Supplementary material of the manuscript titled: ¨A Regional High-resolution AI Weather Model for the Prediction of Atmospheric Rivers and Extreme Precipitation¨

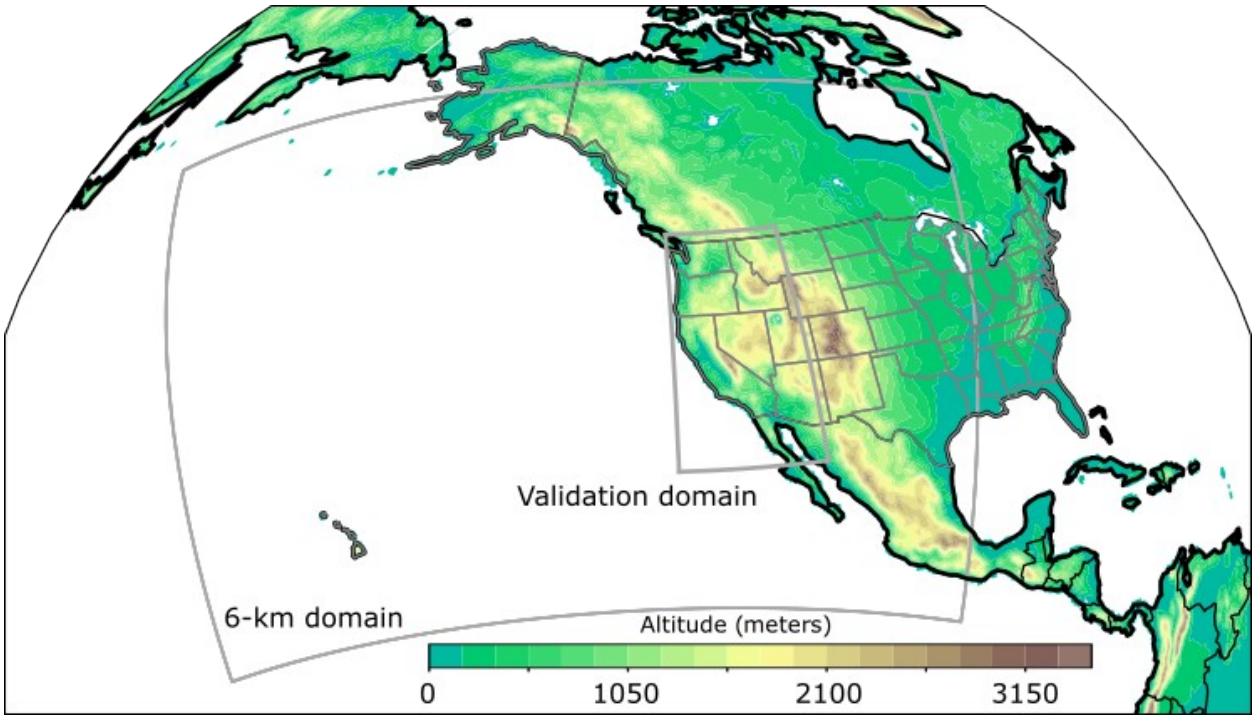

Figure S1. Relevant domains for AI weather model development over the Western United States. **a)** Study domain with altitude in meters. The outer and inner gray boxes represent the 6-km domain and the validation domain, respectively. The following statistics are computed over the validation domain: **b)** mean 24-hour accumulated precipitation, **c)** frequency of rainy days ($\geq$ 0.25 mm), **d)** percentage of precipitation associated with atmospheric rivers (ARs) relative to total precipitation, **e)** 50th percentile, **f)** 75th percentile, and **g)** 90th percentile of 24-hour accumulated precipitation. Values are based on data from the winters of 2020–2021, 2021–2022, and 2022–2023, with each winter spanning from November 1st to March 31st. The number in each panel represents the mean value.

