Supplementary materials for

Identifying source of predictability for vapor pressure deficit variability in the southwestern United States

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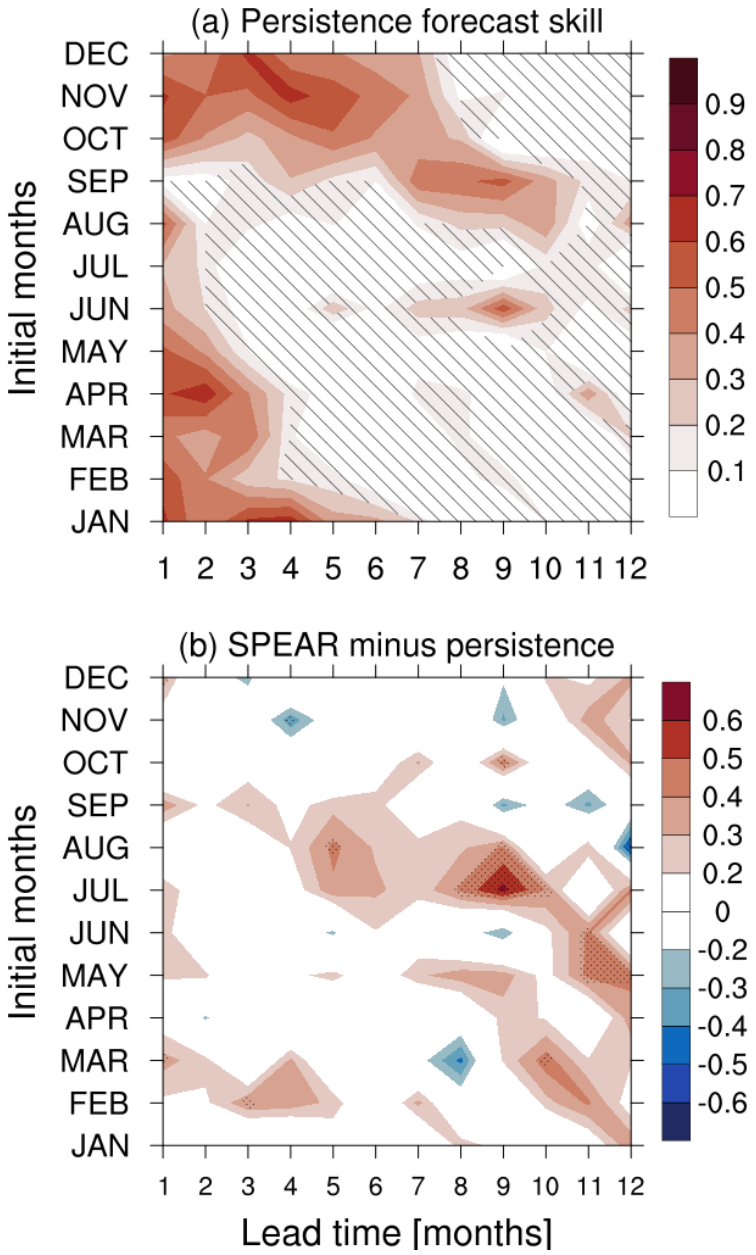
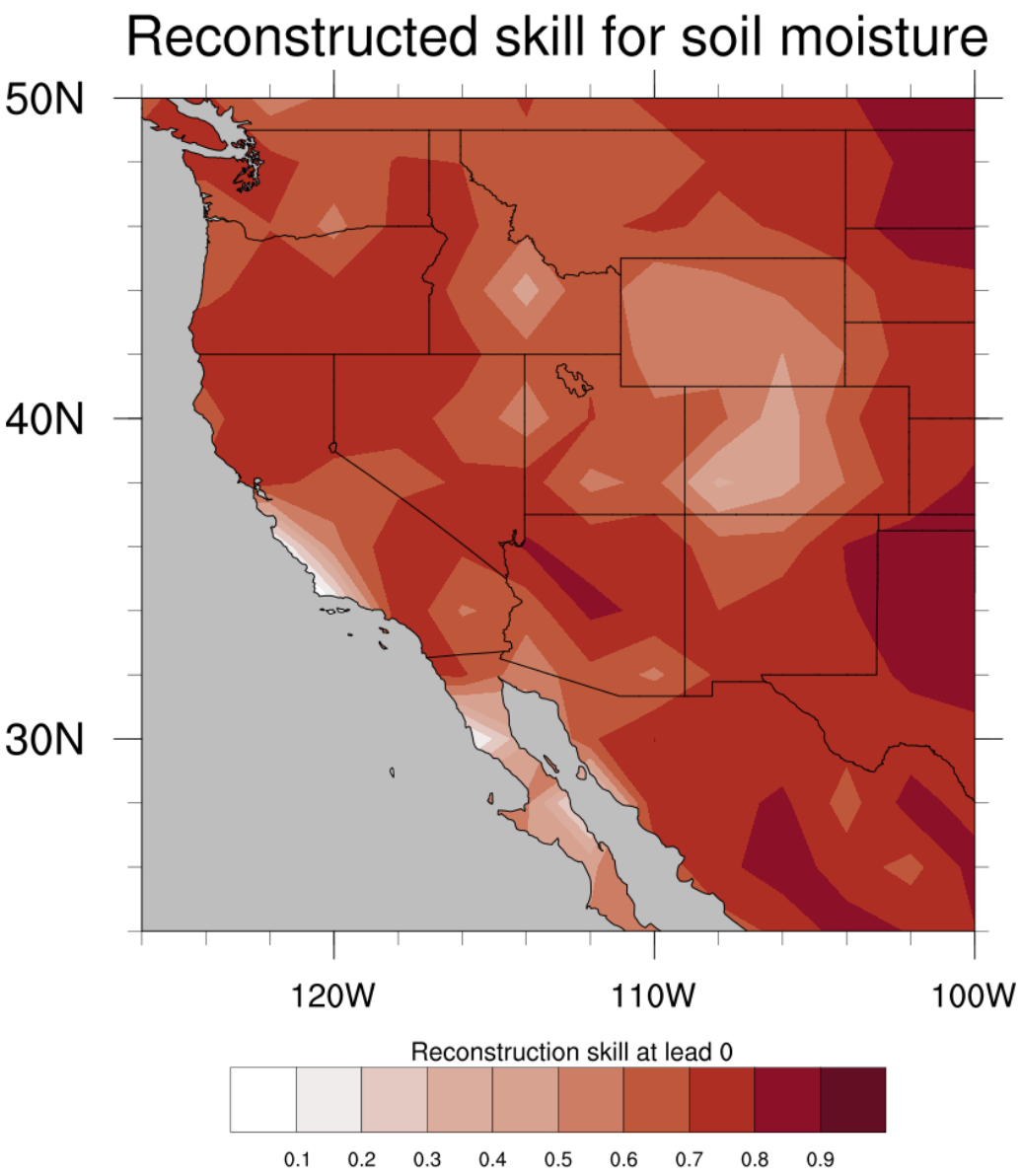
Supplementary Table 1: The 12 CMIP6 pre-industrial control simulations used in this study.

