

Variability of primary production during the spring bloom in NW Iberia: what can we learn from a biophysical model?



L.M Garcia-Garcia and M. Ruiz-Villarreal
 luz.garcia@ieo.es, manuel.ruiz@ieo.es



The IEO observing and modelling system



The Spanish Institute of Oceanography (Instituto Español de Oceanografía, IEO) has been performing sustained observations of physical (temperature, salinity and currents) and biochemical variables (nutrients, oxygen and plankton) along the N and NW Atlantic Iberian coast since the late 80s.

ICHTHYOP LAGRANGIAN MODEL (Lett et al., 2008)

- Advection and dispersion of particles (superindividuals)
- Biological behaviour
- Growth depending on temperature for eggs and larvae + all the processes before

Offline coupling

ROMS PHYSICAL MODEL

- 3.5Km horizontal resolution
- OBC: MyOcean2 (Mercator)
- Atmospheric forcing: Meteogalicia.
- Rivers

Online coupling

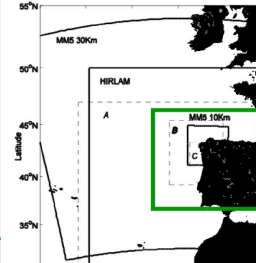
ROMS ECOLOGICAL MODEL (Fennel et al, 2006)

- N2PZD2 model + chlorophyll
- OBC: Temperature/NO3 relationship obtained from IEO data (Vaclan cruises 2003-2008).

Offline coupling

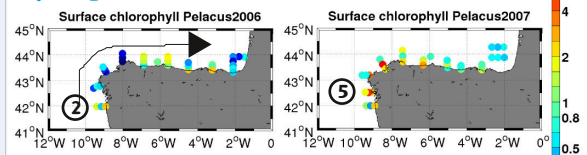
Zooplankton

OBC: MERCATOR PSY2V2

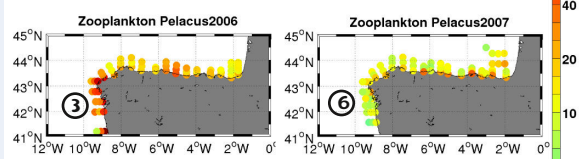


The IEO Pelacus survey monitors every spring the continental shelf for the acoustic determination of biomass of pelagic fish stocks. Hydrographic and biogeochemical variables are also sampled. We focus here on 2006 and 2007

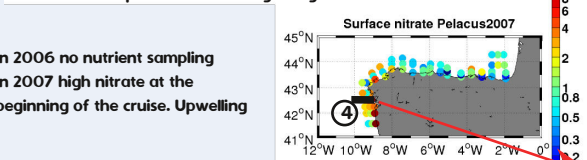
Spring Pelacus cruises 2006 and 2007



In 2006 low chlorophyll at the beginning of the cruise in Galicia
 In 2007 high chlorophyll at the beginning of the cruise in Galicia



In 2006 high zooplankton at the beginning of the cruise in Galicia
 In 2007 low zooplankton at the beginning of the cruise in Galicia



In 2006 no nutrient sampling
 In 2007 high nitrate at the beginning of the cruise. Upwelling

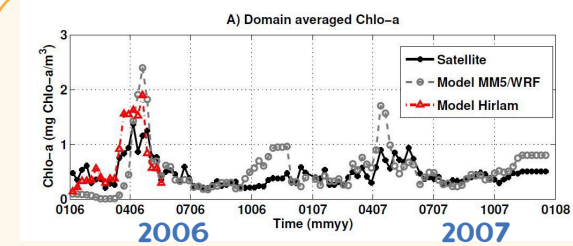
The model shows that...

In NW Iberia blooms result from the interplay of upwelling, as the main source of nutrients, and river plumes, where production can occur even in winter.

In 2006 the cruise started under downwelling conditions. Strong river discharge provided nutrients (1) that sustained production at the plume (2). Concentration of zooplankton was at its maximum associated with the plume (3).

