# BIOGEOCHEMICAL PROCESSES in RHONE DILUTED MESOSCALE STRUCTURES

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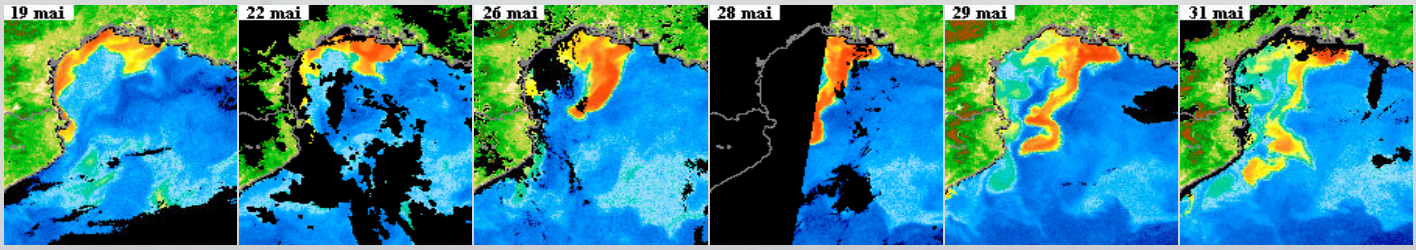
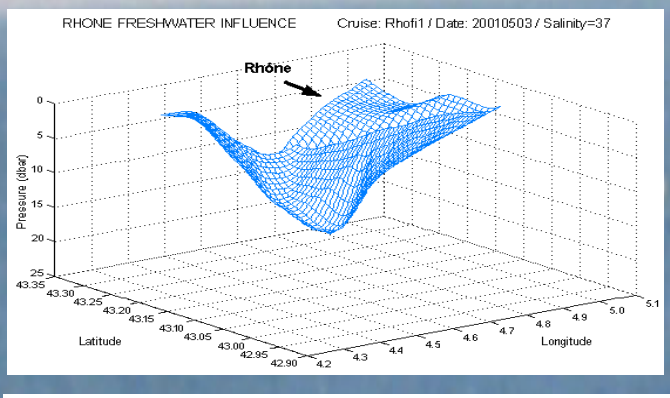
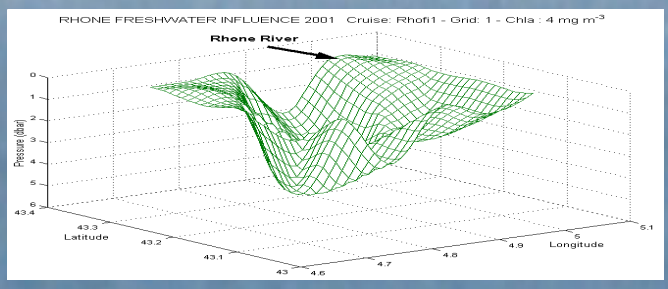
The lagrangian study of the Rhone river plume highlighted that, in spite of the high nutrient concentration available, the dynamical plume is not favourable for phytoplankton development (osmotic stress, turbidity, non stationary flow). Primary production mainly occurred at the far end of the plume, in the salinity range 34-37. However, the Rhone influence may extend very far offshore, as shown by the following sequence of May 2001 SeaWiFS images.

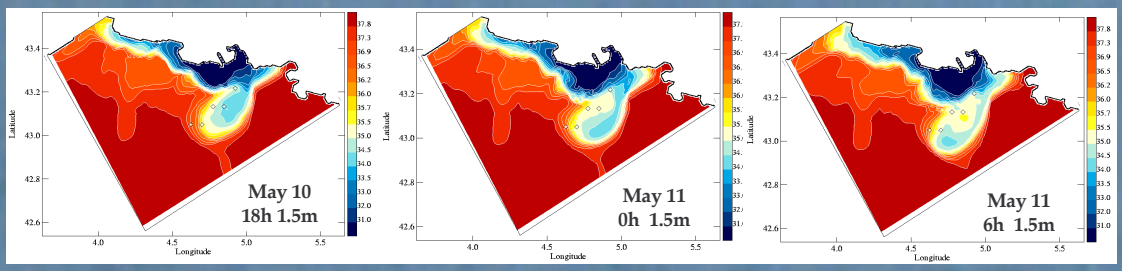



Eulerian studies from a 5 nautical miles spaced grid over the Lion's Gulf continental shelf evidenced diluted structures, westward the Rhone river mouth, 15x20 miles in size (1000 km²) and 20m in thickness (isohaline 37). These structures have a higher content in particles and chlorophyll than the surrounding marine environment.




The total volume (surface-isohaline 36) is about 3 $10^9$ m³ that corresponds to a freshwater volume about 5.6 $10^8$ m³. This is equivalent to a 4 days accumulation of the daily discharge of the Rhone river (1550 $m^3 s^{-1}$).

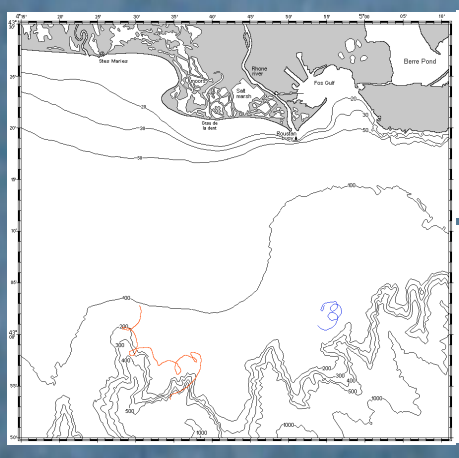


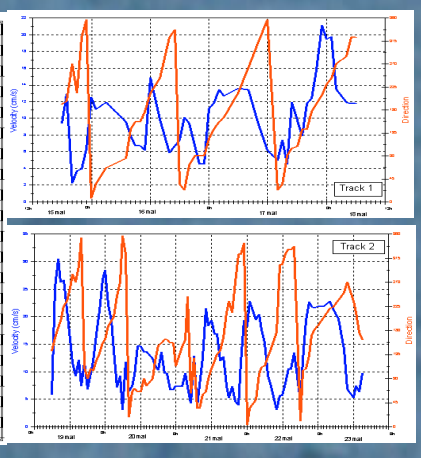

Simulations of the salinity field of the 2002 cruise with a three-dimensional model (Symphonie) suggested a anticyclonic diluted water mass progressively detaching from the river plume (dark blue).

Depending on wind conditions, on the density gradient induced by the Rhone River input and on the intensity of mixing processes, diluted water masses may accumulate along the coast or be transferred offshore in interaction with the shelf currents or the mesoscale circulation at the shelf break. In both cases the residence time of river-born particulate and dissolved compounds is increased and favoured differential processes in C and N assimilation/regeneration to develop.

A new lagrangian experiment focused on these structures to document :

- ☞ *How they can maintain over long distances,*
- ☞ *The biogeochemical processes involved in the functioning of the microbial loop (recycling, grazing, night/day cycle),*
- ☞ *The influence of solar radiation on biogeochemical processes,*
- ☞ *The trace metal of human origin associated to biomass and particles.*






Two trajectories were tracked for 61 and 107 hours respectively during the BiopRhofi 2006 cruise. Inertial oscillations (period about 18.5 h) were evidenced and were superposed to the night/day cycle of phytoplankton cells, as illustrated with CTD fluorescence and dissolved oxygen measurements. Methane-thiol concentration within salps were 100 to 1000 fold higher than in the surrounding marine environment, suggesting that these filtering organisms may play a role in the cycle of volatile compounds and therefore in the speciation of the associated metals complexed.