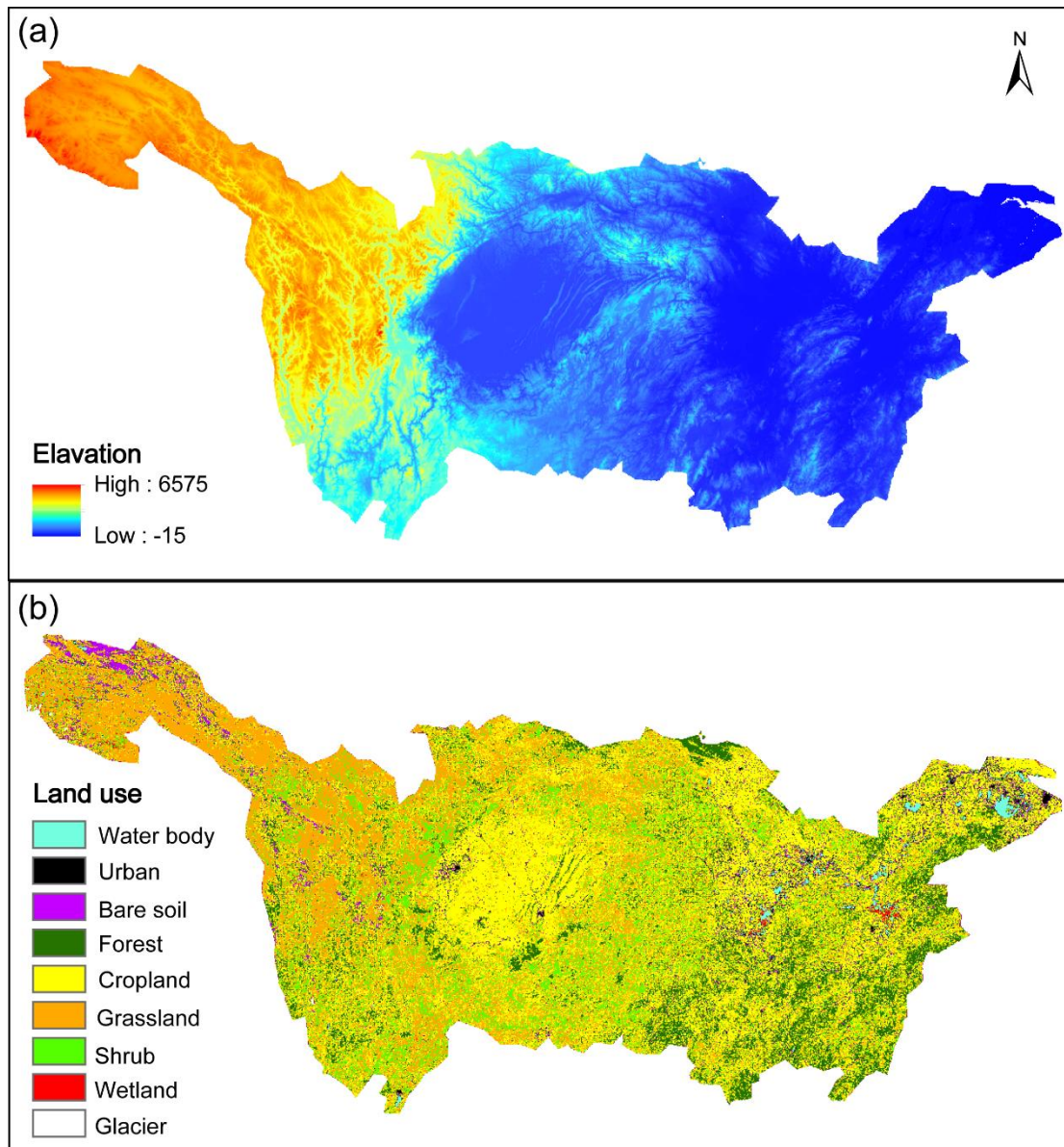
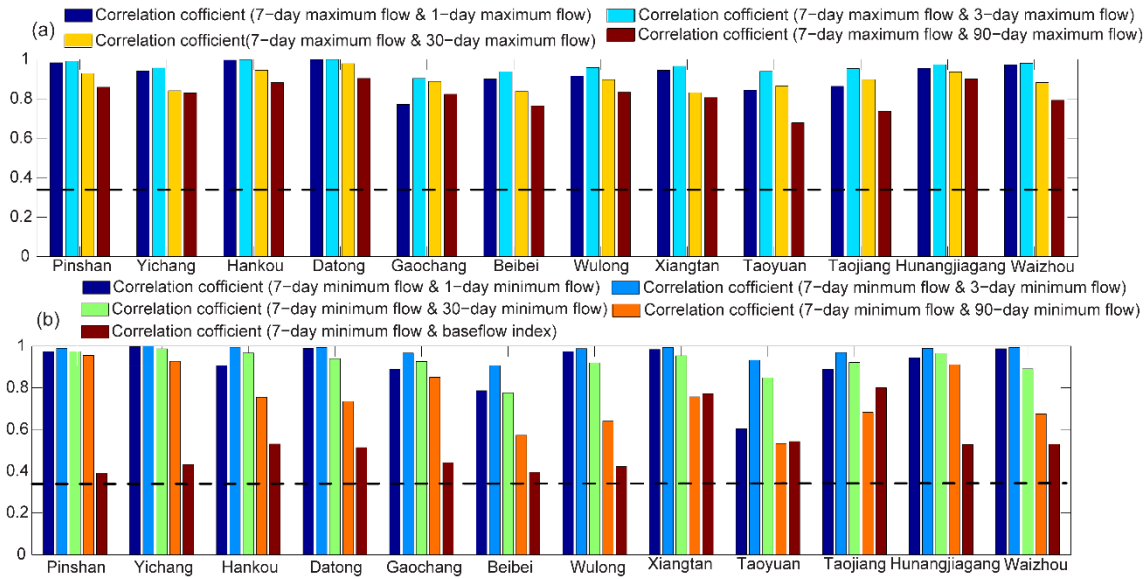
