

Supplementary Material

Future regional increases in simultaneous large Western USA wildfires

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Input variable	CFWI	KBDI	mFFWI	FM100	FM1000	ERC	BI
daily max temperature	x	x	x	x	x	x	x
daily min temperature				x	x	x	x
precipitation	x	x		x	x	x	
daily max relative humidity				x	x	x	x
daily min relative humidity				x	x	x	x
surface wind speed	x		x				x
relative humidity	x		x				
specific humidity						x	x
incoming solar radiation						x	x
elevation						x	x
other fire index			KBDI			FM100 FM1000	FM100 FM1000 ERC

Table S1: Inputs to the fire indexes calculated for this analysis.

RCM	GCM	Resolution	Modeling Group
CanRCM4	CanESM2	0.25°	CCCma
CRCM5-UQAM	CanESM2	0.25°	UQAM
CRCM5-UQAM	MPI-ESM-LR	0.25°	UQAM
CRCM5-UQAM	MPI-ESM-MR	0.25°	UQAM
HIRHAM5	EC-EARTH	0.50°	DMI
RCA4	CanESM2	0.50°	SMHI
RCA4	EC-EARTH	0.50°	SMHI
RegCM4	GFDL-ESM2M	0.25°	NCAR & Iowa State
RegCM4	HadGEM2-ES	0.25°	NCAR & Iowa State
RegCM4	MPI-ESM-LR	0.25°	NCAR & Iowa State
WRF	GFDL-ESM2M	0.25°	NCAR & U Arizona
WRF	HadGEM2-ES	0.25°	NCAR & U Arizona
WRF	MPI-ESM-LR	0.25°	NCAR & U Arizona

Table S2: NA-CORDEX climate simulations used to project future simultaneity.

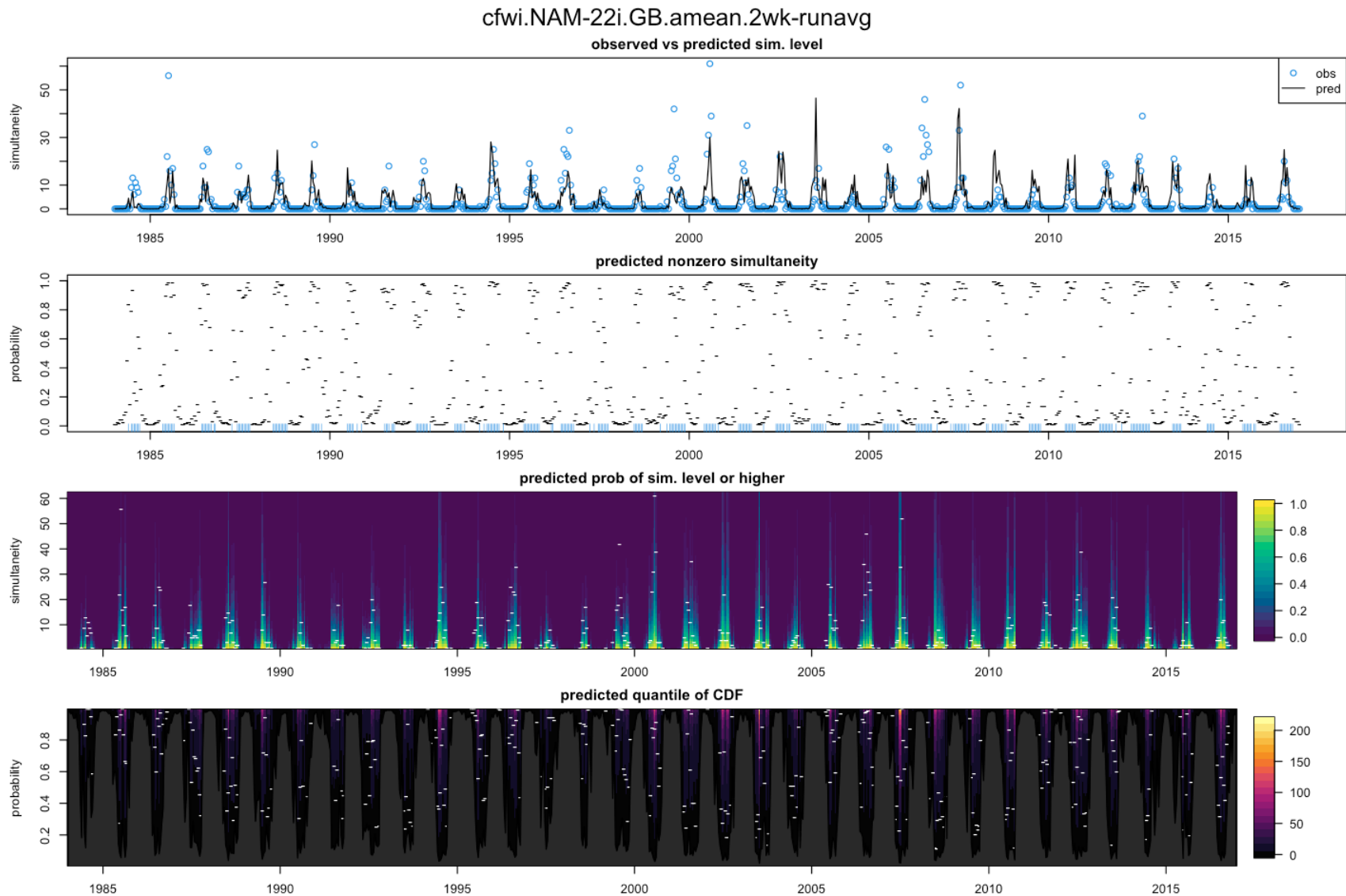
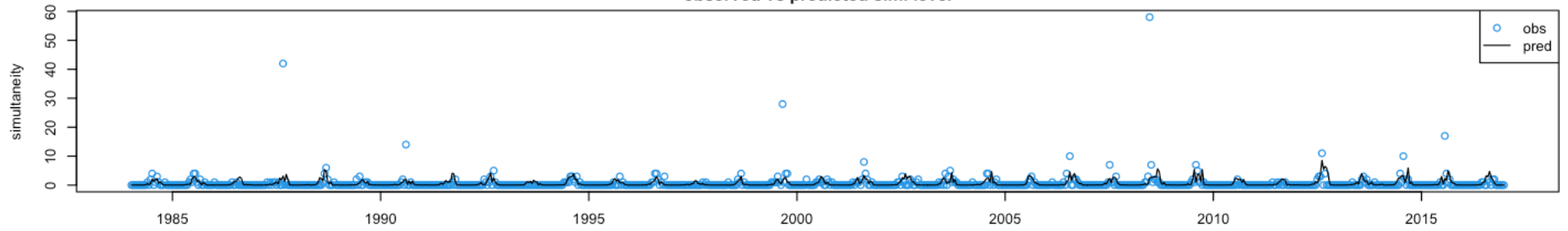


