

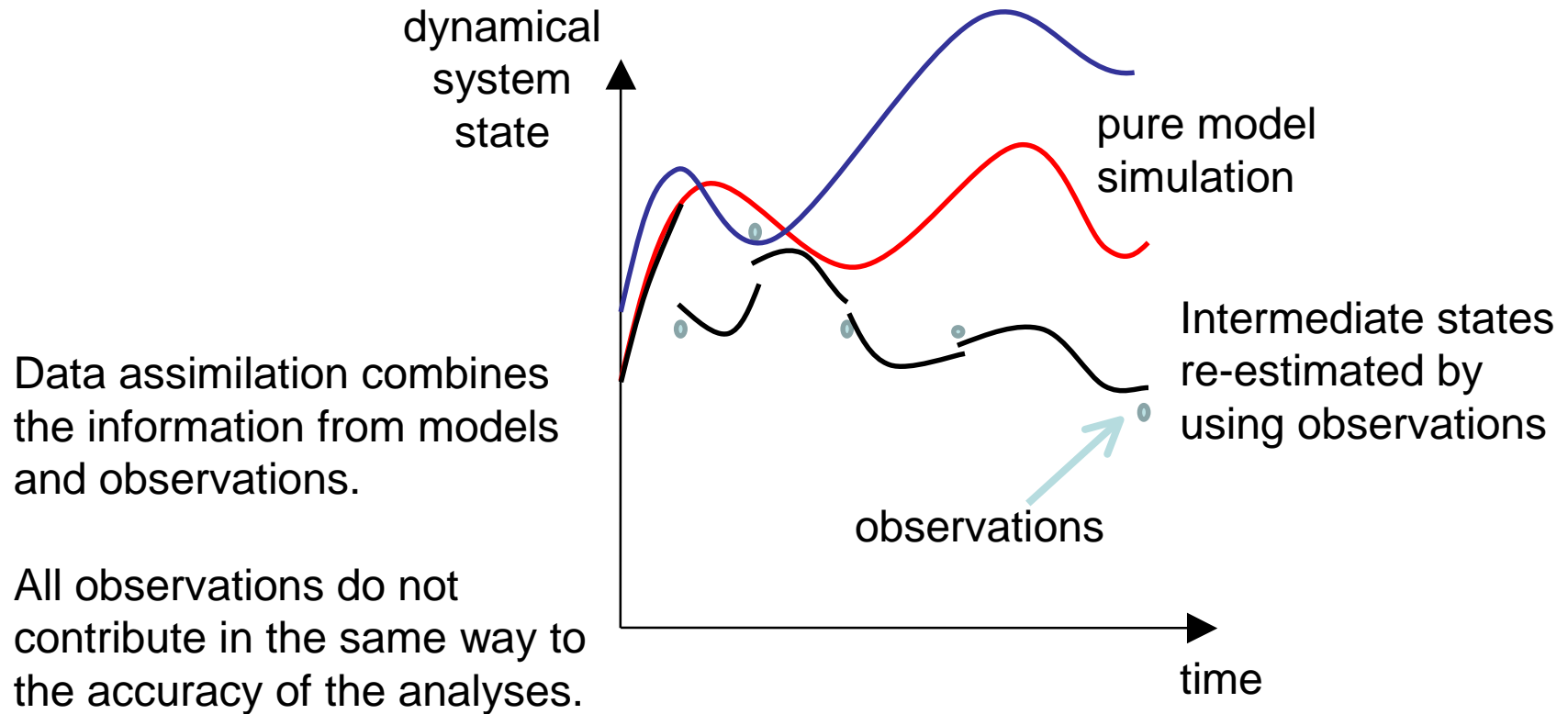
Jerico WP9: Need for fixed observing sites for estimating processes in coastal zone

Presented by Srdjan Dobricic on behalf of research groups at CMCC, DELTARES, DMI, HCMR HZG, IFREMER, INSU/CNRS and MUMM

