

A satellite view of the Mediterranean Sea region, showing the sea in dark blue, the surrounding landmasses in green and brown, and the Earth's curvature at the top.

The MERMeX (*Marine Ecosystems Response
in the Mediterranean Experiment*) **action:**

Mediterranean Marine Ecosystem response to global and anthropogenic changes, retroactions

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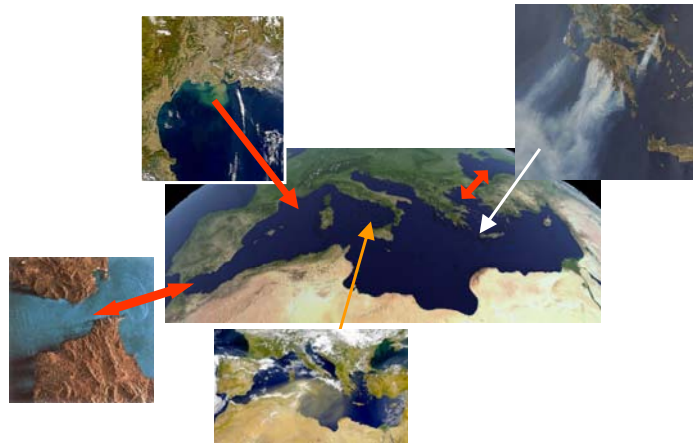
*CEFREM,
Perpignan*

A group of about one hundred scientists from ten laboratories



MOTIVATIONS

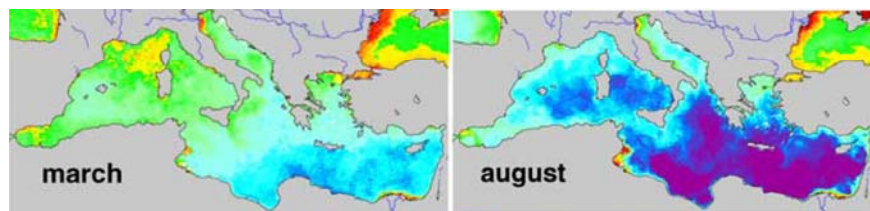
- Strong links between 3 main domains:
OCEAN/ ATMOSPHERE/CONTINENT
→ Proximity and importance of inputs and exchanges



- Heavy populated European coastal areas:
strong anthropogenic pressure but also
area very important for recreation, tourism
and resources



The Mediterranean, as seen by satellite at night



0.01 0.03 0.05 0.07 0.10 0.30 0.50 0.70 1.00 3.00 5.00 10.00 30.00 60.00
mgChl m⁻³
from Bosc et al., 2004

- Low nutrient Low chlorophyll, highly stratified, P limitation
- Strong spatial trophic gradients with high intra-annual variations