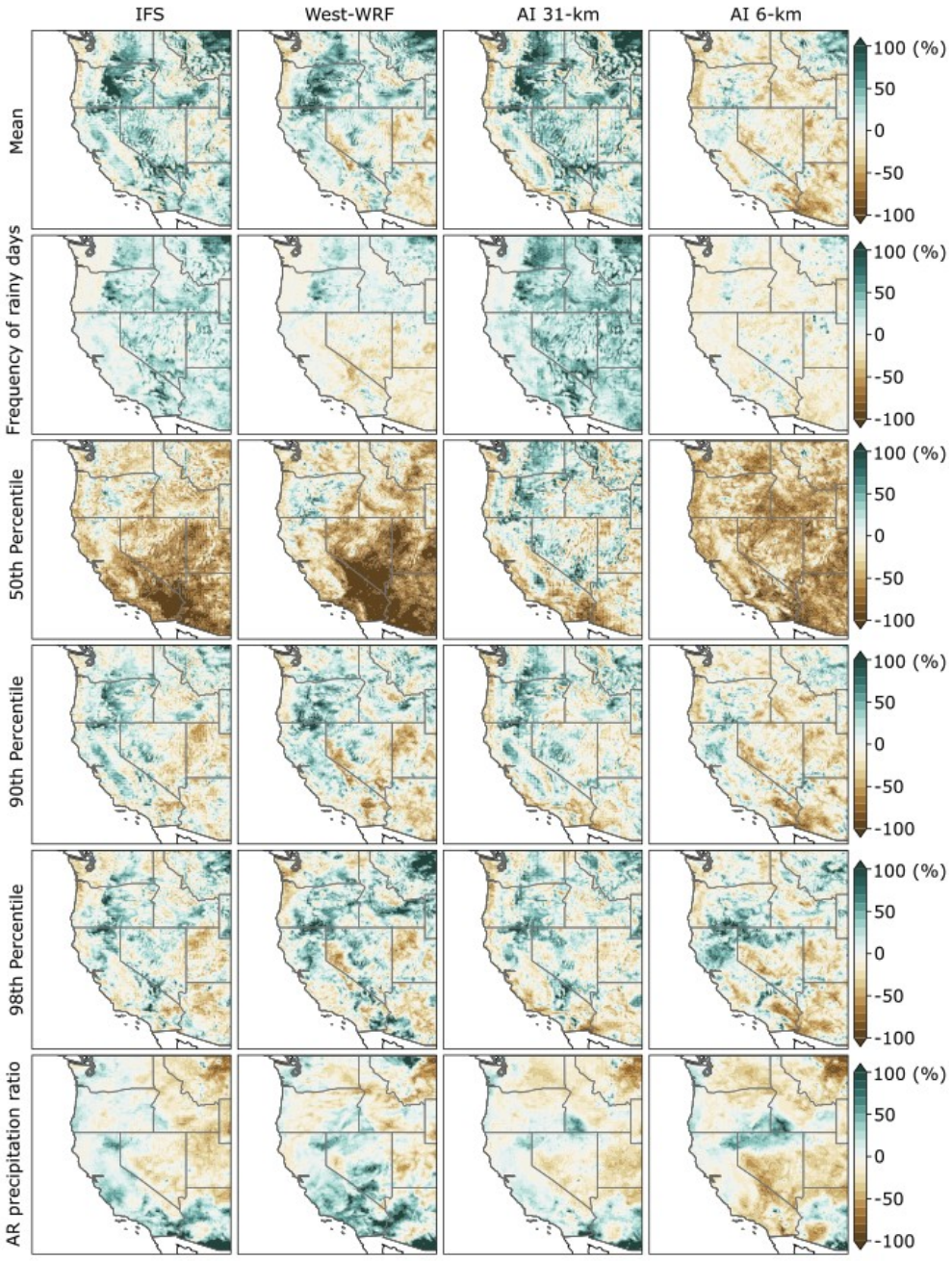

Figure S2. Relative bias of key daily precipitation statistics from dynamical and AI models (both global and regional) over the validation domain at a 120-hour forecast lead time (i.e., accumulated precipitation in the 96-120 hour lead time interval) during the test period. The fields are computed relative to the observed field, shown in column 1 of Figure 1.