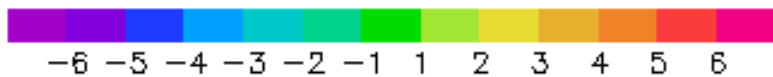
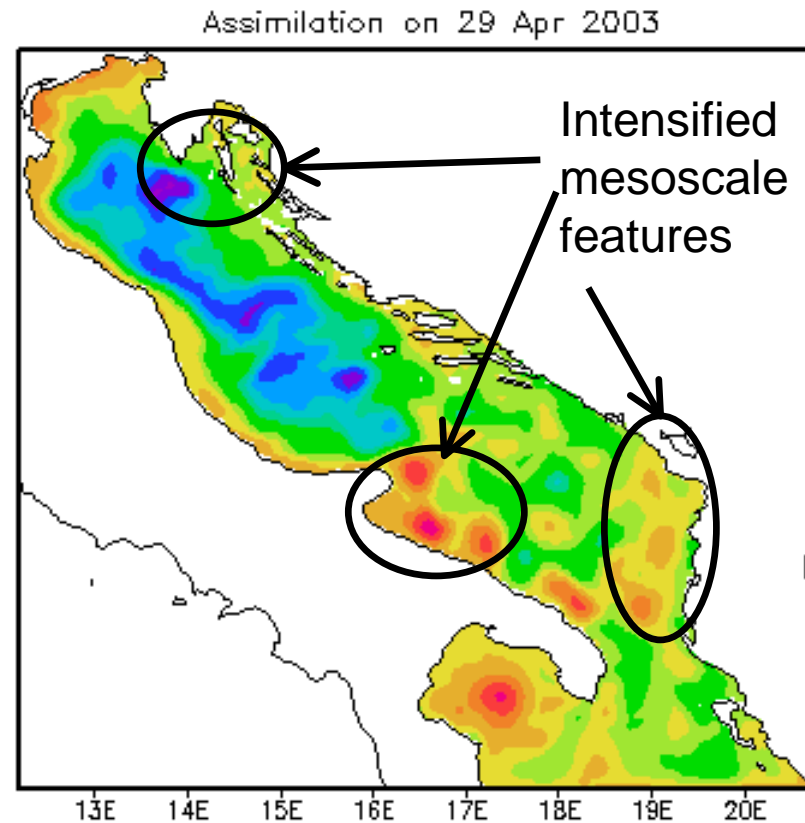
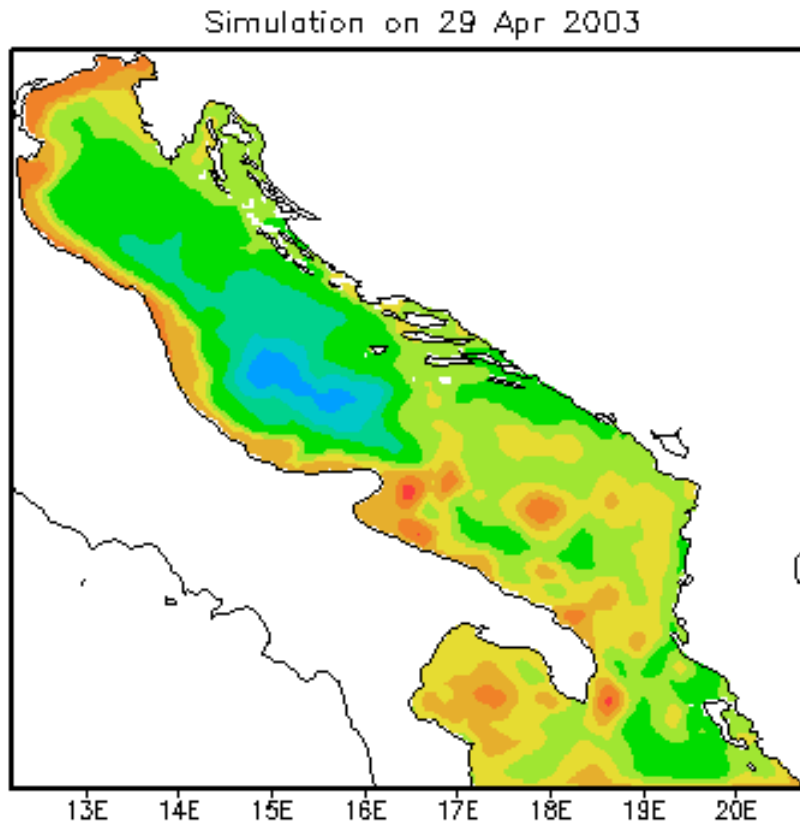
WP9: Motivation

- In order to provide the information on how to optimize investments and extract the most of the data from European coastal observing systems WP9 applies mathematically sophisticated methods based on the statistical measure of the impact of coastal observations.