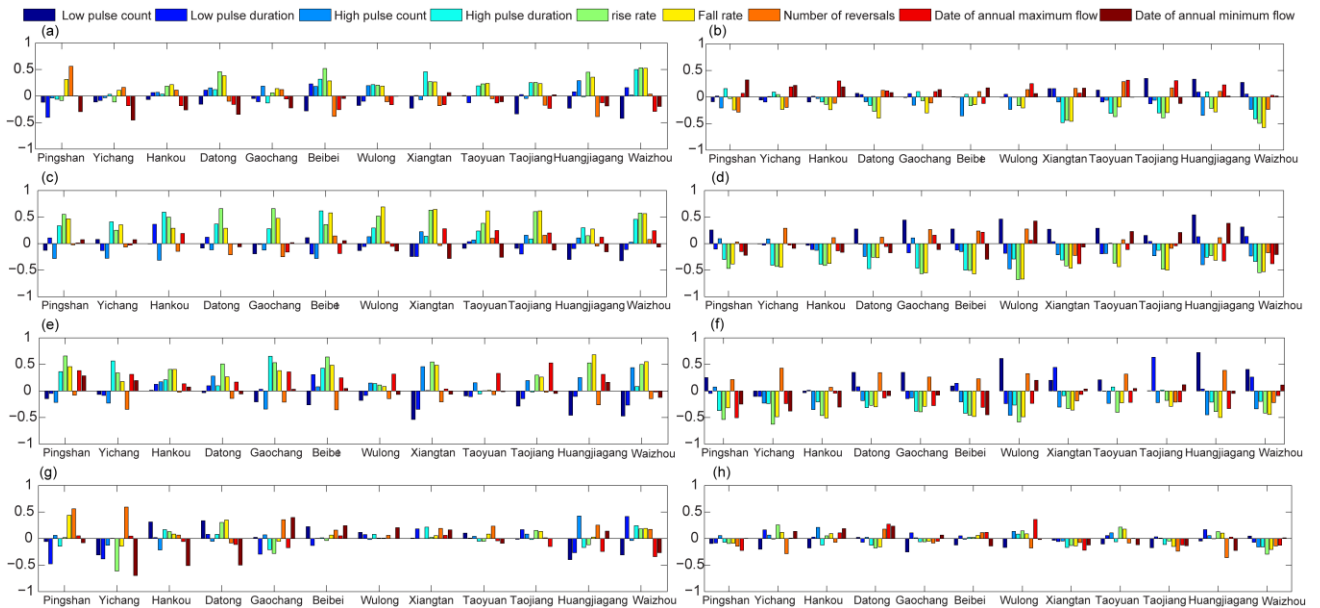




