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christel.pinazo@univ-amu.fr

MASSILIA PROJECT

Modelling of the Bay of Marseille:

Impact of the Anthropogenic Supply on the marine coastal ecosystem

Christel PINAZO¹, Andrea DOGLIOLI¹, Vincent FAURE¹, Marion FRAYSSE^{1,2}, Ivane PAIRAUD², Anne PETRENKO¹, Bénédicte THOUVENIN³, Jacek TRONCZYNSKI⁴, Romaric VERNEY³, Christophe YOHIA¹

¹Aix-Marseille Université; UM110 CNRS IRD, Mediterranean Institute of Oceanography, OSU Institut Pythéas, Station Marine d'Endoume, Ch. de la Batterie des Lions 13007 Marseille ² Laboratoire Environnement Ressources Provence Azur Corse, IFRÉMER Méditerranée, Zone portuaire de Brégaillon - BP 330, 83507 La Seyne/Mer Cedex ³ Laboratoire Physique Hydrodynamique et Sédimentaire, Département Dynamiques de l'Environnement Côtier, Centre de Brest BP 70 29280 Plouzané ⁴ Laboratoire Biogéochimie des Contaminants Organiques, IFREMER Département Biogéochimie et Ecotoxicologie, Rue de l'Ile d'Yeu BP 21105 44311 Nantes Cedex 03

MARSEILLE

Numerical Tools System

(MARS3D, IFREMER

DATA SET: RHOMAV8_19_400m_20071119120000.nc.all

SPM (g/L)