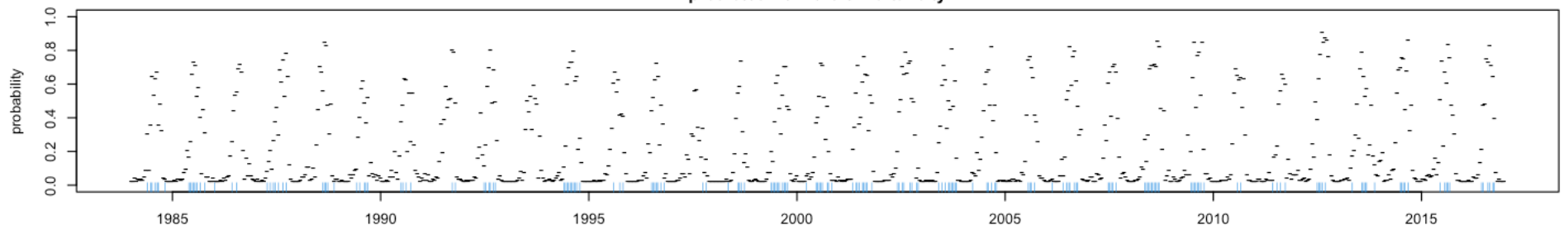
Figure S1. GLM performance compared to observed data in the Great Basin (GB) GACC. The top panel shows average simultaneity (number of large wildfires) predicted by the hurdle GLM (black line) compared to observed simultaneity (blue dots). The second panel shows the probability of non-zero simultaneity predicted by the hurdle GLM (black dashes) compared to observed non-zero simultaneity (blue ticks). The third panel shows the predicted probability of reaching a given level of simultaneity (heatmap) with observed simultaneity overlaid (white dashes). The bottom panel shows predicted quantiles of simultaneity (heatmap) with observed simultaneity overlaid (white dashes). This figure shows results for data on the 0.25° grid; results on the 0.5° grid (not shown) are comparable.

