on-going cal/val activities

Dr. Jean-Luc Widlowski
Climate Risk Management Unit
DG Joint Research Centre

with material from G. Zibordi (JRC), J-F Berthon (JRC) & MyOcean consortium

Overview

European Commission

DG JOINT RESEARCH CENTRE

- FAPAR (LPV)
- surface albedo
- Ocean colour (IVOS)
- Land cover
- RT models (IVOS)

on-going

DG ENTERPRISE

- GMES

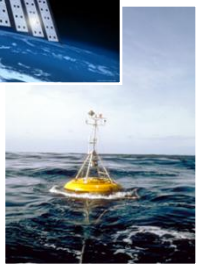
this talk

Global Monitoring for Environment & security

European Commission

GMES is an EU-led initiative

- aims at developing operational user services,
- based on satellite earth observation and in-situ data,
- consists of 3 components:
  - Space Component – coordinated by ESA
  - In-situ component – coordinated by EEA
  - Service Component – EU/public supported



‘Earth compartment’ GMES services

Land

Marine

Atmosphere

‘horizontal’ GMES services

Security

Emergency

Climate

On 9th Nov. 2010 GMES and its Initial Operations have come into force. Regulation (911/2010) gives Commission mandate for 2011-2013. GMES to be funded outside the EU budget (2014-2020). To be discussed / finalised by the EP and the Council

Dedicated funding commitments

EU and ESA investments of about **3,2 billion €** from 2002-2013 serve to:

- Develop pre-operational services
- Develop dedicated space missions
- Ensure access to satellite data
- Coordinate access to in-situ data
- Support the downstream sector

≈ € 260 million

EC FP6
€ 100 million for the fast track services
ESA
€ 100 million (GSE)
€ 30 million additional studies

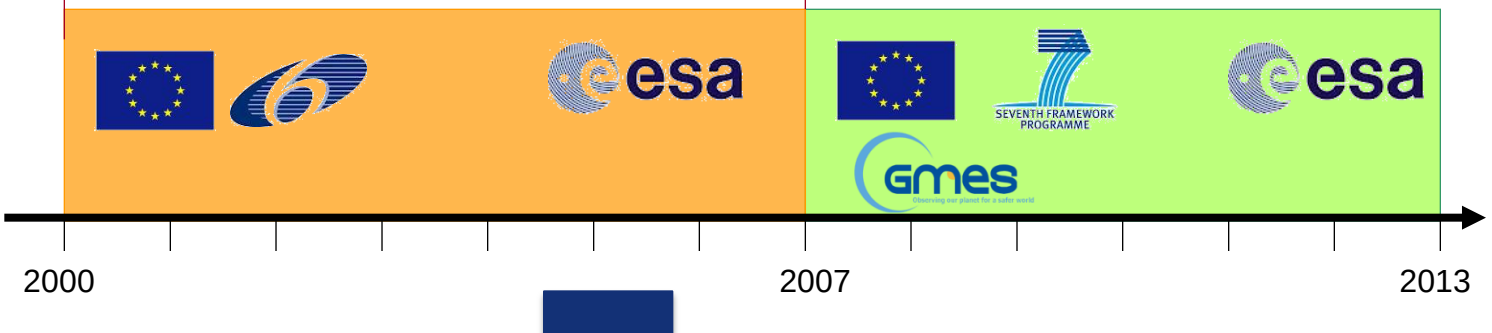
≈ € 3 000 million

EU

FP7 (GSC, services, in situ)	*€ 998 million*
Additional FP7 appropriations	*€ 43 million*
FP7 Data Access Grant	*€ 47 million*
Preparatory Actions	*€ 10 million*
GIO	*€ 107 million*
Other EC services (REGIO, ECHO, ENV…)	*€ 5-10 million*

ESA

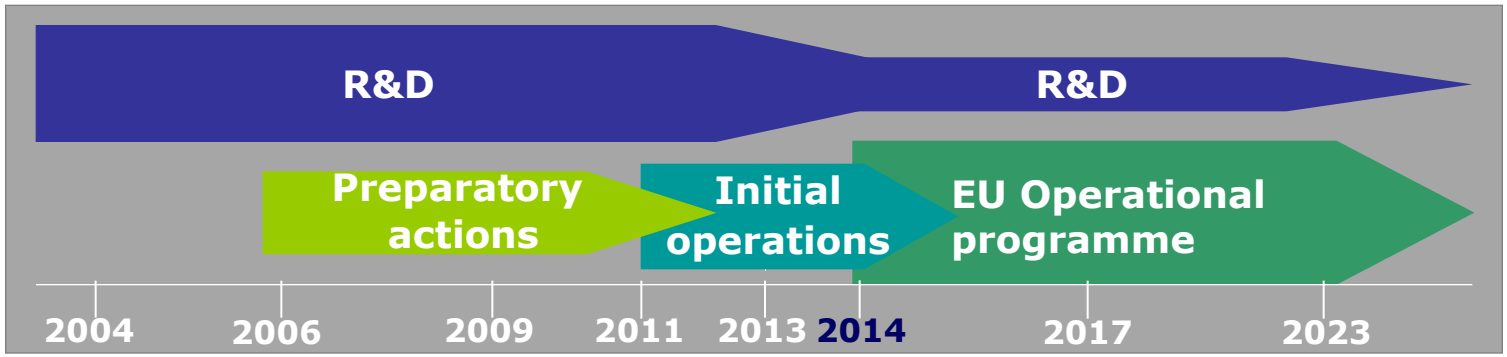
GSC built-up	*€ 1,621 million*
GSE follow-on	*€ 32 million*
Climate Change Initiative	*€ 75 million*



