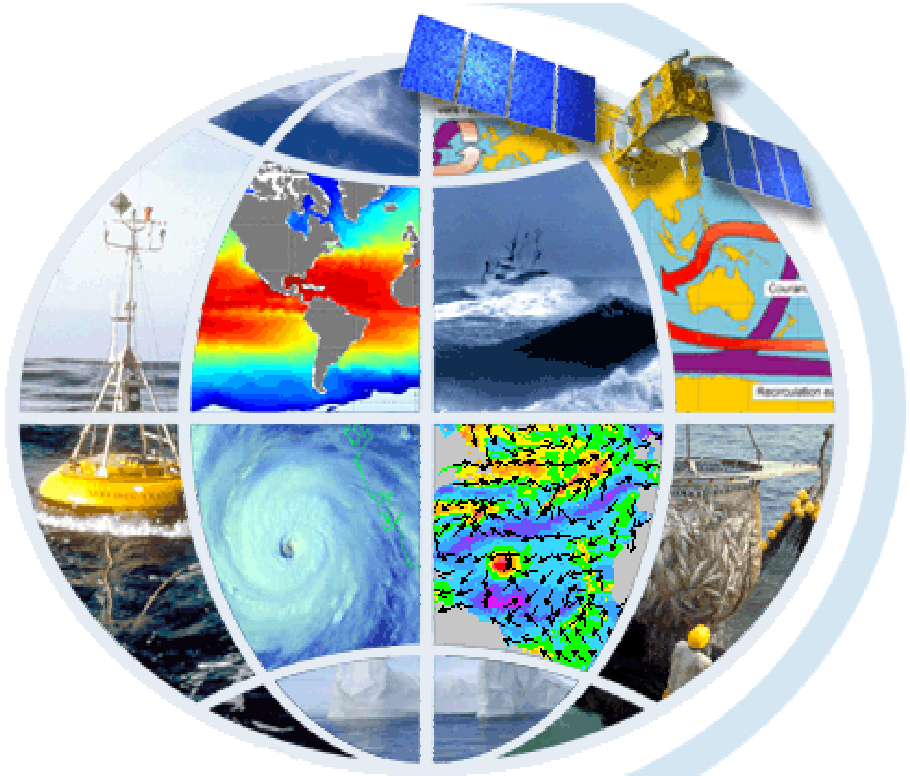
MARINE ENVIRONMENT AND SECURITY FOR THE EUROPEAN AREA

Ocean and Marine Applications for GMES

Development of a European system for operational monitoring and forecasting of the ocean physics, biogeochemistry, and ecosystems, on global and regional scales



MERSEA Integrated Project

R&D project funded under 6th FP of the European Commission

- Thematic priority : SPACE - GMES (Global Monitoring for Environment and Security)
- Ocean and Marine Applications

Four-year project (2004 –2008)

38 contractors, 16 countries (or Int. Org.)

Coordination : IFREMER (Institut Français de Recherche pour l'Exploitation de la Mer), France

MERSEA Participants

Canada :	DFO	Greece :	HCMR	Turkey :	IMS
Cyprus :	FDMR	International :	ECMWF	UK :	NERC-SOC
Denmark :	DMI	Ireland :	Techworks		Ocean Numerics
E.U. :	JRC	Italy :	CNR-ISAC		PML
Finland :	U-HEL		CNR-ISSIA		NERSC-POL
France :	ASP		CoNISMA		The Met Office
	BOOST		ENEA		Univ. Reading
	CLS		INGV		Univ. Southampton
	CNRS		OGS		
	IFREMER	Netherlands :	MARIS		
	MERCATOR		Univ. Utrecht		
	Météo France	Norway :	met no		
Germany :	AWI		NERSC		
	GeoB	Spain :	CSIC		
	IFM/Univ. Kiel		IEO		
	IFM/Univ. Hamburg				

GMES : ocean applications

- MERSEA objective :
  develop the global ocean component of GMES :
  - Climate change, CO^2, seasonal forecasting
  - Ecosystems, fisheries,
  - Marine safety, traffic, pollution (crisis management)
  - Offshore activities
  - Coast guards and Navy applications
  - From global to coastal ocean (coastal management)
  - Scientific research

MERSEA IP objectives

- Development of a European system for operational monitoring and forecasting of the ocean physics, biogeochemistry and ecosystems
  - A global system
  - Support for shelf sea systems
  - Connection to coastal systems

} Nowcasts, forecasts, hindcasts

- It will build the Ocean component of GMES (2008)
- Mersea federates European contribution to GODAE