cfwi.NAM-22i.NC.amean.2wk-runavg

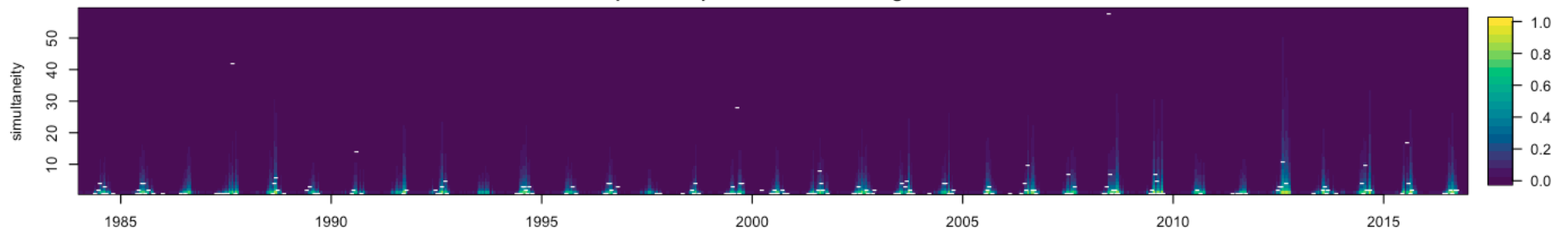
observed vs predicted sim. level



predicted nonzero simultaneity



predicted prob of sim. level or higher



predicted quantile of CDF

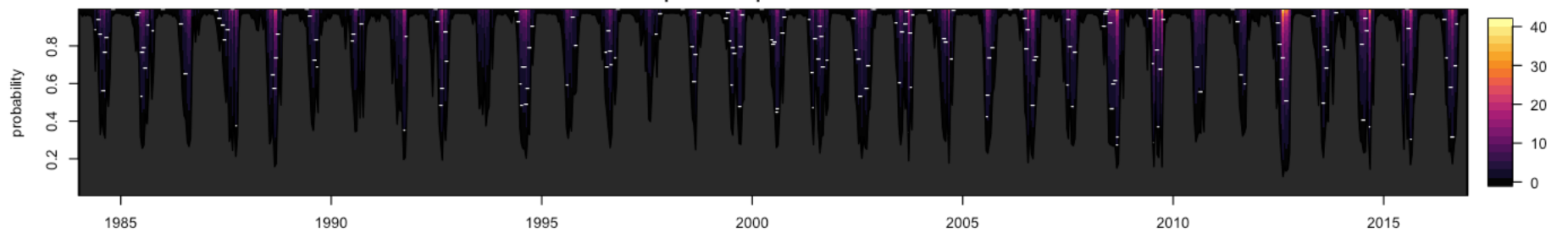
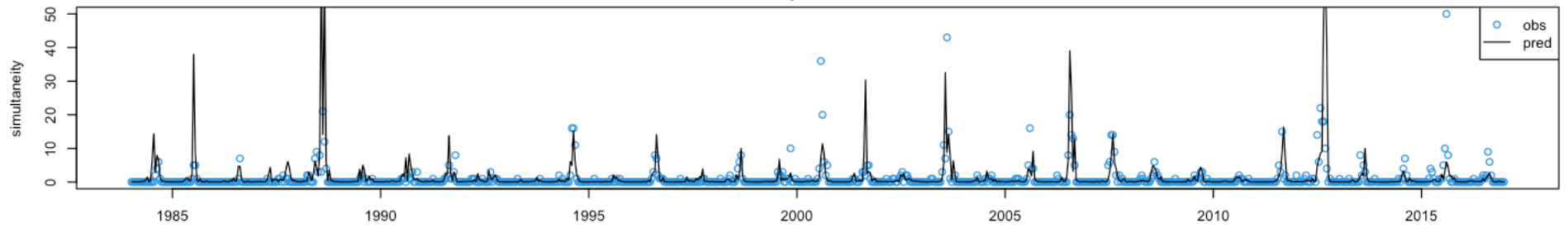
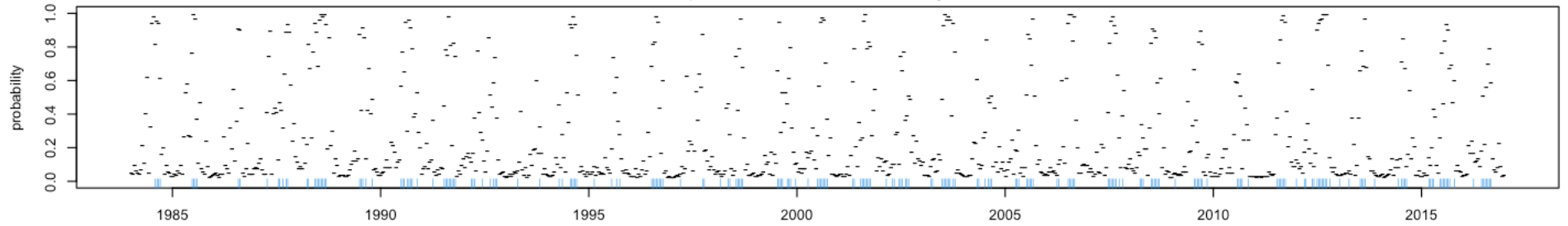


Figure S2. Same as figure S1, but for the Northern California (NC) GACC.

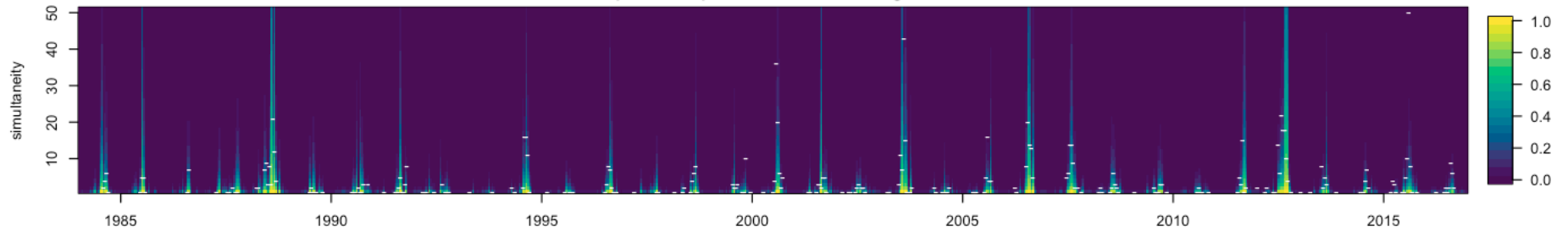
cfwi.NAM-22i.NR.amean.2wk-runavg
observed vs predicted sim. level



predicted nonzero simultaneity



predicted prob of sim. level or higher



predicted quantile of CDF

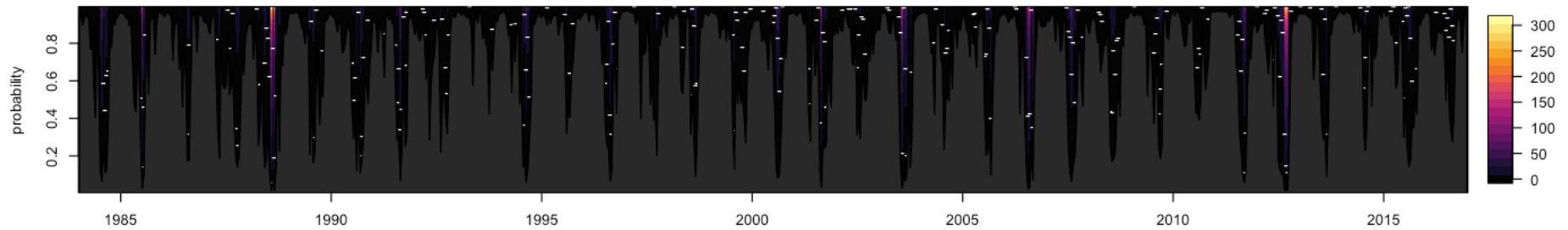
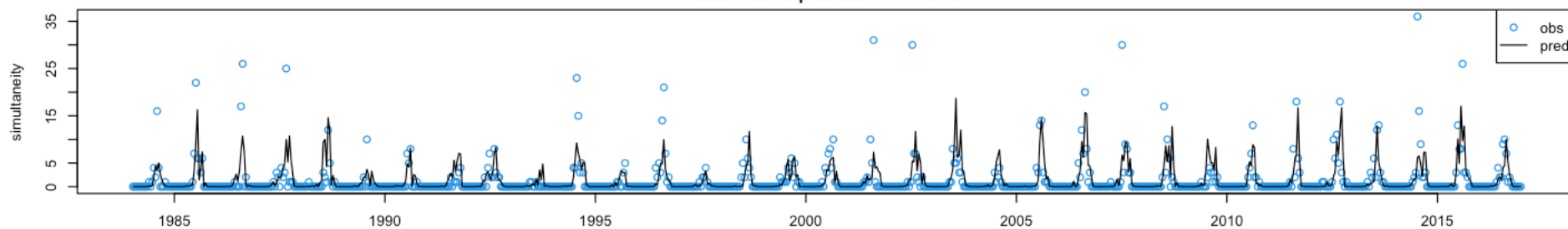


