Increasing Resolution and Accuracy in Sub-Seasonal Forecasting through 3D U-Net: the Western US

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Table S1. Sub-variable list for each target; temperature (first row) and precipitation (second row). Sub-variable's order reflects the sensitivity, high to low.

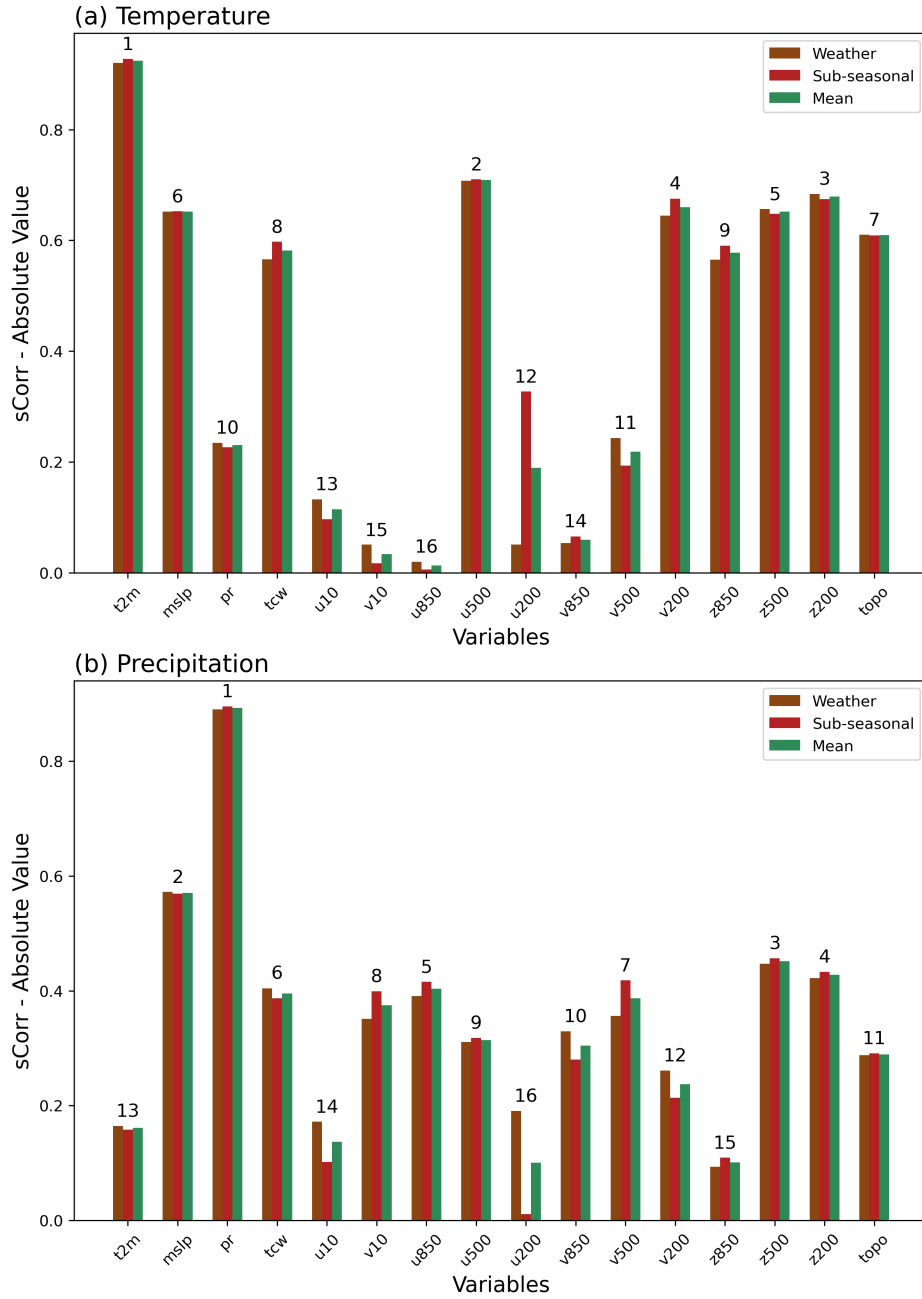| Target	Sub-variable
Temperature	t2m, u500, z200, v200, z500, mslp, topo, tcw
Precipitation	pr, mslp, z500, z200, u850, tcw, v500, v10

Figure S1. Absolute spatial correlation values between various meteorological variables and (a) temperature and (b) precipitation for weather and sub-seasonal timescales in the Western U.S. Variables are ranked by their mean correlation across both timescales, with rankings shown above each bar. The top 8 variables for each target variable were selected for use in the 3D U-Net model.
