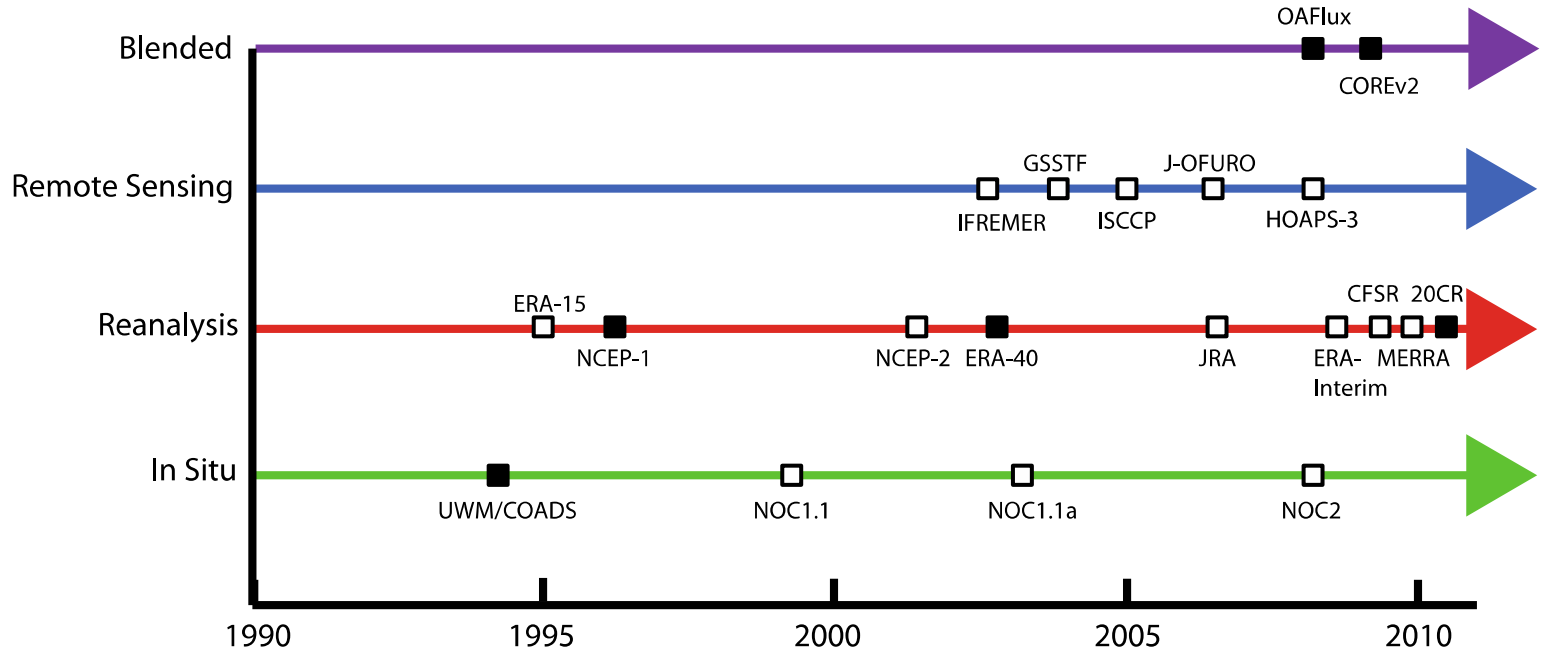
# Implementation strategy for TIE-OHF « cage-team »

**Meeting JAN 2015, Ifremer, Paris**

# General Background

**Clivar/GSOP: Improving the quantification of air–sea fluxes is identified as a critical research area for advancing our understanding of atmosphere–ocean interactions related to Earth's climate variability and change, and for improving our ability to account for ocean signals in short- and long-term climate fluctuations due to modes of natural variability and human influence.**

➔ Several global flux products are currently available and widely used by the community



# Concept of Cages

**All these imperatives suggest some potential locations of the cages in:**

- mid and subpolar latitudes, in the subtropical subduction regions and in the tropical warm pools
- semi-enclosed seas (e.g. Mediterranean Sea)
- a suitable open-ocean CAGE (which could be identified by ocean syntheses).