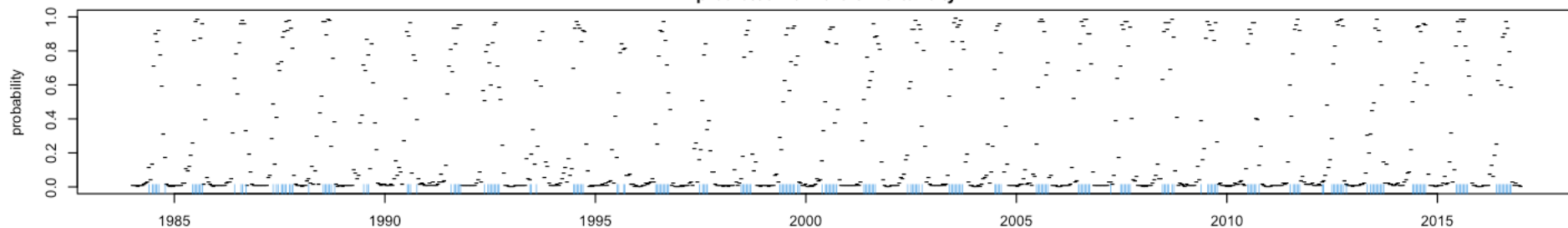
Figure S3. Same as figure S1, but for the Northern Rockies (NR) GACC.

cfwi.NAM-22i.NW.amean.2wk-run80

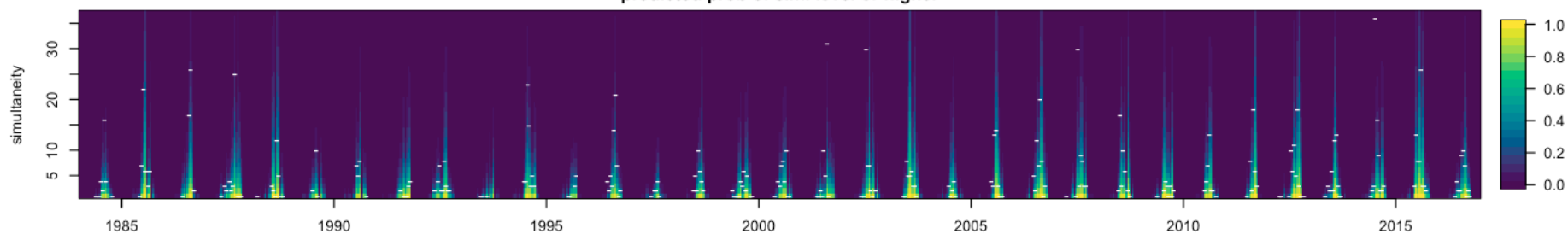
observed vs predicted sim. level



predicted nonzero simultaneity



predicted prob of sim. level or higher



predicted quantile of CDF

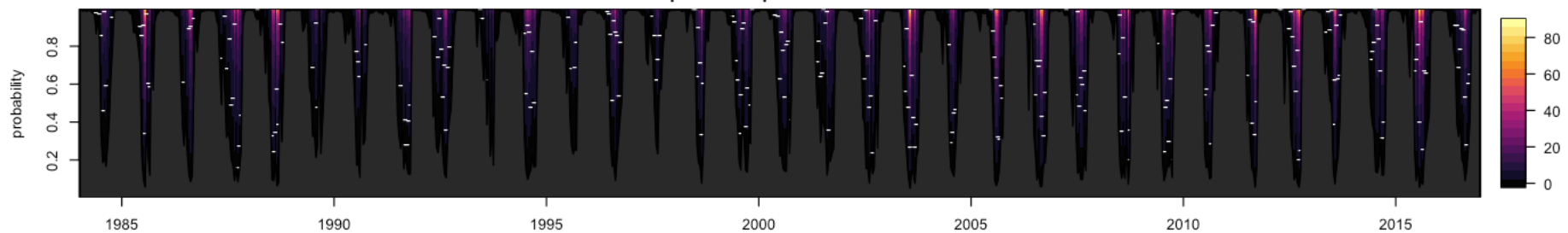
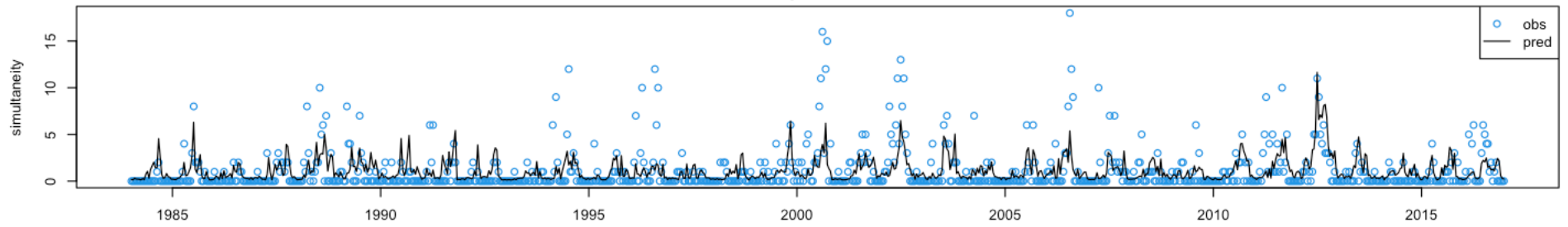
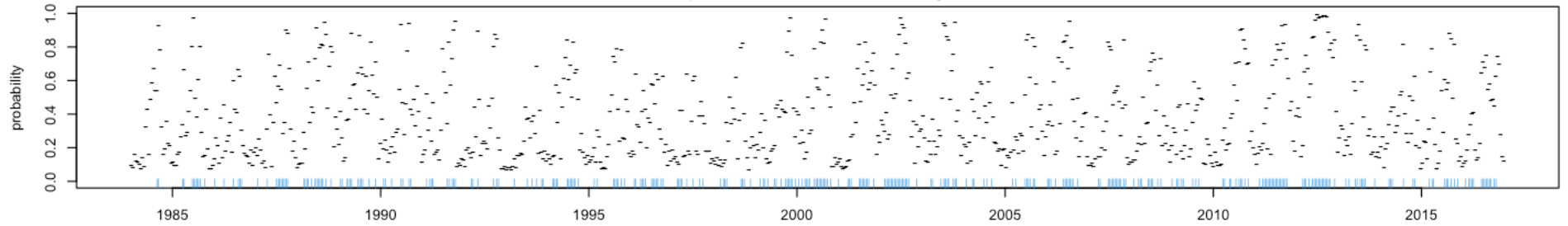


