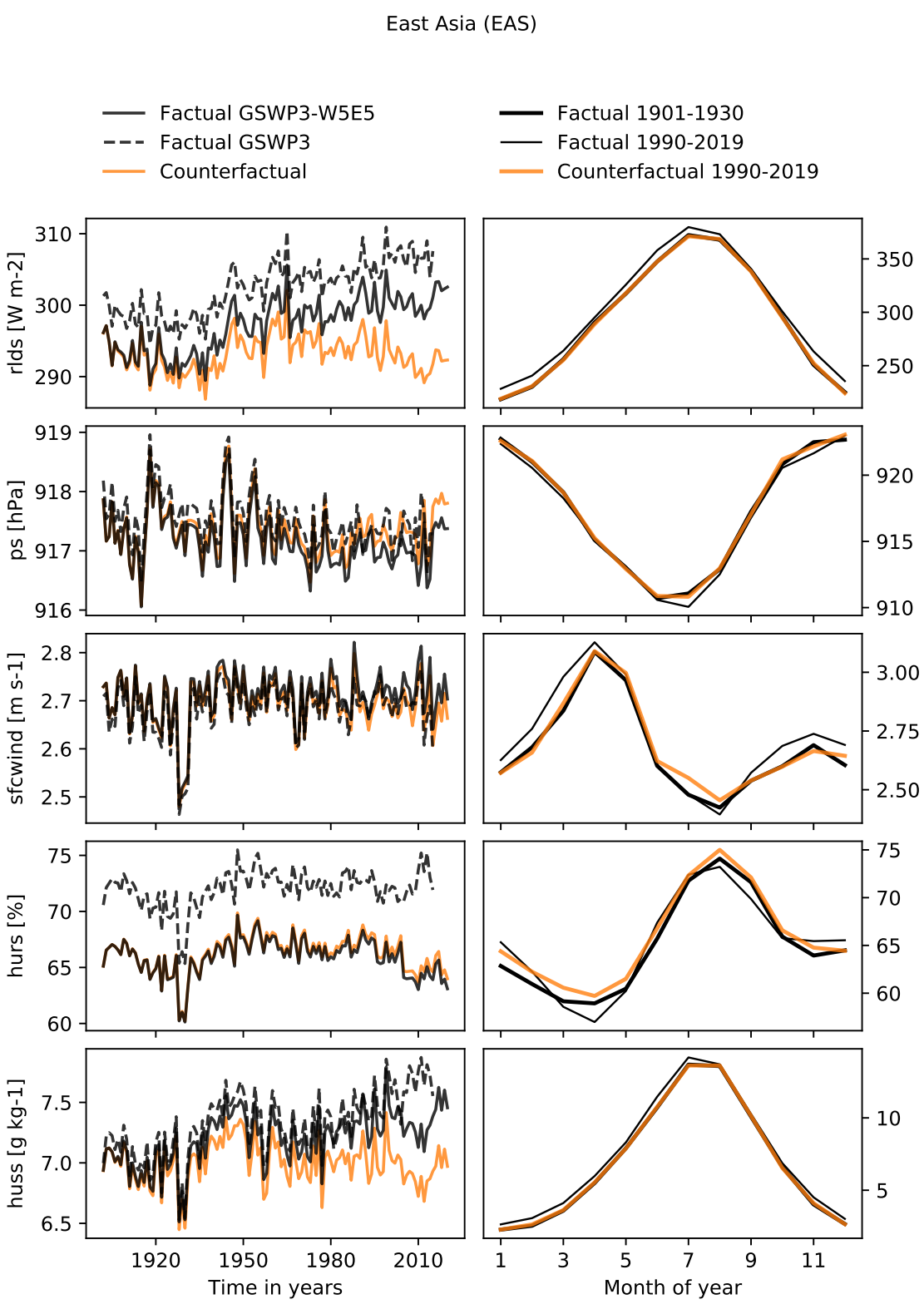

Figure S34: Regional averages for East Asia. Left panels show annual regional mean time series of factual GSWP3-W5E5 data (solid black line), factual GWSP3 data (dashed black line) and counterfactual GSWP3-W5E5 data (orange line) for rlds, ps, sfcwind, hurs and huss. Right panels show multi-year regional mean climatologies of factual and counterfactual GSWP3-W5E5 data for the same variables. To obtain the counterfactual annual cycle (orange line), our method aims to map the late factual (thin black line) to the early factual (thick black line) annual cycle.

