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Changes in discharge dynamics under the constraints of local and global changes in the Chao Lake basin (China)

Y. Chu (1), C. Salles (2), C. Rodier (3), F.-N. Crès (2), L. Huang (1), and M.-G. Tournoud (2)

(1) Anhui Agricultural University, College of Resources and Environment, Hefei (Anhui), China, (2) Université Montpellier 2, Hydrosciences Montpellier, CNRS-IRD-UM1-UM2, Montpellier, France, (3) CNRS, Hydrosciences Montpellier, CNRS-IRD-UM1-UM2, Montpellier, France

Located on the Yangtze basin, the Chao Lake is the fifth largest freshwater lake in China and of great importance in terms of water resources and aquaculture. Its catchment (9130 km^2) includes the city of Hefei and large extends of agricultural and rural areas.
Fast changes are expected in land uses and agricultural practices for the future, due to the touristic appeal of the Chao Lake shore and the growth of the city of Hefei. Climate changes are also expected in this region, with a high impact on rainfall regime. The consequences of these changes on the sustainability of the water inflows into the lake are a major issue for the economical development of the Chao Lake area even though they are little-known.
Our study aims to give tools for estimating such consequences, accounting for uncertainties in scenario data and model parameters.

The dynamics of rivers flowing into the Chao Lake is not very well-known, except for the Fengle River. The Fengle catchment (1480 km^2) is mainly rural. River discharges are recorded at Taoxi station, upstream its outlet into the lake. 20-year records of daily discharges are available. Nine rain gauges, with daily data, daily temperature and evapotranspiration data are also available. The current dynamics of the Fengle River is characterized in terms of flood frequencies on discharge-duration-frequency curves.
The ATHYS freely available hydrological tool (www.athys-soft.org) is used to calibrate and validate a distributed model of the Fengle catchment. Four calibration runs are done on four independent 5-year discharge records. Four different sets of model parameters are discussed. The model is then run for validation. The uncertainties in model predictions are evaluated in terms of errors in the simulated discharges during the validation period, with regards to the 5-year period used for calibration.
The model is then applied on scenarios of changes in land uses and climate. Uncertainties in scenarios of changes are estimated through literature review. The future dynamics of the Fengle River is characterized on discharge-duration-frequency curves. Results are discussed with regards to the uncertainties in model predictions and scenarios changes.

The next step of this study will be to extrapolate the results observed at the scale of the Fengle river as benchmarks for all the rural catchments of the Chao Lake basin. Predictions of changes in the discharge dynamics will then be given at the Chao Lake basin scale.