Figure S4. Same as figure S1, but for the Northwest (NW) GACC.

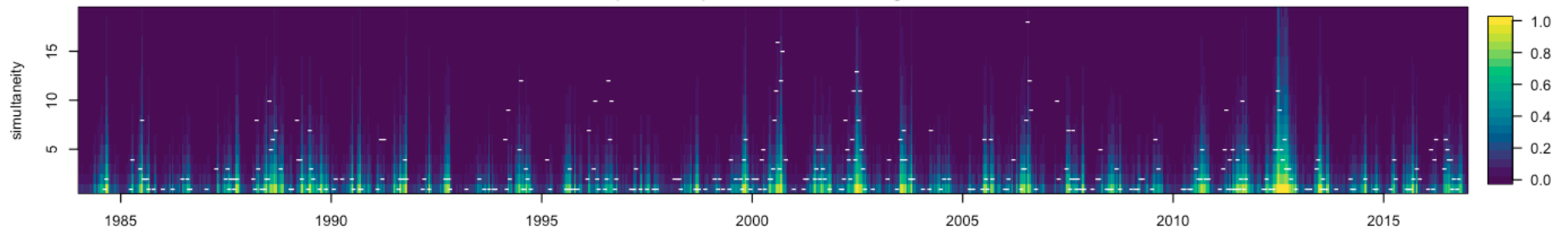
cfwi.NAM-22i.RM.amean.2wk-runavg
observed vs predicted sim. level



predicted nonzero simultaneity



predicted prob of sim. level or higher



predicted quantile of CDF

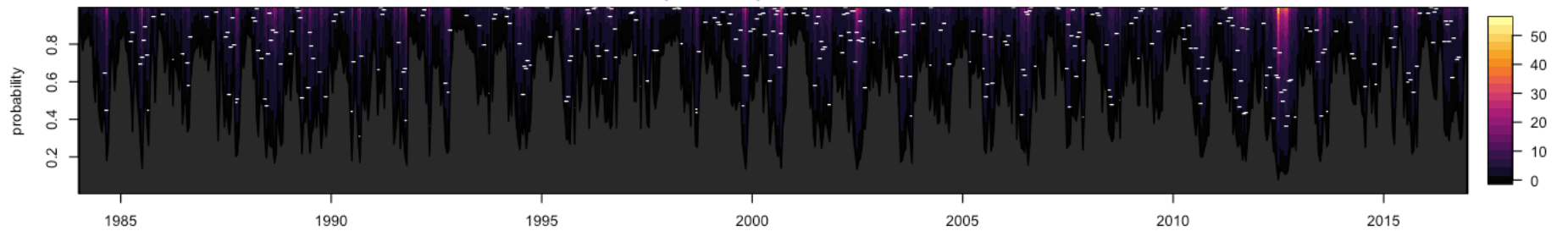
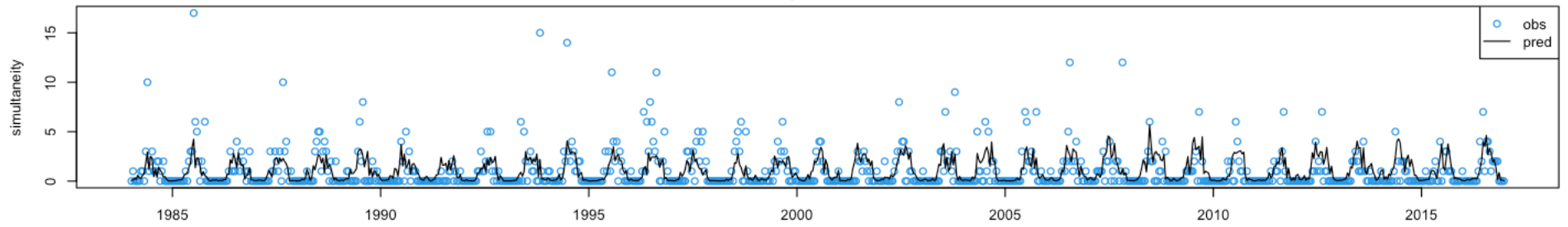
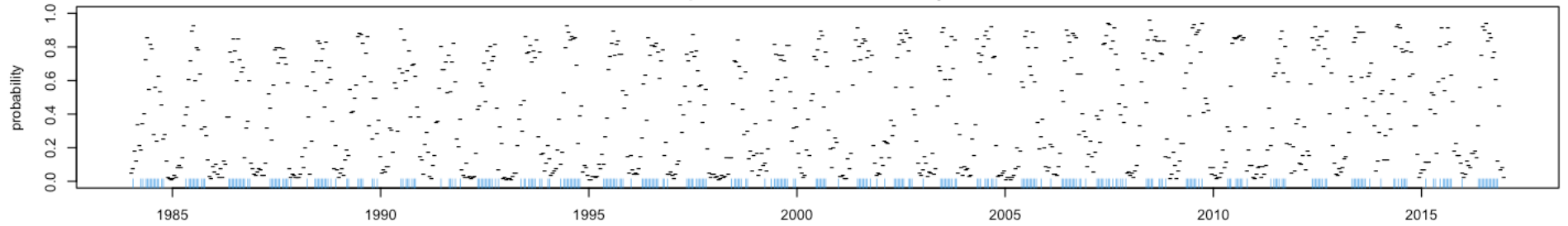