GMES Services

Three development stages:

- demonstration stage (R&D funding)
- pre-operational stage (mixed R&D and operational funding)
- operational stage (operational funding) beginning after regulation (911/2010) was adopted by Council and Parliament



Status:

- GIO started for Land & Emergency services
- Advanced preparatory stage for Atmosphere & Marine services
- Early (& advanced) preparatory stage for Climate (& Security)

GMES Marine Services

The objective is to set up an integrated pan-European capability for ocean monitoring and forecasting, using nationally-available skills & resources.

evolution

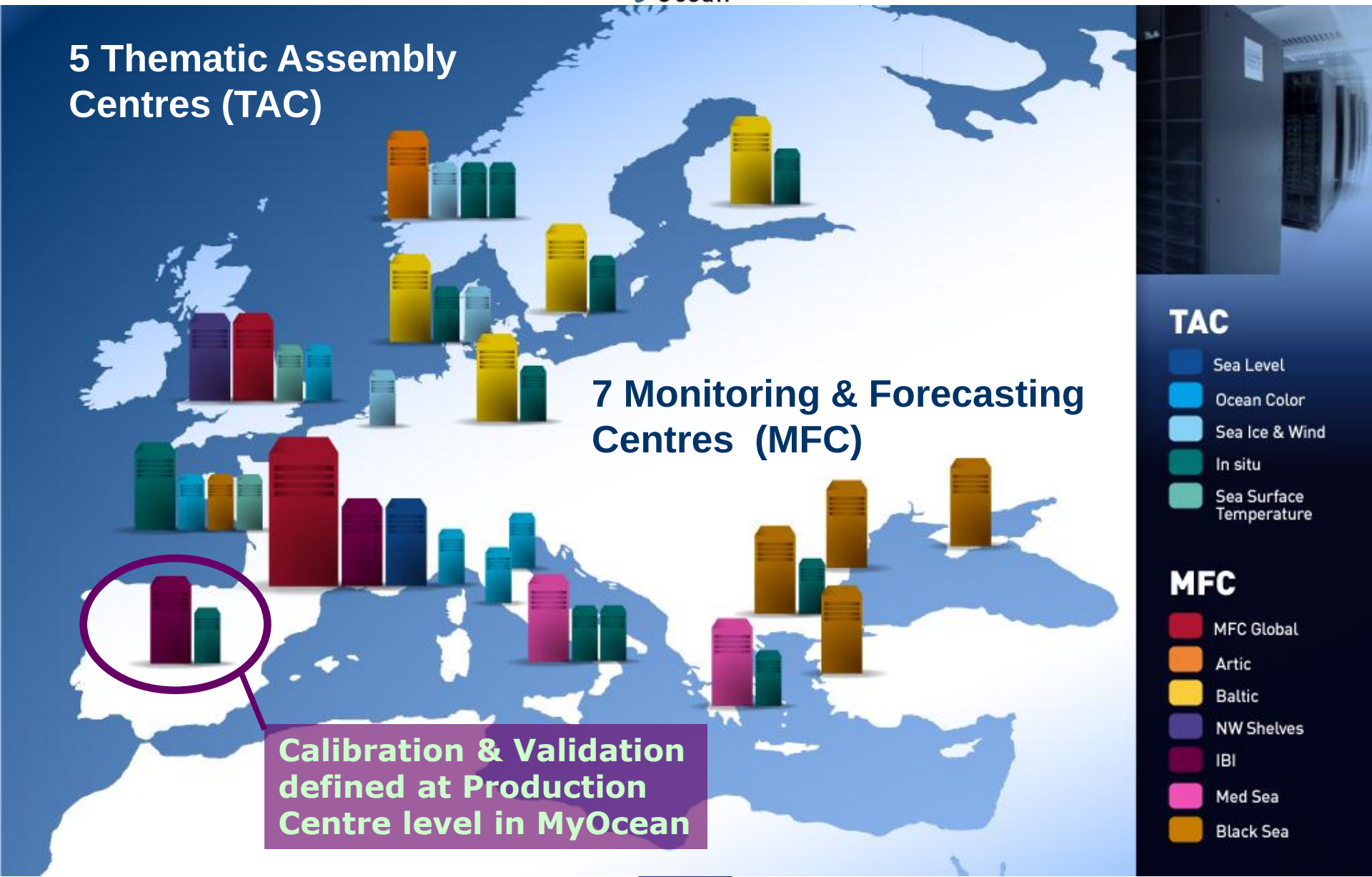
- **FP5 MERSEA Strand 1 (2003-2004): Inter-comparison in the Atlantic Ocean**
- **FP6 MERSEA IP (2004-2008): Adopting common metrics and diagnostics among European operational centres**
- **FP7/GMES MyOcean (2009-2012) and MyOcean2 (2012-2014): implementing operational cal/val activities, providing MyOcean product quality information to users**

