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Simulating the impact of sediment flux of the 2003 flood event of the Rhone River on the Golf of Lions, France

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Sediment fluxes from flood events (return period > 100yrs) tend to have an important impact on the development of strata, although their occurrence is rare. Unfortunately there are almost no field measurements that give better insight into the sediment flux distributed to, and deposited in, the ocean during such events. To get a better understanding of flood event's impact on the strata we applied two numerical models on a Rhone River flood event. A 350yrs recurrence time flood event of the Rhone River occurred in the first week of December 2003. With local accumulation of 500 mm of precipitation, the Rhone River, with an average discharge of $1,700 \text{ m}^3\text{s}^{-1}$, reached a peak discharge of $13,000 \text{ m}^3\text{s}^{-1}$ at the Beaucaire measurement station. First we applied the hydrological model HydroTrend to simulate the discharge and sediment flux during the December 2003 storm. HydroTrend simulates a similar hydrograph as field observations. The model predicts that 4.4 Mt of sediment flowed from the Rhone River into the Golf of Lions over the 5 day storm event. Secondly we simulated the sediment deposition in the coastal zone with a two-dimensional momentum-based jet model Plume. The model simulates the mixing and advection of river water (simulated by HydroTrend) in the sea. An advection-diffusion routine uses the currents to determine the aerial extent of deposition from the surficial plume, using flocculation and settling values. The model results for the single storm event show a plume that reaches a maximum width of 5 km, flowing southwards out of the Rhone River outlet, than bending sharply west by currents. 90% of the sediment is deposited within 10 km from the river mouth, and it forms a sediment layer up to 35cm.