Figure S5. Same as figure S1, but for the Rocky Mountain (RM) GACC.

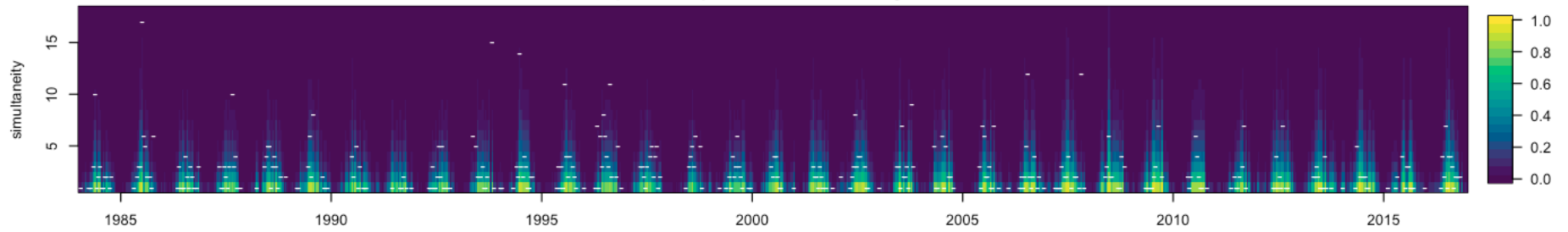
cfwi.NAM-22i.SC.amean.2wk-runavg
observed vs predicted sim. level



predicted nonzero simultaneity



predicted prob of sim. level or higher



predicted quantile of CDF

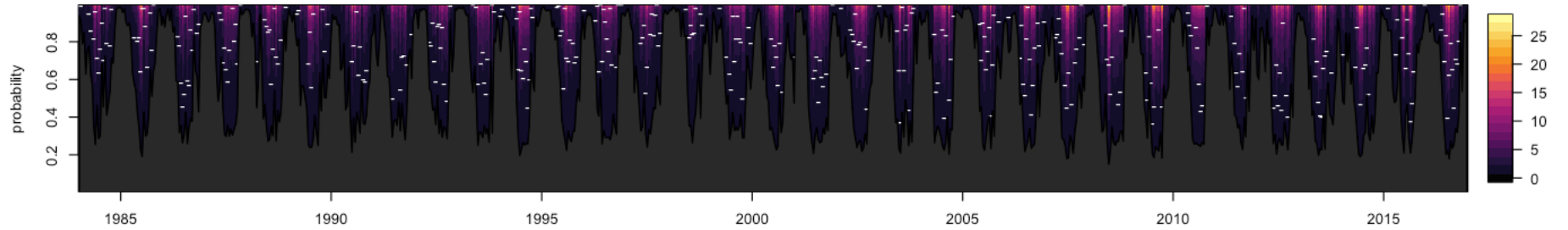
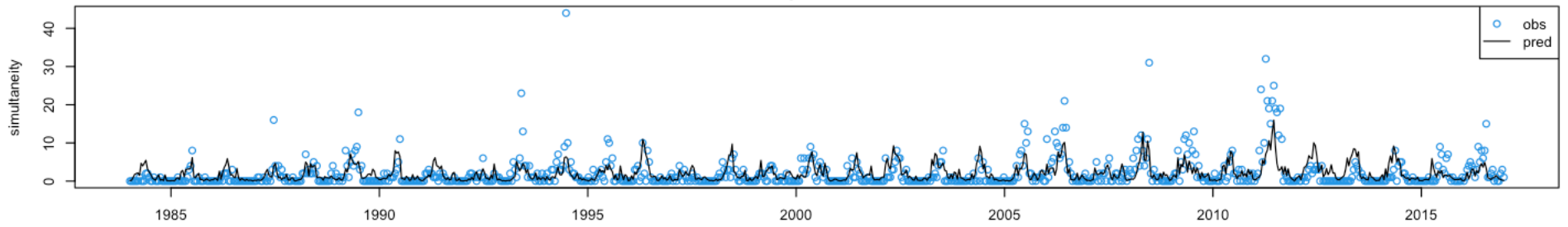


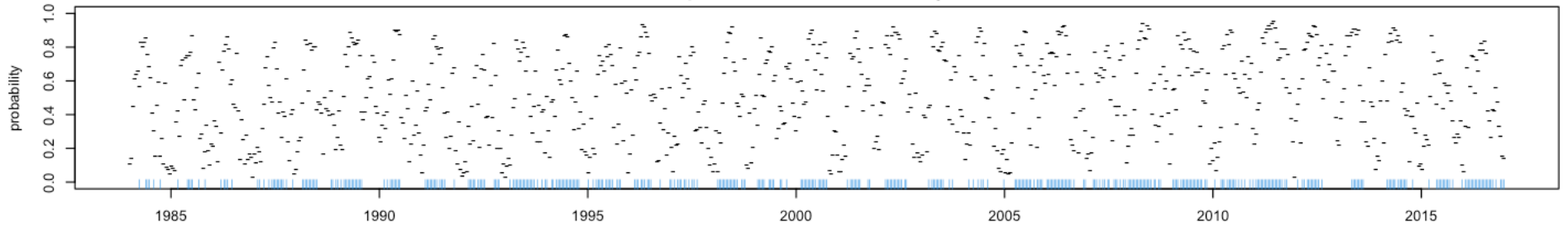
Figure S6. Same as figure S1, but for the Southern California (SC) GACC.

