Supplementary materials include three supplementary figures and one supplementary table.

Figure S1: Location of study area.

Figure S2: Chicago design hyetographs for different return periods.

Figure S3: Spatial input data. (a) land cover (from 1985-2022 China 30-meter annual land cover dataset and its dynamics, sourced from zenodo.org), (b) soil classification (from the Harmonized World Soil Database v1.2 available on the FAO Soil Portal website).

Table S1: Statistical criteria for evaluation.

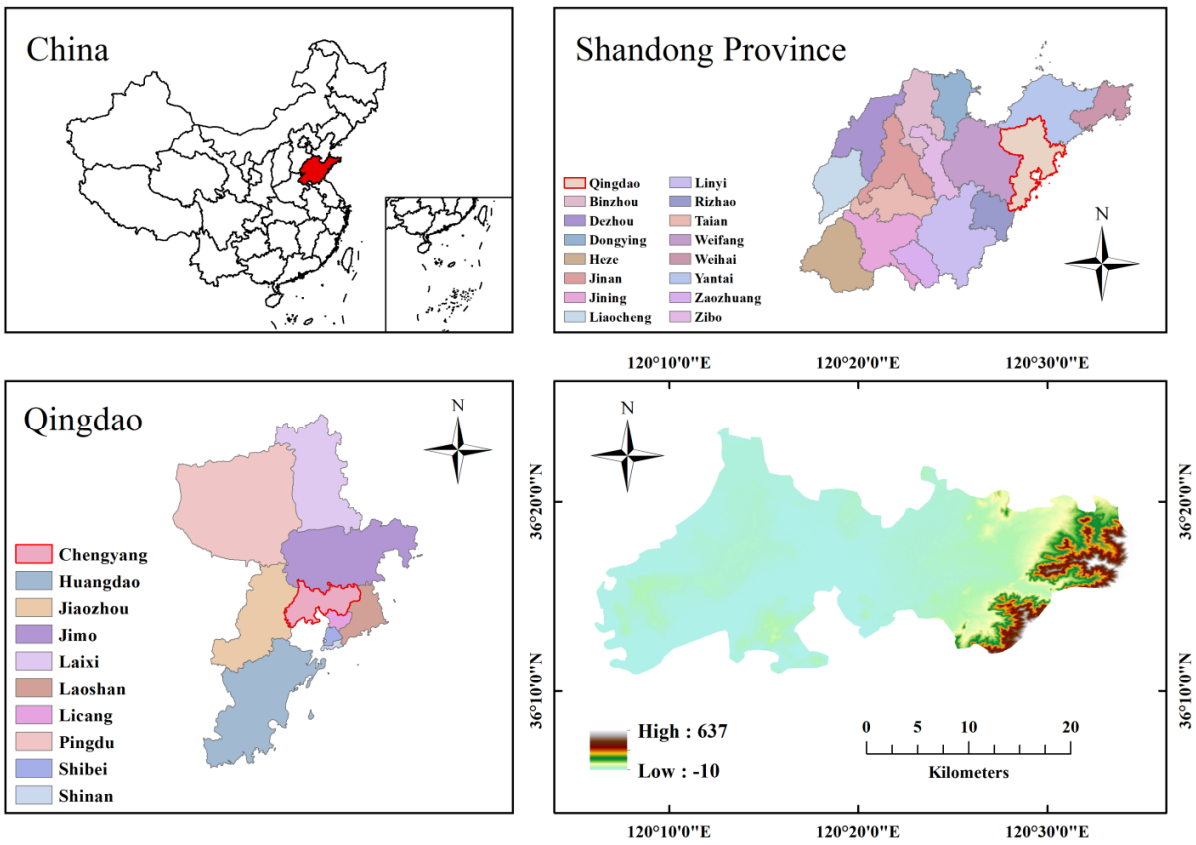


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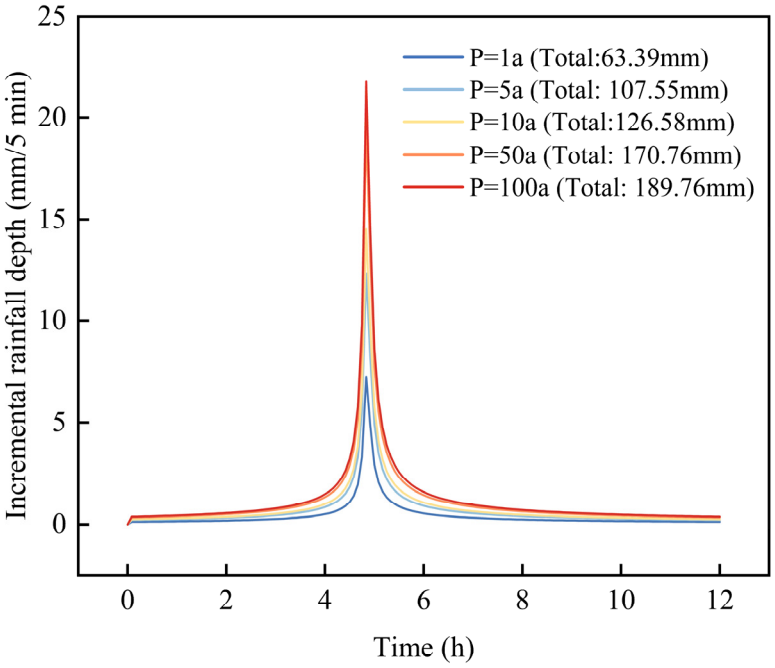