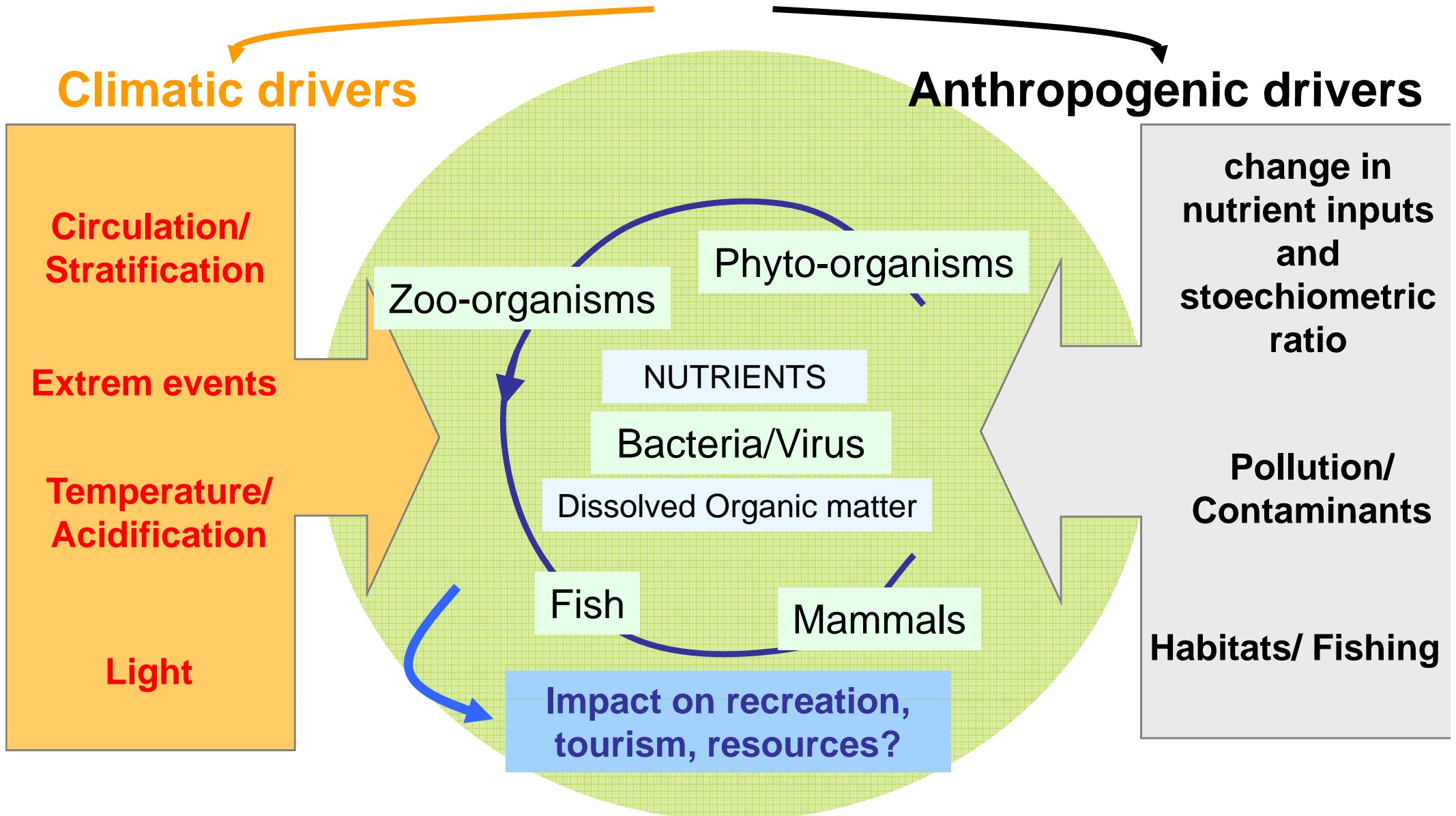
- Almost enclosed Sea but highly dynamic: residence time very short
→ quick answer of the system to natural and anthropogenic changes



MERMEx

SCIENTIFIC OBJECTIVES

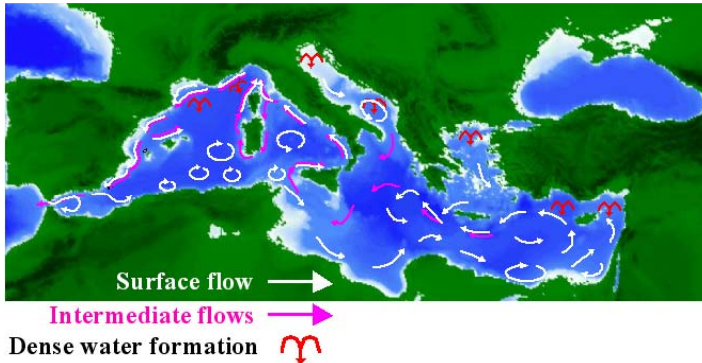
What will be the marine Mediterranean ecosystem response to the changes of :





MAIN TOPICS

INFLUENCE OF HYDRODYNAMICS?



Large scale circulation (after Pinardi, 1997)

- **Effect of change of stratification/destratification** and surface hydrodynamics on the «nutrient-cline» evolution?
- **Effect of change of convection** on nutrients, organic matter transfer and remineralization between surface and deep layers?
- **Effect of change of thermo-haline circulation** on the biogenic elements budgets at the straits?

(Links with HYMEX)



Rhone flood in 2002



Massive inputs of aerosols (Saharan
+Biomass burning in summer 2007

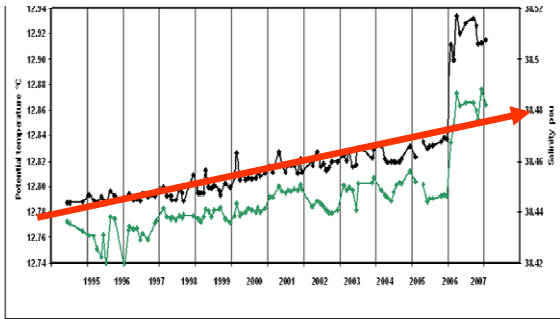
INFLUENCE of EXTREME EVENTS?