fm100.NAM-22i.SW.amean.2wk-runavg

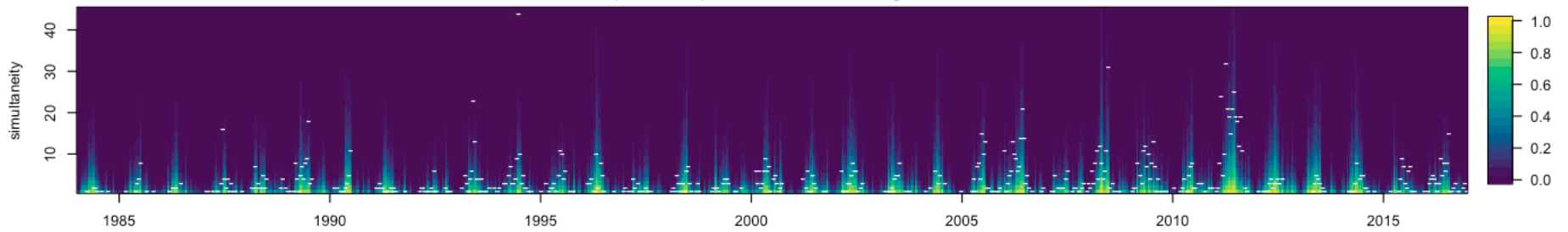
observed vs predicted sim. level



predicted nonzero simultaneity



predicted prob of sim. level or higher



predicted quantile of CDF

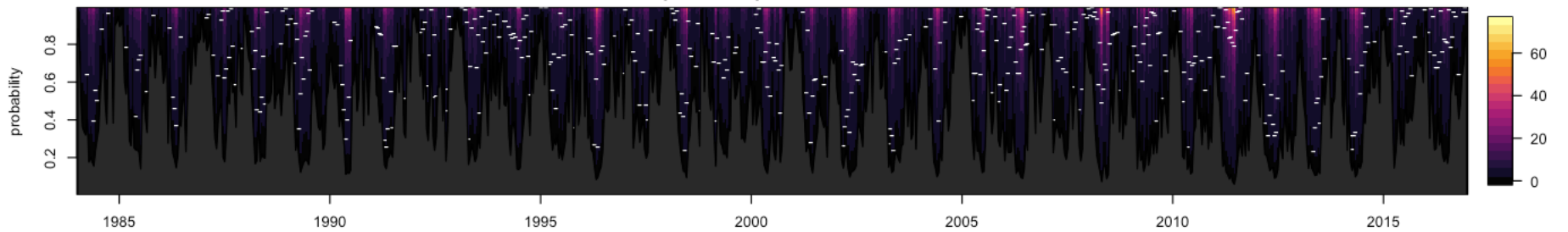


Figure S7. Same as figure S1, but for the Southwest (SW) GACC.