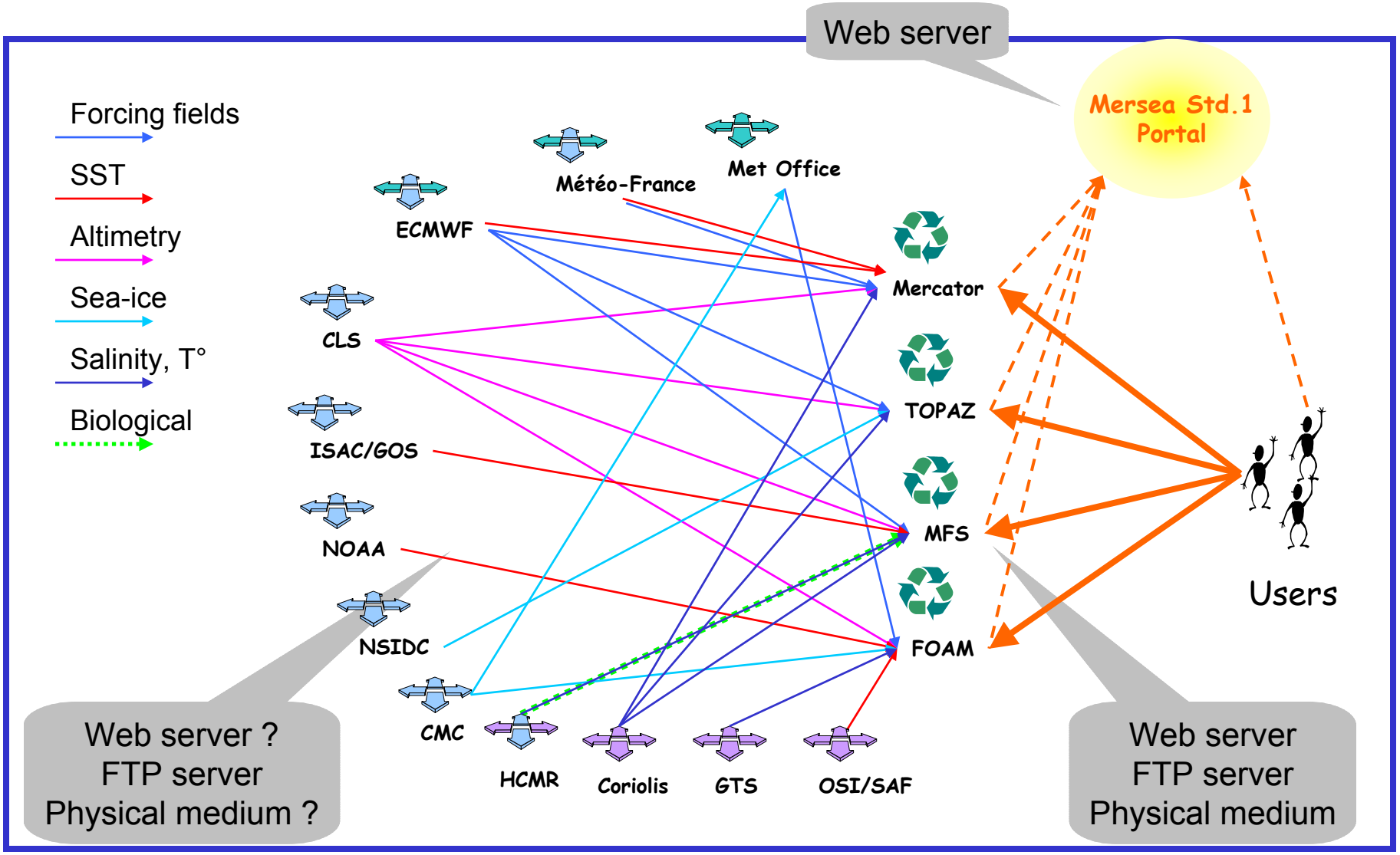
Basic components

- Input
  - Remote sensed data : sea surface height, SST, ocean colour, sea ice
  - Forcing fields : from NWF, and scatterometre winds
  - In situ : profiles (ARGO, XBT, ..), surface (ships, drifters), moorings (time series)
- High resolution models with data assimilation
  - Analysis, forecasting
  - Downscaling to regional or to coastal
- Product development, information delivery