- ***Global Ocean Data Assimilation Experiment (1998-2008)***
- ***GODAE Ocean View (2009+): Operational Oceanography initiatives around the world working together to strengthen the forecasting capabilities***

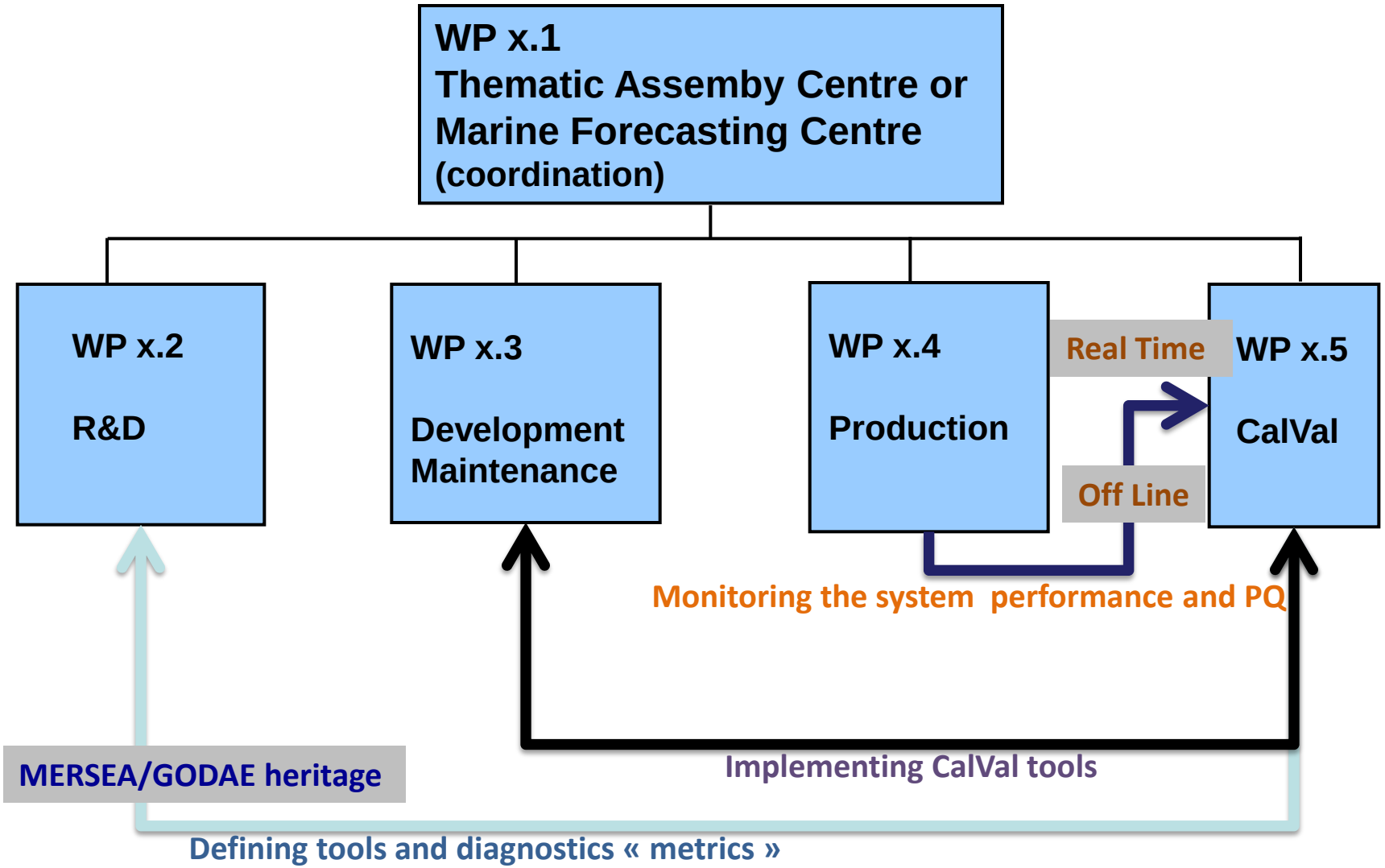
Intercomparison and validation task team proposing common activities

MyOcean *is a consortium of 60 partners in 28 countries including two European bodies (JRC and ECMWF).*

Production Centres



Cal/Val at level of Production Centres



Implementing a Scientific QA plan

- Define a transverse CalVal group from X.5 experts so as to have a consistent definition of scientific CalVal tools/methodologies among all the production centres.
- Request definition of a Scientific Calibration Plan / Scientific Validation Plan for MyOcean Version 1 (then Version 2) system & subsystems
- Request reporting at WP level for each Calibration and Validation Phase
- Top level Quality Assurance Review Group (QuARG) defines scientific assessment requirements, reviews the overall value of these plans, and verifies that production centre reports are compliant with plans