**Figure S1.** Elevation and land use in the Yangtze River Basin: (a) DEM of the Yangtze River Basin; (b) land use map of the Yangtze River Basin

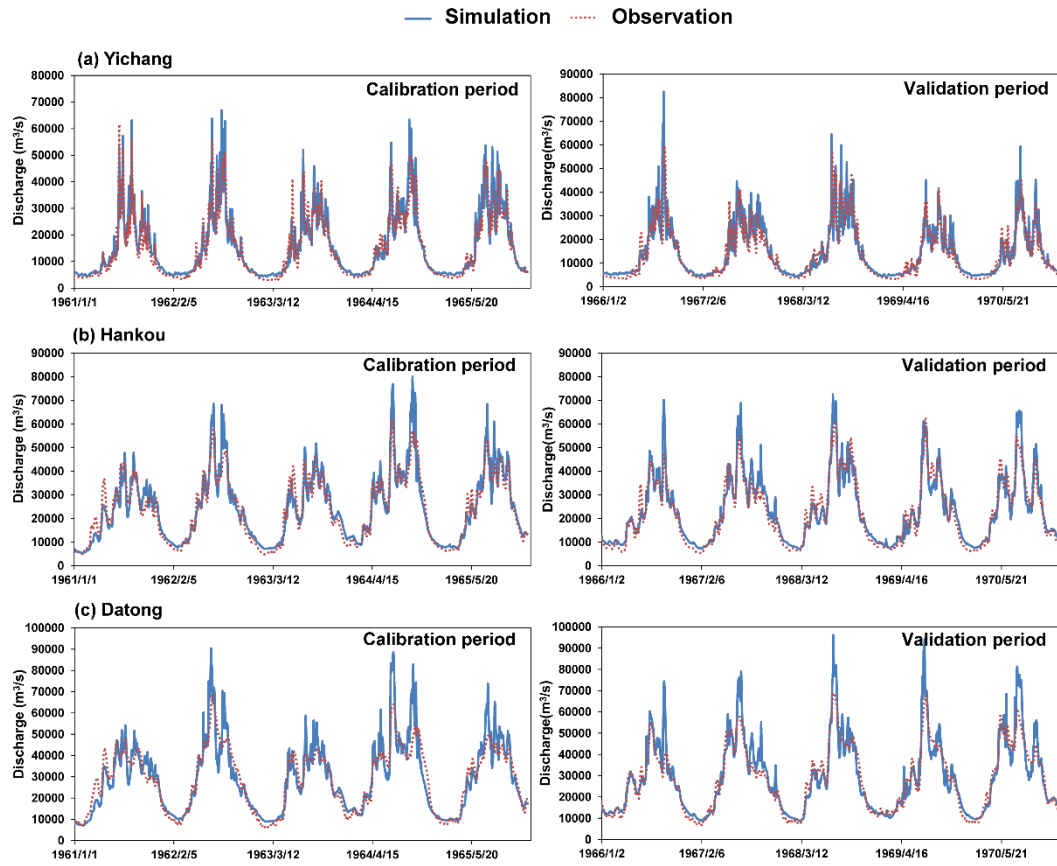


**Figure S2.** Inter-correlation of parameters in group 2 of the IHA metrics: (a) correlation between 7-day maximum flow with 1-day, 3-day, 30-day and 90-day maximum flow; (b) correlation between 7-day minimum flow with 1-day, 3-day, 30-day, and 90-day maximum flow and baseflow index; The dashed line is the threshold corresponding to the significance level ( $p = 0.05$ )