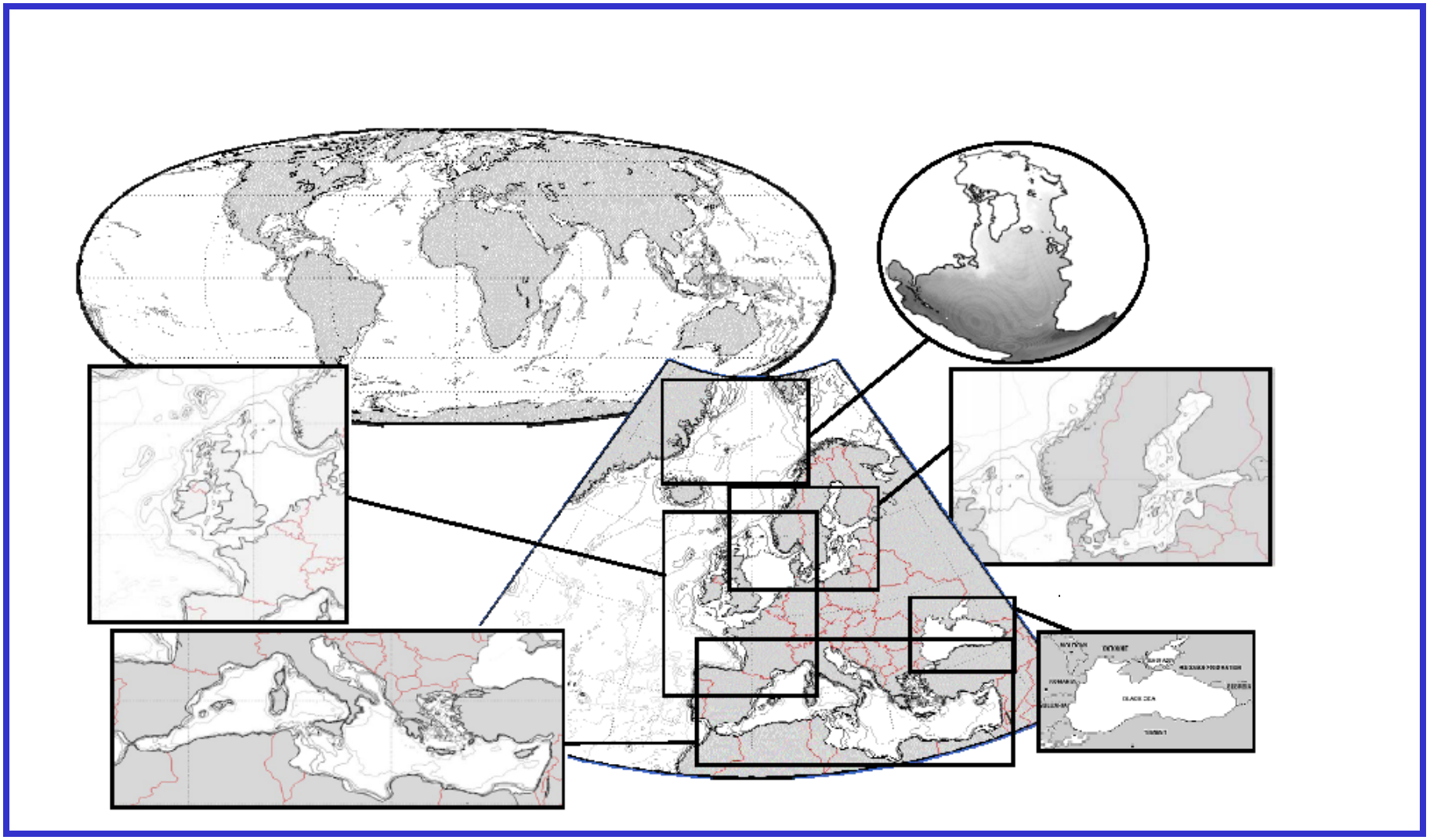
Initial situation

- Four Global systems, with different caracteristics
  - MERCATOR (France)
  - TOPAZ (NERSC, Norvège)
  - FOAM (Met Office, UK)
  - MFS (Med. Forecasting System, INGV, Italie)
- Great diversity of regional / coastal systems
  - Arctic, North and Baltic seas
  - NW European shelves (UK)
  - Bay of Biscay
  - Mediterranean + Cataluñia, Ligurian, Adriatic, Aegean
  - Etc …
- Services, applications, formats, pratices are very diverse

Current Architecture



MERSEA Global to Regional coverage

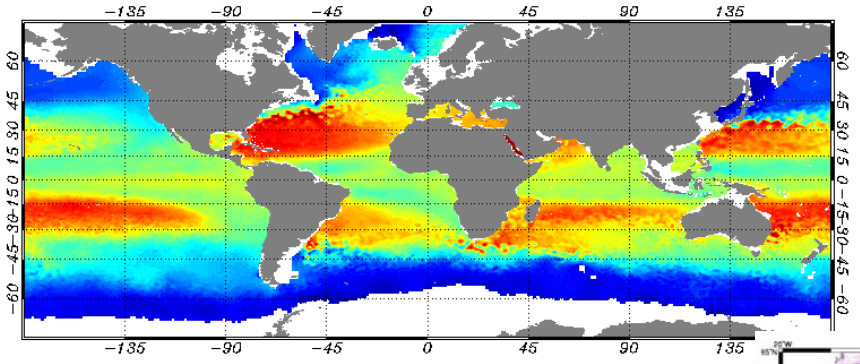


Global to regional, downscaling

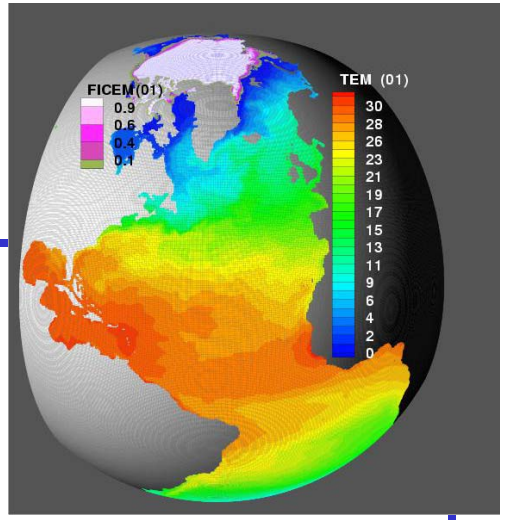
- From Global (resolution 1/12° = 8 km) to :
  - Arctic
  - NE Atlantic shelf
  - Mediterranean
- From NE Atlantic shelf to
  - North and Baltic Sea
- From North Atlantic and Arctic to
  - Greenland and Newfoundland shelf