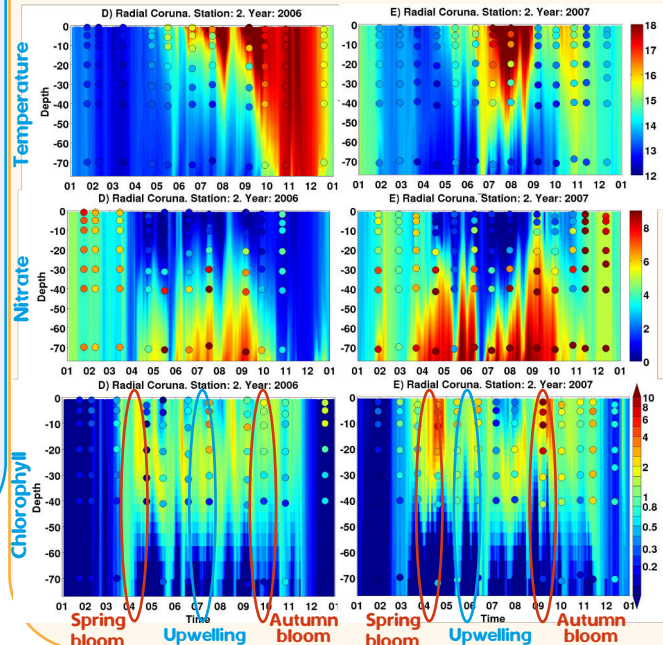
In 2007 the cruise started under upwelling conditions, causing the uplift of nutrients (4) and sustaining production (high chlorophyll (5)). Zooplankton was low during the cruise (6), but bloomed later.

Hovmueller plots of this section

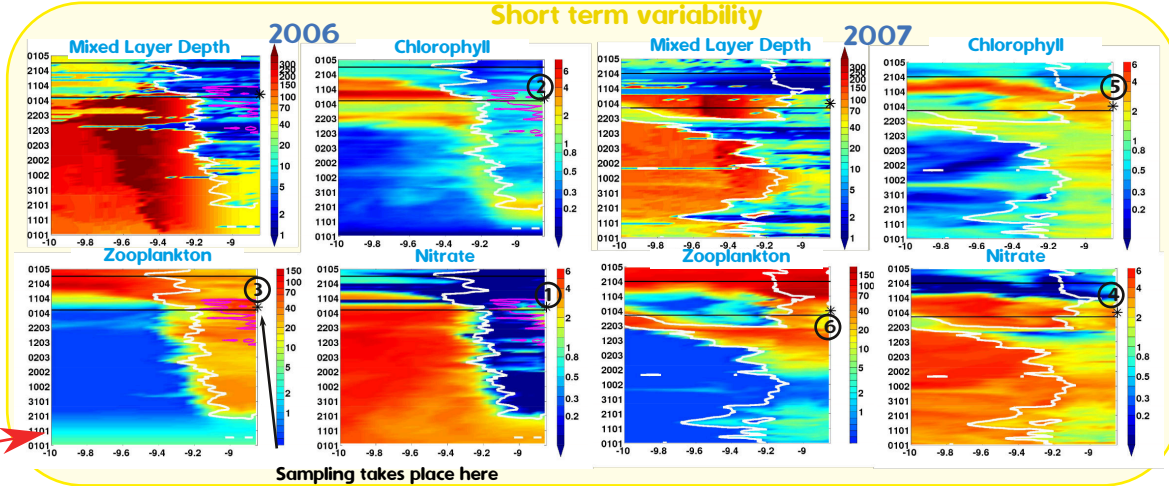


Seasonal and interannual variability (model vs Modis)

The model reproduces the seasonal and interannual variability.
 The model overestimates the spring bloom.
 The timing and intensity of the bloom depends on the meteo forcing.



The monthly vertical profiles (dots) of temperature, nitrate and chlorophyll provide information on the water column stratification and mixing, the onset and decline of blooms or the occurrence of upwelling events bringing nutrients to the surface and enhancing production. The model (background) matches well the observations and complete the information at scales not captured by the monitoring system.



Sampling takes place here