



Supplement of

Deep learning of flood forecasting by considering interpretability and physical constraints

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Table S1 Performance of the four models for flood forecasting at different lead times for training.

Lead times/h	Models	NSE	KEG	R ²	RMSE	MAE
t+1	LSTM	0.977	0.964	0.980	16.14	7.14
	FTA-LSTM	0.986	0.972	0.987	12.32	5.19
	FTMA-LSTM	0.990	0.977	0.990	10.62	4.76
	PHY-FTMA-LSTM	0.992	0.984	0.992	9.65	4.03
t+2	LSTM	0.959	0.944	0.963	21.52	11.29
	FTA-LSTM	0.966	0.983	0.967	20.93	7.85
	FTMA-LSTM	0.969	0.960	0.972	18.54	8.80
	PHY-FTMA-LSTM	0.976	0.949	0.977	16.56	9.10
t+3	LSTM	0.943	0.945	0.948	25.09	13.91
	FTA-LSTM	0.949	0.943	0.952	22.05	11.02
	FTMA-LSTM	0.954	0.963	0.955	21.14	10.79
	PHY-FTMA-LSTM	0.958	0.955	0.963	20.01	11.45
t+4	LSTM	0.933	0.915	0.942	27.59	15.83
	FTA-LSTM	0.945	0.956	0.948	23.06	14.57
	FTMA-LSTM	0.948	0.953	0.949	22.12	13.75
	PHY-FTMA-LSTM	0.950	0.948	0.955	23.63	14.27
t+5	LSTM	0.929	0.917	0.929	29.16	18.91
	FTA-LSTM	0.930	0.942	0.931	27.99	16.37
	FTMA-LSTM	0.934	0.925	0.937	26.08	16.18
	PHY-FTMA-LSTM	0.937	0.931	0.937	25.58	15.19
t+6	LSTM	0.905	0.900	0.917	33.29	19.78
	FTA-LSTM	0.907	0.913	0.913	33.63	17.86
	FTMA-LSTM	0.917	0.926	0.919	30.59	15.83
	PHY-FTMA-LSTM	0.927	0.949	0.929	28.05	16.04

Table S2 Performance of the four models for flood forecasting at different lead times for validation.

Lead times/h	Models	NSE	KGE	R ²	RMSE	MAE
t+1	LSTM	0.977	0.953	0.979	15.84	8.45
	FTA-LSTM	0.985	0.969	0.985	12.65	6.28
	FTMA-LSTM	0.987	0.975	0.988	11.83	5.04
	PHY-FTMA-LSTM	0.988	0.984	0.988	11.50	4.26
t+2	LSTM	0.956	0.939	0.961	21.83	11.94
	FTA-LSTM	0.961	0.974	0.961	19.07	10.22
	FTMA-LSTM	0.967	0.950	0.970	18.83	9.52
	PHY-FTMA-LSTM	0.968	0.954	0.970	18.56	9.45
t+3	LSTM	0.934	0.928	0.938	27.09	14.93
	FTA-LSTM	0.942	0.927	0.943	25.07	13.49
	FTMA-LSTM	0.948	0.947	0.951	23.66	12.56
	PHY-FTMA-LSTM	0.952	0.945	0.955	21.57	12.74
t+4	LSTM	0.918	0.914	0.929	28.15	16.43
	FTA-LSTM	0.928	0.938	0.933	28.17	14.20
	FTMA-LSTM	0.931	0.946	0.933	28.44	16.24
	PHY-FTMA-LSTM	0.939	0.938	0.944	26.13	14.59
t+5	LSTM	0.898	0.890	0.900	36.43	22.83
	FTA-LSTM	0.905	0.911	0.910	32.54	19.36
	FTMA-LSTM	0.915	0.915	0.920	30.43	20.52
	PHY-FTMA-LSTM	0.918	0.930	0.919	30.33	16.65
t+6	LSTM	0.865	0.851	0.886	40.61	23.77
	FTA-LSTM	0.876	0.894	0.886	37.38	20.57
	FTMA-LSTM	0.883	0.889	0.896	36.52	20.65
	PHY-FTMA-LSTM	0.908	0.905	0.911	32.02	20.18