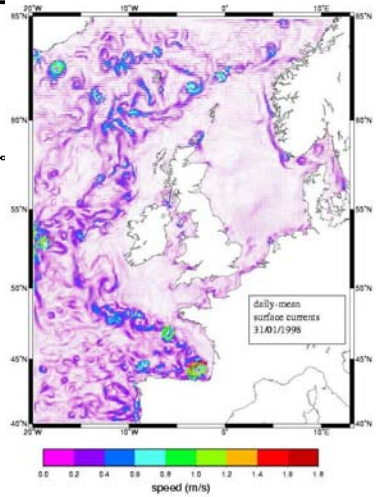
The target Mersea system

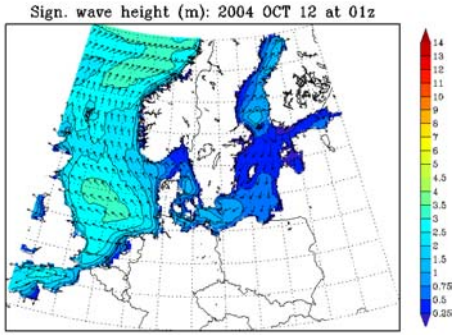
- A global system, high resolution model,
  - with biogeochemistry and sea ice
  - Pooling of resources for development and expertise
- A co-ordinated network of regional systems over european seas
  - Commom modelling framework
  - Support for coastal systems
- Improve and facilitate access to data, products, and services
- Full validation, inter-operability, developement of standards and best practices.
- Develop user-oriented applications



