Vulnerability of coastal ecosystems
to global change and extreme events
Biarritz - October 2011

# Response of plankton communities of the Bay of Calvi (northwestern Mediterranean) to climate variation over the past three decades (1979 – 2010)

Anne GOFFART *, Amandine COLLIGNON and Jean-Henri HECQ

University of Liège, Belgium

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* A.Goffart@ulg.ac.be

STARESO
Station de Recherches Sous-Marines et Océanographiques

Université de Liège

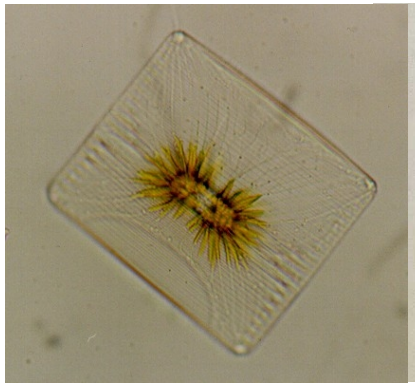
# The studied area : the Bay of Calvi, Corsica


- Open bay and narrow shelf
- Oligotrophic characteristics
- Few anthropogenic pressures
- Reference for the WFD

# Time-series

## Phyto- and zooplankton time-series from 1979

High sampling frequency during phyto- and zooplankton blooms (1-7 times per week)



A.Goffart@ulg.ac.be JH.Hecq@ulg.ac.be

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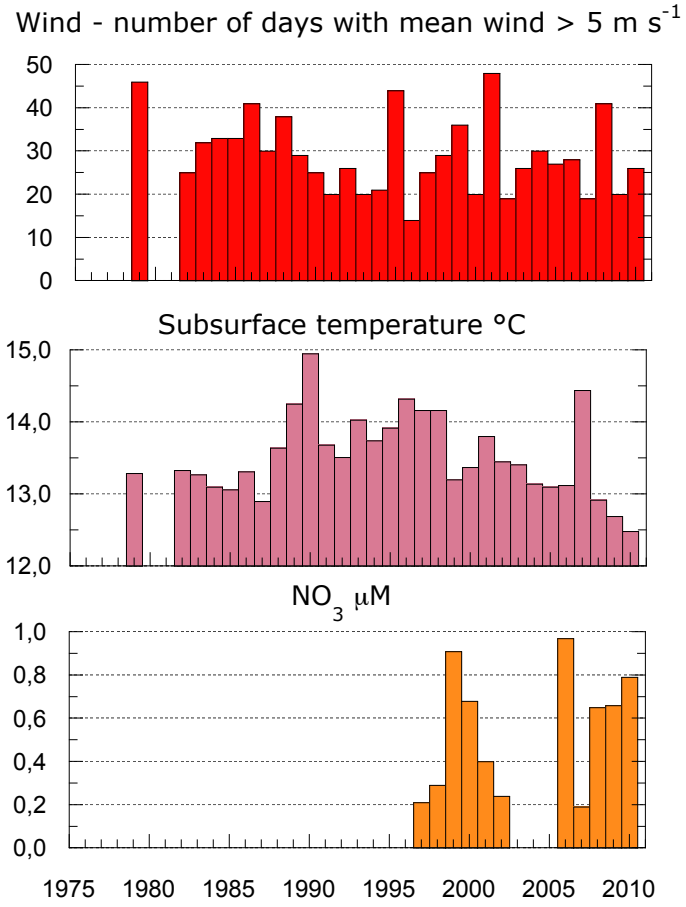
# Objectives