**The selection of CAGES should be based upon the following basic requirements –**

(i) The chosen cages should reasonably represent the variety of sea-air interaction processes and ocean dynamics conditions  relatively low lateral advection, relatively strong storage terms and the weak potential changes of the ocean heat content.

(ii) From air-sea interaction view point we will focus on the areas with dominating turbulent fluxes, and the regions where radiative fluxes are equally important compared to the turbulent exchanges.

(iii) based upon the data coverage: ARGO buoys, Glider data, full depth hydrology meteorological buoys, VOS meteorology, research vessel (RV) meteorology, ..

# Concept of Cages

## Approach:

- **Net Heat Flux:** radiative components will be taken as given (along with its uncertainty) from existing data sets
- **Horizontal Advection:** estimating the local heat storage and horizontal advection of heat based on a simultaneous re-analysis of ocean temperature and currents (Wang and Carton, 2002), based on data gathered through the CLIVAR GSOP inter-comparison program (CLIVAR Exchanges 64), and for atmos. advection?
- **OHC:** from in situ observing system, each “box-indicator” developed for specific region, and validated via the cross comparison with remote sensing data

## Implementation plan (suggestion):

1.) Develop 2 “test-cages” for method development: Mediterranean Sea, North Atlantic

2.) Clarify which datasets aught to be used for the test-cages: organize teleconf in beginning of January?

3.) Develop team and strategy plan for implementation (teleconf.)

