Supplement of Hydrol. Earth Syst. Sci., 29, 2023–2042, 2025
https://doi.org/10.5194/hess-29-2023-2025-supplement
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Hydrology and Earth System Sciences
Open Access
EGU

Supplement of

Deep-learning-based sub-seasonal precipitation and streamflow ensemble forecasting over the source region of the Yangtze River

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S1. Evaluation of temperature forecasts

By applying the delta method to the raw ECMWF forecasts, the mean absolute bias of temperature forecasts can be reduced by 0.49℃ averaged over all lead times. In particular, delta improves the forecasts more remarkably (by 0.93℃ and 0.67℃) for lead times of 1-5 days and 6-10 days, suggesting that delta method is able to effectively reduce the bias of sub-seasonal ECMWF temperature forecasts.

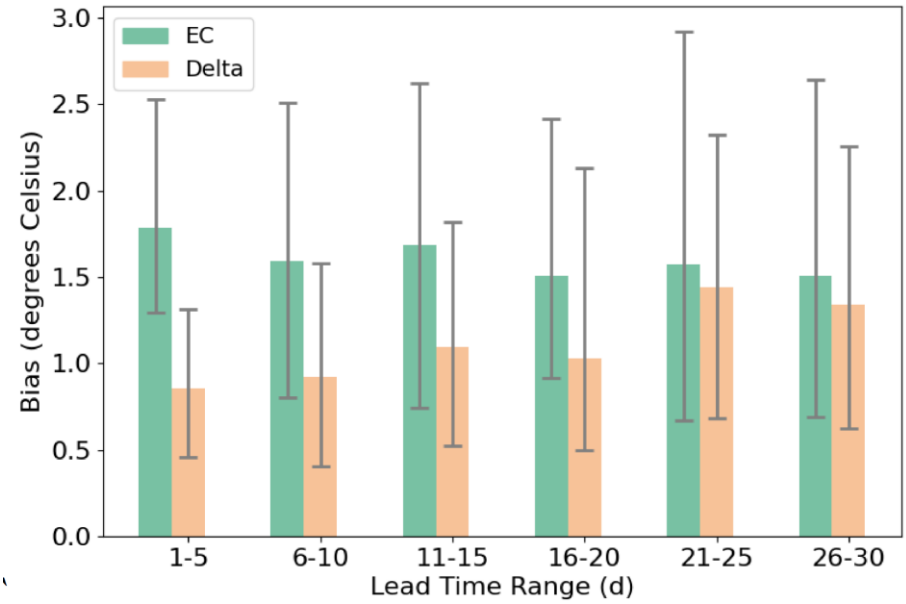

Figure S1. The mean absolute bias of temperature forecasts across lead times of 1-30 days. Error bar represents the 25th-75th percentile interval.

Table S1. The hyperparameters in loss function of CNNs

Lead time	*a*	*b*
0~7 days	2	0.4
8~15 days	2	0.8
16~23 days	2	1.5
24-30 days	2	2

Table S2. The hyperparameters of hybrid hydrologic model

Hyperparameters	Value	Descriptions
Learning_rate	Epoch 0-30: 1e-2 Epoch 31-40: 5e-3 Epoch 41-50: 1e-3	Learning rate
Output_dropout	0.22	Dropout applied to the output of the LSTM
Seq_length	177	Length of input sequence
Hidden_size	21	Number of neurons in the hidden layer
initial_forget_bias	3	Initial value of the forget gate bias