**Figure S3.** Correlation coefficient between the eco-flow metrics and the parameters in group 3, 4 and 5 of the IHA metrics: (a) Correlation coefficient between the spring ecosurplus and the parameters in groups 3, 4 and 5 of the IHA metrics; (b) Correlation coefficient between the spring ecodeficit and the parameters in group 3, 4 and 5 of the IHA metrics; (c) Correlation coefficient between the summer ecosurplus and the parameters in group 3, 4 and 5 of the IHA metrics; (d) Correlation coefficient between the summer ecodeficit and the parameters in group 3, 4 and 5 of the IHA metrics; (e) Correlation coefficient between the autumn ecosurplus and the parameters in group 3, 4 and 5 of the IHA metrics; (f) Correlation coefficient between the autumn ecodeficit and the parameters in group 3, 4 and 5 of the IHA metrics; (g) Correlation coefficient between the winter ecosurplus and the parameters in group 3, 4 and 5 of the IHA metrics; (h) Correlation coefficient between the winter ecodeficit and the parameters in group 3, 4 and 5 of the IHA

metrics;



**Figure S4.** Comparison of model simulated daily streamflow with observed daily streamflow at (a) the Yichang gauge; (b) the Hankou gauge; and (c) the Datong gauge

**Table S1.** Statistics of the hydrological parameters in the Mann-Kendall test

| Name                | PS    | YC    | HK    | DT    | GC    | BB    | WL    | XT    | TY    | TJ    | HJG   | WZ    |
|---------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Annual ecosurplus   | 1.53  | 1.63  | 2.05  | 1.48  | 0.75  | -0.16 | -0.06 | -1.60 | -0.99 | -0.48 | -0.55 | -0.55 |
| Annual ecodeficit   | 0.11  | 2.62  | 0.57  | 0.16  | 2.90  | 1.95  | 2.09  | 0.01  | 2.30  | 0.79  | 2.48  | -0.22 |
| Spring ecosurplus   | 3.16  | 2.55  | 1.49  | 1.13  | 1.93  | -1.03 | -0.15 | -0.32 | -0.60 | -1.13 | -1.54 | -0.40 |
| Spring ecodeficit   | -1.51 | -0.22 | 0.20  | 0.30  | -0.60 | 1.23  | 1.97  | 0.55  | 2.74  | 1.50  | 0.66  | -0.22 |
| Summer ecosurplus   | -0.25 | 0.01  | 0.72  | 0.13  | -0.85 | 0.90  | 0.79  | 1.43  | 0.68  | 0.93  | 0.56  | -0.32 |
| Summer ecodeficit   | 0.76  | 1.48  | 0.96  | 0.60  | 2.29  | 0.41  | 0.93  | -0.46 | 0.43  | -0.29 | 0.36  | -0.31 |
| Autumn ecosurplus   | -0.28 | -2.86 | -1.62 | -1.36 | -2.60 | -1.46 | -1.86 | -0.40 | 0.27  | -1.25 | -1.71 | -0.90 |
| Autumn ecodeficit   | 0.65  | 3.80  | 3.19  | 2.13  | 2.73  | 2.64  | 2.86  | -0.80 | 2.32  | -0.32 | 2.88  | -1.36 |
| Winter ecosurplus   | 3.21  | 3.83  | 3.23  | 2.45  | 3.37  | 1.97  | 2.03  | 1.94  | 1.57  | 0.78  | 2.09  | 1.10  |
| Winter ecodeficit   | 0.02  | -1.53 | -1.01 | -1.00 | -1.07 | 1.10  | -0.79 | -0.69 | -0.55 | -0.84 | -1.65 | -0.89 |
| Low pulse count     | 1.99  | -0.82 | -0.53 | 0.03  | 4.13  | 6.84  | 4.43  | -0.22 | 4.29  | 5.22  | 1.98  | -1.03 |
| Low pulse duration  | -3.84 | -3.09 | -2.00 | -1.99 | -3.98 | 4.67  | -3.42 | -2.88 | -4.54 | -3.24 | -2.16 | -1.52 |
| High pulse count    | 0.50  | -0.84 | -1.53 | 0.44  | 1.66  | -0.05 | -2.57 | 1.91  | -1.06 | 0.52  | -2.51 | 1.87  |
| High pulse duration | -0.66 | -0.68 | 0.28  | -1.29 | -3.01 | -1.92 | 0.22  | -0.98 | 0.51  | 0.61  | 1.98  | -0.63 |
| Rise rate           | -1.93 | -4.76 | -3.86 | -0.67 | -3.90 | -3.57 | -3.86 | 0.78  | -5.10 | -0.34 | -4.20 | -0.85 |
| Fall rate           | 1.90  | 0.07  | -1.83 | 0.00  | -0.15 | 0.00  | -0.58 | 1.64  | 0.90  | 1.39  | -3.55 | -0.60 |
| Number of reversals | 5.58  | 7.50  | 0.31  | 0.02  | 7.75  | 8.55  | 7.89  | 4.58  | 7.89  | 7.05  | 6.42  | 1.25  |
| Date of maximum     | -0.04 | 0.75  | 1.40  | 1.36  | -0.15 | 0.90  | 1.09  | 1.47  | 1.82  | 1.93  | -0.10 | 0.35  |
| Date of minimum     | -1.43 | -3.97 | -2.42 | -1.99 | 0.54  | -1.99 | 0.73  | -1.94 | -1.37 | -2.56 | 0.00  | -2.42 |