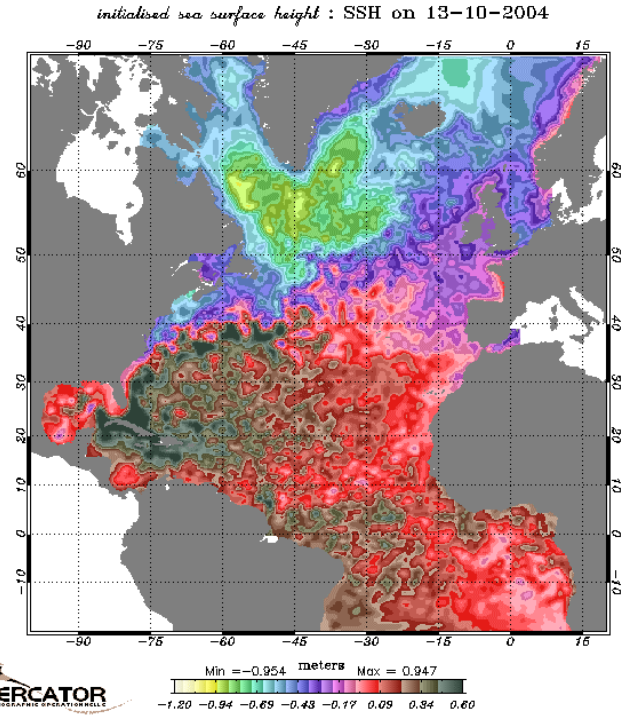
Topaz



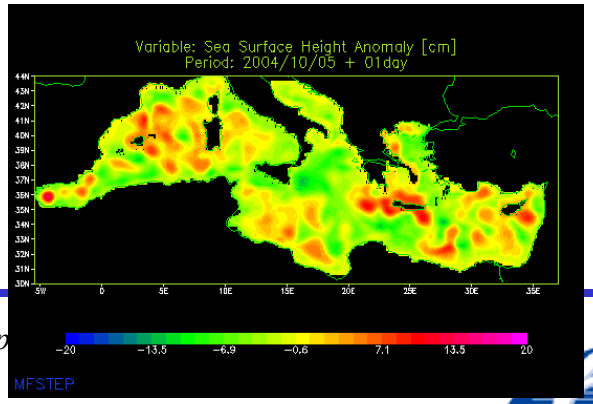




DMI



Met Office

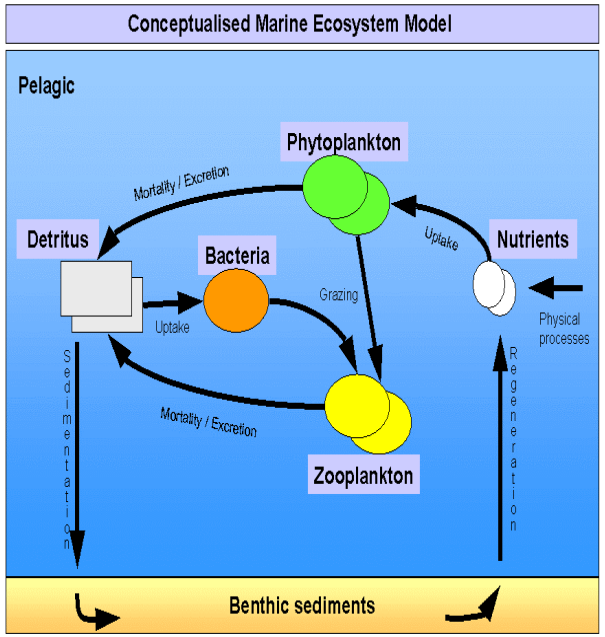


MFS

Experiments - applications - products

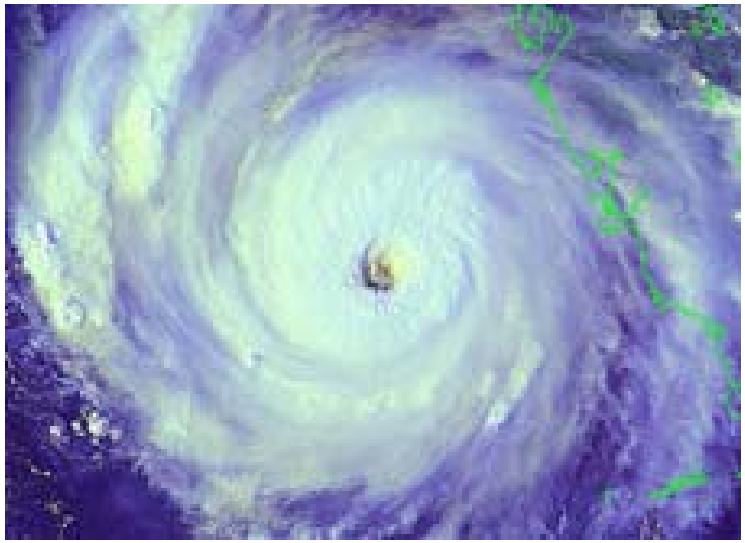
- Biogeochemical variability in regional and shelf seas (Atlantic margin and Med Sea)
  - Global carbon cycle
  - Coastal ecosystems, algal blooms, eutrophication, water quality
  - Improve, validate, integrate into operational systems

Coupling physical and ecosystem models



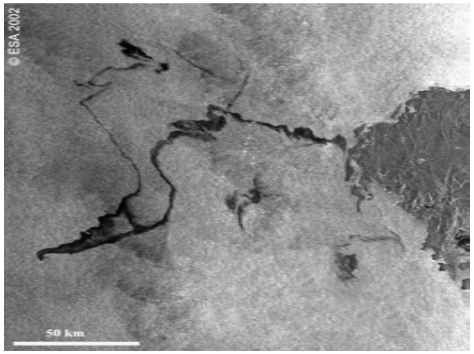
Experiments - applications - products

- Seasonal forecasting
  - Provide initial conditions to coupled global (or local) models
  - Determine statistics of ocean variability (covariances)

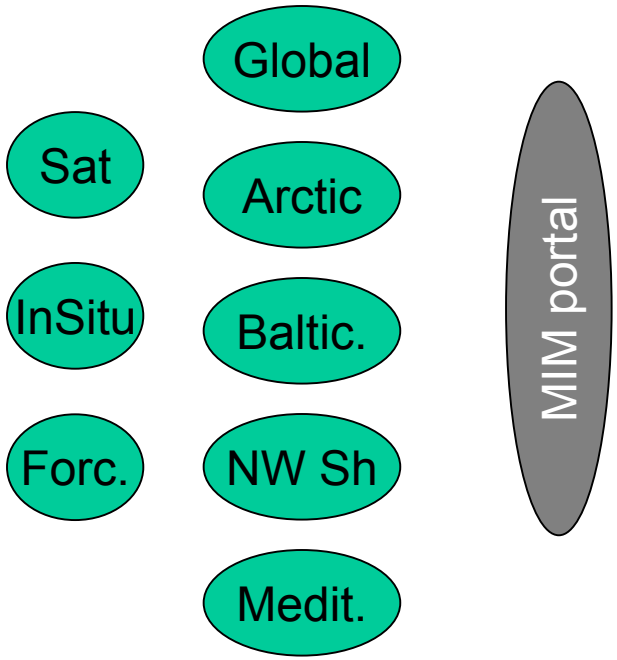


Experiments - applications - products

- User products :
  - offshore oil exploration and production
    - (relocatable high resolution models)
  - wave forecasts and ship routing
    - wave-current interaction, sea ice
  - oil drift fate prediction