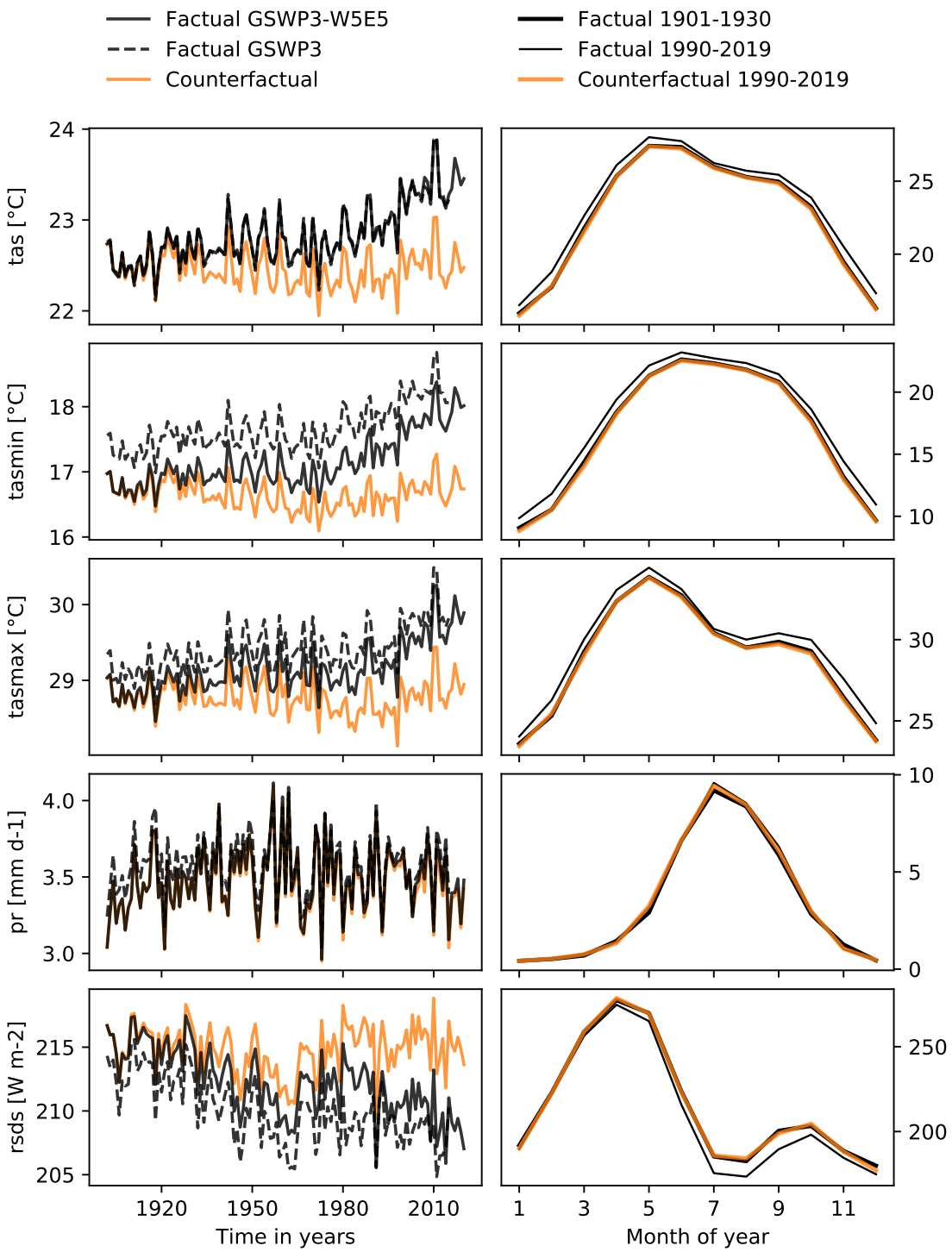

Figure S35: Regional averages for South Asia. Left panels show annual regional mean time series of factual GSWP3-W5E5 data (solid black line), factual GWSP3 data (dashed black line) and counterfactual GSWP3-W5E5 data (orange line) for tas, tasmin, tasmax, pr and rsds. Right panels show multi-year regional mean climatologies of factual and counterfactual GSWP3-W5E5 data for the same variables. To obtain the counterfactual annual cycle (orange line), our method aims to map the late factual (thin black line) to the early factual (thick black line) annual cycle. See Table 1 in main text for full names of variables.