WP9: DA as a tool to estimate importance of observations

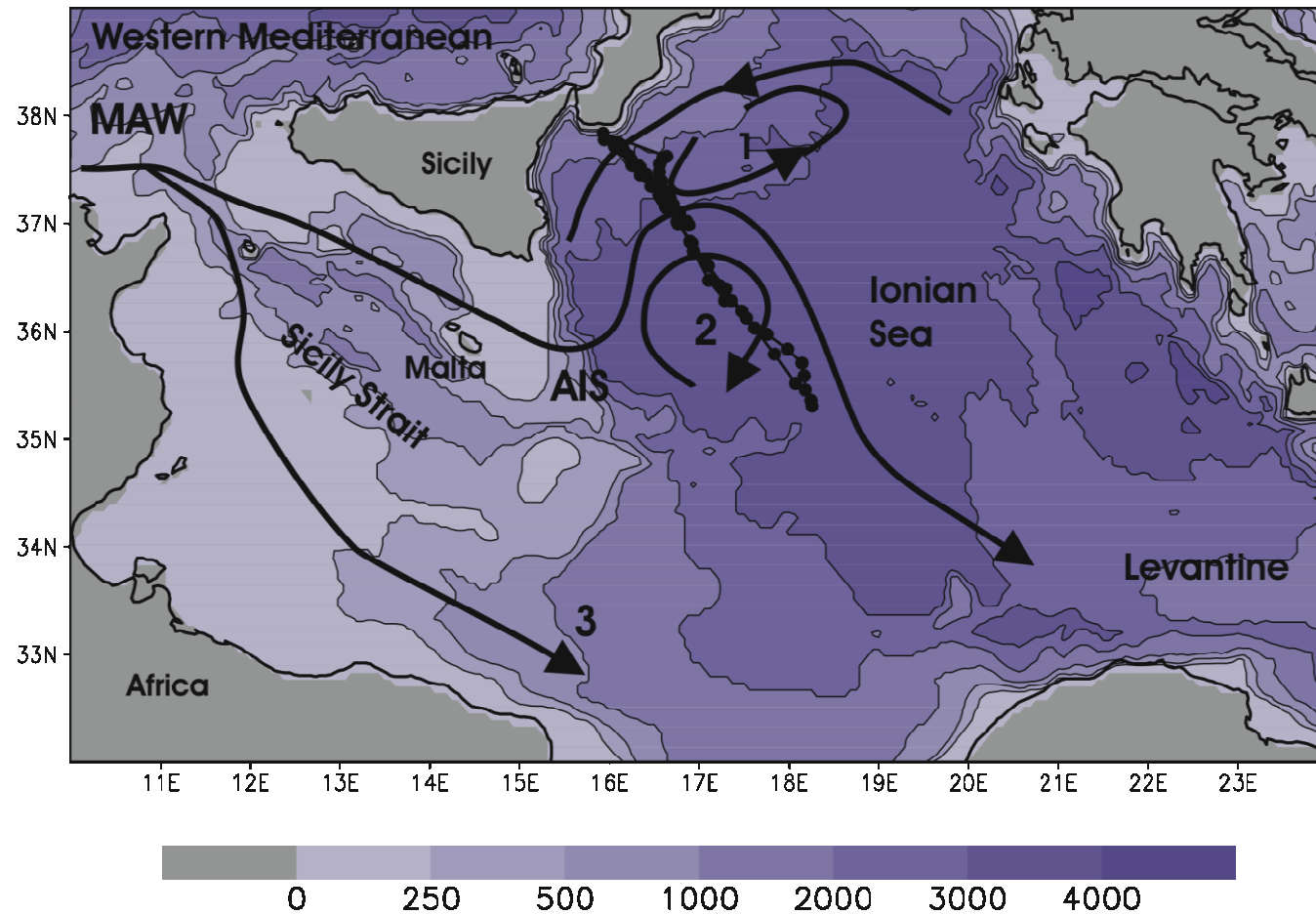


Improved coastal ocean state estimates by DA