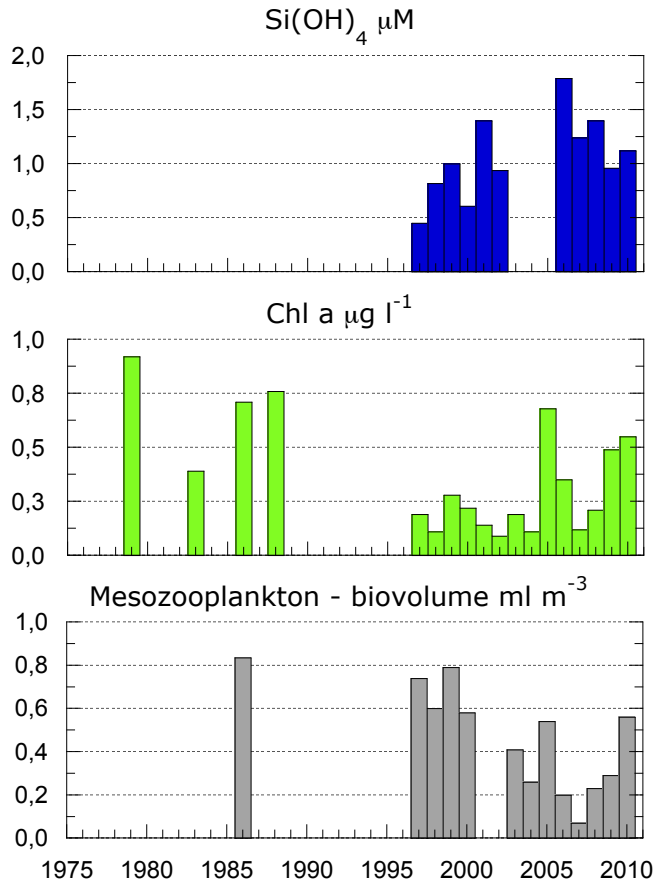
- To detect trends in changes in plankton communities between 1979 and 2010
- To show how climate variation affect the dynamics of the plankton of the Bay of Calvi
- To assess the response of the pelagic ecosystem to extreme climate conditions