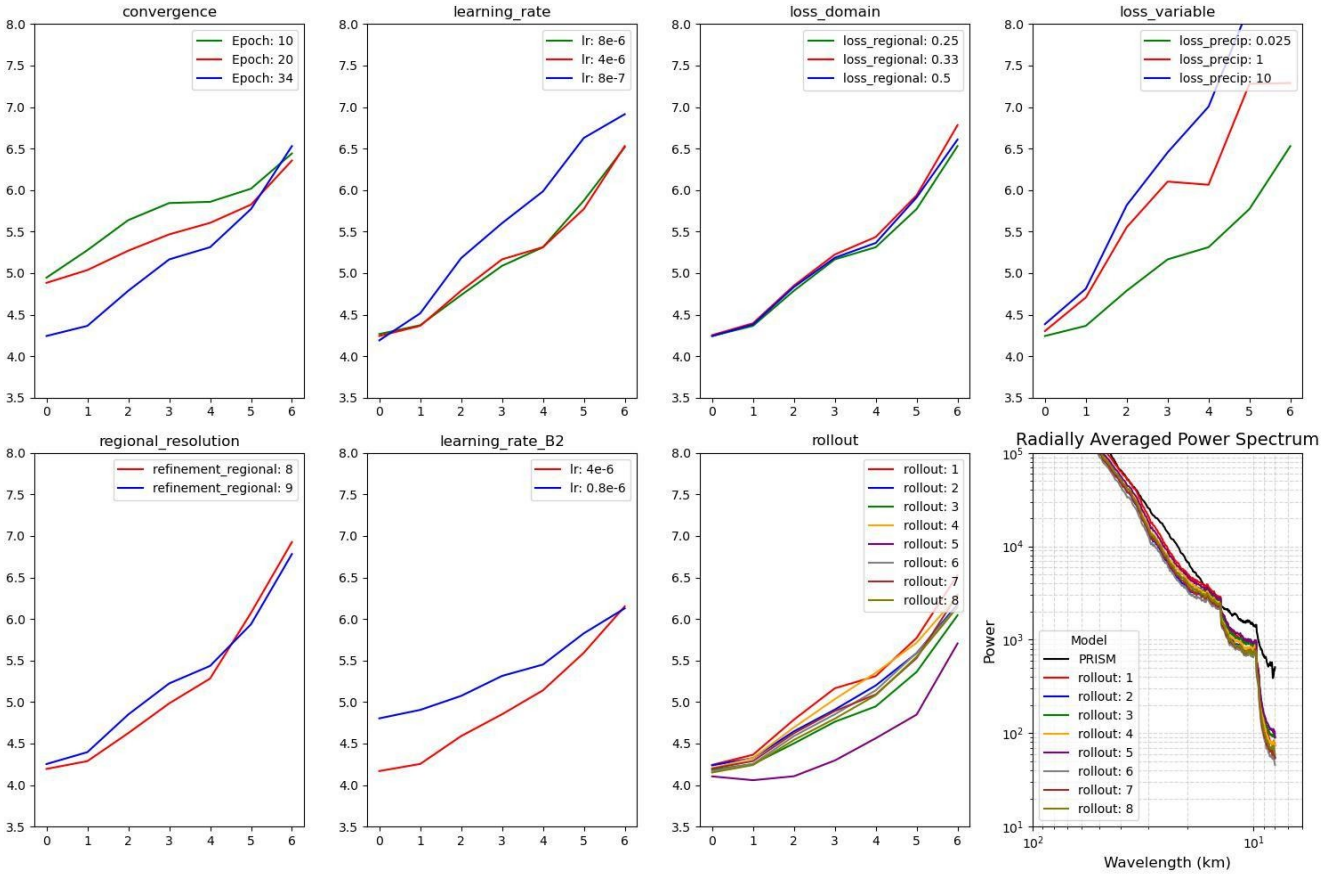

Figure S3. Sensitivity of the 6-km AI forecast error to certain hyperparameters: a) number of epochs, b) learning rate in stage B1, c) scaling of the regional domain in the loss function, d) scaling of precipitation in the loss function, e) the number of refinements of the icosahedron over the regional domain, f) learning rate in stage B2, g) rollout and h) RAPS across different rollouts.