Programme National Environnement Cotier

Chantier Méditerrannée Nord–Occidental

Nearshore dynamics of nutrients and chlorophyll during Mediterranean–type flash–floods

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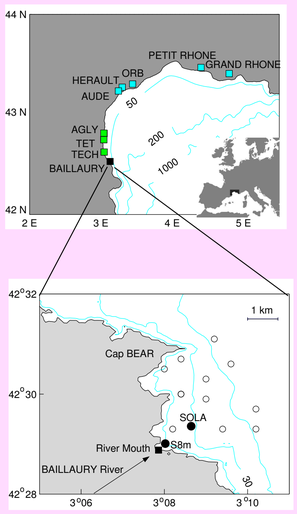
Study Location and sampling strategies



– out of influence of RHONE

– 6 permanent Mediterranean–type rivers at the regional scale

– local BAILLAURY River (intermittent flow between October and May, no flow in Summer)

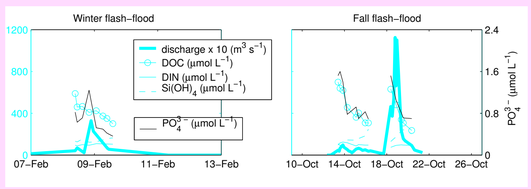
■ river mouth discharge and surface samples, every 1 to 4 hours for discharge above 5 $m^3 s^{-1}$

● daily marine samples at surface at S8m, at 3 m and 24 m below surface at SOLA

○ CTD profiles before, during and after flow event

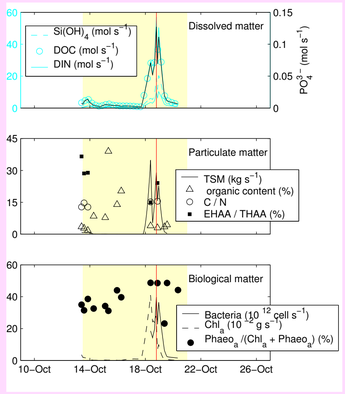
Biogeochemical parameters: salinity, NO3, NH4, NO2, PO4, Si(OH)4, DOC, TSM, POC, PON, pigments, bacteria, particulate amino acids

Baillaury River discharge and dissolved loads in 2005



=> river discharge is zero except during two flash–floods
=> dissolved loads patterns similar at different seasons
=> DIN loads not correlated to discharge : in excess
=> silicate dilutes when discharge increase
=> phosphate peak more or less in phase with discharge peak

N / P = 60 to 120, N / Si = 0.5



The October 2005 event: fluxes at the river mouth

– discharge peak lasted 12 h between October 18 and 19
– total runoff = 10^7 m^3
– very low phosphate inputs compared to DIN and silicate

– TSM peak before flow peak
– organic content in TSM peak = 5 %
– C/N in TSM peak = 15
– EHAA/THAA drop from 0.37 to 0.15
– degraded pigments

Main findings

=> low phosphate inputs compared to DIN and silicate by the Baillaury River

=> flash–flood inputs partly hidden at the shallowest site by swell resuspension

=> at the beginning of the flow event, at the deepest site, river solute inputs dilute conservatively

=> during main turbid pulse at sea, phosphate is released

=> after the water cleared, diatom photosynthesis occurred leading to a sharp but transitory peak of Chlorophyll a (2 µg L^{-1})

=> long–term data for nutrients and salinity confirm the conservative dilution during flash–floods

=> long–term data for Chlorophyll a and salinity are also consistent with the nearshore stimulation of sharp and transitory phytoplanktonic blooms

K. Guizien, F. Charles, F. Lantoine, J.–J. Naudin. Nearshore dynamics of nutrients and chlorophyll during Mediterranean–type flash–floods. 2007. Aquatic Living Resources. 20.

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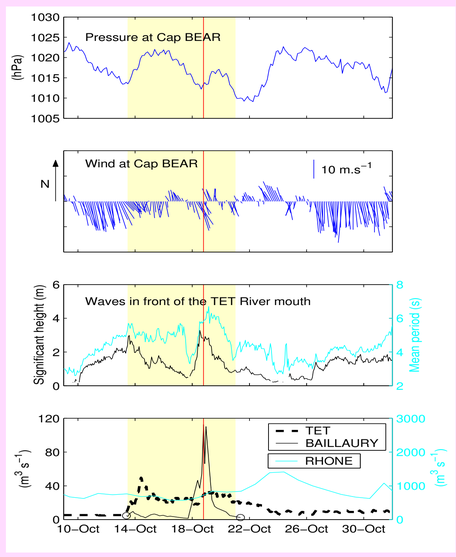
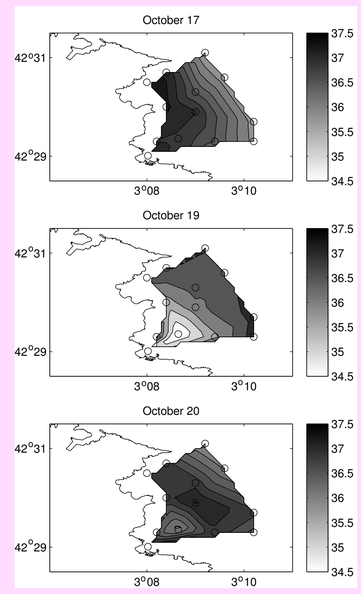
The October 2005 flash–flood event at sea