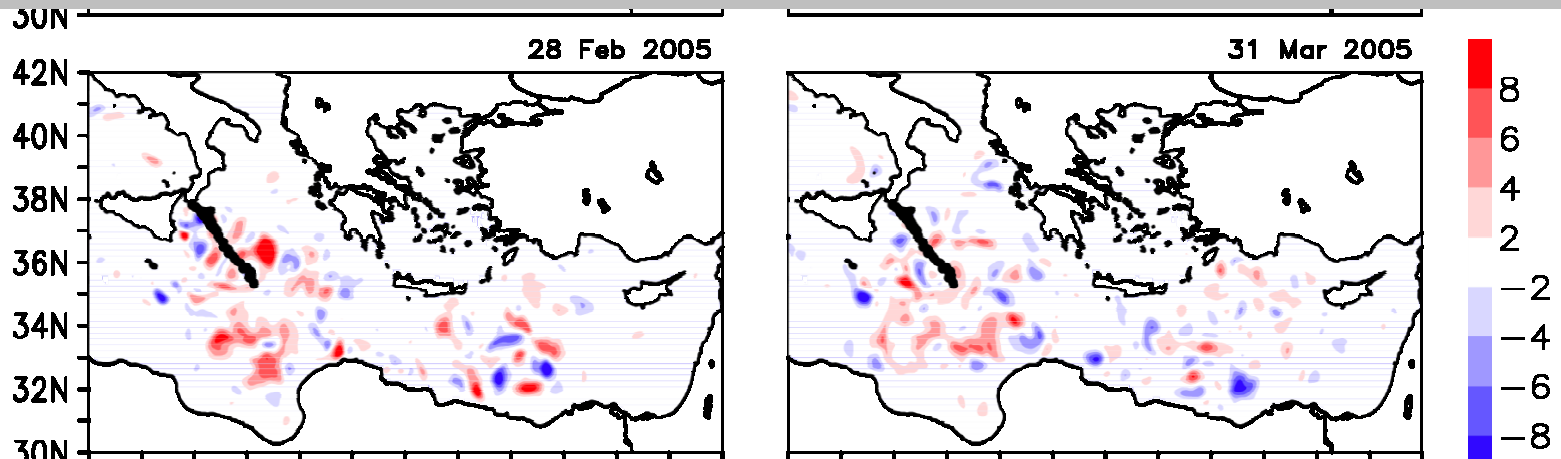
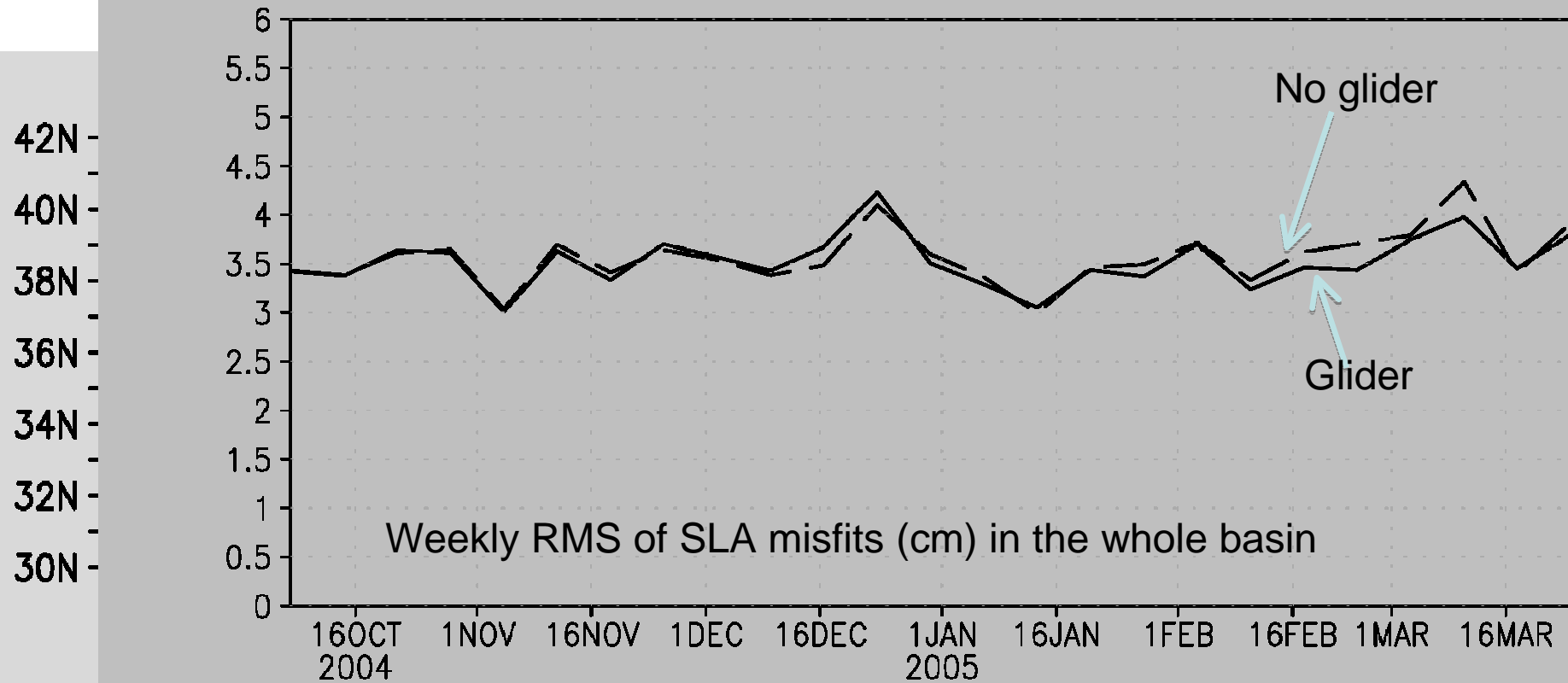
Sea level (cm)

Glider observations in the Ionian Sea



Dobricic et al. 2010, Atmos. Ocean. Dyn.