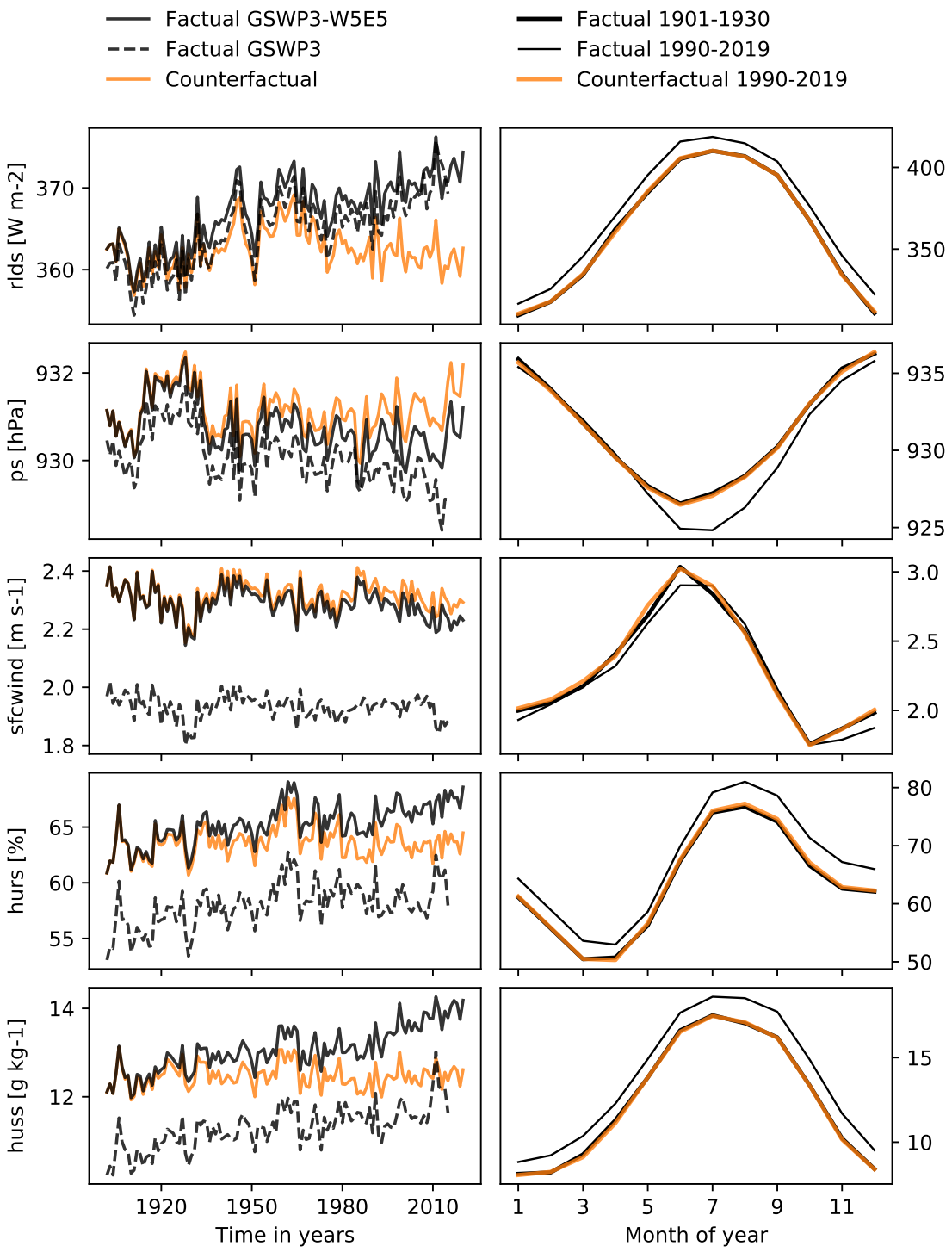

Figure S36: Regional averages for South Asia. Left panels show annual regional mean time series of factual GSWP3-W5E5 data (solid black line), factual GWSP3 data (dashed black line) and counterfactual GSWP3-W5E5 data (orange line) for rlds, ps, sfcwind, hurs and huss. Right panels show multi-year regional mean climatologies of factual and counterfactual GSWP3-W5E5 data for the same variables. To obtain the counterfactual annual cycle (orange line), our method aims to map the late factual (thin black line) to the early factual (thick black line) annual cycle.