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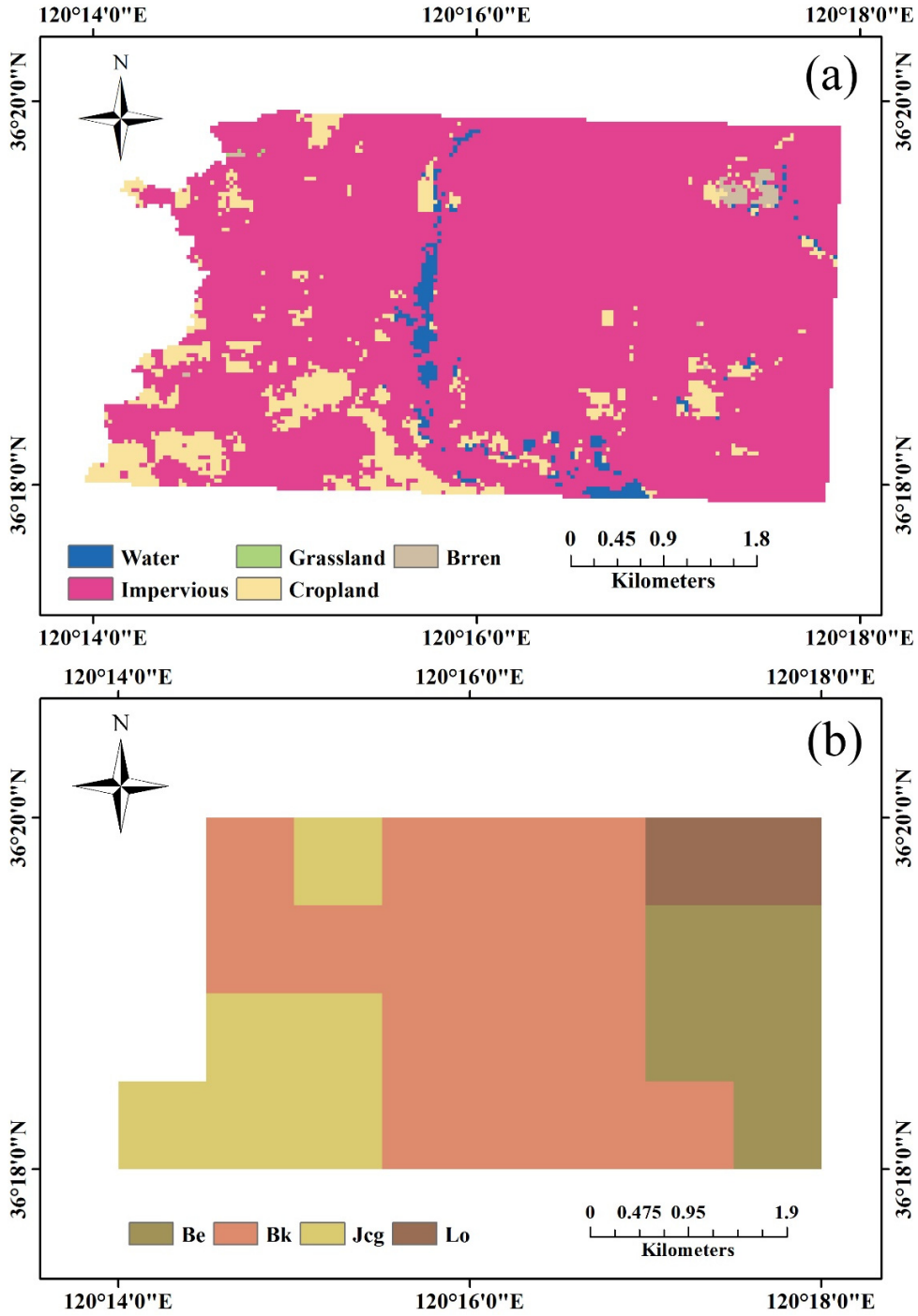


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Table S1: Statistical criteria for evaluation.

Evaluation criterion	Description
Coefficient of Determination (R^2 score)	R^2 measures the proportion of the variance in the dependent variable that is predictable from the independent variables.
Mean Squared Error (MSE)	MSE measures the average of the squares of the errors, indicating how close the fitted values are to the actual values.
Mean Absolute Error (MAE)	MAE measures the average magnitude of the errors in a set of predictions, without considering their direction.
Root Mean Squared Error (RMSE)	RMSE is the square root of the MSE and provides a measure of the differences between predicted and observed values.
Mean Absolute Percentage Error (MAPE)	MAPE measures the average magnitude of the errors as a percentage of the actual values.
Mean Squared Percentage Error (MSPE)	MSPE measures the average of the squared percentage errors.

Note: The metrics summarized for the ten Crossformer runs were evaluated on the standardized scale. Accordingly,R^2, MSE, MAE, and RMSE are dimensionless. For evaluations performed in the original units, MAE and RMSE retain the units of the evaluated variable, whereas MSE has squared units.