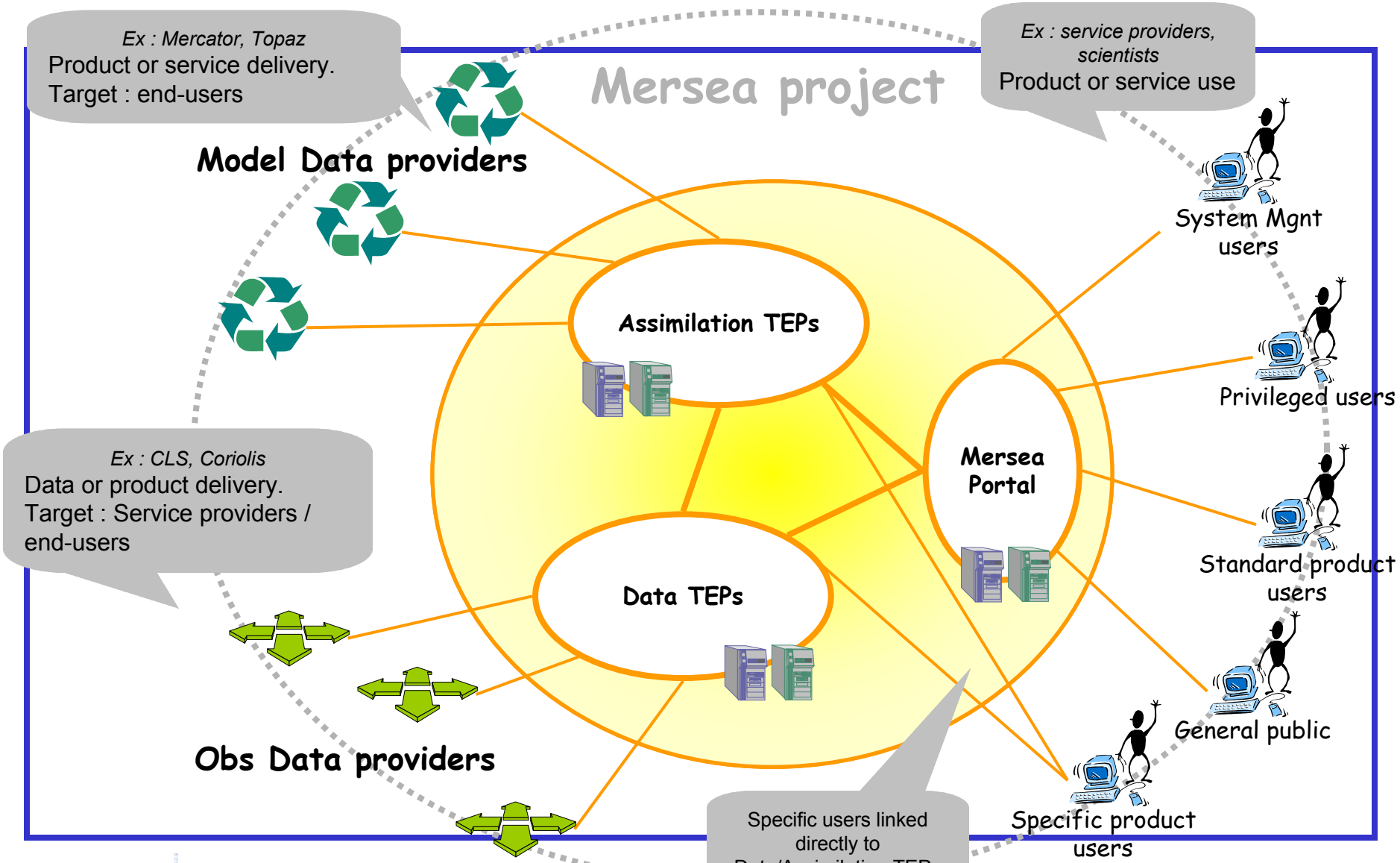


Basic components

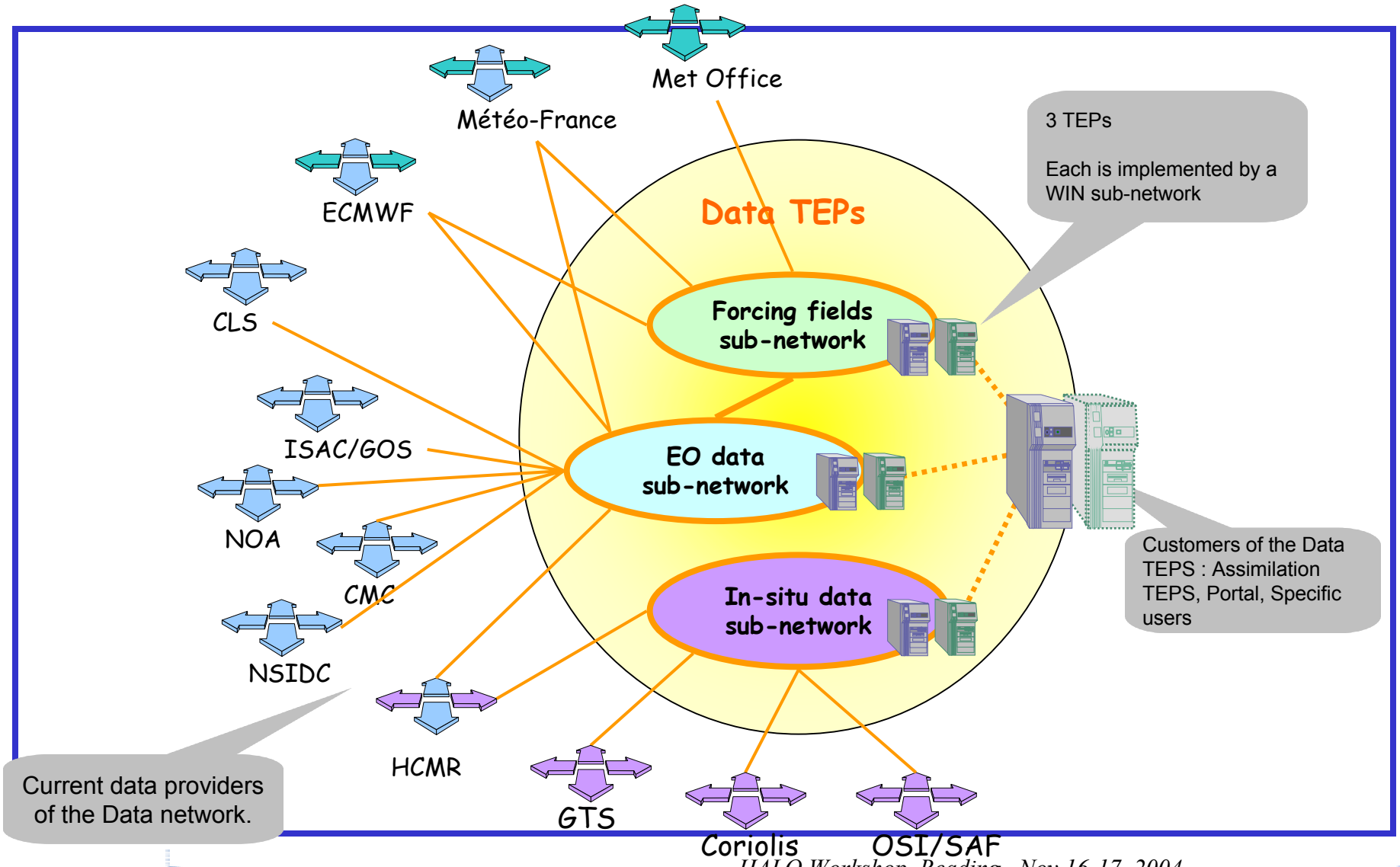


- 8 ThEmatic Portals (TEP)
  - 3 DATA TEP (Satellite, In Situ, Forcings)
  - 5 ASSIMILATION TEP (Global, Arctic, Med, Baltic, NWShelves)
