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Variability of benthic mineralization in the Rhone River prodelta during a flood event: the importance of organic matter origin

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Each year, flood events in the Rhone River Basin deliver 70% of the yearly input of terrigeneous particles to the Gulf of Lion in the Northwestern Mediterranean Sea. Therefore, riverine exports of organic carbon occur mainly during flood events implying thus specific deposition processes in the sediment. The mechanisms involved during a flood event are therefore likely to control the sediment organic carbon degradation and preservation.
In June 2008, an exceptional flood occurred in the Rhone River, due to its large concentration of particles (up to 3 g/l of suspended particulate matter), the late spring-summer timing and the alpine origin of the flood. In situ oxygen microprofiles and sediment diffusive oxygen uptake (DOU) rates were measured in April 2007, September 2007, June 2008 and December 2008. Organic carbon and pigment contents in surface sediments were also measured. Moreover, repeated visual observations and OC measurements (3, 4 and 6 months after the flood) allowed us to study the fate of the flood deposit over several months.
Under low discharge rates, DOU rates range between 20 and 4.5 mmolO2 m-2 d-1, the highest values being located at the vicinity of the river outlet. However, during flood conditions, benthic mineralization displayed an homogeneous and lower value in the prodelta (8.5 $\pm$ 1.5 mmolO2 m-2 d-1) and the adjacent continental shelf. A decrease in benthic mineralization processes constitutes thus the initial response of the system to this new deposit. The lower organic carbon degradation activity during the flood is related to changes in lability of the riverine POC supply since the flood deposit was characterized by lower organic carbon and phytodetritus contents. The soil origin of the flood organic matter in the case of June 2008 flood certainly explains these features and the response of the sediment oxygen demand.