- Impact of **massive river inputs** of sediment, contaminants, nutrients, and organic matter on the spatial assemblage of benthic and pelagic ecosystems.
- Impact of **massive atmospheric inputs** on oceanic productivity in oligotrophic regions (Links with CHARMEX)

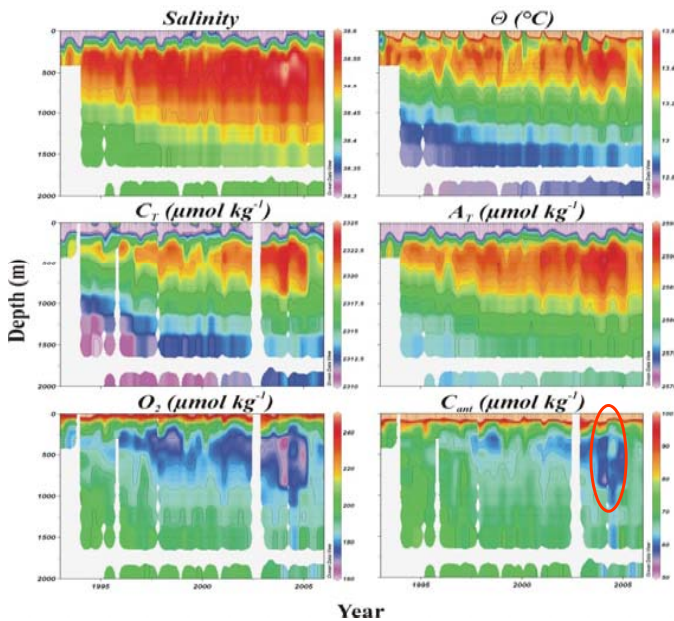


MAIN TOPICS

Temp. increase in Deep waters :
+ 0.05 ° in 10 years



From DYFAMED time-series data
(Marty et Chiavérini, in rev.)



Temporal trend for anthropogenic CO₂
at DYFAMED, Touratier & Goyet sub.

INFLUENCE OF TEMPERATURE and ACIDIFICATION?

- Effect on the **solubility pump**? Consequences for anthropogenic CO₂ sequestration?
- Effect on the main biological processes: Primary production, remineralization and calcification
- Effect on **biodiversity**, including change in the structure community, exotic species migration and on food web functioning? Possibility for acclimation and/or adaptation?



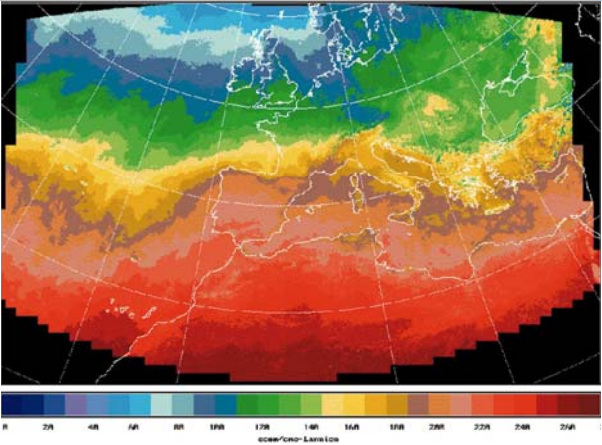
Tropical toxic algae on French Riviera
coast in summer 2008



MAIN TOPICS

INFLUENCE OF LIGHT RADIATION (Links with CHARMEX)

