Article

Improved the Characterization of Flood Monitoring Based on Reconstructed Daily GRACE Solutions over the Haihe River Basin

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Supplementary Figures show the statistical distribution characteristics of the data used in the paper, and the outliers in precipitation data are caused by extreme rainfall, which is responsible for the flood events in the Haihe River Basin.

Supplementary Tables highlight the superiority of CN05.1-CN05.1 among ten kinds of reconstructed results. Table S1 and Table S2 display the CC, NSE as well as RMSE between reconstructed TWSA and GRACE TWSA and daily TWSA products, respectively. In addition, the uncertainty is shown in Table S3 among reconstructed TWSA.
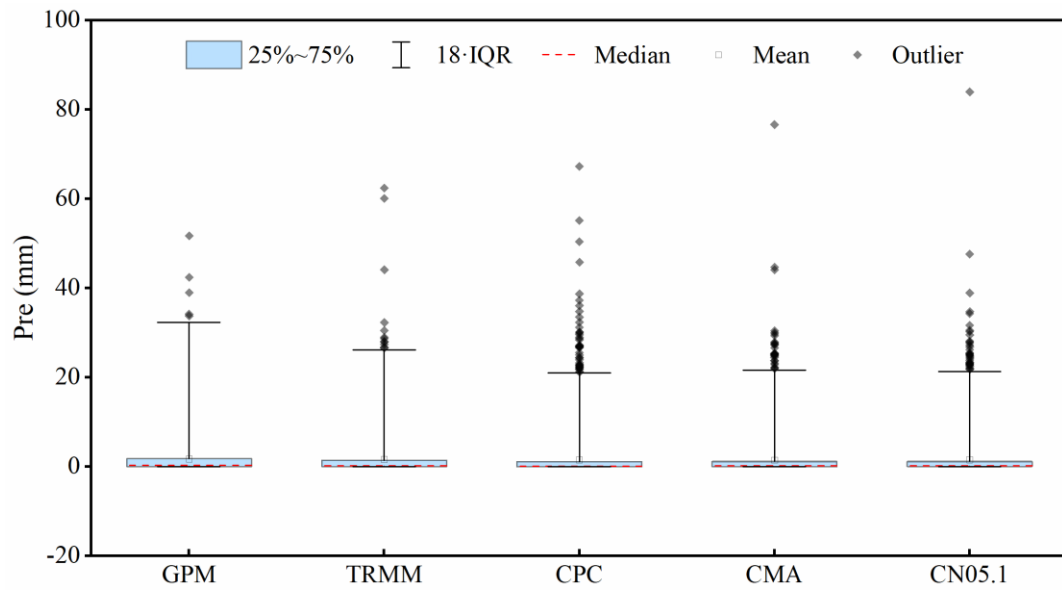
Figure S1. Statistical distribution of different rainfall products in Haihe River Basin from January 1, 2004 to December 31, 2021.
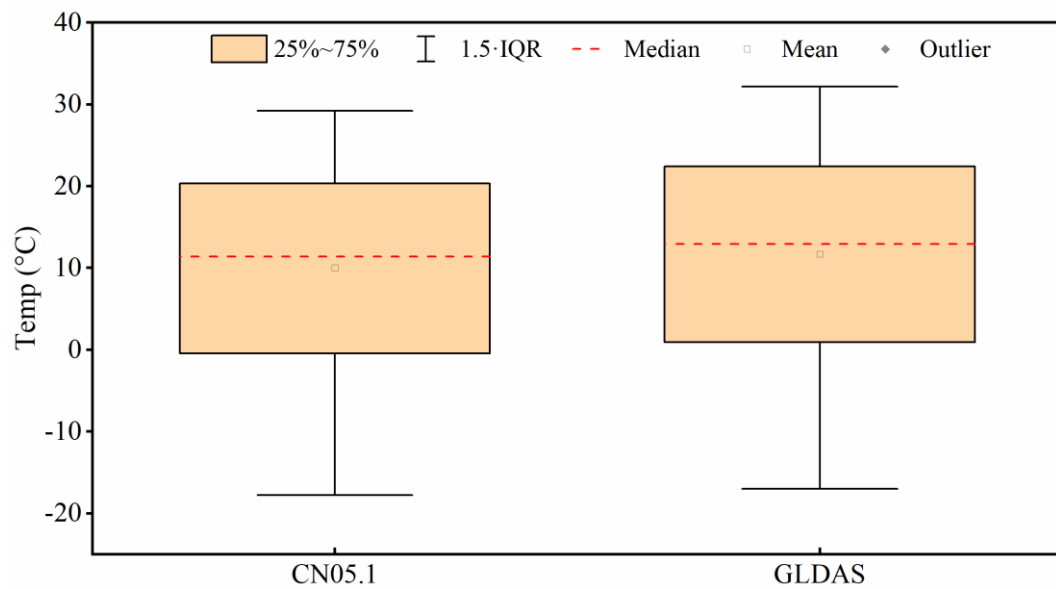