Impact of glider observations



WP9:Methodology

Recently the estimation of the impact of observations had some important developments in meteorology. There are three main groups of methods:

- Observation exclusion (traditional)
- Backward adjoint integration (very efficient in operational systems)
- Ensemble estimate (efficient if EnKF is used for the assimilation)

WP9:Participants

- CMCC
- IFREMER
- DMI
- DELTARES
- HCMR
- HZG
- MUMM
- INSU/CNRS

WP9: Work Plan

Three tasks:

1. Scientific coordination
2. Impact of existing observational platforms
3. Impact of future observational platforms

WP9: Work Plan Task 9.1

Task 9.1: Scientific coordination: It coordinates the overall experimental design, creates a common structure for the presentation of experimental results, provides inputs to WP2 and WP10. (lead CMCC)

This will be achieved by:

- Organize the first technical meeting on the planned methods that will be used in experiments (Mon. 3)
- Coordinate the writing of the first scientific report on the methods that will be used in experiments (D9.1 - Mon.12)
- Coordinate the writing of intermediate report on OSE and OSSE experimental results (D9.2 and D9.3 – Mon.18)
- Coordinate the writing of the second scientific report (D9.4 - Mon.24)
- Coordinate the writing of final reports on OSE and OSSE experimental results (D9.5 and D9.6 – Mon.36)
- Coordinate the writing of the input on OSE and OSSE for the final project report (MS29 and MS30 – Mon.42)
- Provide the input to WP2 and WP10

WP9: Work Plan Task 9.2

Task 9.2: Impact of existing observational platforms on estimates of coastal processes by the use of high resolution coastal models: OSE experiments. (lead HCMR) (D9.2 and D9.5 - Mon.12 and 36)

- The impact of surface currents measurements from a HF radar installation on the Aegean state estimates is evaluated using a $1/30^0$ resolution ocean model and the SEEK multivariate data assimilation scheme which already assimilates SSH, SST and T/S in situ data. (HCMR)
- Relative impact of in situ observations of temperature and salinity profiles by existing coastal platforms is evaluated for the Adriatic Sea in a period 2007-2009 by the use of $1/50^0$ resolution ocean model and the OceanVar data assimilation scheme which assimilates satellite SLA, VOS XBT and coastal CTD observations. (CMCC)
- The impact of the coastal observations of temperature and salinity on the operational basin scale data assimilation system of the Mediterranean Sea is evaluated during the Target Observation Period. The model has the horizontal resolution of $1/16^0$ and uses the OceanVar data assimilation scheme. (CMCC)

WP9: Work Plan Task 9.2

- Relative impact of coastal platforms observing temperature, salinity and water level in the Baltic and North Sea. The ocean model has the horizontal resolution of $1/12^0 \times 1/20^0$ in Baltic-North Sea and $1/72^0 \times 1/120^0$ in the Baltic-North Sea transition waters, and the assimilation is performed by the 3DVAR with anisotropic covariances (DMI).
- A technique based on the Ensemble Kalman Filter is applied to estimate the short term impact of each coastal platform measuring the sea level in the North Sea and the North-Eastern Atlantic Shelf. The storm surge model has the horizontal resolution of $1/40^0 \times 1/60^0$ and the data assimilation is based on the Ensemble Kalman Filter and the Two-Sample Kalman Filter. (DELTARES).
- The impact of existing data from operational FerryBoxes (Dutch Rijkswaterstaat, HZG, others) and Smart Moorings (CEFAS, Dutch Rijkswaterstaat) on the forecasts of suspended matter and chlorophyll in the Southern North Sea and German Bight. The Delft3D biogeochemical model has a horizontal resolution down to 1×1 km. Ensemble Kalman filter and Optimal Interpolation techniques can be applied. (DELTARES).

WP9: Work Plan Task 9.2

- Using an Ensemble Kalman filter technique, simulations of the existing observational platforms for in situ temperature and salinity data in the North Sea are performed. The oceanographic model has the horizontal resolution of $1/15^0$. (MUMM).
- The impact of existing Hf radar measurements in the German Bight on current and water level forecasts will be assessed using an Ensemble Kalman Filter technique. A three dimensional primitive equation model with $1/110^0$ resolution will be used for prediction and the estimation of the background statistics. (HZG).

WP9: Work Plan Task 9.3

Task 9.3: Impact of future coastal observing platforms on the estimates of coastal processes by the use of high resolution coastal models: OSSE experiments (lead MUMM) (D9.3 and D9.6 - Mon.12 and 36)

- Simulated impact of assimilation of positions of surface drifters in the Adriatic Sea is estimated by the use of the ocean model with the horizontal resolution of $1/50^0$ and the OceanVar data assimilation scheme. A historical test case will be made for the selected period of experimental deployment of surface drifters in the Adriatic Sea. (CMCC).
- Simulated impact of temperature observations from instruments implemented on fishing nets in the Adriatic Sea. The ocean model has the horizontal resolution of $1/50^0$ and applies the OceanVar data assimilation scheme. A historical test case will be made for the period of MFSTEP observations. (CMCC).