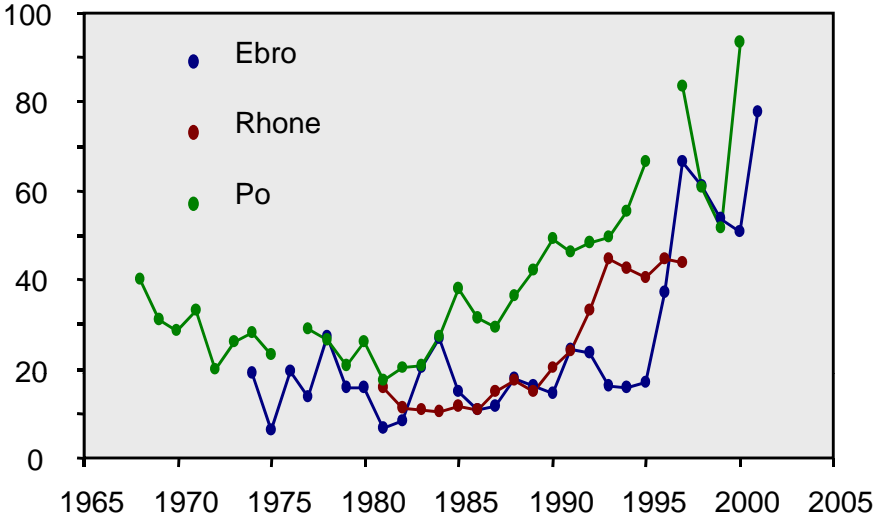
- Effect of solar radiation variation (UVR/PAR) on solar radiation penetration in Mediterranean waters?
- Effects of solar penetration variation on ecosystems: primary production, Food web structure, organic volatile production, CO₂ fluxes



UV/Visible doses in Med >> oceanic areas located in the same degrees of latitude owing to its weak cloudy coverage, Watts .m-2, mean over 1 month- March 97

INFLUENCE OF STOECHIOMETRIC RATIO

Evolution of N/P in 3 rivers NWMed: impact of anthropogenic activity



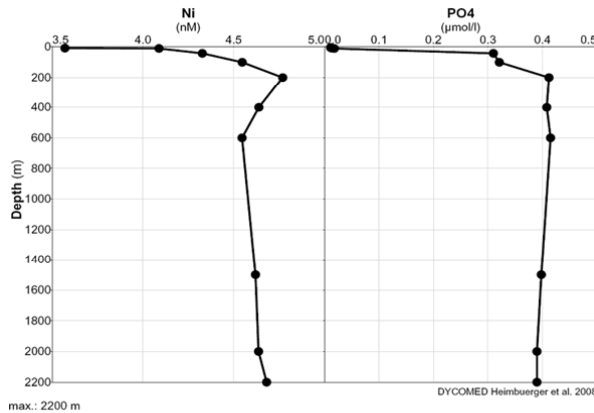
- Effect on primary production, heterotrophic mineralization and **carbon sequestration** efficiency
- What can we learn from **changes of stoichiometric ratio of biogenic elements on those impacts?** For example, is N₂ fixation a response to stratified and nutrient-depleted ecosystems, or a shift from siliceous to non siliceous organisms could be expected?



MAIN TOPICS

INFLUENCE OF CHEMICAL CONTAMINANTS (CC)

- Does oligotrophy favor CC bioaccumulation and bioamplification along the food webs?
- Consequence of changes in PP and carbonate dynamic for the CC fluxes?
- What is the real status of “new pollutants” in the Mediterranean Sea, including pharmaceutical products? Could they have any impact on the trophic food chain?



max.: 2200 m
Figure 3: Dissolved Ni concentration profile, compared with phosphate concentration profile. Data acquired at the *DIFAMED* station (Ligurian Sea), September 1st, 2008 (Heimbürger et al., 2008)

Bioactive TEs also have a potential toxicity and may inhibit biological development