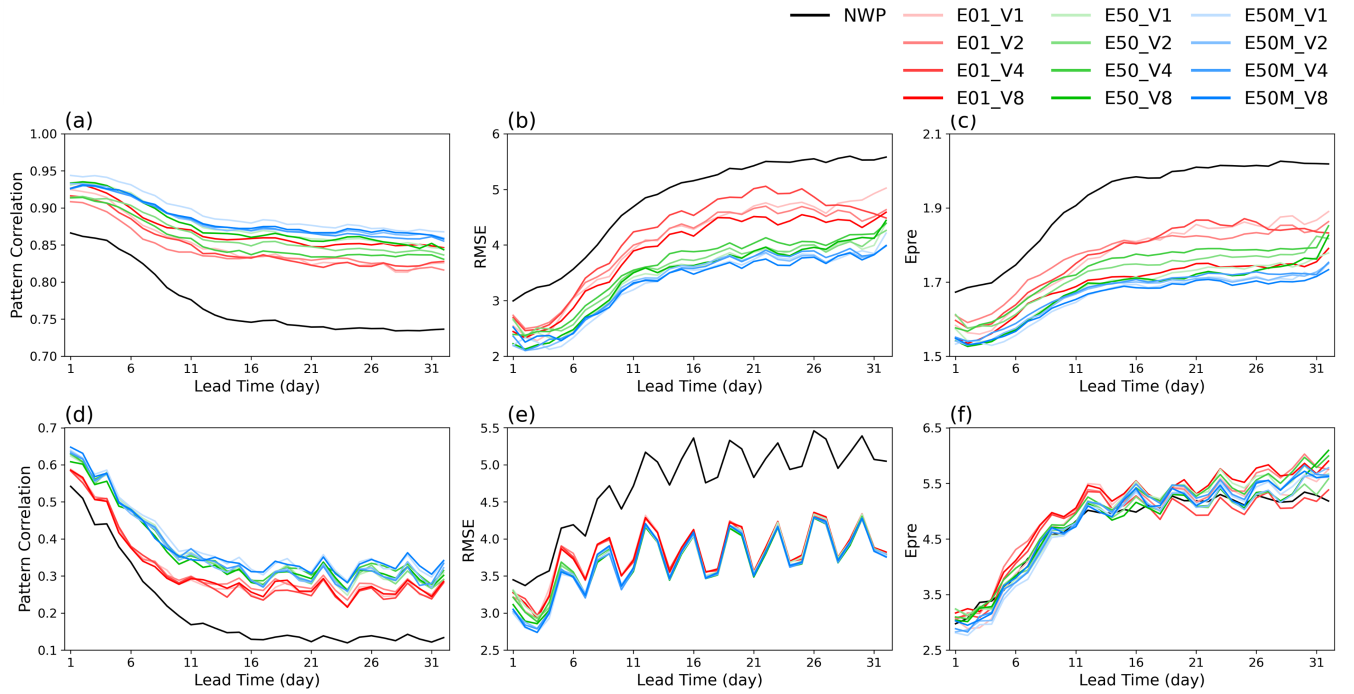
Figure S2. Ensemble sensitivity benchmark scores for the Western U.S., comparing NWP and 3D U-Net models with varying input variables (V1, V2, V4, V8) and ensemble configurations (E01, E50, E50M) for temperature (a-c) and precipitation (d-f) forecasts over 32 days. Metrics shown are (a, d) pattern correlation, (b, e) RMSE, and (c, f) E_{pre}.
