



Impact factors on water quality in the confluence zone of the Daning River and the Yangtze River at different hydrological conditions in the Three Gorges Reservoir

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Water quality of the Three Gorges Reservoir (TGR) in the Yangtze River became a major concern since the first closure of the dam in 2003. Increasing eutrophication and algal bloom events, especially in confluence bays and backwater areas are observed. Substance transport, water exchange and interaction between water masses in confluence areas of tributaries and the Yangtze main stream are of special interest and mainly driven by large scale water level fluctuations and temporal discharge variations in the reservoir. The Daning River, one tributary of the TGR also adjoins to Dachang city and Wushan city which are by backwater of the TGR.

In the frame of the Sino-German “Yangtze-Project” [1] water quality data and samples were collected in the Daning River and its confluence zone with the Yangtze River during two fieldtrips in August and December, 2011. Remarkable hydrological changes during the sampling time were present in August whereas conditions in December were rather stable.

Water quality data was recorded in-situ and on-line in varying depths with a towed underwater sensor system. The monitored data comprise seven important physico-chemical water parameters (temperature, electrical conductivity, turbidity, dissolved oxygen, oxygen saturation, pH, chlorophyll a) coupled with a 3D positioning system. Geostatistical evaluation and interpolation of the physico-chemical water parameter data was conducted to get 3D distribution models for the parameters in the water bodies. Selective water samples for analysis of inorganic components (anions, cations, nutrients) in the dissolved and particulate phases were taken from different depths by a free flow sampler.

Results reveal that pollutant plumes in the water above the thermocline surround the urban areas during the stable conditions of December. In August the degree of mixing of Yangtze main stream water with the Daning River water was the main driving force for the water chemistry. Contrarily, water quality was mainly controlled by the development and the collapse of a separated temperature layered water body in the confluence bay at Wushan. Main algal growth was limited to the confluence areas in the vicinity of the cities during both sampling periods. Consequently, water chemistry and water quality of the confluence zone are both strongly dependent on the hydrological and seasonal weather conditions but are not necessarily related to each other.

Future work will focus on this and other study areas in the TGR covering different seasonal and hydrological conditions. Results will also be used as input data for the numerical modeling in the Yangtze-Project [1]. Important knowledge for the understanding of long-term pollutant dynamics and water quality tendency in the TGR and other reservoirs can be achieved.

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References

[1] Bergmann A, et al. (2011) The Yangtze-Hydro Project: a Chinese–German environmental program. *Environmental Science and Pollution Research*. Doi: 10.1007/s11356-011-0645-7