Model name	Length (years)	Period (YYYYMM)	Ensemble	Reference
BCC-CSM2-MR	600	185001-244912	r1i1p1f1	Wu et al., (2018)
CanESM5	1000	520101-620012	r1i1p1f1	Swart et al., (2019)
CESM2	1200	000101-120012	r1i1p1f1	Danabasoglu et al., (2020)
CESM2-WACCM	499	000101-049912	r1i1p1f1	Danabasoglu et al., (2020)
GFDL-CM4	500	015101-065012	r1i1p1f1	Held et al., (2019)
GFDL-ESM4	500	000101-050012	r1i1p1f1	Krasting et al., (2018)
GISS-E2-1-G	851	415001-500012	r1i1p1f1	Kelley et al., (2020)
GISS-E2-1-H	801	318001-398012	r1i1p1f1	Kelley et al., (2020)
MIROC6	800	320001-399912	r1i1p1f1	Tatebe et al., (2019)
MRI-ESM2-0	701	185001-255012	r1i1p1f1	Yukimoto et al., (2019)
SAM0-UNICON	700	000101-070012	r1i1p1f1	Park et al., (2019)
UKESM1-0-LL	750	196001-270912	r1i1p1f2	Sellar et al., (2019)



Supplementary Figure 1: **a)** Anomaly correlation (AC) skill for area-averaged VPD anomalies in the southwestern US as a function of initialization month (vertical axis) and forecast lead times up to 12 months (horizontal axis). AC skill is computed based on the entire 1992–2022 period using verification datasets from ERA5 reanalysis. Forecasts were generated from the persistence forecasting tool. **b**) AC skill difference between the SPEAR seasonal forecast system as illustrated in Fig. 1D in the text and the persistence forecasting tool. Hatching in **a** indicates correlation coefficients not statistically significant at the 95% significance level following Ref [11]. Stippling in **b** indicates correlation coefficients are statistically significant different at the 95% significance level.



Supplementary Figure 2: Reconstruction skill map of monthly depth-averaged soil moisture (SM) anomalies down to 100 centimeters at the initial month (lag=0) when SM model-analogs are selected. The SPEAR pre-industrial control simulation constitutes the model-analog library. The top 15 analogs from the SPEAR model are selected as the ensemble members.

References for supplementary materials

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