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A new method of quantifying discharge of small rivers into lakes and inland seas

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Continental discharge is an important component of the global hydrological cycle, providing the majority of the input part of the ocean water balance. Buoyant inflow usually causes surface density stratification at the large shelf areas, and plays a significant role in physical, chemical, and biological processes there that is especially important for the lakes and inland seas. Although there is a lack of discharge data for most of rivers in a global scale. Regular direct measurements of discharge are performed only for a relatively small number of rivers, generally the biggest ones or ones that flow through densely populated areas. Within this problem an indirect method of assuming a volume of river discharge was developed.
The general idea of the method is the following. Firstly, the spatial surface spread of the plume generated by the considered river discharge is identified using high resolution satellite imagery of the coastal zone adjacent to the river estuary. Secondly, a series of numerical simulations of the river runoff spread is performed under various prescribed external forcing conditions which include the discharge rate. Varying forcing conditions we iteratively improve the accordance between simulated and observed river plumes therefore consequentially specifying the value of river discharge.
The developed method was applied and validated against in situ date for several rivers feeding the Black Sea. Practical importance of this work consists in the fact, that the suggested method is an alternative for the expensive and laborious direct measurements of the river discharge, which are used nowadays.