CalVal methodologies and tools were improved from MyOcean V0 to V2 system in each Production Centres

- Scientific Cal/Val plans upgraded from V1 to V2
- Focus assessment per Products in the Catalog
- Analyzing added value from V0 to V1, and V1 to V2
- Real time monitoring in place in all production centre
- Dissemination of ocean product quality information to users

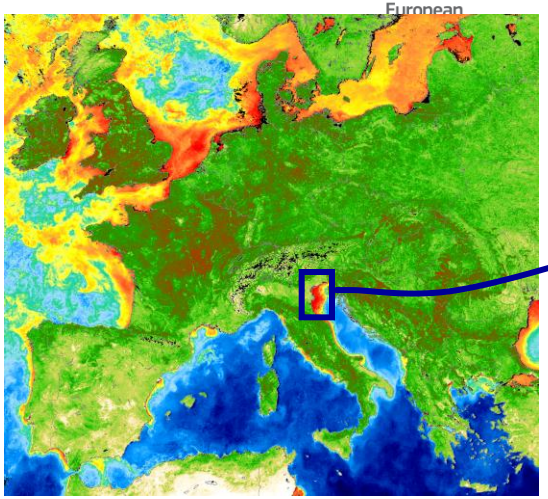
Due to transverse activities, CalVal more consistent at production level

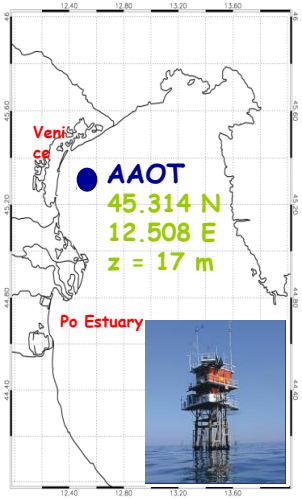
- WP using common dataset for validation (provided by TACs)
- TACs/MFCs CalVal approaches more consistent
- Neighbouring MFCs started to adopt common CalVal strategies
- Analyzing benefits of regional products vs global

Validation efforts (in situ measurements)