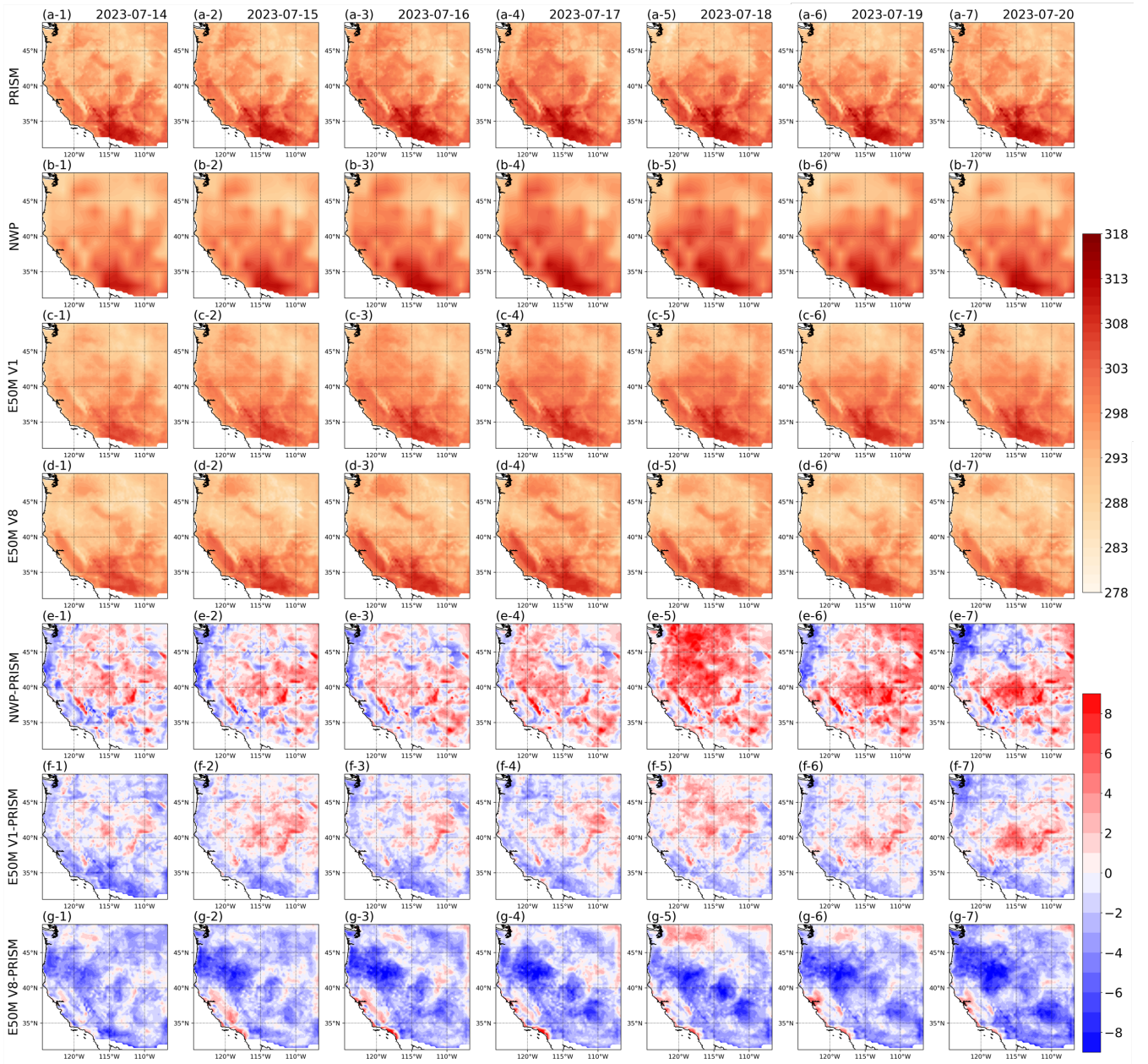
Figure S3. Daily temperature forecasts for the Western U.S. from July 14 to July 20, 2023, with initial condition on July 13. Rows represent (a) PRISM observations, (b) NWP forecasts, (c) 3D U-Net E50M V1 predictions, (d) 3D U-Net E50M V8 predictions, (e) differences between NWP and PRISM, (f) differences between E50M V1 and PRISM, and (g) differences between E50M V8 and PRISM. Columns show forecasts for date on the top.