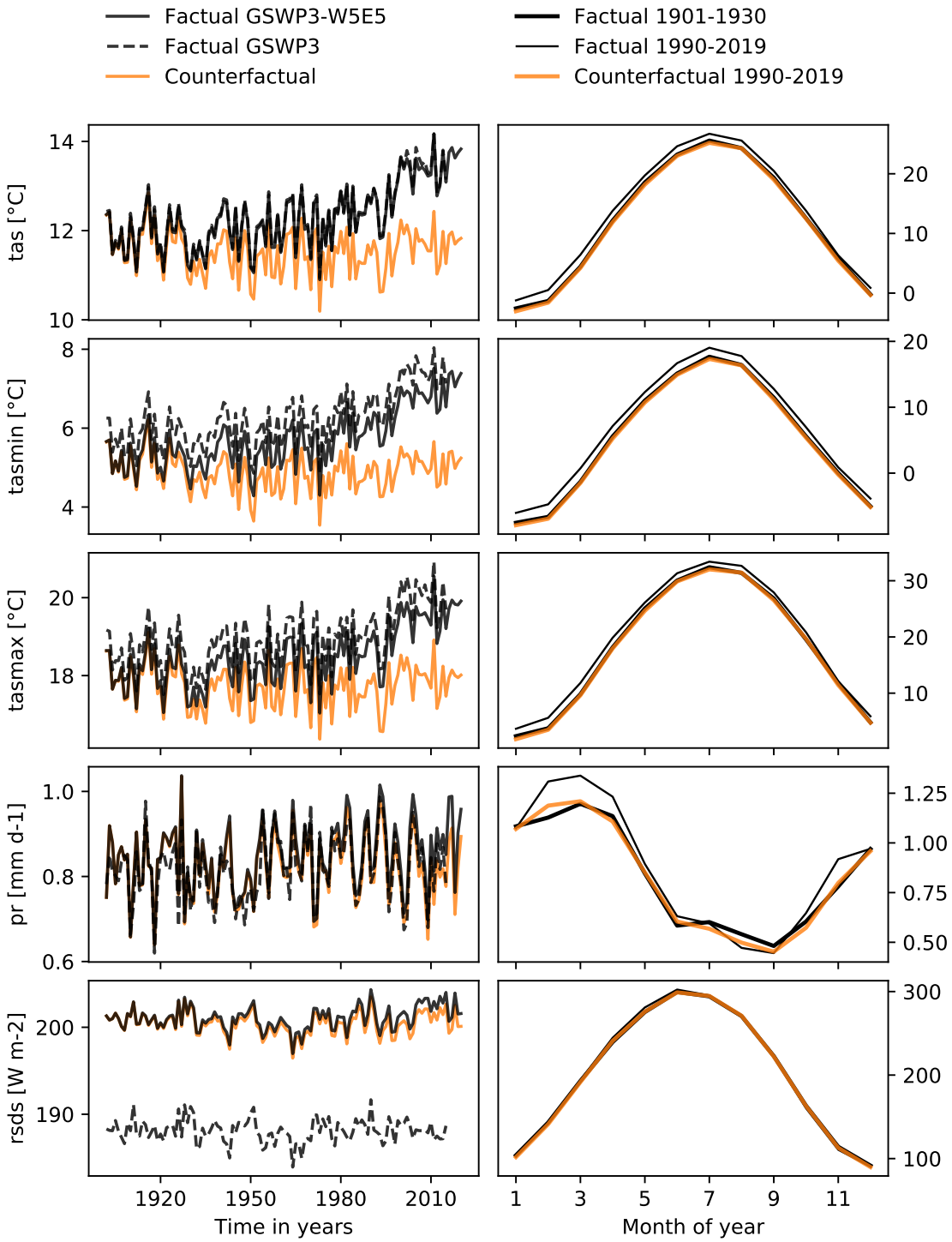

Figure S37: Regional averages for Central Asia. Left panels show annual regional mean time series of factual GSWP3-W5E5 data (solid black line), factual GWSP3 data (dashed black line) and counterfactual GSWP3-W5E5 data (orange line) for tas, tasmin, tasmax, pr and rsds. Right panels show multi-year regional mean climatologies of factual and counterfactual GSWP3-W5E5 data for the same variables. To obtain the counterfactual annual cycle (orange line), our method aims to map the late factual (thin black line) to the early factual (thick black line) annual cycle. See Table 1 in main text for full names of variables.