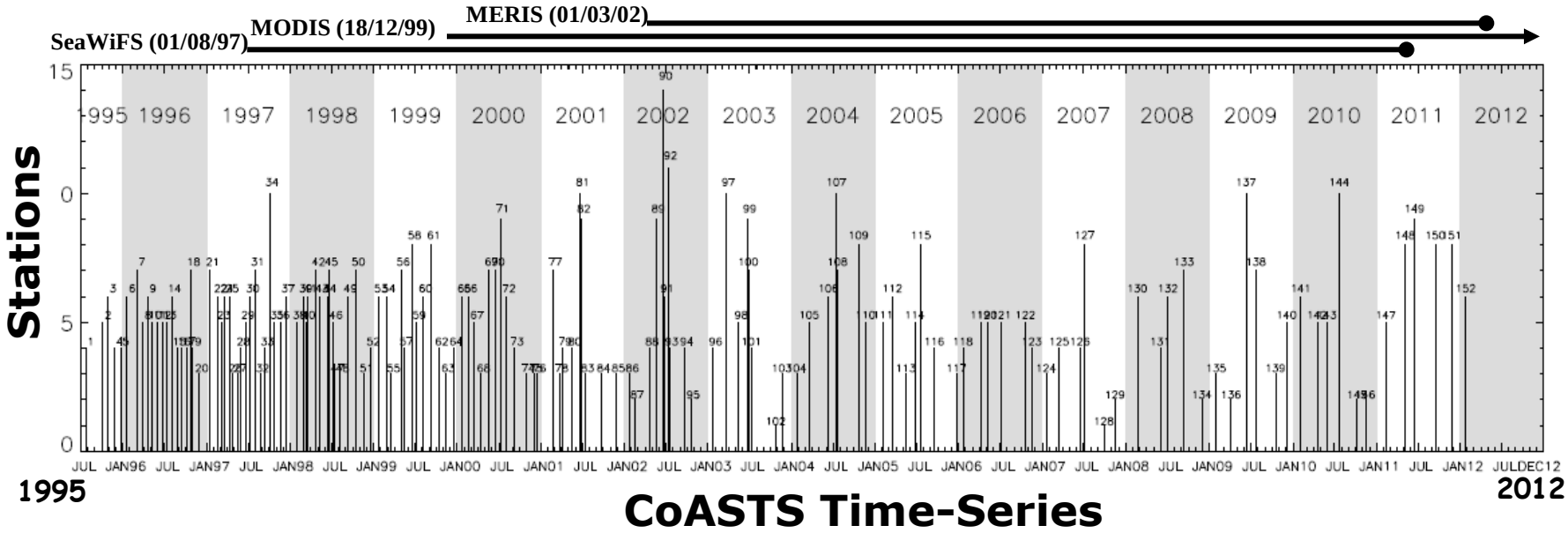
Coastal Atmosphere & Sea Time Series

Monthly FAPAR and Chlorophyl a composite from SeaWiFS imagery





The "Aqua Alta" Oceanographic Tower (AAOT) in the northern Adriatic Sea



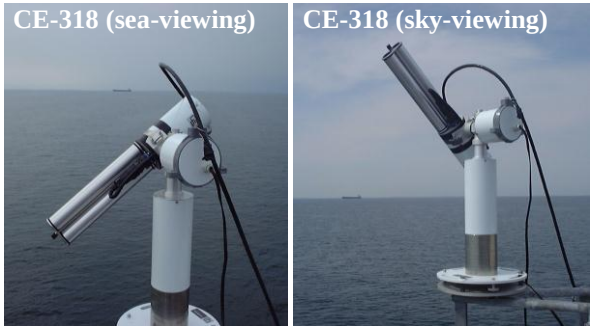
G.Zibordi et al. Coastal Atmosphere and Sea Time Series (CoASTS), Part 1: A long-term measurement program. NASA Tech. Memo. 2002-206892, v. 19, S.B.Hooker and E.R.Firestone, Eds., NASA GSFC, Greenbelt, Maryland, 2002, 29 pp.

AERONET Ocean Color

European Commission

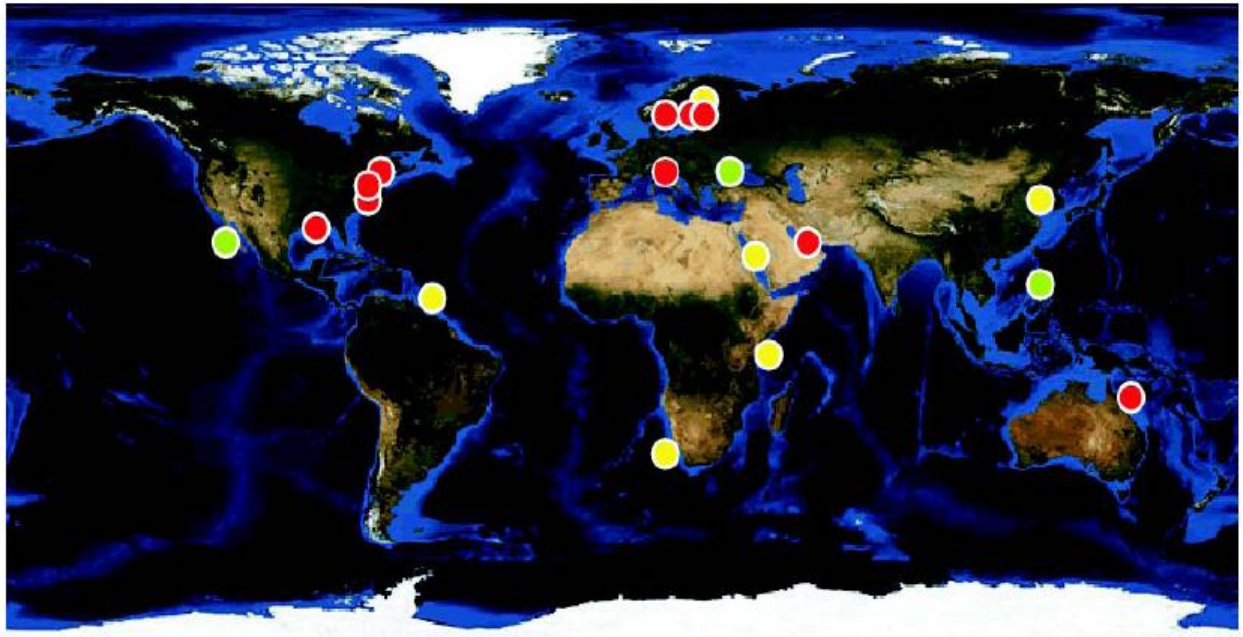
AERONET-OC is an integrated network supporting ocean color validation with highly consistent time-series of standardized $L_{WN}(\lambda)$ measurements.