Zoom on the winter - spring bloom

# Trends in environmental and plankton parameters

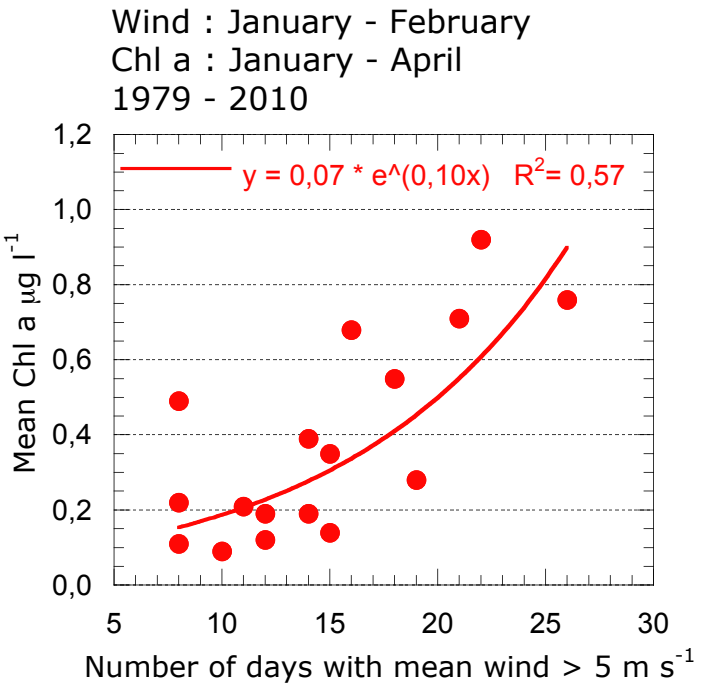
January - April

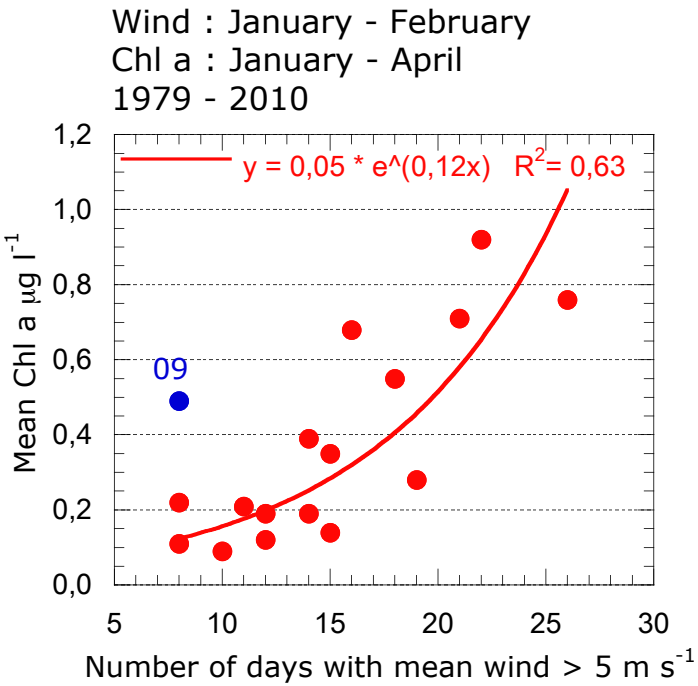


# Control of phytoplankton by wind stress

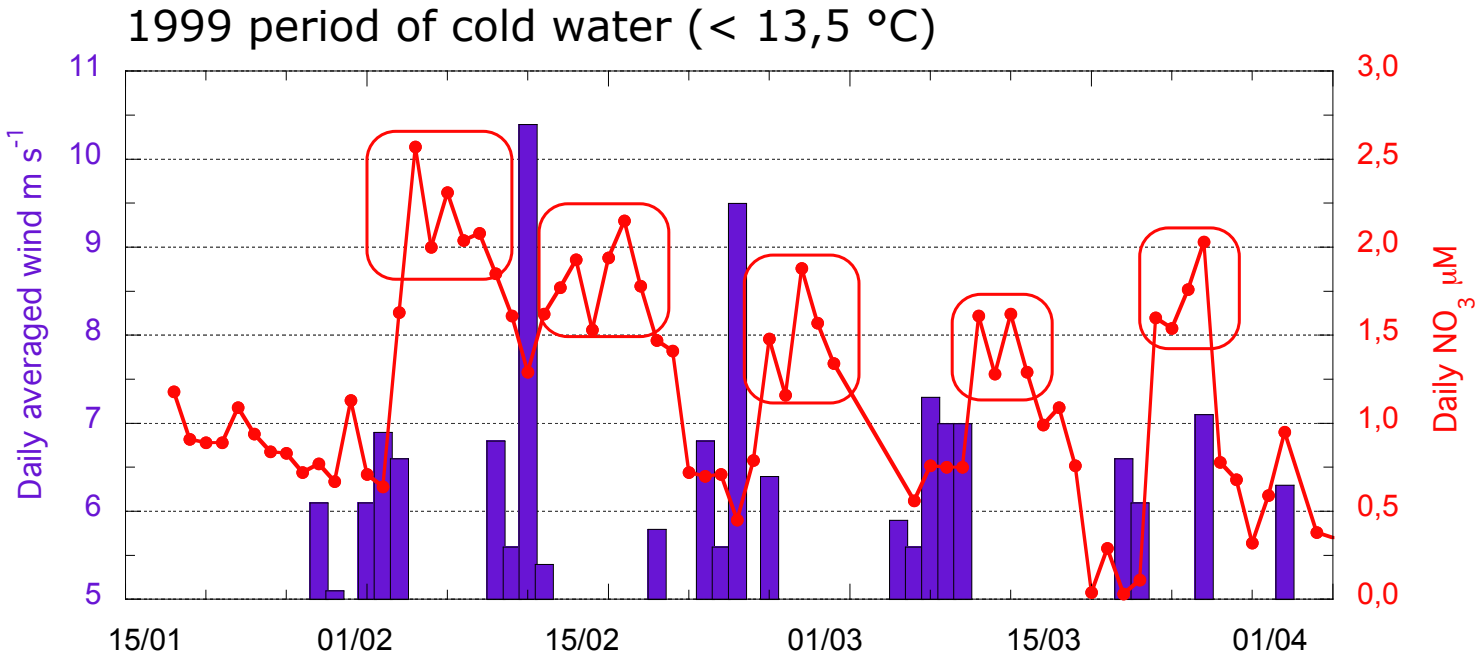
## Phytoplankton biomass is controlled by wind forcing



