

## A 439-year daily discharge dataset (1861 - 2299) for the upper Yangtze River, China

Data for storage were used four GCMs (GFDL-ESM2M, HadGEM2-ES, IPSL-CM5A-LR and MIROC5), changes in temperature and precipitation in the upper Yangtze River basin were analyzed from 1861 to the end of 23<sup>th</sup> century under conditions with anthropogenic climate change (the four RCP scenarios) and for a scenario without human-induced climate change (abbreviated as the piControl scenario), and the scenarios were compared. The discharge at the Cuntan station in the period 1861 - 2299 was simulated by four hydrological models (HBV, SWAT, SWIM and VIC) that were driven by the four GCMs, and changes in discharge in a warming world were compared with those in the piControl scenario.

The datasets include two daily discharge time series under (1) Scenario without anthropogenic climate change (piControl) and (2) Scenarios with anthropogenic climate change, which include 16 combinations of outputs of four hydrological models that were driven by four GCM simulations (total 64 combinations under the RCP scenarios). We list the availability of climate scenarios from four climate models for different periods (Tab. 1), the short description of the four hydrological models (Tab. 2) and the two datasets of discharge time series under the piControl scenario and scenarios with anthropogenic climate change effects simulated by the four hydrological models (HBV, SWAT, SWIM, and VIC) (Tab. 3).

**Table 1: Availability of climate scenarios from four climate models for different periods**

| Climate scenario | CO <sub>2</sub> concentration | GFDL-ESM2M | HadGEM2-ES | IPSL-CM5A-LR | MIROC5    |
|------------------|-------------------------------|------------|------------|--------------|-----------|
| piControl        | 286 ppm                       | 1861-2099  | 1861-2299  | 1861-2299    | 1861-2299 |
| Historical       | Recorded CO <sub>2</sub>      | 1861-2005  | 1861-2005  | 1861-2005    | 1861-2005 |
| Future           | RCP2.6                        | 2006-2099  | 2006-2299  | 2006-2299    | 2006-2299 |
|                  | RCP4.5                        | 2006-2099  | 2006-2099  | 2006-2299    | 2006-2099 |
|                  | RCP6.0                        | 2006-2099  | 2006-2099  | 2006-2099    | 2006-2099 |
|                  | RCP8.5                        | 2006-2099  | 2006-2099  | 2006-2299    | 2006-2099 |

**Table 2: Short description of the four hydrological models**

| Model | Institution  | Spatial<br>disaggregation  | Representation<br>of soils                        | Representation<br>of vegetation           | Routing<br>method                                       |
|-------|--|--|---|---|---|
| HBV   | Swedish<br>Meteorological<br>and Hydrological<br>Institution   | Sub-basins,<br>10 elevation<br>zones & land<br>use classes               | 1 soil layer,<br>2 soil<br>parameters             | Fixed<br>monthly plant<br>characteristics | A simple<br>time-lag<br>method                          |
| SWAT  | United States<br>Department of<br>Agriculture  | Sub-basins and<br>hydrological<br>response units                         | Up to 10 soil<br>layers,<br>11 soil<br>parameters | A simplified<br>EPIC approach             | Muskingum<br>method                                     |
| SWIM  | The Potsdam<br>Institute for<br>Climate Impact<br>Research, based<br>on the SWAT and<br>MATSALU models | Sub-basins and<br>hydrotopes   | Up to 10 soil<br>layers,<br>11 soil<br>parameters | A simplified<br>EPIC approach             | Muskingum<br>method,<br>reservoirs<br>and<br>irrigation |
| VIC   | University of<br>Washington,<br>University of<br>California, and<br>Princeton<br>University            | Grid of large<br>and uniform<br>cells with sub-<br>grid<br>heterogeneity | 3 soil layers,<br>19 parameters                   | Fixed<br>monthly plant<br>characteristics | Linearized<br>St. Venant's<br>equations                 |

**Tab.3: The two datasets of discharge time series under the piControl scenario and scenarios with anthropogenic climate change effects simulated by the four hydrological models (HBV, SWAT, SWIM, and VIC)**

| model | dataset    |            | GFDL-ESM2M | HadGEM2-ES | IPSL-CM5A-LR | MIROC5    |
|-------|------------|------------|------------|------------|--------------|-----------|
| HBV   | piControl  | piControl  | 1861-2099  | 1861-2299  | 1861-2299    | 1861-2299 |
|       |            | Historical | 1861-2005  | 1861-2005  | 1861-2005    | 1861-2005 |
|       | Historical | RCP2.6     | 2006-2099  | 2006-2299  | 2006-2299    | 2006-2299 |
|       | +Feature   | RCP4.5     | 2006-2099  | 2006-2099  | 2006-2299    | 2006-2099 |
|       |            | RCP6.0     | 2006-2099  | 2006-2099  | 2006-2099    | 2006-2099 |
|       |            | RCP8.5     | 2006-2099  | 2006-2099  | 2006-2299    | 2006-2099 |
| SWAT  | piControl  | piControl  | 1861-2099  | 1861-2299  | 1861-2299    | 1861-2299 |
|       |            | Historical | 1861-2005  | 1861-2005  | 1861-2005    | 1861-2005 |
|       | Historical | RCP2.6     | 2006-2099  | 2006-2299  | 2006-2299    | 2006-2299 |
|       | +Feature   | RCP4.5     | 2006-2099  | 2006-2099  | 2006-2299    | 2006-2099 |
|       |            | RCP6.0     | 2006-2099  | 2006-2099  | 2006-2099    | 2006-2099 |
|       |            | RCP8.5     | 2006-2099  | 2006-2099  | 2006-2299    | 2006-2099 |
| SWIM  | piControl  | piControl  | 1861-2099  | 1861-2299  | 1861-2299    | 1861-2299 |
|       |            | Historical | 1861-2005  | 1861-2005  | 1861-2005    | 1861-2005 |
|       | Historical | RCP2.6     | 2006-2099  | 2006-2299  | 2006-2299    | 2006-2299 |
|       | +Feature   | RCP4.5     | 2006-2099  | 2006-2099  | 2006-2299    | 2006-2099 |
|       |            | RCP6.0     | 2006-2099  | 2006-2099  | 2006-2099    | 2006-2099 |
|       |            | RCP8.5     | 2006-2099  | 2006-2099  | 2006-2299    | 2006-2099 |
| VIC   | piControl  | piControl  | 1861-2099  | 1861-2299  | 1861-2299    | 1861-2299 |
|       |            | Historical | 1861-2005  | 1861-2005  | 1861-2005    | 1861-2005 |
|       | Historical | RCP2.6     | 2006-2099  | 2006-2299  | 2006-2299    | 2006-2299 |
|       | +Feature   | RCP4.5     | 2006-2099  | 2006-2099  | 2006-2299    | 2006-2099 |
|       |            | RCP6.0     | 2006-2099  | 2006-2099  | 2006-2099    | 2006-2099 |
|       |            | RCP8.5     | 2006-2099  | 2006-2099  | 2006-2299    | 2006-2099 |