Geophysical Research Abstracts
Vol. 15, EGU2013-1656, 2013
EGU General Assembly 2013

Use of satellite imagery to improve estimates of total river discharge into the Black Sea

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Continental discharge is an important component of the global hydrological cycle. It is especially important for the inland seas and certain shelf areas. One good example is the Black Sea, where the long-term average annual volume of the continental runoff exceeds the atmospheric precipitation and is close to the evaporation. Although the Black Sea is one of the most thoroughly studied seas on Earth, its water budget is prone to uncertainties. One of the reasons for this lies in the fact that only 10 to 15 major rivers are usually taken into account, albeit there are more than 1000 small rivers and watercourses feeding the sea.
We have developed a new method of estimating the total volume of freshwater discharge using satellite imagery. The indirect technique derives the volume of continental runoff accumulated in surface-advected river plumes on the one hand and plume dissipation rates on the other hand. The sum gives the total freshwater inflow, including small rivers and watercourses. Spatial surface spread of river runoff is determined using high resolution satellite imagery ($\sim$50 m) of the Black Sea from May, 2010 to April, 2012. The color scanner data was collected by MERIS-EnviSat and reanalyzed by MERIS Case-2 Regional algorithm. The evaluation of internal structure of plumes and dissipation parameters is based on numerical modeling. To this end we use the newly developed Lagrangian model STRiPE that simulates dynamics of surface-advected river plumes. This method was applied and tuned for the eastern part of the Black Sea coast.