



Determining the water age of Lake Taihu during the water transfer from Yangtze River, China

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To improve water quality and alleviate the eutrophication problem for Lake Taihu, the third largest shallow lake in China, water transfer project from Yangtze River, was initiated to dilute the polluted water and export pollutants out of the lake in 2002. The impact of water transfer on transport processes of dissolved substance in the lake is studied by using the concept of water age using a three-dimensional numerical model, Environmental Fluid dynamic Code (EFDC). Influences of inflow tributaries and wind forcing on water age distribution are investigated. Model results show that the effect of water transfer on transport processes in the lake is strongly affected by hydrodynamic conditions induced by wind and inflow/outflow tributaries. Water age in Lake Taihu has highly spatial and temporal heterogeneity, with the mean water age of approximately 130 days in summer and 230 days in other seasons during the simulation year. Southeastly wind, the dominant wind direction in summer, could improve eastern areas of the lake which provide drinking water source and Meiliang Bay, the most polluted bay in the lake. The most efficient flow discharge of transferred water for diluting the lake could be approximately 100 m³/s while considering benefit/cost ratio. Additionally, the water transfer project just minor effects on parts of the lake rather than the entire lake, unless nutrient concentrations in the transferred water are reduced to a reasonable level. This study provides useful information for better understanding the complex hydrodynamic and mass transport processes in the lake, which is important for developing and implementing effective lake management strategies.

Keywords: water transfer; water age; EFDC; Lake Taihu; Yangtze River