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Bo Liu, Huib E. de Swart

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# Impact of river discharge on phytoplankton bloom dynamics in eutrophic estuaries: A model study

Bo Liu\*, Huib E. de Swart

*Institute for Marine and Atmospheric research Utrecht, Utrecht University,  
Utrecht, The Netherlands*

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## Abstract

Field observations in estuaries reveal that phytoplankton blooms are strongly affected by advection processes related to river flow. To gain quantitative insight into this dependence, experiments were performed with a new idealised model that couples physical and biological processes. Advection of phytoplankton and nutrient by subtidal flow was explicitly accounted for, as well as longitudinal and vertical mixing processes. Results show that the idealised model is capable of reproducing the observed bloom. The specific spatial distribution of phytoplankton population emerges because the latter is suppressed in the upper reach by the advection processes, and the growth is limited in the lower reach by low nutrient concentrations. A sensitivity study of model results to different river discharges reveals the presence of three regimes. In the low discharge regime, blooms form because growth is faster than decay due to advection processes. In the high discharge regime, the situ-

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\*Corresponding author.

Postal address: Institute for Marine and Atmospheric research Utrecht, Utrecht University, Princetonplein 5, 3584 CC Utrecht, The Netherlands

Email address: B.Liu2@uu.nl

Tel.: +31 0302537759

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