4.) Start to draft scientific paper for cage method

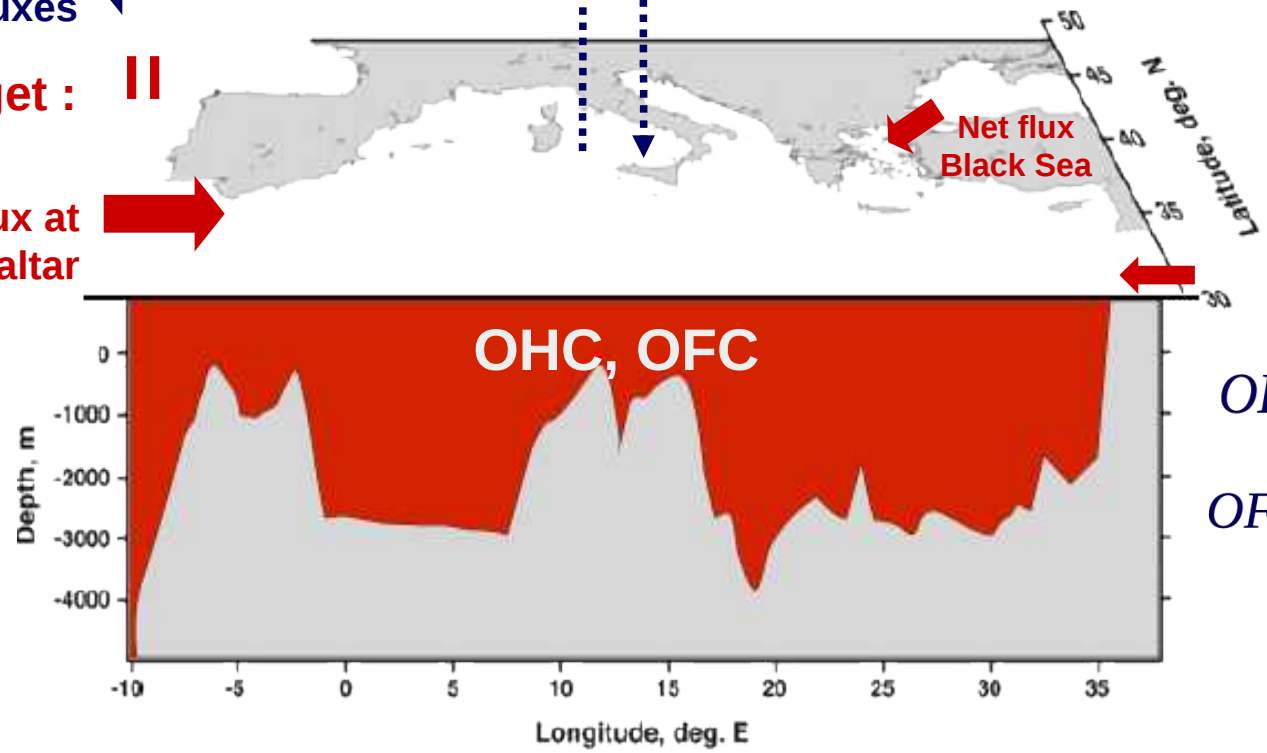
# Natural cage: Mediterranean Sea

Net atmospheric fluxes

Radiative and turbulent fluxes
Precipitation, Evaporation

Budget : II

Net flux at Gibraltar




$$OHC = \int_z \rho c_p T_0(z)\, dz$$

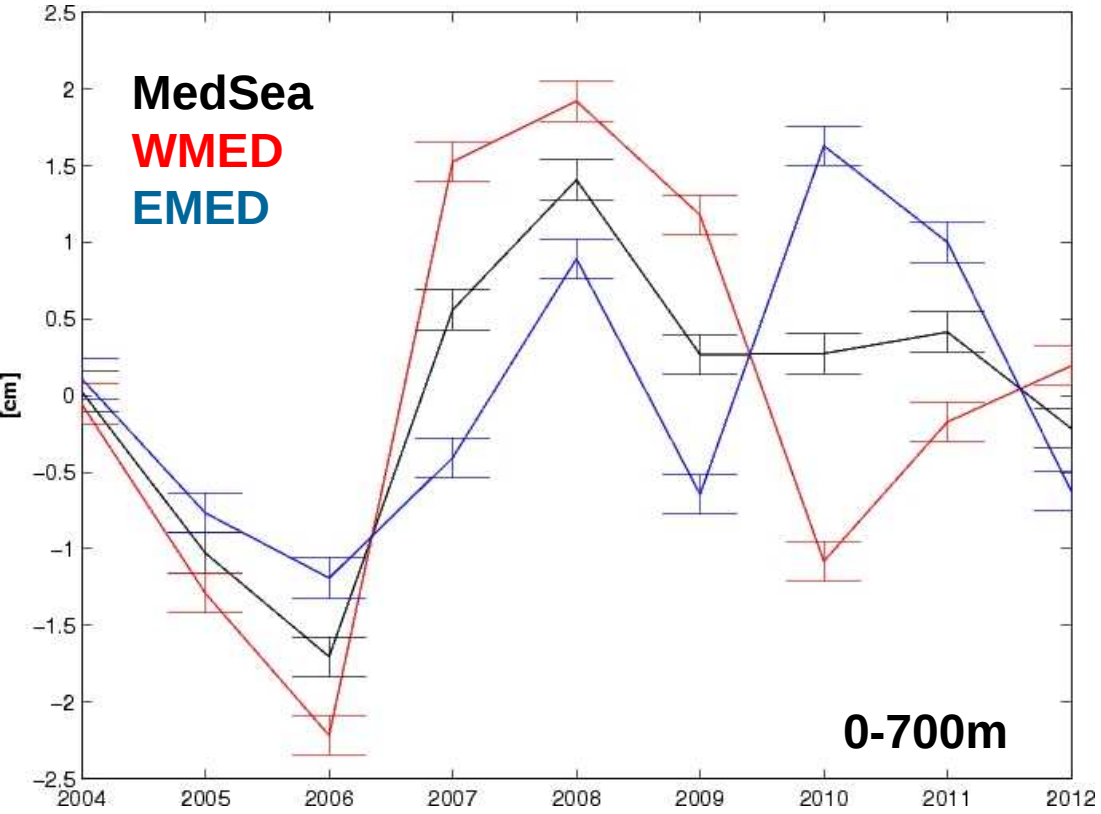
$$OFC = -a \int_z \frac{\rho(T,S,p)}{\rho(T,0,p)} \frac{S_0}{(S_r + S_0)}\, dz$$

