

Title: Understanding hydro-eco-environment changes in the upper Yangtze River

Abstract

Climate change and human activities influence the hydrological and biogeochemical processes and impact on the ecosystem. This study investigated flow regime changes in the Upper Yangtze River using the eco-flow metrics (ecosurplus and ecodeficit) and the “Indicators of Hydrologic Alteration” (IHA), and analyzed the net anthropogenic nitrogen input (NANI) in this watershed and its impact on the river water quality using a distributed hydrological model. Results showed that annual streamflow decreased in 50 years. Autumn streamflow evidently decreased after the 1980s, which resulted from the decrease in precipitation and water storing by reservoirs. Summer high flow decreased after the 1980s which was also primarily attributed to the decrease in precipitation. Winter streamflow increased in the two most recent decades, which resulted from the reservoir release. Results also showed that the Three Gorges Reservoir (TGR) elevated low flow in the dry season and reduced peak flow in summer since 2003. The simulated results showed that annual total nitrogen loading in the watershed was 1.50 ton/km² in average. The amount of nitrogen loading in July and August took more than 65% of the annual total nitrogen loading. The export coefficient was influenced by the nitrogen supply and hydrological processes especially the rainfall-runoff processes. The concentration of total nitrogen was higher in rainy season. The decrease in autumn precipitation since the 1990s, suggests that TGR is facing a serious challenge in maintaining water storage in the reservoir and releasing the water to the downstream ecosystem