South-easterly wind event

Large-scale waters surface inputs and a homogenization by a

downwelling process

Erosion event in Cortiou (WWTP) and transport nearshore

inside the Bay of Marseille

Wind

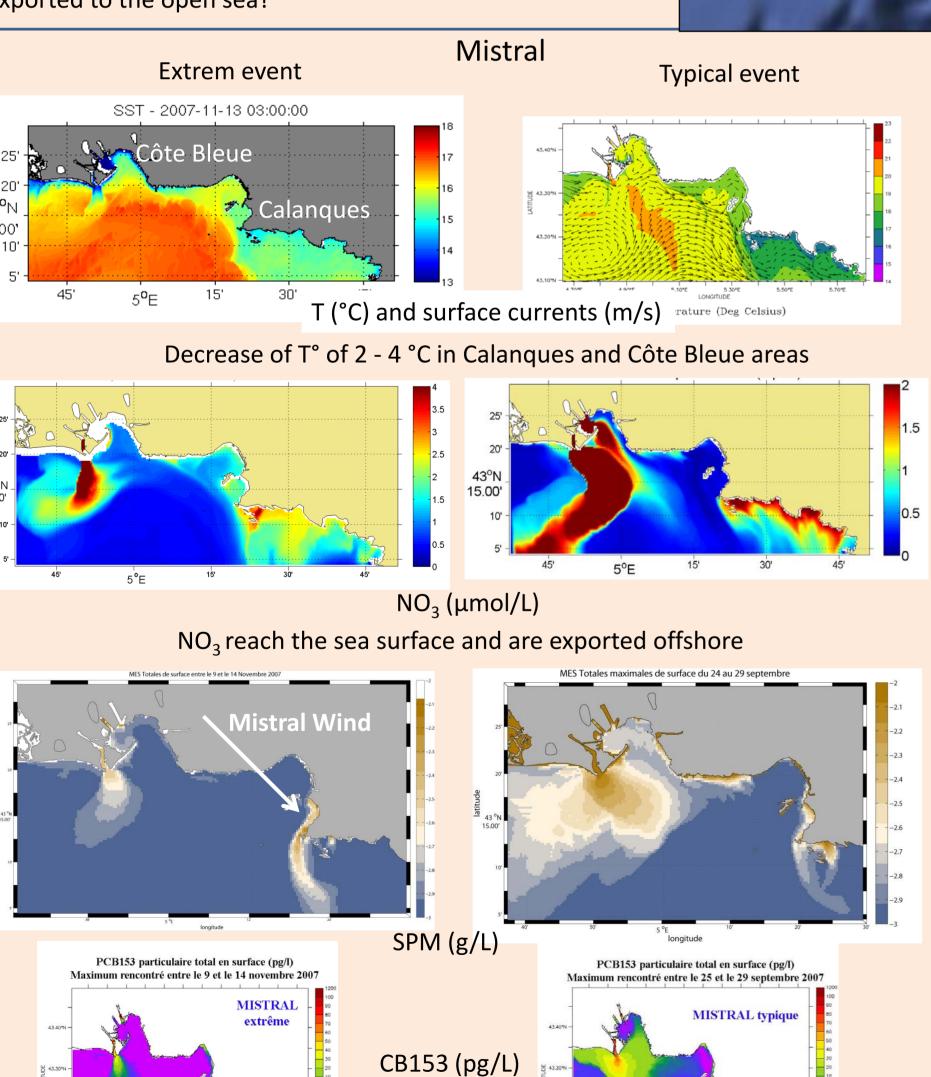
INTRODUCTION

Numerical tools and in-situ observations were used in the area off Marseille to answer the following questions:

- What are the respective contributions of the physical forcing in the modulation of the oligotrophic level of this coastal ecosystem submitted to strong anthropogenic inputs?
- What is the influence of extreme events, which frequency increases with global warming (floods, storms, heat events), on the changes in the first trophic level (phytoplankton) in the Bay of Marseille?
- Are the chemical contaminant (PCB) inputs from the city to the sea off Marseille, stocked inside the coastal marine area or exported to the open sea?

4.70°E 4.90°E 5.10°E 5.30°E 5.50°E 5.70°E LONGITUDE

(PCB ALG+PCB PL+PCB PVL+PCB PH)*1000



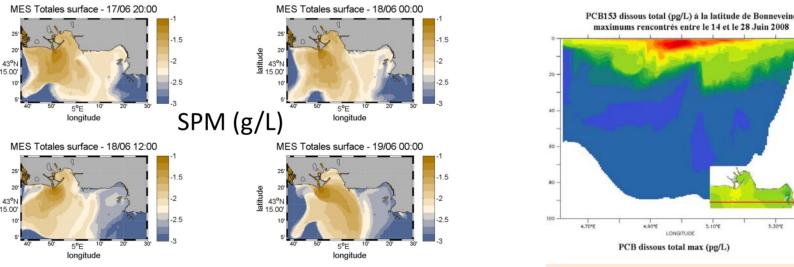
Sediment erosion (SPM, particulate CB153) in the Southern Bay and offshore

export at the sea surface

(PCB ALG+PCB PL+PCB PVL+PCB PH)*1000

Rhone River diluted water intrusion Decrease of salinity and anticyclonic eddy (Schaeffer et al, 2011) pushing Rhone River diluted water in the Bay of Marseille Salinity and surface currents (m/s) NO_3 (µmol/L) Chlorophylle MODIS OC5 19/6/2008

High Nutrients and Organic Matter inputs inducing a high increase of these surface concentrations directly impacting phytoplankton CB153 (pg/L)



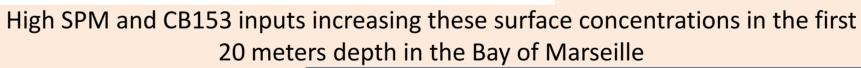
 NO_3 (µmol/L)

PCB153 particulaire total en surface (pg/l)

(PCB_ALG+PCB_PL+PCB_PVL+PCB_PH)*1000

CB153 (pg/L)

cimum rencontré entre le 19 et le 23 novembre 2007

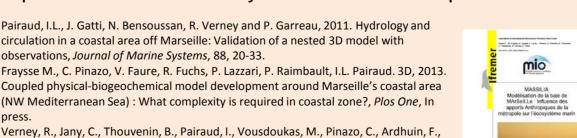


CONCLUSION

maximums rencontrés entre le 14 et le 28 Juin 2008

PCB dissous total max (pg/L)

- Building of a Numerical tools system of the area off Marseille available for further studies
- Reliable simulation of meteorology, hydrodynamics, biogeochemistry, sedimentology and CB153 transfers in the Bay of Marseille
- Characterization for each event of the inputs of Nutrients OM, SPM and CB153, their spatial impact and their export
- The complete results could be found in the scientific report of the Massilia Project and in scientific publications:

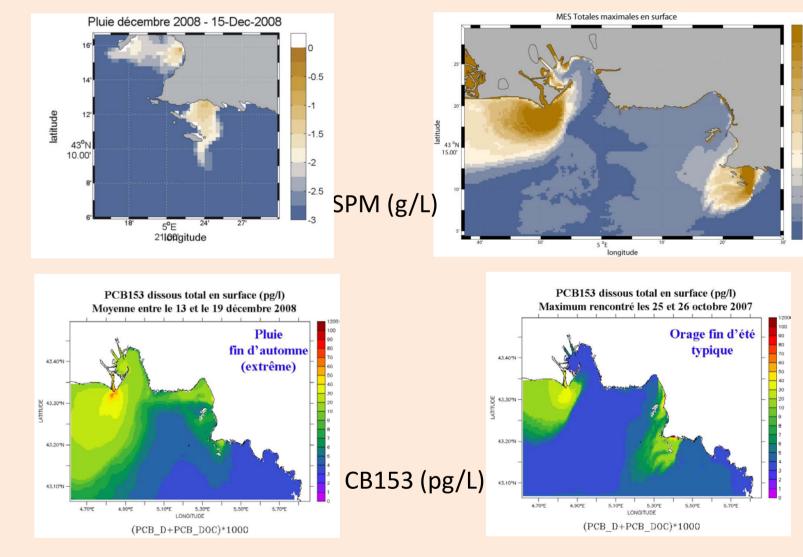


Cann, P., 2013. Sediment transport in the bay of Marseille: role of extreme events. roceedings of Coastal Dynamics'13, Arcachon, France, 1811-1822. nouvenin et al., CIESM 2013 (Poster 3008) Export of chemical contaminants from a big nediterranean city: modelling of dissolved and particulate transport in the bay of

his study was supported by GIRAC, METROC and PNEC-EC2CO MASSILIA projects, sustained by the water agency AERMC, ACRI-ST and the PACA region. The authors acknowledge the staff of the SOMLIT national network for littoral observations (INSU-CNRS) for roviding the data time series, IFREMER for providing ocean color remote sensing data computed with the OC5 algorithm, the ompagnie Nationale du Rhone for data on Rhone river discharges, P. Lazzari, C. Solidoro, and S. Salon for providing biogeochemic undary conditions from OPATM-BFM (Lazzari et al, 2010; 2012). and Meteo France. Rhone data concentration were provided by he national MOOSE program (Mediterranean Oceanic Observing System on Environment) and the Service d'Observation of the Mediterranean Institute of Oceanography (MIO). The authors gratefully acknowledge N. Garcia, V. Lagadec and M. Fornier for nalytical and field assistance. This study was part of the "MERMEX WP3-c3A" and international "IMBER" project. We are grateful to DEA-MPM (Direction des Eaux et Assainissement- Marseille Provence Metropole) and SERAM (Société d'Exploitation du Réseau d'Assainissement de Marseille) for providing Marseille urban river and WWTP discharge. Many thanks also to Pierre Garreau, Franci

Autumn Rainfall Typical event Extrem event Chl (µg/L)

Strong OM and nutrients localized inputs inducing strong variations these concentrations locally but having weak impact on phytoplankton at this season



Strong SPM and CB153 localized inputs inducing strong variations these concentrations locally and in Calanques area and the Southern Bay

concentrations locally and in Calanques area and the Southern Bay				
Event	Inputs		Spatial Impact	Exports
Rhone River Intrusions	Strong Nutrients and OM inputs	Strong SPM and CB153	On the sea surface over a large area	
Rainfall	Nutrients and OM	SPM and CB153	On the sea surface Over a limited area	
Mistral Wind	Strong Nutrients inputs by upwelling	Erosion Southern Bay	The whole water column (upwelling)	Offshore Export of surface water
South- easterly Wind	Weak inputs (most of events)	Erosion WWTP	The whole water column (downwelling)	Offshore Export of deep water + Nearshore Export Of surface water
	Event Rhone River Intrusions Rainfall Mistral Wind South- easterly	Rhone River Intrusions Rainfall Mistral Wind Strong Nutrients and OM inputs Nutrients and OM Strong Nutrients inputs by upwelling Weak inputs (most of events)	EventInputsRhone River IntrusionsStrong Nutrients and OM inputsSPM and CB153RainfallNutrients and OM OB153SPM and CB153Mistral WindStrong Nutrients inputs by upwellingErosion Southern BaySouth- easterlyWeak inputs (most of events)Erosion WWTP	EventInputsSpatial ImpactRhone River IntrusionsStrong Nutrients and OM inputsSPM and CB153On the sea surface over a large areaRainfallNutrients and OM CB153SPM and CB153On the sea surface Over a limited areaMistral WindStrong Nutrients inputs by upwellingErosion Southern BayThe whole water column (upwelling)SoutheasterlyWeak inputs (most of events)Erosion WWTPThe whole water column