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Global assessment of nutrient loads to the world's largest lakes

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Lakes are essential resources of drinking water for a large part of mankind. Even so, most of the industrial and domestic waste water is discharged – often untreated – into rivers and streams that are finally the tributaries of these important freshwater bodies. Additionally, diffuse nutrient sources such as fertilizer and atmospheric deposition exacerbate existing algal blooms and low oxygen concentrations in rivers, lakes, and reservoirs. In this tense atmosphere of competing water uses, it is necessary to analyze all sources of pollution as well as their total contributions in order to protect these water bodies against deterioration. Finally, this is a general and urgently needed basis for developing recommendations for involved stakeholders and decision makers.
Therefore, the project eartH_2Observe, initiated and financed by the European Commission, creates the necessary and underlying quantitative and qualitative hydrological and water use data. In this context, information for global as well as for regional water resource assessments is being prepared based on new earth observations and an ensemble of global hydrological models. As a member of this ensemble, WaterGAP3 provides global estimates of lake water quality relevant parameters on a 5 arc minutes grid, namely total phosphorus and total nitrogen. These nutrient loads to lakes from different sources such as industrial fertilizer, organic fertilizer, domestic loads, atmospheric deposition, and urban surface runoff are estimated for the period 1990 to 2010 in a monthly time step. Whereas nutrient loads and their changes into numerous lakes worldwide are calculated, a special focus is set on nutrient loads into the large and shallow Lake Peipus, which is located between Estonia and Russia and subject to blooms of harmful cyanobacteria.
We present estimates, trends, as well as sources of present nutrient loads (TN and TP) to the world's largest lakes with detailed insights to the Lake Peipus situation. Finally global hotspots of nutrient pollution to lakes are identified and discussed.