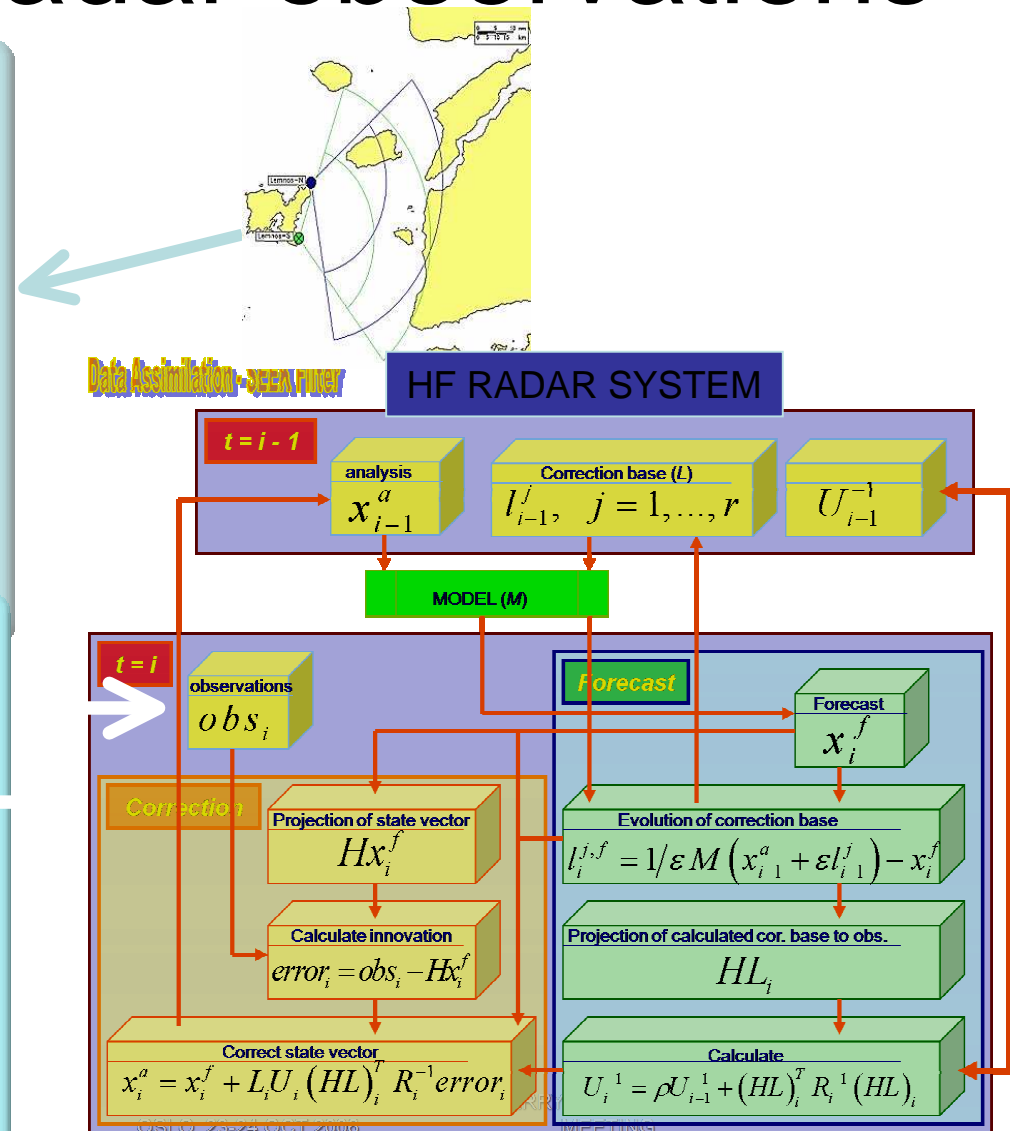
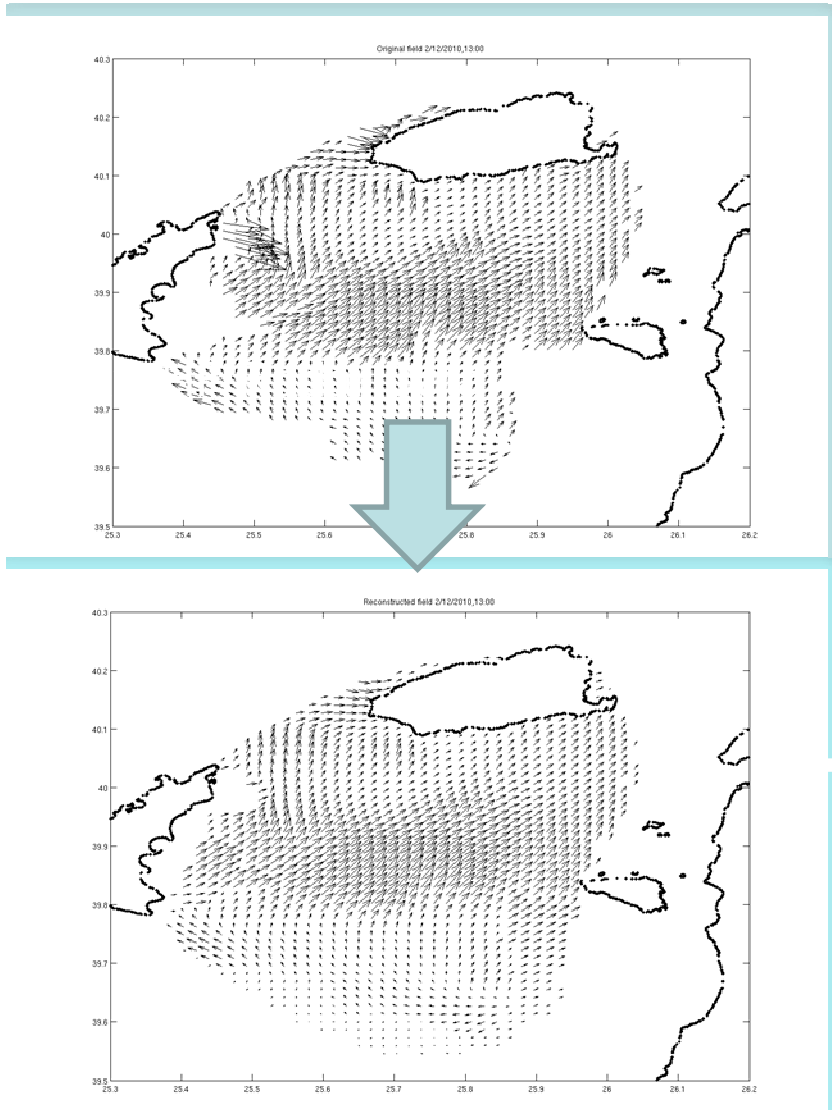
WP9: Work Plan Task 9.3