Figure S2. Statistical distribution of the temperature from CN05.1 and GLDAS in the Haihe River Basin.
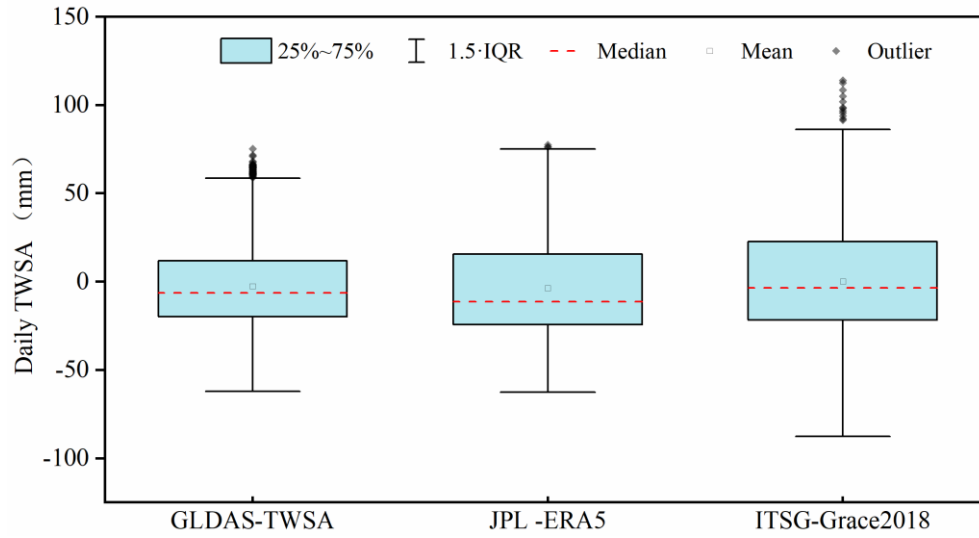
Figure S3. Statistical distribution of the daily TWSA products in the Haihe River Basin.

Table S1. CC, NSE and RMSE values between reconstructed monthly TWSA$_{total}$ and GRACE TWSA.

GRACE TWSA	CC	NSE	RMSE (mm)
GLDAS-GPM	0.97	0.94	23.36
GLDAS-TRMM	0.98	0.96	18.79
GLDAS-CPC	0.98	0.96	20.03
GLDAS-CMA	0.98	0.95	20.60
GLDAS-CN05.1	0.98	0.96	18.52
CN05.1-GPM	0.97	0.93	24.74
CN05.1-TRMM	0.98	0.96	18.80
CN05.1-CPC	0.98	0.96	20.11
CN05.1-CMA	0.98	0.95	20.69
CN05.1-CN05.1	0.98	0.96	18.50

Table S2. CC, NSE and RMSE values between reconstructed daily TWSA and Daily TWSA products at residual term.

Daily TWSA products	CC	NSE	RMSE (mm)
GLDAS-GPM	0.65 ~ 0.78	0.40 ~ 0.60	17.43 ~ 23.40
GLDAS-TRMM	0.74 ~ 0.84	0.50 ~ 0.75	13.08 ~ 20.86
GLDAS-CPC	0.67 ~ 0.86	0.41 ~ 0.57	13.38 ~ 23.17
GLDAS-CMA	0.72 ~ 0.79	0.49 ~ 0.60	18.26 ~ 20.53
GLDAS-CN05.1	0.74 ~ 0.90	0.50 ~ 0.80	11.80 ~ 20.91
CN05.1-GPM	0.65 ~ 0.75	0.42 ~ 0.58	17.80 ~ 23.40
CN05.1-TRMM	0.73 ~ 0.87	0.53 ~ 0.75	12.88 ~ 21.05
CN05.1-CPC	0.66 ~ 0.86	0.42 ~ 0.58	13.36 ~ 23.43
CN05.1-CMA	0.70 ~ 0.80	0.48 ~ 0.63	18.66 ~ 20.75
CN05.1-CN05.1	0.74 ~ 0.90	0.52 ~ 0.81	11.35 ~ 20.02

Table S3. Uncertainty among the reconstructed monthly TWSA$_{total}$ and daily TWSA$_{residual.}$

Uncertainly (mm)	Monthly TWSA$_{total}$	Daily TWSA$_{residual}$
GLDAS-GPM	11.93	12.43
GLDAS-TRMM	6.22	6.51
GLDAS-CPC	7.84	7.97
GLDAS-CMA	8.78	8.91
GLDAS-CN05.1	6.75	6.97
CN05.1-GPM	15.31	15.49
CN05.1-TRMM	6.45	6.85
CN05.1-CPC	8.08	8.24
CN05.1-CMA	9.05	9.12
CN05.1-CN05.1	6.17	6.26

* The CN05.1-CN05.1 is used as reference data.