



Influence of distributary channels on sediment and organic matter supply in the Po prodelta (Italy)

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From November 2008 through May 2009, the Po river (north of Italy) experienced several floods exceeding $5,000 \text{ m}^3 \text{ s}^{-1}$. This long series of events ended with a large flood in early May 2009 ($8,000 \text{ m}^3 \text{ s}^{-1}$). An event-response sampling was carried out in the Po prodelta in April-May 2009 to characterize this latter event. The water sampling was carried out during two periods of the May 2009 flood, including early in the event under conditions of moderate river flow ($5000 \text{ m}^3 \text{ s}^{-1}$) and 24h later during the peak discharge ($8000 \text{ m}^3 \text{ s}^{-1}$). At each station, profiles of conductivity, transmittance, and fluorescence were acquired. Surface and bottom waters were sampled to collect sediments in suspension. In addition, a few days before the May 2009 event, suspended sediments were collected at Pontelagoscuro gauging station, 90 km upstream from the coast. Biogeochemical compositions and sedimentological characteristics of suspended samples were investigated using bulk and biomarker analyses.

During moderate flow, the water column did not show evidence of plume penetration. Stations re-occupied 24h later exhibited marked physical and biogeochemical changes during the peak flood. However, the concentration of terrestrially-derived material in surface waters was still less than expected. These results suggested that, since material enters the Adriatic as buoyancy-driven flow with a reduced transport capacity, settling and flocculation processes result in trapping a significant fraction of land-derived material in shallow sediments and/or within distributary channels.

A two end-member mixing model was used to quantify the influence of land-derived material and autochthonous phytoplankton in the surface plume. In both moderate and peak discharge, the relative fraction of terrigenous OC decreased with distance from the Pila distributary. In spite of this north-to-south decrease, concentrations of allochthonous OC exhibited an overall increase throughout the prodelta because of the flood, especially in the northern prodelta. In the southern prodelta, a thick layer of fresh water characterized by relatively low SSC was observed during the peak of the flood. In this region, autochthonous OC was the main OC source even during the peak flood. This suggests that settling processes, coupled with significant input of fresh water, are key factors for phytoplankton blooms during flood events in this region.