INFLUENCE OF HABITAT AND RESOURCE

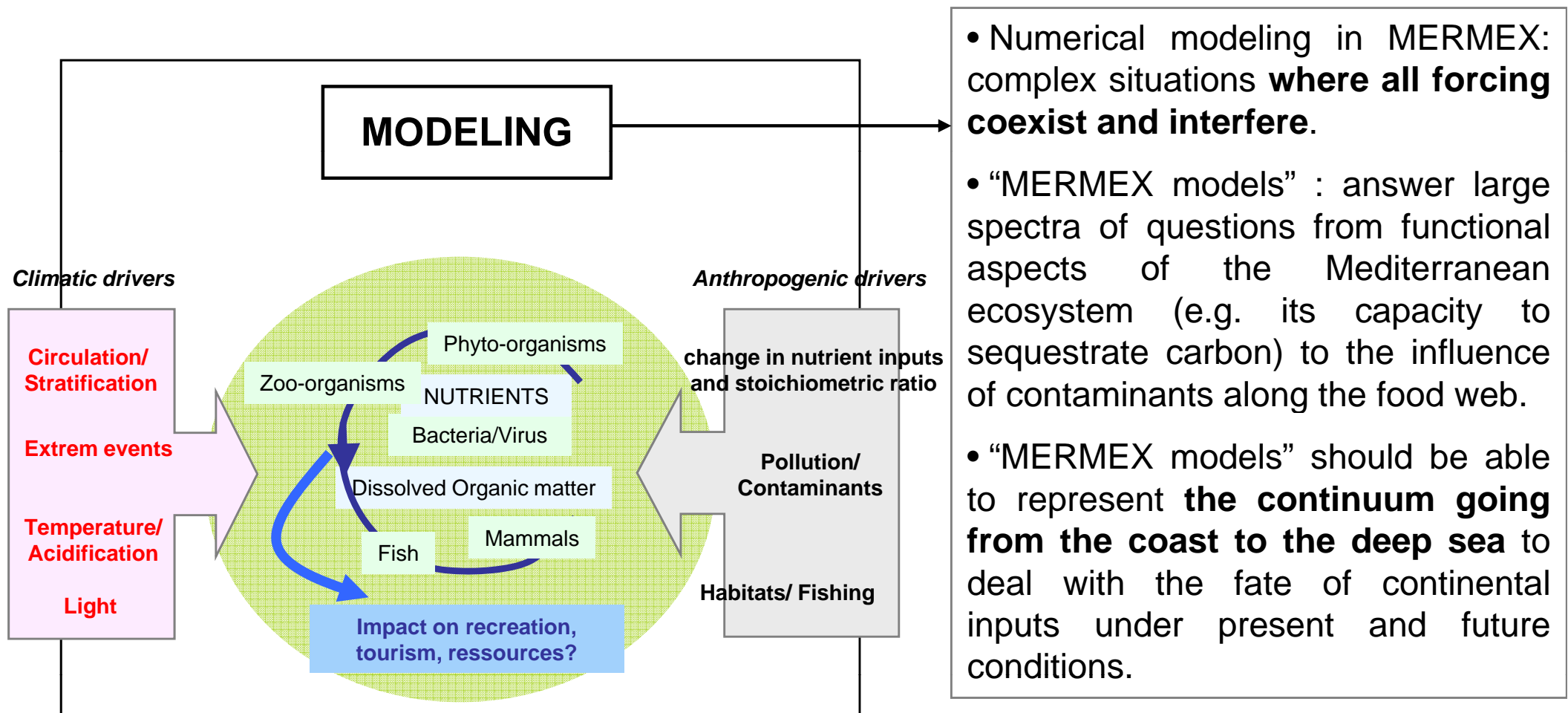
- Effects of environmental changes on species and communities spatial distribution. *Impact on ecoregions spatial extent? Northern extension of southern species or assemblages?*
- Biogeochemical fluxes among ecoregions: what is the role of each species in the biogeochemical fluxes, their contribution to production, biomass? Do system stability and resilience rely on a rather small number of species?



MAIN TOPICS

... strong interaction between experimental approaches and modeling:

Can we build a group of accurate models able to simulate the evolution of the Mediterranean marine ecosystems according to different scenario?





PROJECT LIFE

Writing of a White book

This work is in progress and will constitute a large publication: this review article will be submitted to **Progress in Oceanography** by the end of 2008 and publication might be expected for 2009-2010.

Letter of intend (LEFE): Objectives 2009: Implementation of MERMEx (*cf talk tomorrow*)

MERMEx Web site

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about Mermex
Links, liens
web sites
Mails, information
17 July 2008
News
Call for a Mermex-CIESM-SESAME special session in ASLO Nice 2009 !
CR Decembre 2007, Cadarache meeting
CR June 2008, CEREGE meeting
Mermex abstract at EGU Vienna 2008

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MERMEX

about Mermex (Home)

jeudi 26 juin 2008 par ML

The French community working in marine biogeochemistry and biological ecosystems is currently structured to initiate the MERMEX project (Marine Ecosystems Response in the Mediterranean Experiment). This programme led by the 'Institut National des Sciences de l'Univers (INSU)' will be associated to (...) > [SUITE](#)

<http://mERMEx.com.univ-mrs.fr/>

Communications

Special Session Joint CIESM/ CNRS/ INSU Session (ASLO 2009, Nice)

“Signals of Change in the Mediterranean and Black Seas: Multi-Lateral Initiatives”

34 submitted abstracts