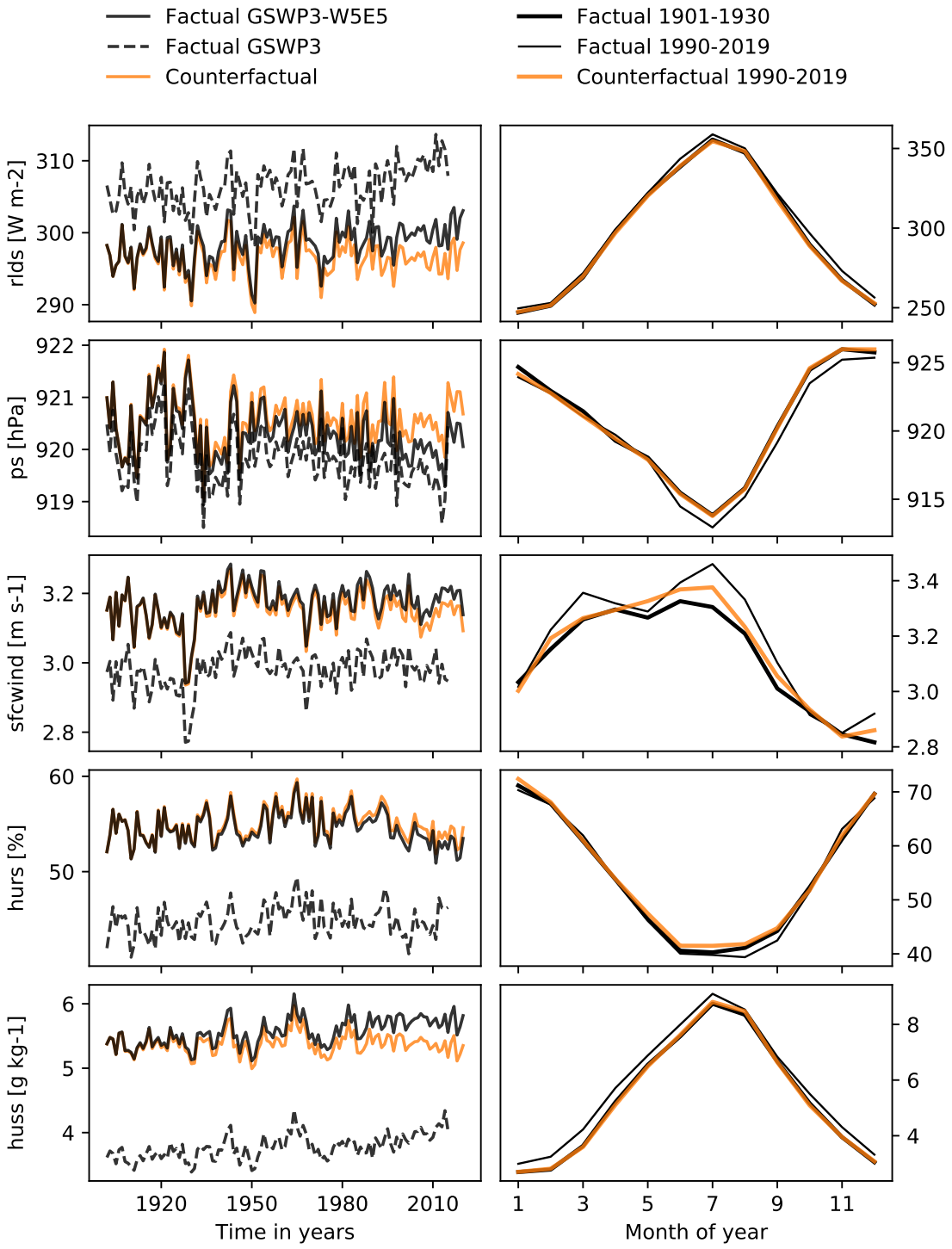

Figure S38: Regional averages for Central Asia. Left panels show annual regional mean time series of factual GSWP3-W5E5 data (solid black line), factual GWSP3 data (dashed black line) and counterfactual GSWP3-W5E5 data (orange line) for rlds, ps, sfcwind, hurs and huss. Right panels show multi-year regional mean climatologies of factual and counterfactual GSWP3-W5E5 data for the same variables. To obtain the counterfactual annual cycle (orange line), our method aims to map the late factual (thin black line) to the early factual (thick black line) annual cycle.