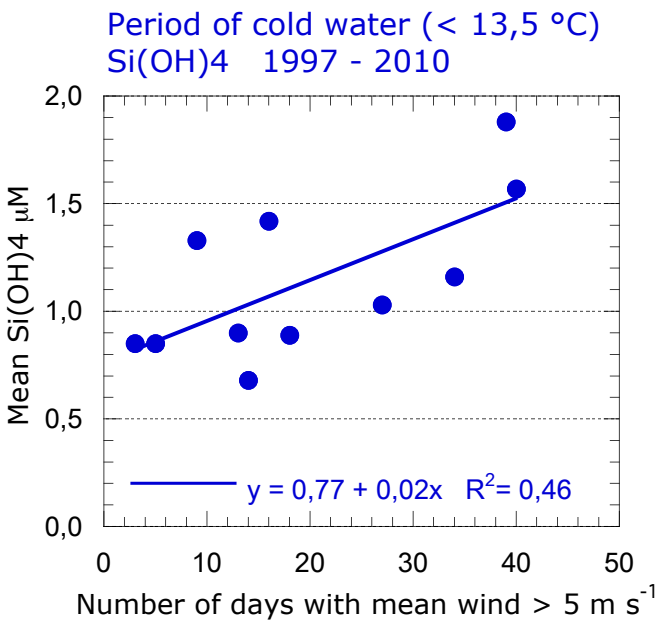
# Control of nutrient availability by wind stress

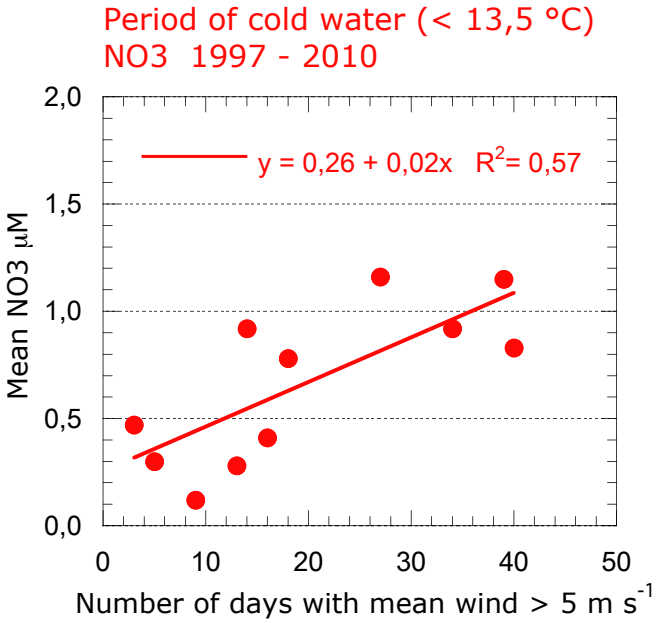
In unstratified water column (surface temperature < 13,5 °C), surface nutrient enrichment is strongly controlled by wind stress - annual example -



# Control of nutrient availability by wind stress

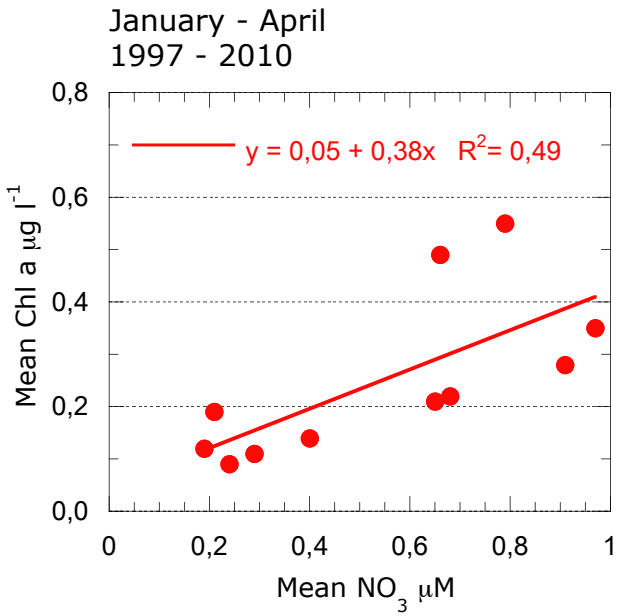
In unstratified water column (surface temperature < 13,5 °C), surface nutrient enrichment is strongly controlled by wind stress - time-series example -