Archived products via http://aeronet.gsfc.nasa.gov



Autonomous system: SeaPRISM

Aeronet-OC sites:
- active
- planned
- potential

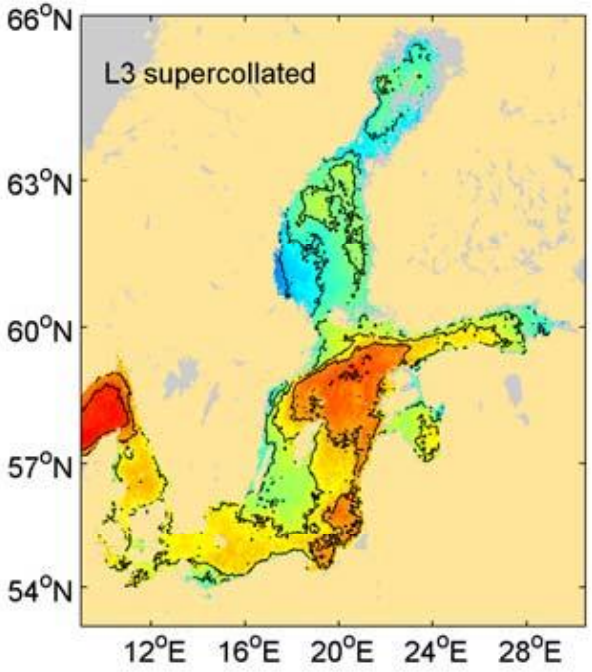


G. Zibordi et al. ,A Network for Standardized Ocean Color Validation Measurements. Eos Transactions, 87: 293, 297, 2006.

G. Zibordi et al., Aeronet-OC: An Overview, Canadian Journal of Remote Sensing, 2010 (submitted).

Example: calibrating models for the Baltic

validated satellite SST product



Near real time comparison to SST TAC data
Forecasting skill evaluated

candidate SST models

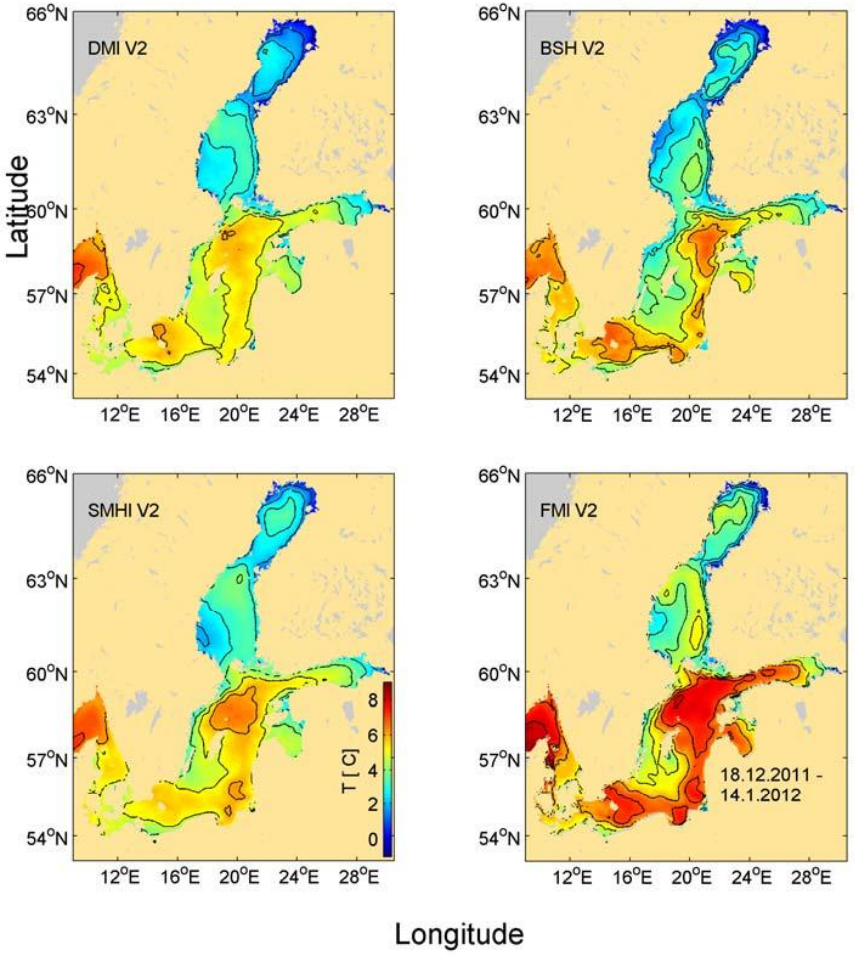


Figure III.2.1.2. Mean SST in the Baltic for 18.12.2011 - 14.1.2012 and forecast length +12 hours; top right: coverage of SST observations

Example: calibrating models for the Baltic

Verify Sea Surface Temperature:

- Against validated satellite data
- Between the 4 existing models and operational systems

