

What caused the decline of China's largest freshwater lake? Attribution analysis on Poyang Lake water level variations in recent years

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In recent years, dramatic decline of water level of the Poyang Lake, China's largest freshwater lake, has raised wide concerns about the water security and wetland ecosystem. This remarkable hydrological change coincided with several factors like the initial operation of the Three Gorges Dam (TGD) in 2003, the big change of lake bottom topography due to extensive sand mining in the lake since 2000, and also climate change and other human activities in the Yangtze River basin may add to this complexity. Questions raised to what extent that the lake hydrological changes is caused by climate change and/or human activities. In this study, quantitative assessment was conducted to clarify the magnitude and mechanism of specific influencing factors on recent lake decline (2003-2014), with reference to the period of 1980–1999. The attempts were achieved through the reconstruction of lake water level scenarios by the framework of neural network. Major result indicates that the effect of lake bottom topography change due to sand mining activities has became the dominant factor for the recent lake decline, especially in winter season with low water level. However, the effect of TGD regulation shows strong seasonal features, its effect can accounts for 33%-42% of the average water level decline across the lake during the impoundment period of September-October. In addition, the effect of climate change and other human activities over the Yangtze River basin needs to be highly addressed, which is particularly prominent on reducing lake water level during the summer flood season and autumn recession period. The result also revealed that due to different mechanism, the responses of the lake water level to the three influencing factors are not consistent and show great spatial and temporal differences.