**Budget = Lateral net flux – Ocean integrated heat and/or freshwater**

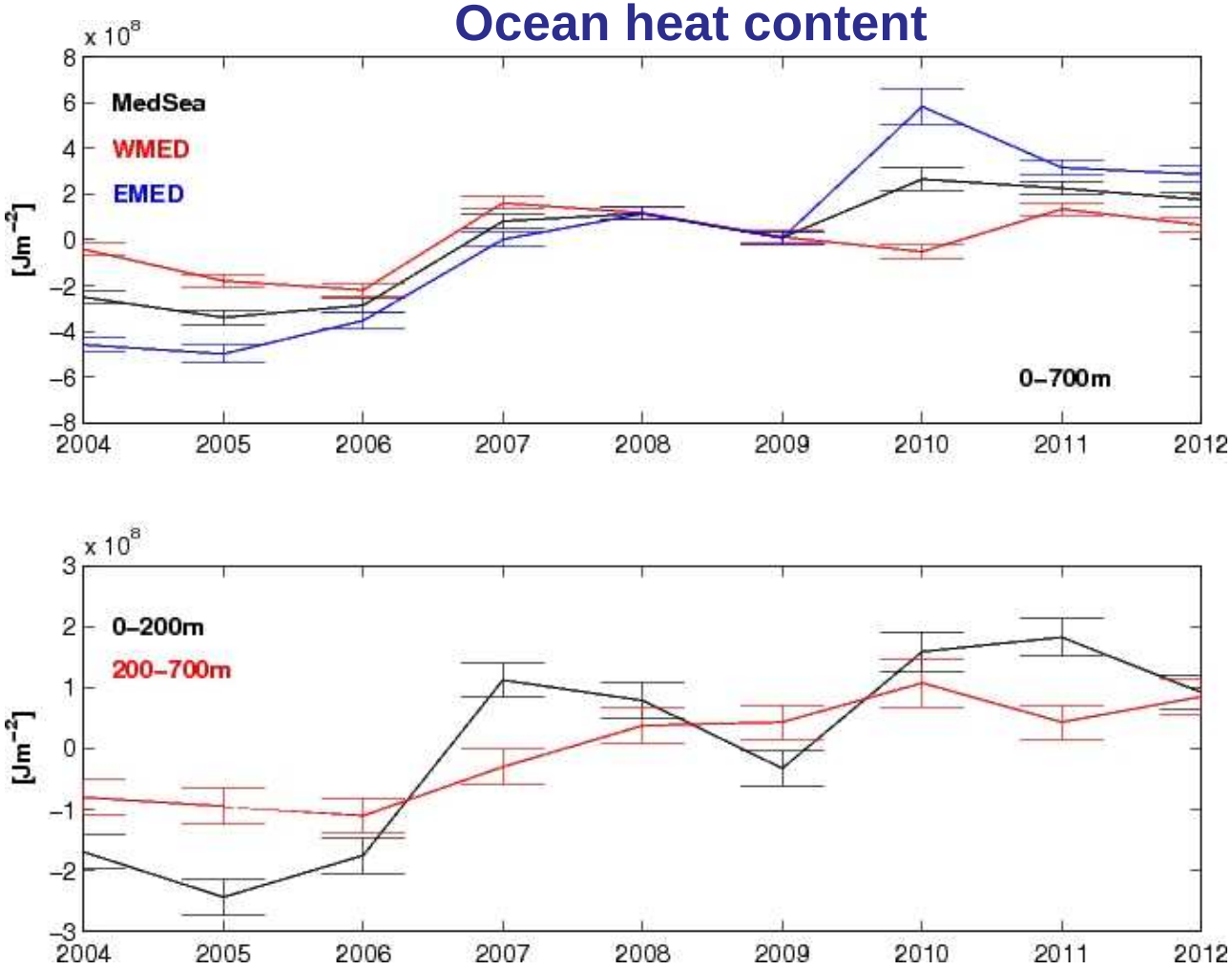
# First steps done …

# Natural cage: Mediterranean Sea

## Steric sea level

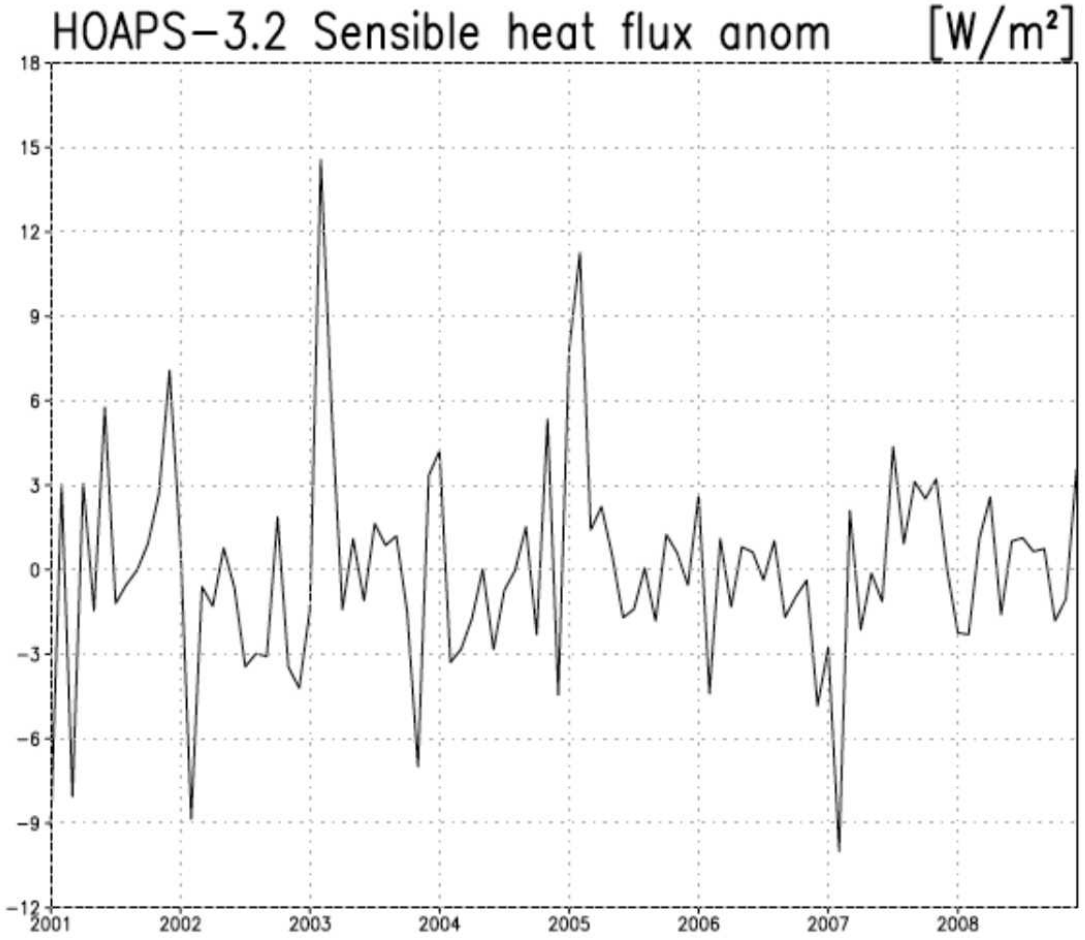


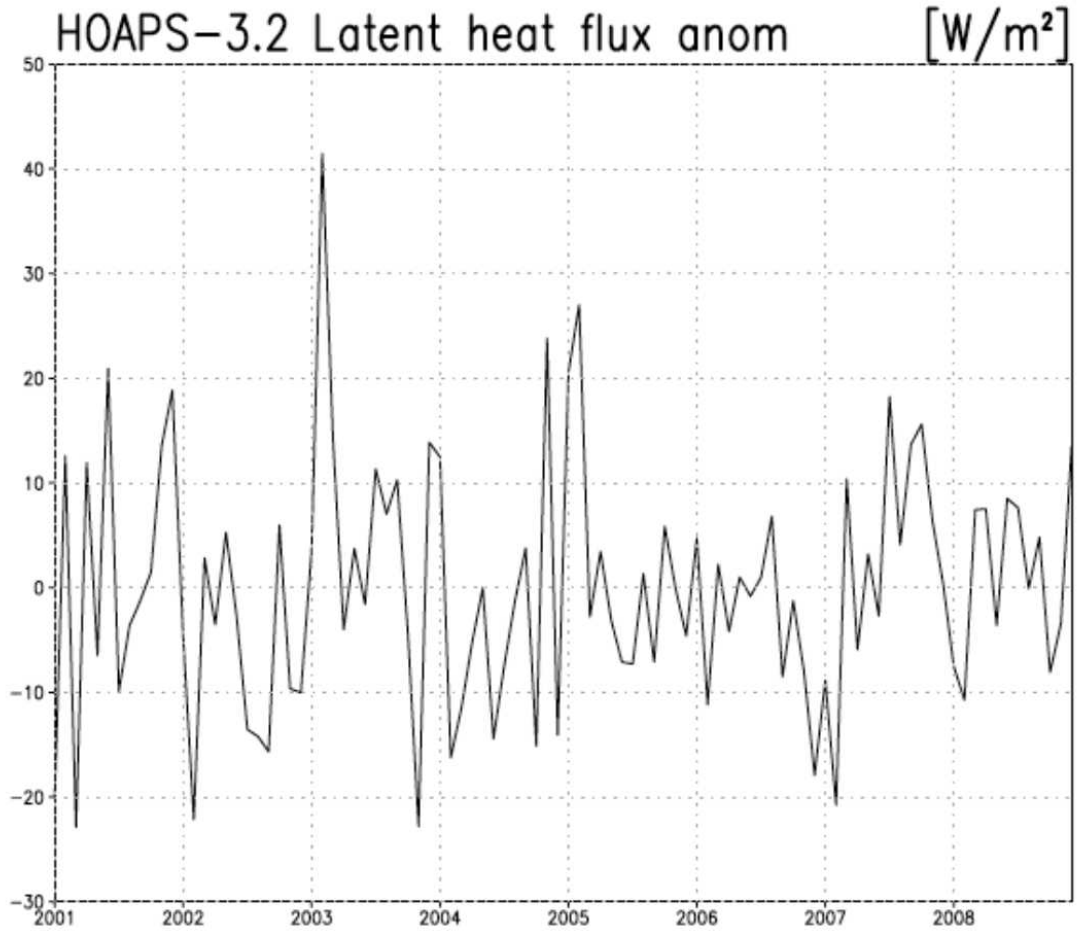

## Ocean heat content




- Ocean components are developed and are ready for implementation, also for other regions of “cage-experiment”

- Generation of mean sensible and latent heat flux from DWD




- First steps done, but…

# Next steps? …

## Implementation plan (suggestion):

1.) Develop 2 “test-cages” for method development: Mediterranean Sea, North Atlantic: (note that for high latitudes uncertainties for turbulent fluxes increase, and hence, knowledge of uncertainty scales are needed ( DWD (CM SAF) will deliver uncertainty scales in March 2015)

2.) Clarify which datasets aught to be used for the test-cages: organize teleconf in beginning of January?
i) OHC: for MedSea developped (2004-2012); next step: develop OHC for North Atlantic box

3.) Develop team and strategy plan for implementation (teleconf.) and start to draft scientific paper for cage method

## Suggestion for cage-team:

**General concept:** Sergey Gulev, Simon Josey, Carol-Anne Clayson, Bertrand Chapron, Keith Haines, Semyon A. Grodsky, Rachel T. Pinker

**OHC:** Karina von Schuckmann, Clement de Boyer Montégut

**Net atmospheric flux:** Axel Andersson, Chris Merchant, Rainer Hollmann, Abderahim Bentamy, Richard Danielson, Igor Esau

**Lateral flux:** Keith Haines, Maria Valdivieso, Semyon A. Grodsky