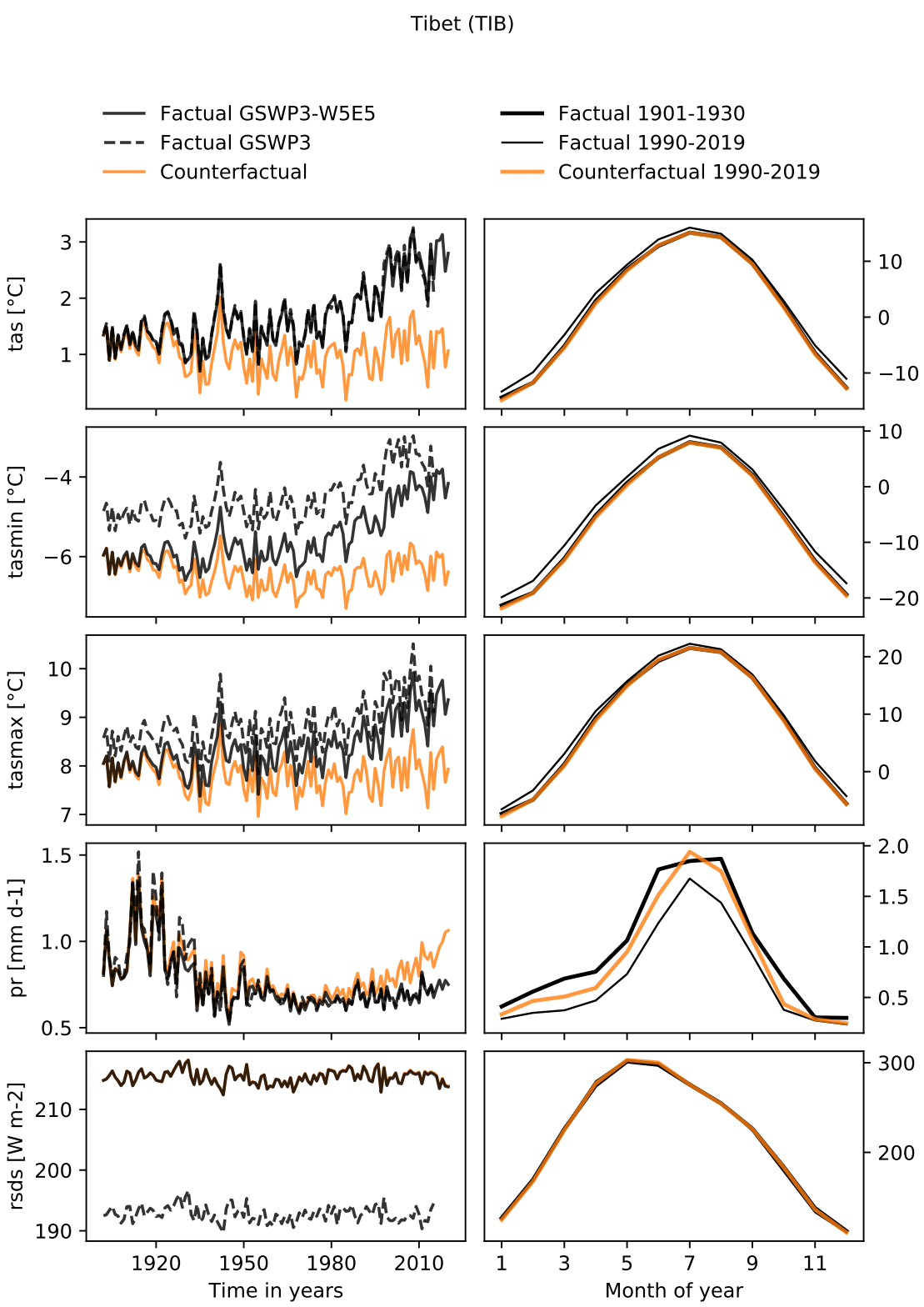

Figure S39: Regional averages for Tibet. Left panels show annual regional mean time series of factual GSWP3-W5E5 data (solid black line), factual GWSP3 data (dashed black line) and counterfactual GSWP3-W5E5 data (orange line) for tas, tasmin, tasmax, pr and rsds. Right panels show multi-year regional mean climatologies of factual and counterfactual GSWP3-W5E5 data for the same variables. To obtain the counterfactual annual cycle (orange line), our method aims to map the late factual (thin black line) to the early factual (thick black line) annual cycle. See Table 1 in main text for full names of variables.