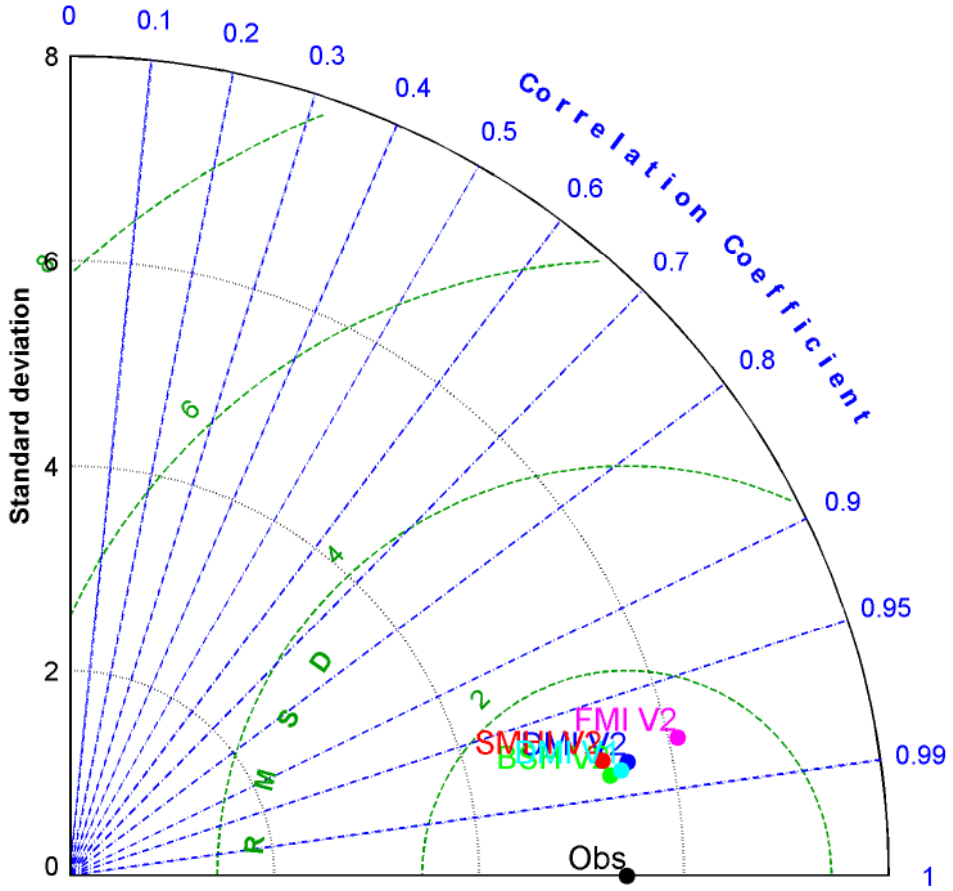


Figure A.2a.4: Taylor diagram for SST in the Baltic with respect to the L3 supercollated satellite data for 2007 for the DMI V1 and V2, BSH V2, SMVI V2 and FMI V2 model versions (nearest neighbour interpolation was used to put satellite data onto modelgrid).

Sea surface temperature (SST) in 4 PU models (SMHI, DMI, BSH,FMI) as validated with the supercollated daily level 3 Mersea / Météo-France SST product (EUR-scol-ATL-v01), which uses data from various sensors (EUR-L2P-NAR18_SST, EUR-L2P-NAR17_SST, USA-RSS-AMSRE-MW-L2-SST, REMSS-L2P-TMI, NAVO-L2P-AVHRR, EUR-L2P-SEVIRI_1_1H_SST, NAVO-L2P-GOES_12_1H_SST, NAVO-L2P-AVHRR18_G, NAVO-L2P-AVHRR18_L, EUR-L2P-ATS_NR_2P)