- Simulated impact of glider observations in the Baltic Sea. The ocean model has the horizontal resolution of $1/12^{\circ} \times 1/20^{\circ}$ in Baltic-North Sea and $1/72^{\circ} \times 1/120^{\circ}$ in the Baltic-North Sea transition waters, and the assimilation is performed by the 3DVAR with anisotropic covariances. (DMI).
- The impact of observations from moving platforms (e.g., ships of opportunity, gliders, ...) on the quality of southern North Sea high resolution model forecasts will be investigated using an Ensemble Kalman filter. The model horizontal resolution is $1/15^{\circ}$. (MUMM)

WP9: Work Plan Task 9.3

- The impact to be expected from additional use of SST and SSS data provided by the FerryBox system is assessed using an Ensemble Kalman filter technique. The data sets are provided by the COSYNA observing system. A three dimensional primitive equation model with $1/110^0$ resolution is used for prediction and the estimation of the background statistics in the German Bight. (HZG)
- Using representer-based methods, future coastal observing systems in the Bay of Biscay are designed. The possible improvements of observing networks based on ARVOR-C platforms (vertical T/S pseudo-Eulerian profilers designed for the shelf) and gliders combined with existing measurements from ships of opportunity (RECOPESCA program on fishing boats) will be explored. The model resolution is $1/25^{\circ}$ (4Km). (IFREMER)

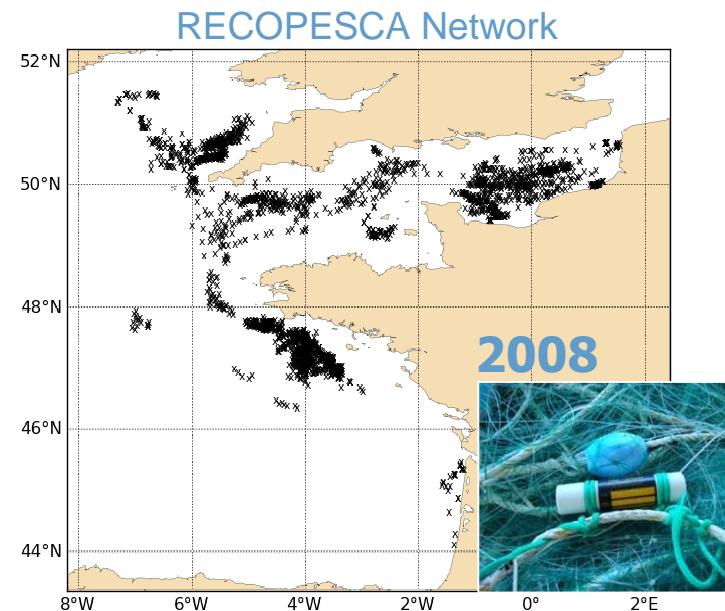
Poseidon System: Impact of HF radar observations