Hydrological and meteorological parameters

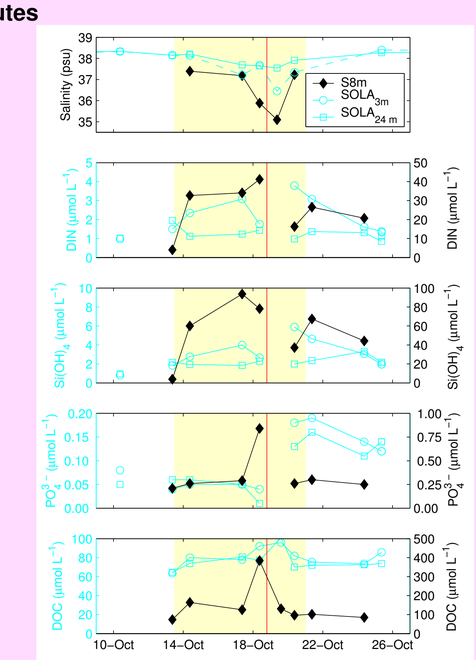
– local flash–flood preceded by a regional flow event
– the Bay of Banyuls–sur–Mer isolated from outer low saline waters during the flash–flood

– moderate swell (Hs = 3 m, Tp = 8 s)





Solutes

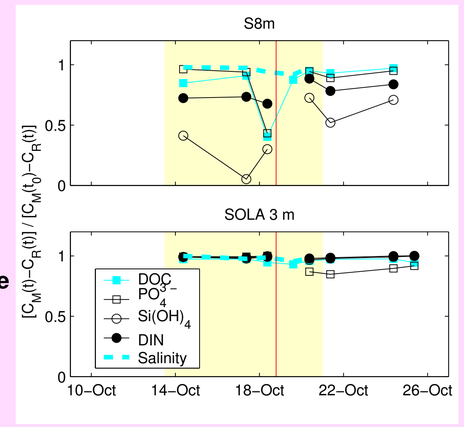


→ Resuspension or dilution ?

– at S8m, resuspension dominated causing DIN and silicate releases

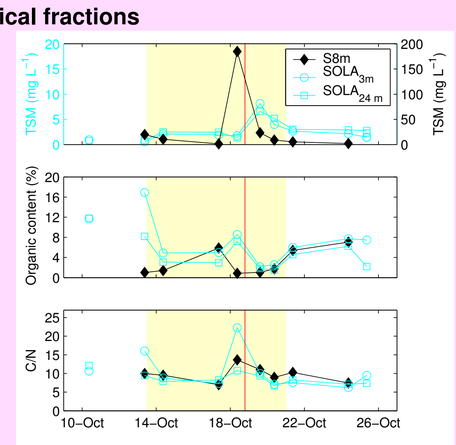
– at SOLA, dilution dominated leading to DIN and silicate concentrations increases until October 20

– at SOLA, after October 20, phosphate concentrations increased more than dilution explained



– phosphate was released through reactive processes during main turbid pulse, one day after river discharge peak

Biological fractions

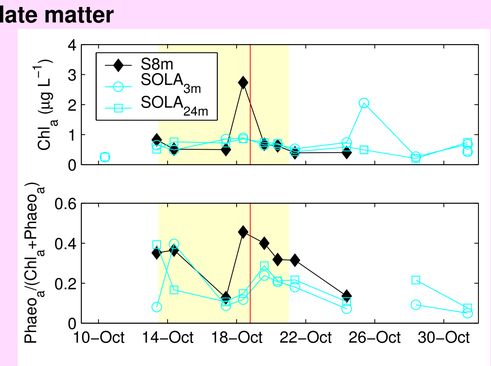


– low organic content in turbid pulses at S8m and SOLA

– at S8m, peak of degraded pigments of river origin

– a very attenuated pigment peak of river origin is transported at SOLA one day after river discharge peak

Particulate matter

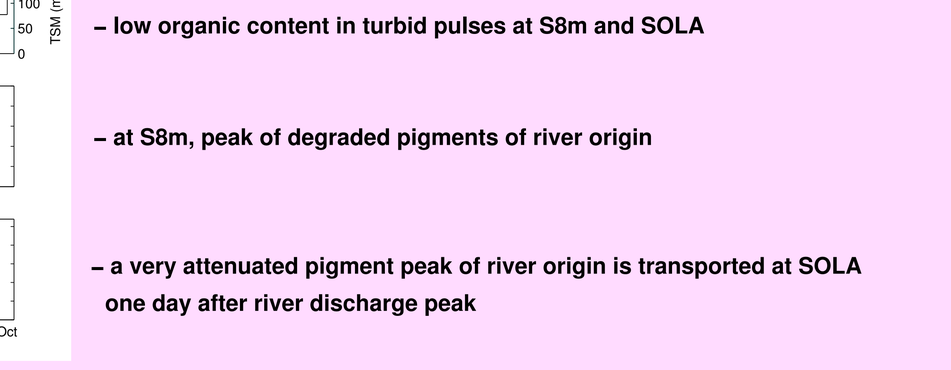


– a peak of fresh Chlorophyll a appears 7 days after the river discharge peak while all solute (DIN, phosphate, silicate) concentrations have decreased to their pre–flow event values

– pigment ratios indicate fresher POM at SOLA than at S8m

Long term monitoring at the SOLA station

– frequent low salinity events
– some of them followed by sharp increases in Chlorophyll a biomass



– DIN and silicate correlates negatively with salinity

– phosphate do not correlate with salinity