Mediterranean Ocean Forecasting System

Most production centres provide quality info in real time to users

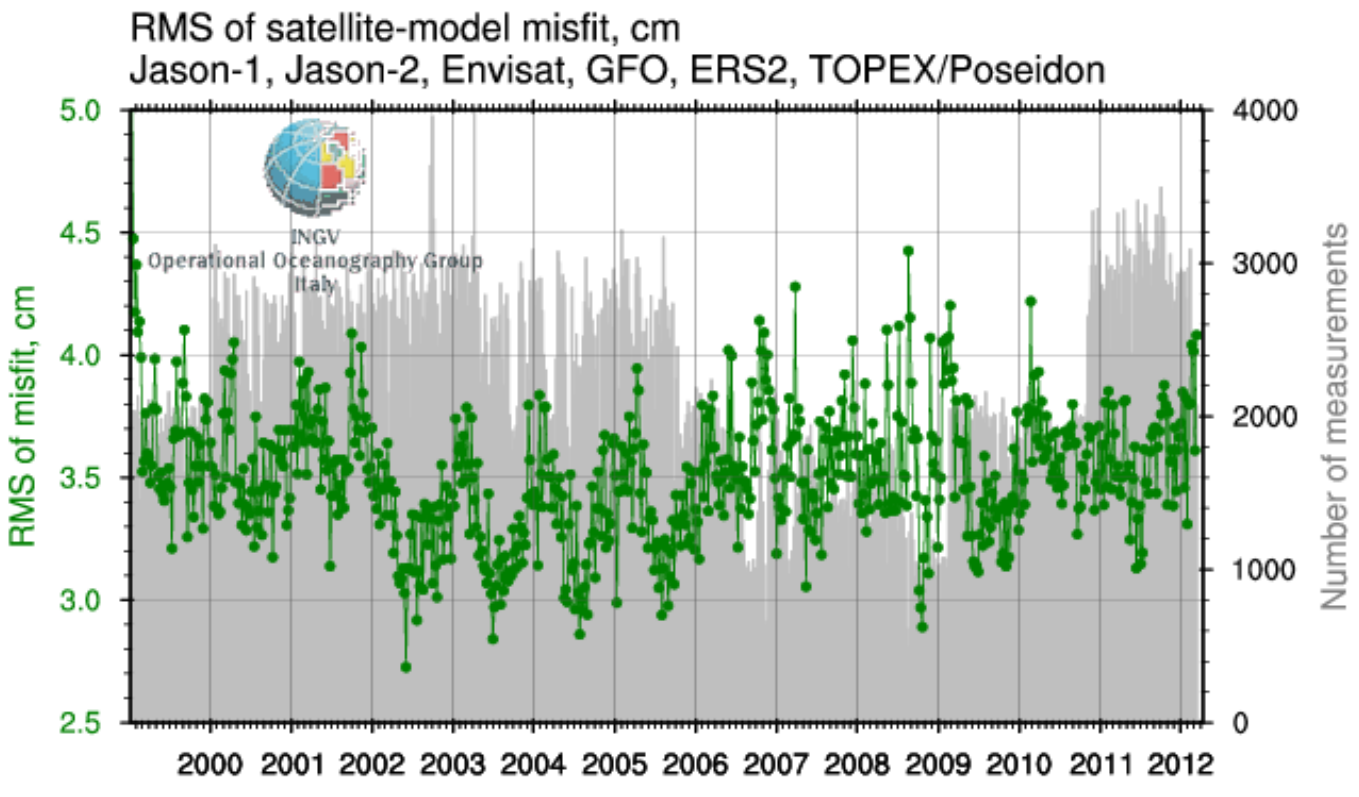
Evaluation

The model evaluation is updated on Wednesday.
The first seven days of analyses are compared with Sea Level Anomaly, ARGO-CTD (Temperature and Salinity), XBT (Temperature), and satellite Sea Surface Temperature.

Data

RMS of Sea Level Anomaly misfit

Sea Level Anomaly



Expected Accuracy

Product: GLOBAL_ANALYSIS_FORECAST_PHYS_001_001_c
GLOBAL_FORECAST_PHYS_001_001_d

Method: *The accuracy numbers given here are calculated from average and Root Mean Square of observations- model differences. These numbers represent error values that are rarely reached, except in high variability regions where errors are generally large due to small scales that are neither represented by the models nor sufficiently observed (and consequently not constrained by the assimilation of observations).*

Sea surface temperature (K)

	Hindcast		Forecast day 3	
	Mean difference	RMS difference	Mean difference	RMS difference
	0,02	0,65	0,02	0,65

Sea level (cm)

	Hindcast		Forecast day 3	
	Mean difference	RMS difference	Mean difference	RMS difference
	-0,1	7,0	-0,1	7,0

Temperature (K)

	Hindcast		Forecast day 1		Forecast day 3		Forecast day 5	
	Mean difference	RMS difference	Mean difference	RMS difference	Mean difference	RMS difference	Mean difference	RMS difference
0 - 5m	0,14	0,51	0,01	0,60	0,19	0,62	0,00	0,66
5 - 100m	0,03	0,84	0,03	1,01	0,03	1,04	0,03	1,08
100 - 300m	0,12	0,79	0,09	0,94	0,03	0,97	0,03	1,00
300 - 800m	0,12	0,44	0,09	0,53	0,03	0,54	0,03	0,56
800 - 2000m	0,12	0,22	0,09	0,24	0,03	0,24	0,03	0,25

Quality information for users

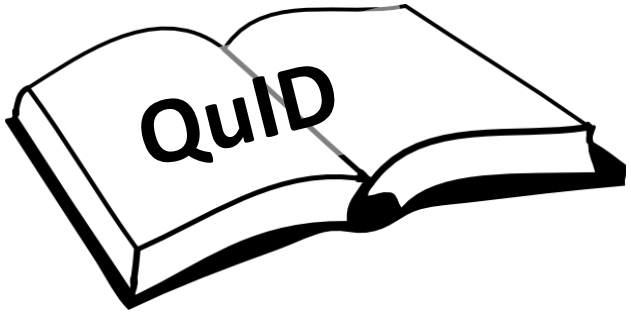
Estimated accuracy numbers

Temperature (K)

	Hindcast		Forecast da
	Mean difference	RMS difference	Mean difference
0 - 5m	0.14	0.51	0.01
5 - 100m	0.03	0.84	0.03
100 - 300m	0.12	0.79	0.09
300 - 800m	0.12	0.44	0.09
800 - 2000m	0.12	0.22	0.09

At-a-glance tables of accuracy numbers for a single product

Quality information doc



Detailed quality information for a single product

Reviewed by QuARG for consistency

Summary of product quality for previous quarter

Single report covering all real-time products

Cal/Val in MyOcean2

- All European partners have adopted a common calval strategy, implemented in a consistent way
- MyOcean validation strategy is now user driven: product quality assessment and ocean metrics are dedicated to inform adequately users and downstream services
- Scientific assessment is in the core of the production centres, as well as, a top level transverse activity. Efforts are done to provide accuracy information for all ocean products in the catalog
- Products of “Observation” centres are used to assess products of “forecasting” centres, and strong links are implemented between both communities
- Since the MERSEA project, the European community is a strong contributor to the international development of ocean validation activity (GODAE….), and plays an active role in the improvement and design of the ocean observing network

Thank you