Projected seasonality of simultaneity

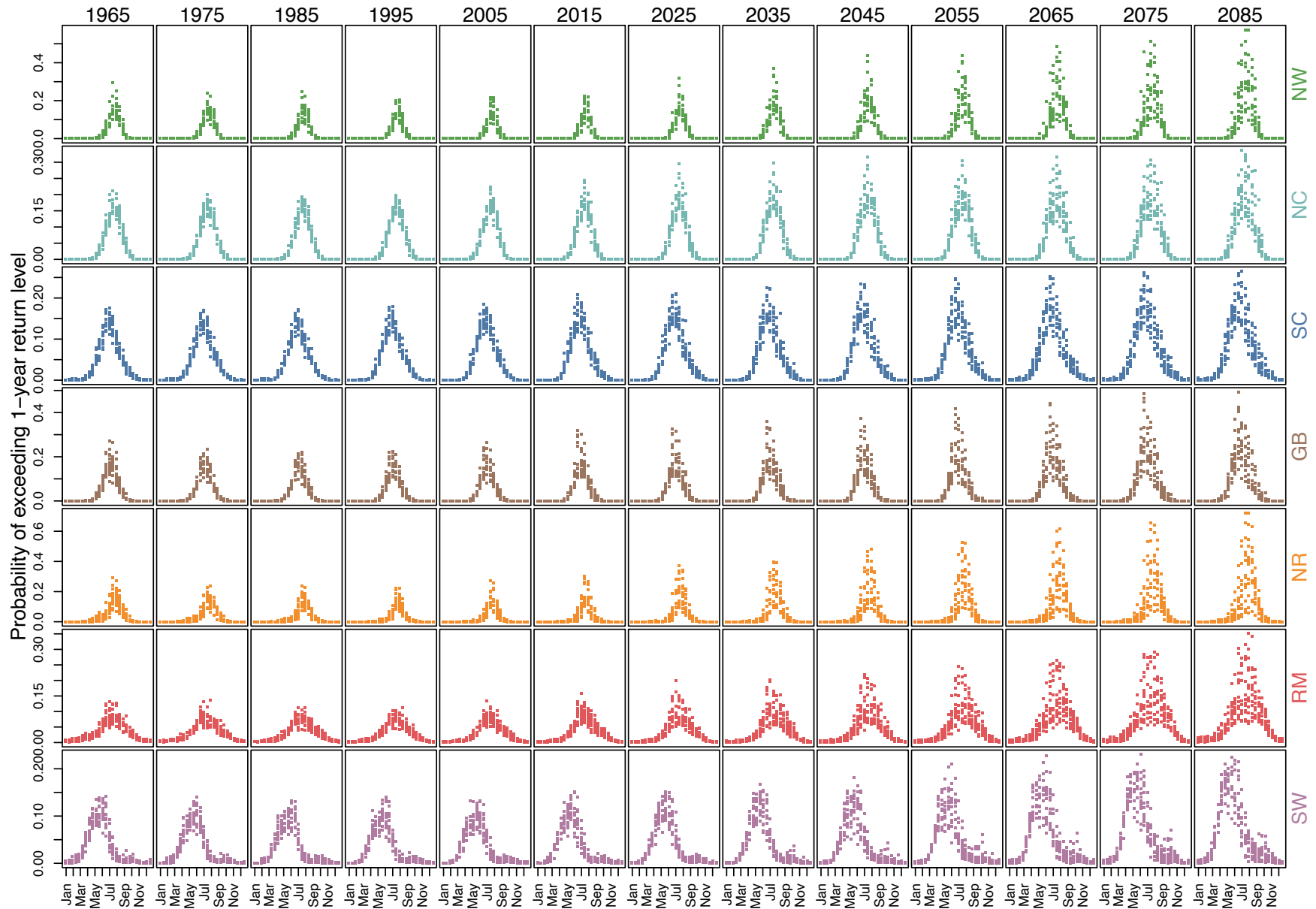


Figure S8. Projected evolution of seasonality of simultaneity. Each panel shows the seasonal variation in simultaneity on a biweekly basis by GACC (rows) and 30-year window (columns) for the 13 RCMs.

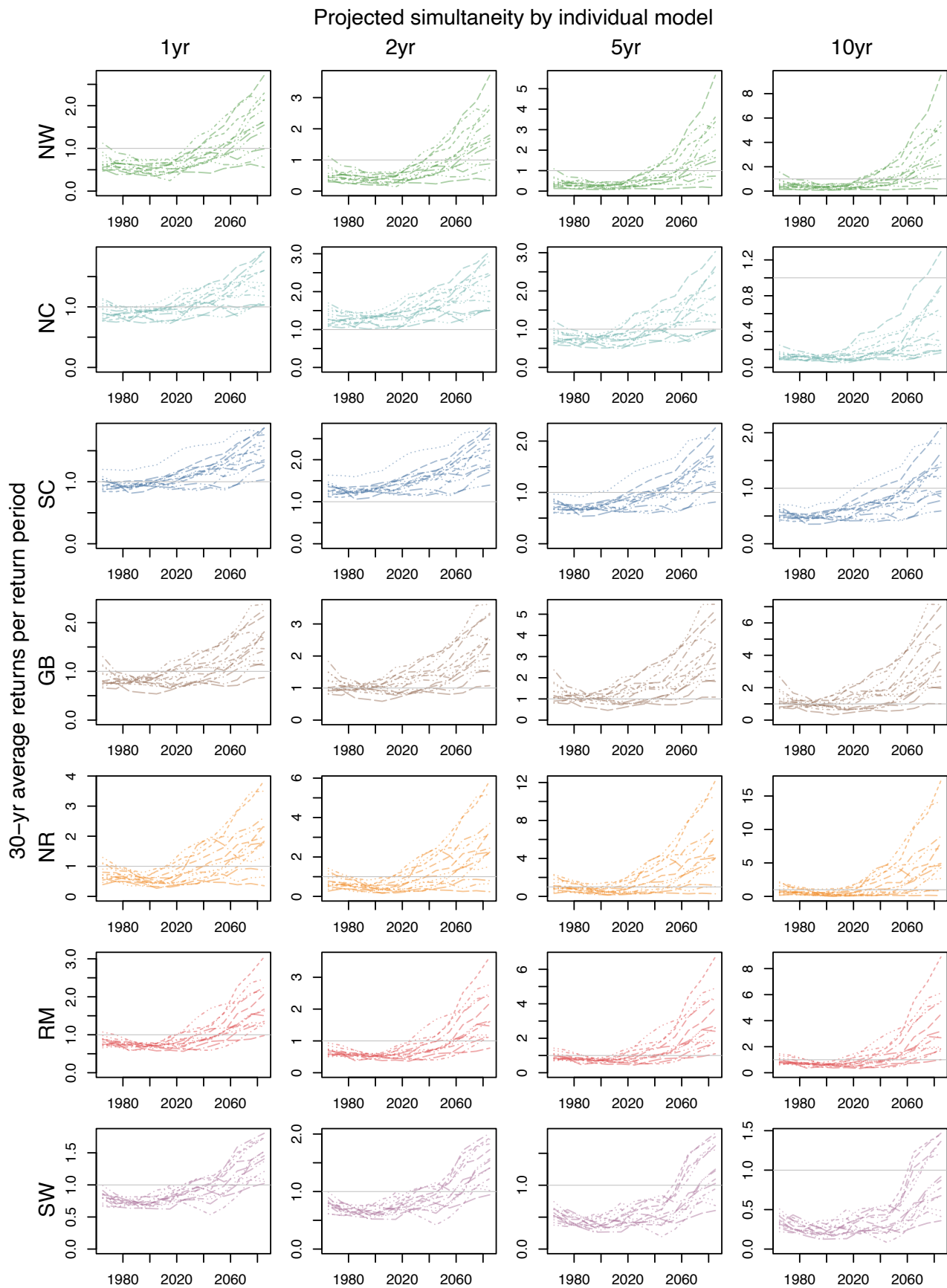


Figure S9. Evolution of simultaneity (normalized to returns per return period) projected by each of the 13 RCM simulations. Each panel shows the annual average returns per return period for GACC (rows) and return period (columns) for rolling 30-year average windows.