Aeronautica Militare

Centro Operativo per la Meteorologia – C.O.Met.

Italian Air Force
Meteorological Centre

AIOM – Salerno, 28 Ottobre 2016

Gestione operativa dei modelli di previsione del moto ondoso

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COMET, Italian Air Force Meteorological Centre
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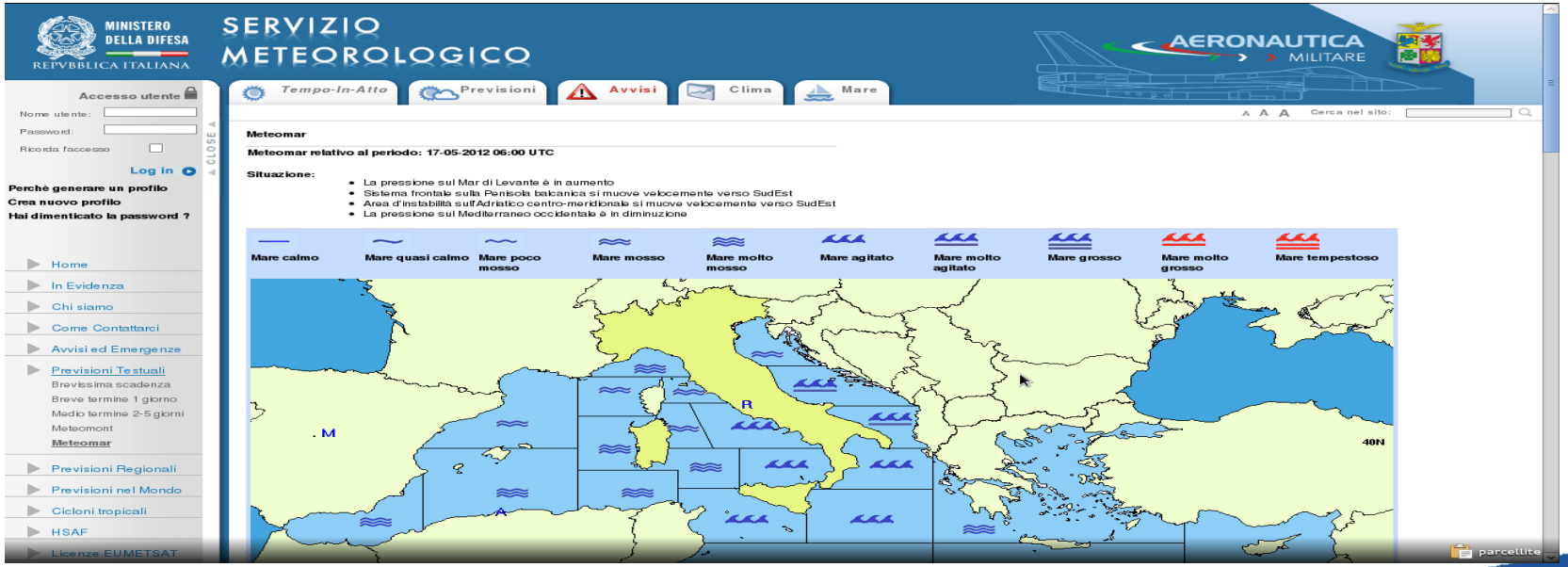
Sommario

- Servizi operativi di Meteorologia Marina forniti dall'A.M.
- Suites operative dei modelli atmosferici e marini
- Infrastruttura ICT
- Attività di sviluppo correnti e piani futuri