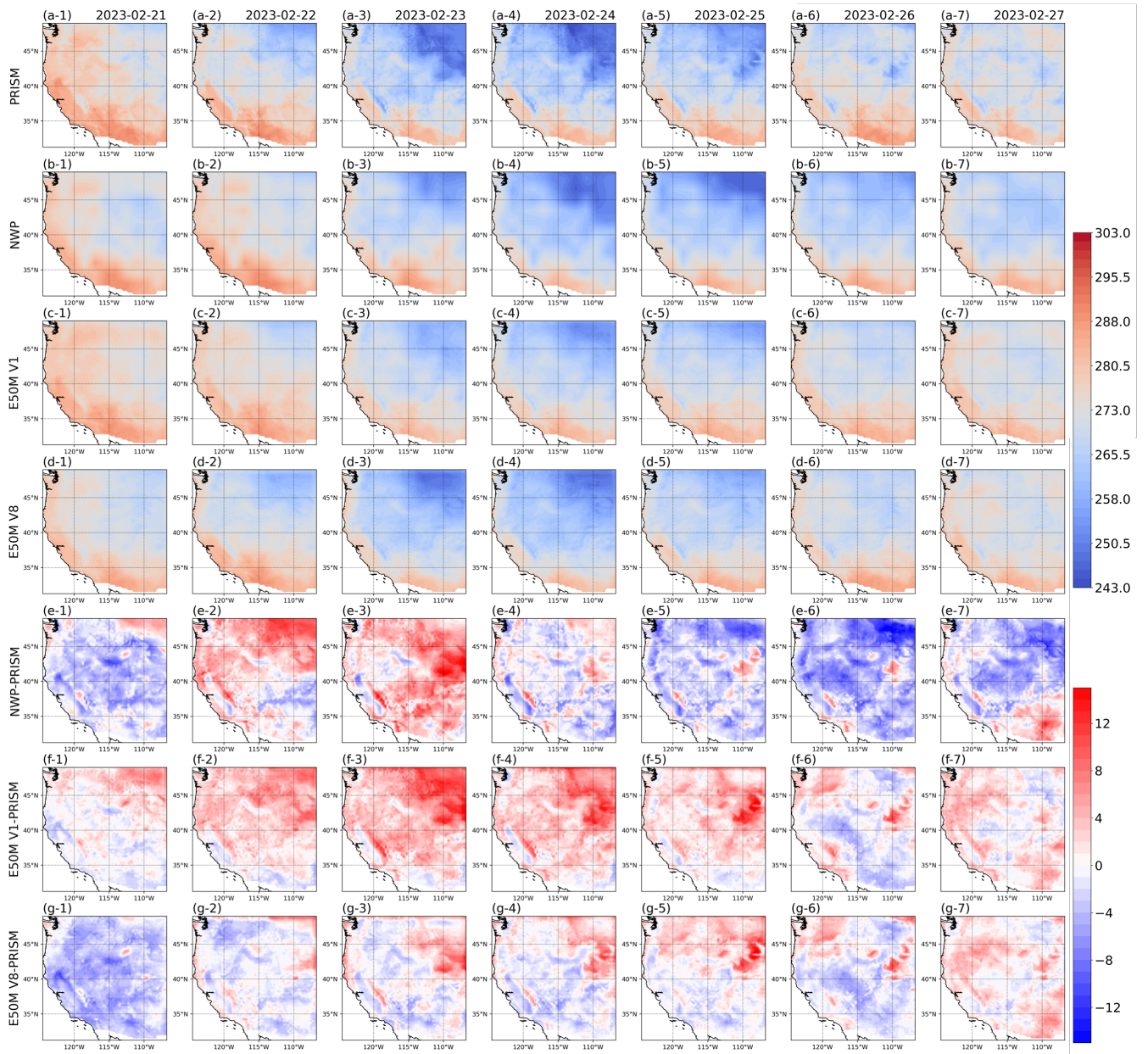
Figure S4. Daily temperature forecasts for the Western U.S. from February 21 to February 27, 2023, with initial condition on February 20, 2023. Layout is the same as Figure S3.