- There is a general portal (MIM portal), connecting to the MERSEA information sources through 8 TEP

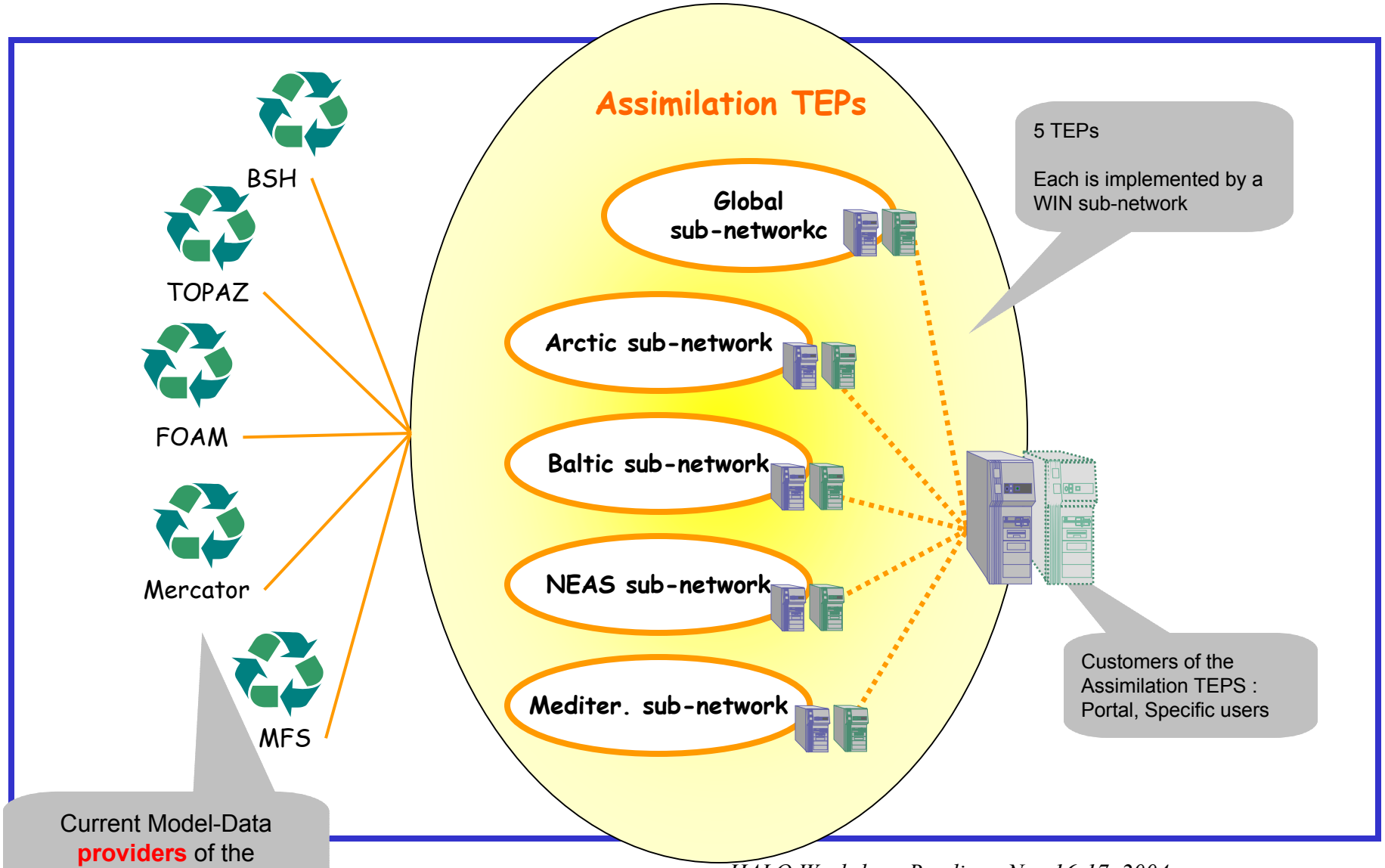
Mersea system logical breakdown : 1st level



