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Mzymta river plume dynamics in the eastern part of the Black Sea: observations and modeling

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The aim of this work is to study the dynamics of the Mzymta River plume and its interactions with coastal waters of the eastern part of the Black Sea.
An array of in-situ hydrographic data was obtained during the recent expedition of the Shirshov Institute of Oceanology to the Mzymta mouth region of the Black Sea coast. The measurements were taken during the flood period on 25-30 of May, 2010. They included continuous records of the bottom layer velocity at four mooring stations deployed at the plume and the adjacent area, and similar records of the river inflow at the mooring station set at the river mouth. Also, meteorological data were collected at two coastal meteorological stations. The first station was situated near the river mouth and the second one was set near the southern edge of the plume extension about 8 km away from the first one. In addition to these continuously recorded measurements, everyday CTD top-to-bottom profilings at 5 stations were made, as well as continuous CTD measurements along the boat track using a shipboard pump-through system.
Based on these observations, a direct Lagrangian particle tracking model has been developed. The main goal of this transport model is prediction of the dispersal of river freshwater discharge. Predetermined arrays of the ambient sea current velocity, the river inflow and wind stress data together with the turbulence and the drag coefficients are the input parameters. The modeling program consists of three modules. The first module simulates the motion of individual freshwater particles using its Lagrangian tracking. After that the second module parameterizes and actualizes dissipation processes which affect the plume. Finally in the third module the obtained deposition of all particles comprises the presumptive river plume as the result of the subsequent interpolation.
This model simulates the dynamics of the plume spread generated by the Mzymta river inflow in the coastal waters of the eastern part of the Black Sea. Various parameters of this plume evolving out of different wind, stream and inflow conditions can be obtained and visualized using this model. As a result high correlations between shape, size and other parameters of the plume on the one hand and main governing forces on the other hand were obtained.