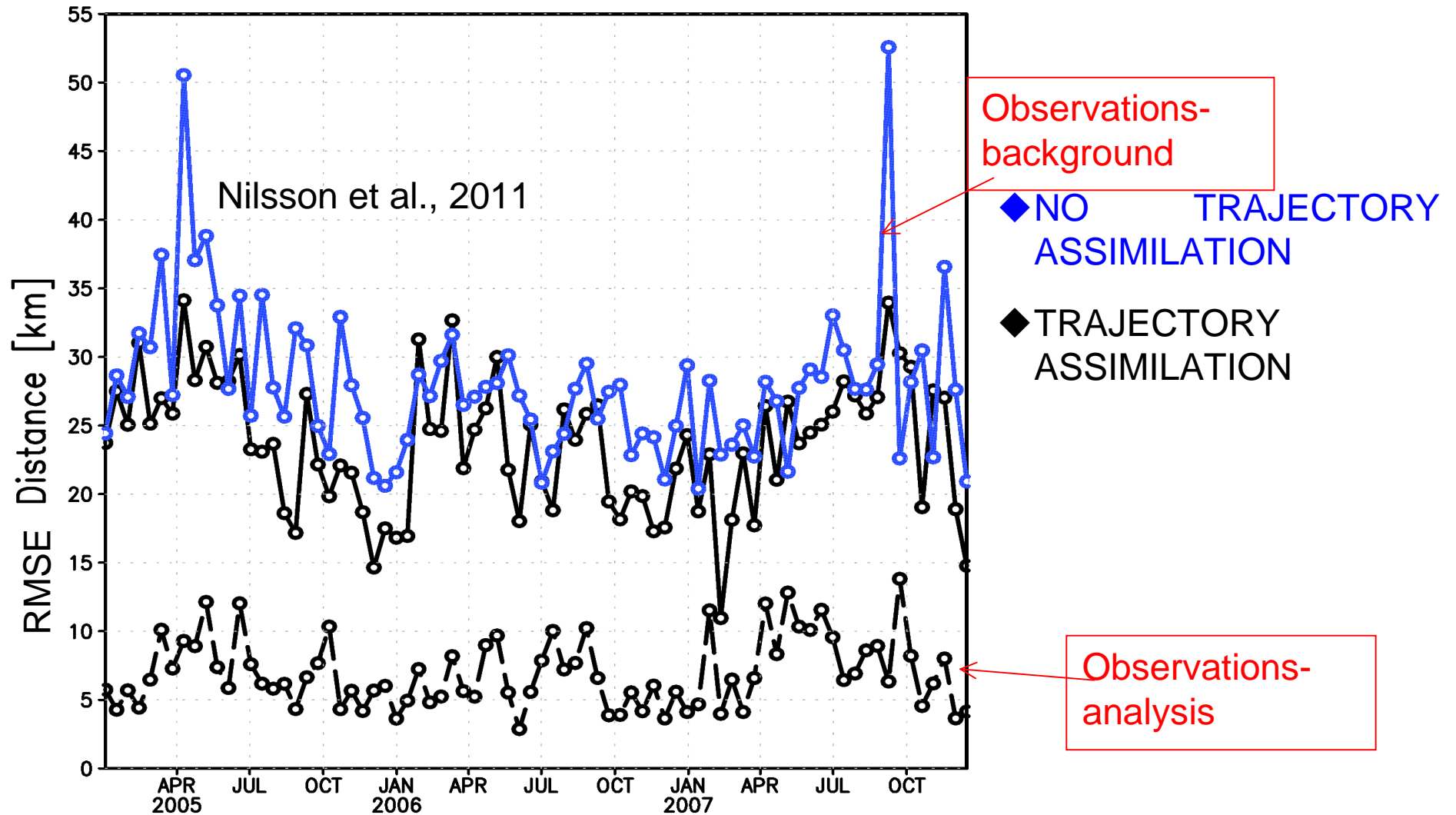
IFREMER: RECOPESCA program on fishing boats

To assess existing *in situ* observing systems
following:

- sensor precision
- observation network design



CMCC: Assimilation of float positions



MOON coastal stations in real time: Every day hourly data



WP9: Outputs

- The main outputs will be reports giving the information on the impact of observing platforms on ocean state estimates by the use of high resolution coastal models.
- Before obtaining experimental results we plan to provide mainly recommendations, because although the experiments are very sophisticated we may expect that our results will have some degree of uncertainty mainly due to the following two assumptions:
 - Some methods are optimal only for linear processes,
 - They all measure the impact on particular DA systems.
- After the intermediate experimental results (Mon 18) we will in collaboration with WP1, WP2, WP3 and WP10 discuss how we could contribute to the development of the strategic plan in the input for the final project report (Mon. 42).