Data network logical breakdown



Assimilation network logical breakdown



Interacting components

- Land : river run-off, aerosols (via atmosphere)
- Atmosphere : **Wind**
  - fluxes (momentum, heat, moisture, gas exchange),
  - Waves
  - Wind driven currents
  - Clouds : incoming solar radiation
  - E-P
- Global :
  - fluxes, re-analysis (ERA40, NCEP)
- Regional, coastal :
  - High resolution (HIRLAM, ALADIN, …)

Interacting components

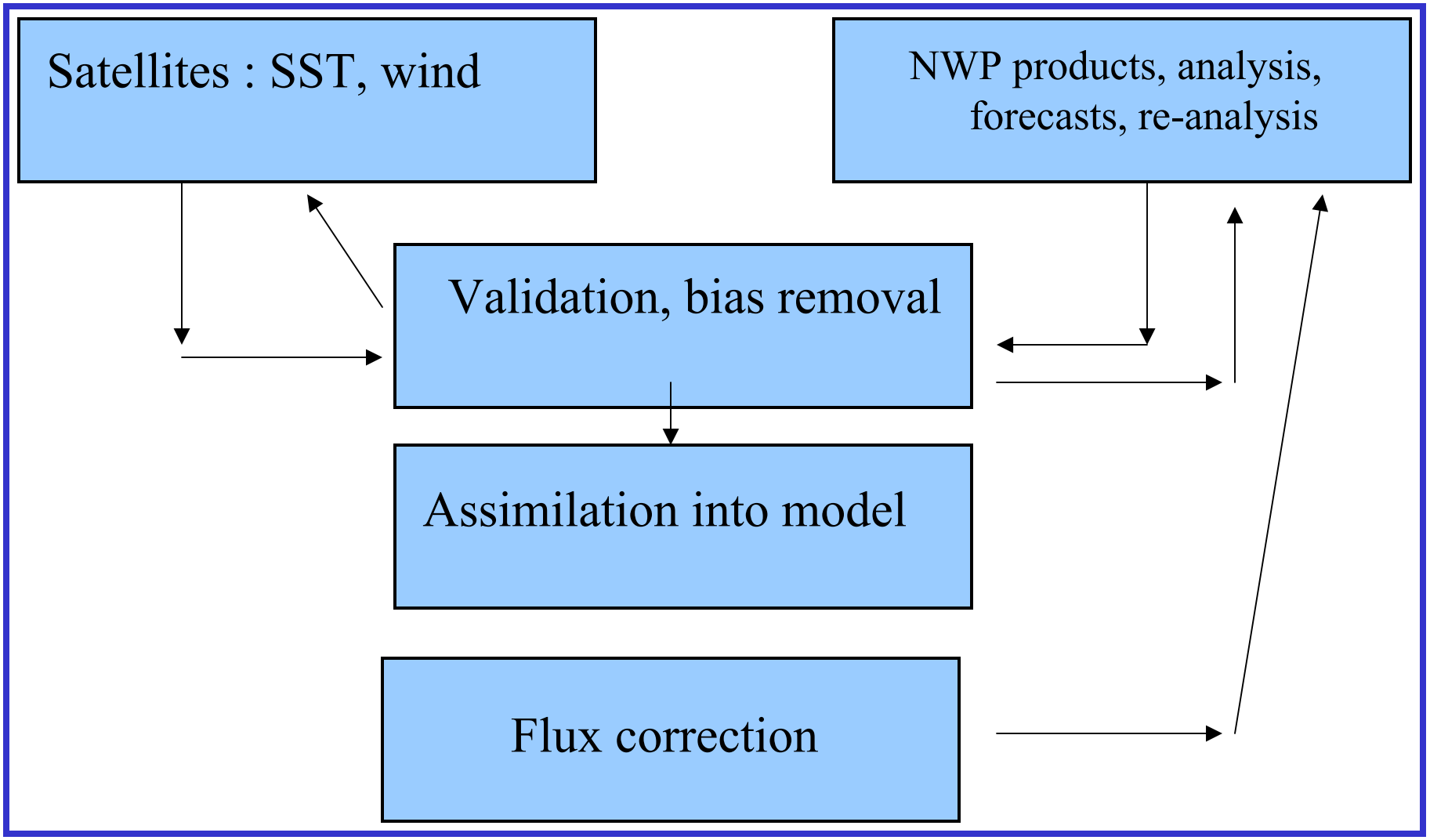
Meteorological agencies provide GMES services (by default?) for which MERSEA inputs are necessary :

- Oil spill response, search and rescue, drifting objects
- Wave forecasts
- Hurricane and seasonal forcasts
- Ice drift

Other feedbacks :

- Sea ice (albedo, fluxes)
- Atmospheric pressure for altimeter correction (IB)
- Aerosols for ocean colour, iron input

Ocean – Atmosphere Interactions : fluxes



Conclusions

- Weak coupling between land and ocean
  - Except River run-off
- Strong interactions with atmosphere, mostly physical
  - Two – way interactions
- CO^2 :
  - Physical pump
  - Biological pump : more prospective ?
- Several links already in place to exchange data in real-time

Remarks

- Distinguish project from the system to be delivered
  - Architecture
- Re-analyses are important
  - CO2,
  - validation of fluxes
- Ocean component depends more on standard NWP than chemistry (GEMS)