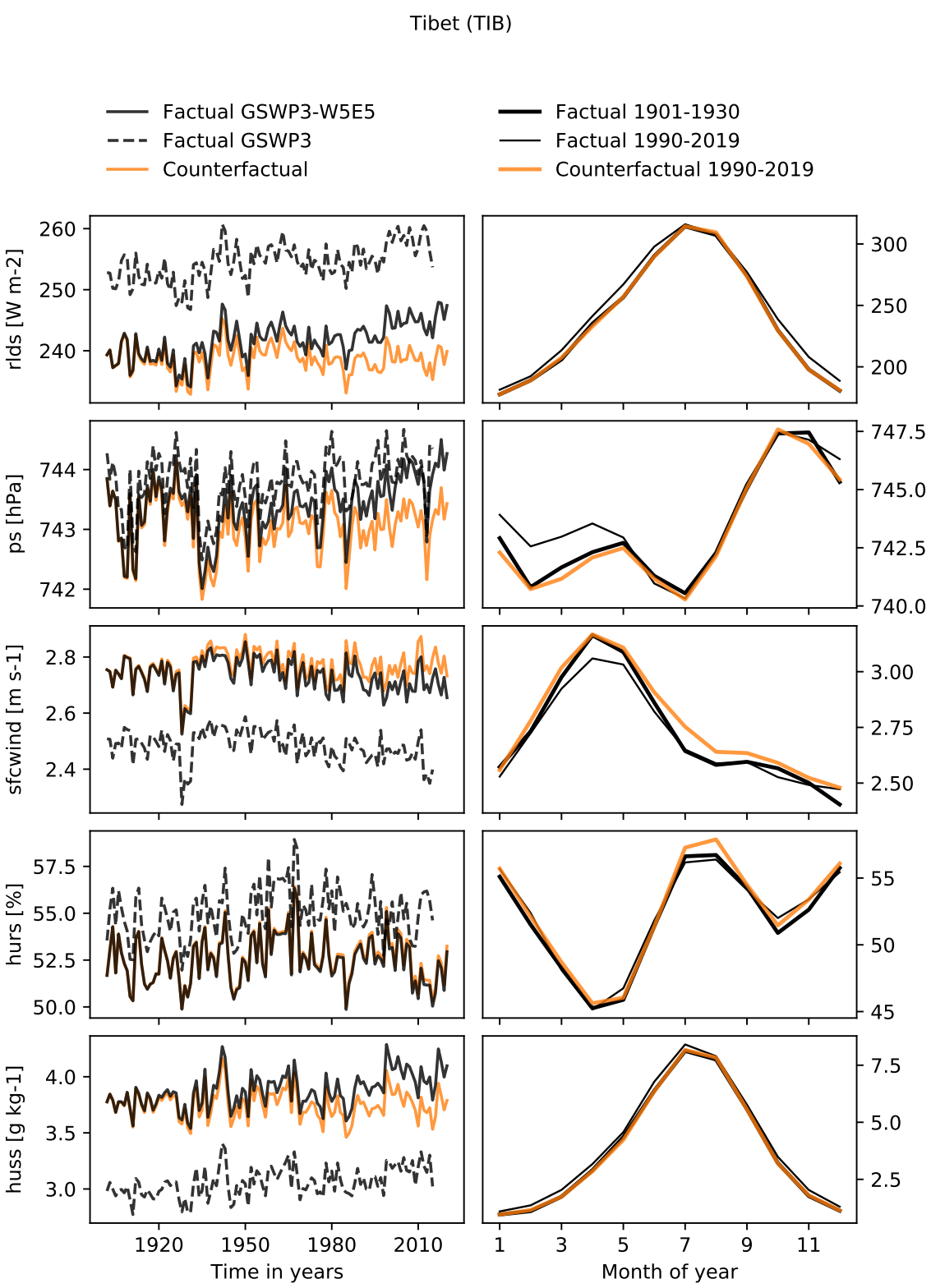

Figure S40: Regional averages for Tibet. Left panels show annual regional mean time series of factual GSWP3-W5E5 data (solid black line), factual GWSP3 data (dashed black line) and counterfactual GSWP3-W5E5 data (orange line) for rlds, ps, sfcwind, hurs and huss. Right panels show multi-year regional mean climatologies of factual and counterfactual GSWP3-W5E5 data for the same variables. To obtain the counterfactual annual cycle (orange line), our method aims to map the late factual (thin black line) to the early factual (thick black line) annual cycle.

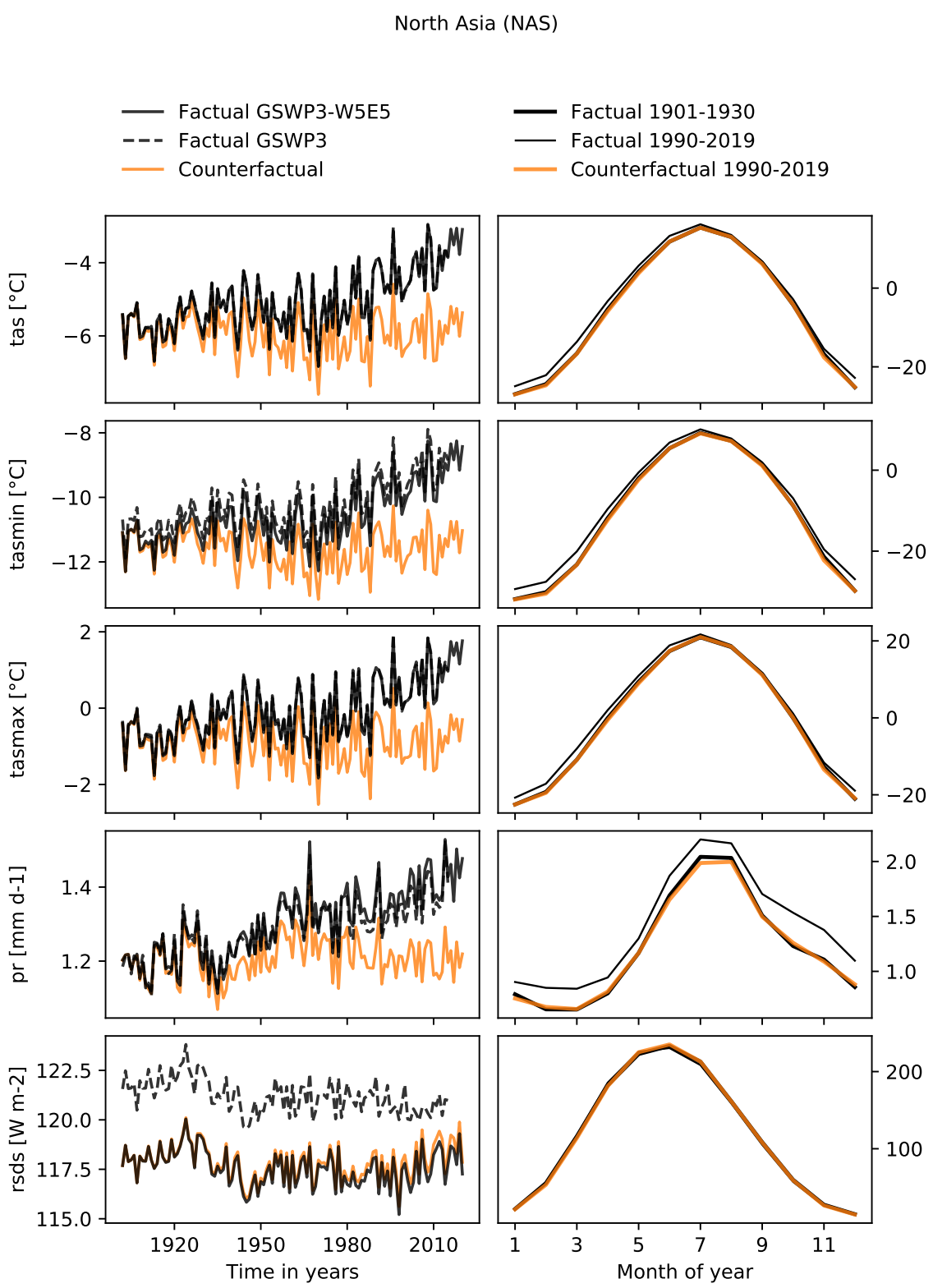

Figure S41: Regional averages for North Asia. Left panels show annual regional mean time series of factual GSWP3-W5E5 data (solid black line), factual GWSP3 data (dashed black line) and counterfactual GSWP3-W5E5 data (orange line) for tas, tasmin, tasmax, pr and rsds. Right panels show multi-year regional mean climatologies of factual and counterfactual GSWP3-W5E5 data for the same variables. To obtain the counterfactual annual cycle (orange line), our method aims to map the late factual (thin black line) to the early factual (thick black line) annual cycle. See Table 1 in main text for full names of variables.