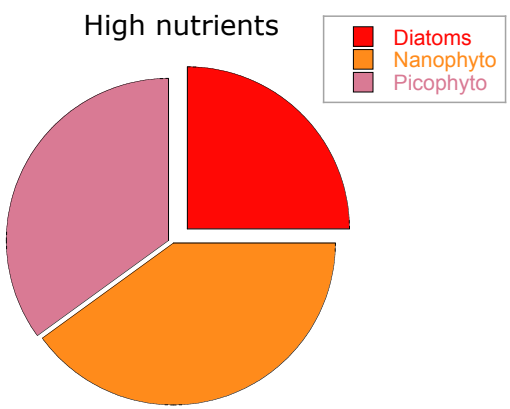


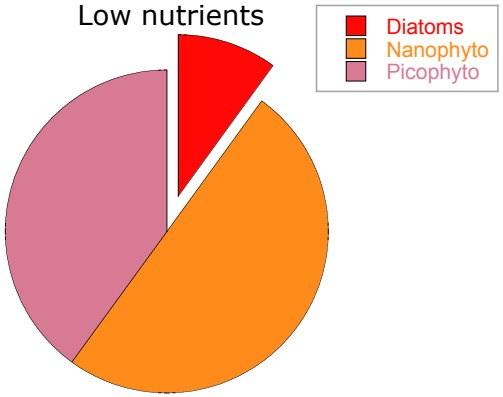



# Control of phytoplankton by wind stress

Phytoplankton biomass and composition are controlled by wind forcing and subsequent nutrient enrichment



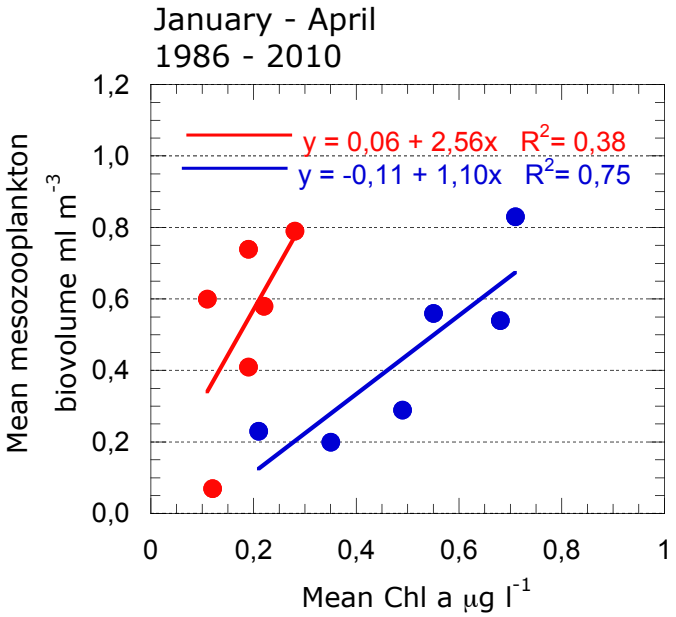



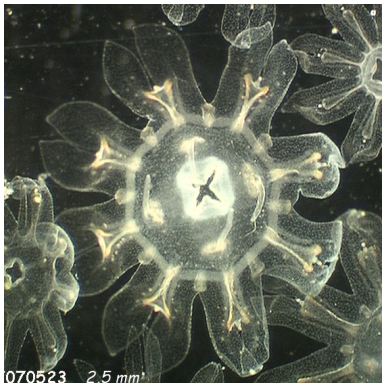




Bottom-up control of phytoplankton production

# Control of mesozooplankton dynamics

Mesozooplankton biomass and composition are controlled by phytoplankton availability AND interactions with higher trophic levels (e.g. jellyfishes)




Bottom-up & top-down control of mesozooplankton communities

Composition : still a lot of work ...

# Conclusions

- No continous trends in changes in phytoplankton communities of the Bay of Calvi between 1979 and 2010 but an exceptional response of the system to extreme climate conditions during the winter - spring period

- Evidence of long-term changes of mesozooplankton communities : modifications are controlled by variations in phytoplankton biomass and composition during the winter - spring period and by the frequency of jellyfish outbreaks

- The Bay of Calvi is one of the few areas where very specific characteristics can be used to study the responses of marine ecosystem to physical forcing and changing climate


Thank you for your attention

Special thanks to Louis Legendre for helpful discussions