Note: Numbers in red indicate that the absolute values of the statistics of the hydrological parameter in the Mann-Kendall test are larger than the threshold (1.96) corresponding to the significance level ( $p = 0.05$ ). PS means the Pingshan gauge, YC means the Yichang gauge, HK means the Hankou gauge, DT means the Datong gauge, GC means the Gaochang gauge, BB means the Beibei gauge, WL means the Wulong gauge, XT means the Xiangtan gauge, TY means the Taoyuan gauge, TJ means the Taojiang gauge, HJG means the Huangjiagang gauge, and WZ means the Waizhou gauge.

**Table S2.** Evaluation of the performance of the hydrological model for simulating daily river discharge in the calibration and validation periods

| Gauge        | Calibration period(1961-1965) |        | Validation period (1966-1970) |        |
|--------------|-------------------------------|--------|-------------------------------|--------|
|              | NSE                           | RE (%) | NSE                           | RE (%) |
| Pingshan     | 0.86                          | 4.8    | 0.85                          | 3.2    |
| Gaochang     | 0.89                          | -3.5   | 0.90                          | 4.9    |
| Beibei       | 0.75                          | 4.6    | 0.68                          | 1.2    |
| Wulong       | 0.77                          | 2.7    | 0.72                          | 2.1    |
| Huangjiagang | 0.72                          | 3.0    | 0.69                          | 3.6    |
| Xiangtan     | 0.75                          | 4.4    | 0.77                          | -2.1   |
| Taojiang     | 0.76                          | 3.6    | 0.70                          | -7.3   |
| Taoyuan      | 0.78                          | 4.5    | 0.83                          | -3.7   |
| Waizhou      | 0.72                          | 4.0    | 0.80                          | 3.4    |
| Yichang      | 0.82                          | 3.7    | 0.77                          | 4.9    |
| Hankou       | 0.89                          | 4.7    | 0.89                          | 4.1    |
| Datong       | 0.80                          | 4.0    | 0.85                          | 4.0    |