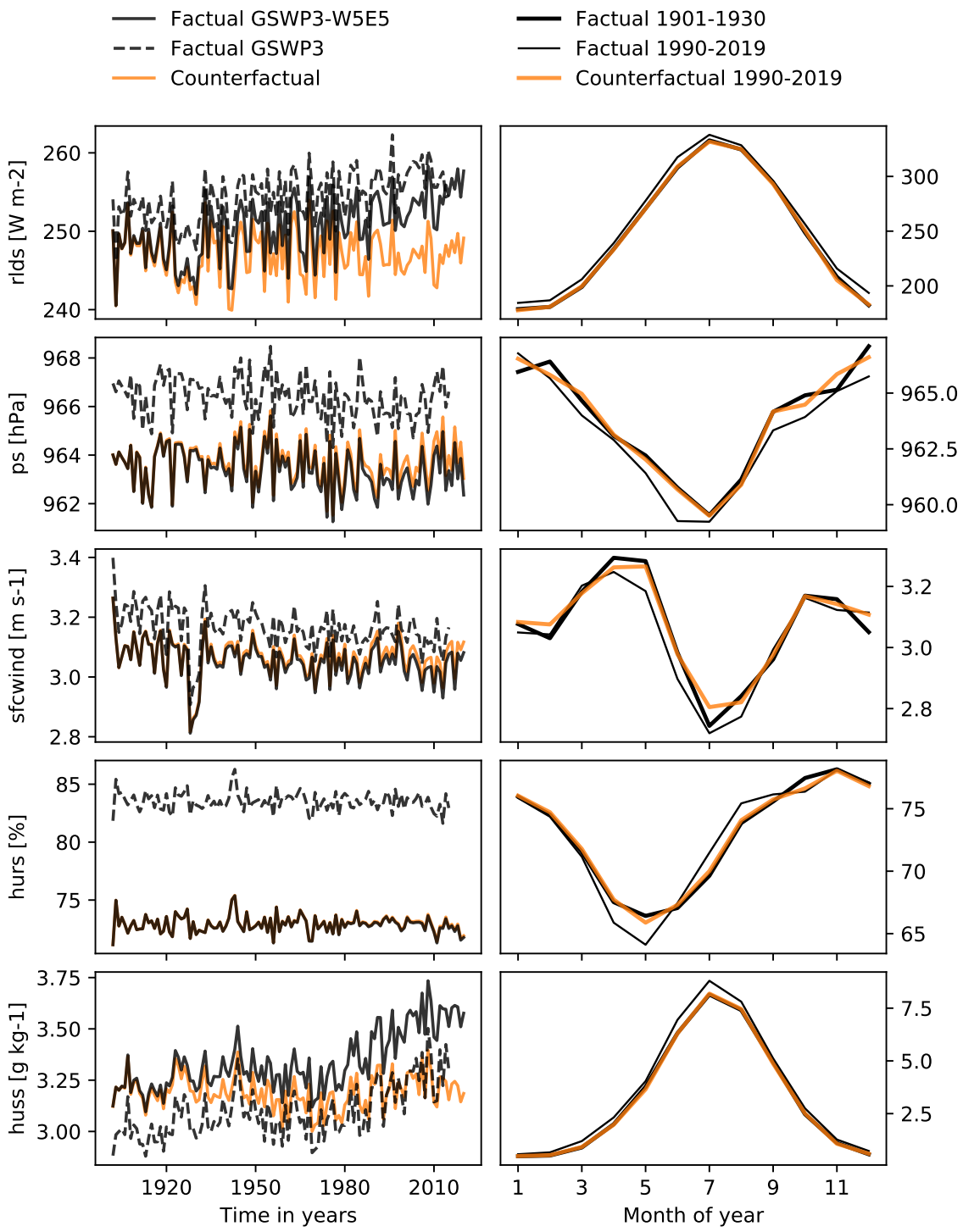

Figure S42: Regional averages for North Asia. Left panels show annual regional mean time series of factual GSWP3-W5E5 data (solid black line), factual GWSP3 data (dashed black line) and counterfactual GSWP3-W5E5 data (orange line) for rlds, ps, sfcwind, hurs and huss. Right panels show multi-year regional mean climatologies of factual and counterfactual GSWP3-W5E5 data for the same variables. To obtain the counterfactual annual cycle (orange line), our method aims to map the late factual (thin black line) to the early factual (thick black line) annual cycle.