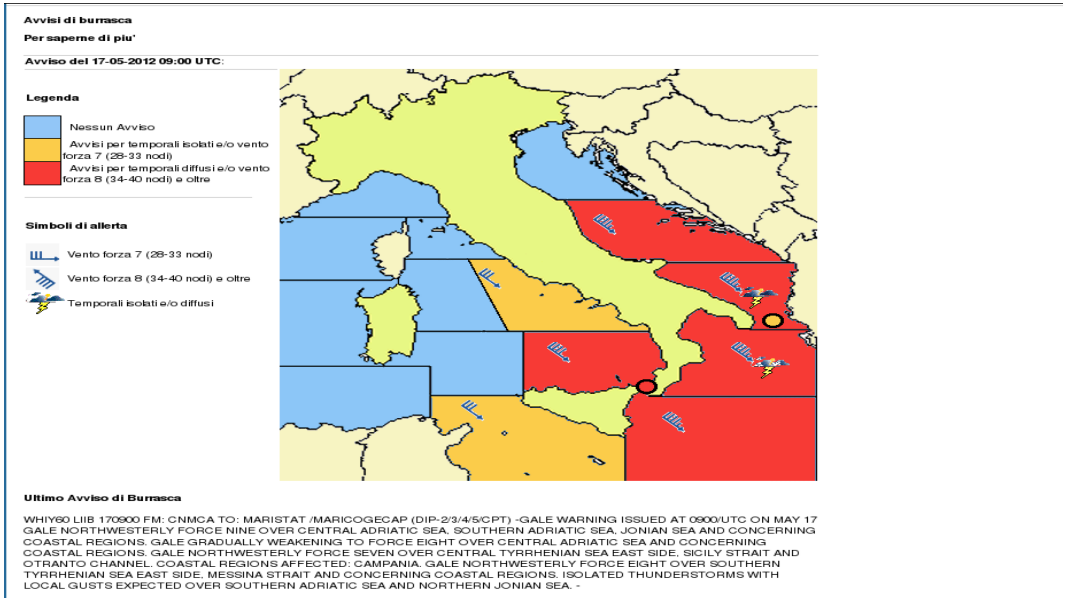
Servizi Operativi (1)

- Marine and weather watch/nowcasting/forecasting over Mediterranean sea (operated by Forecasting Division)



Servizi Operativi (2)

- Marine and weather watch over Italian seas and coasts: emission of gale warnings (by Forecasting Division)



Avvisi di burrasca

Per saperne di piu'

Avviso del 17-05-2012 09:00 UTC:

Legenda

Nessun Avviso

Avvisi per temporali isolati e/o vento forza 7 (28-33 nodi)

Avvisi per temporali diffusi e/o vento forza 8 (34-40 nodi) e oltre

Simboli di allerta

Vento forza 7 (28-33 nodi)

Vento forza 8 (34-40 nodi) e oltre

Temporali isolati e/o diffusi

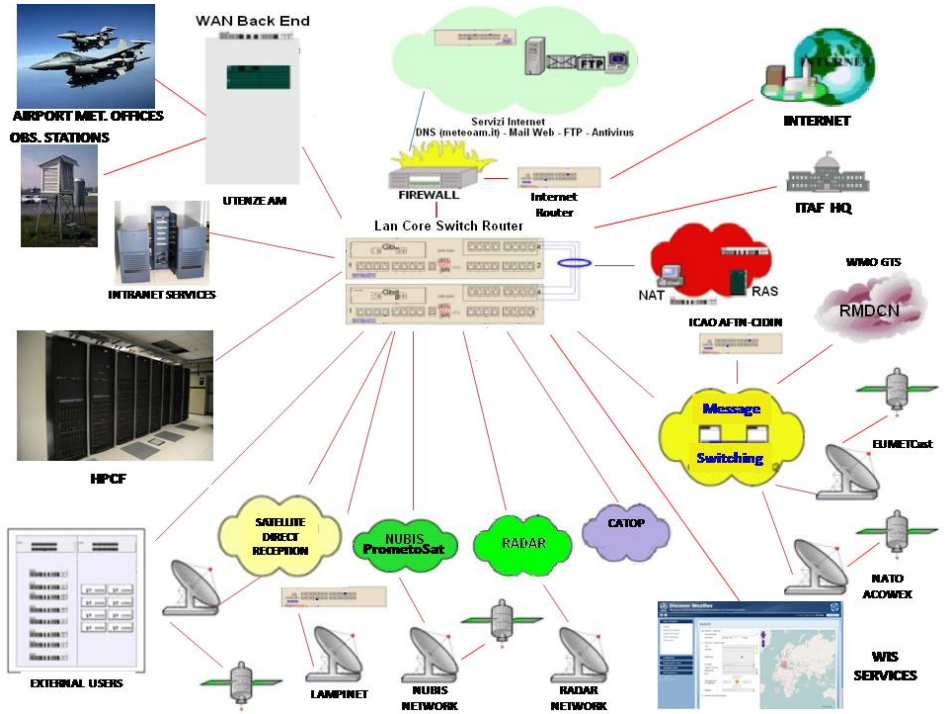
Ultimo Avviso di Burrasca

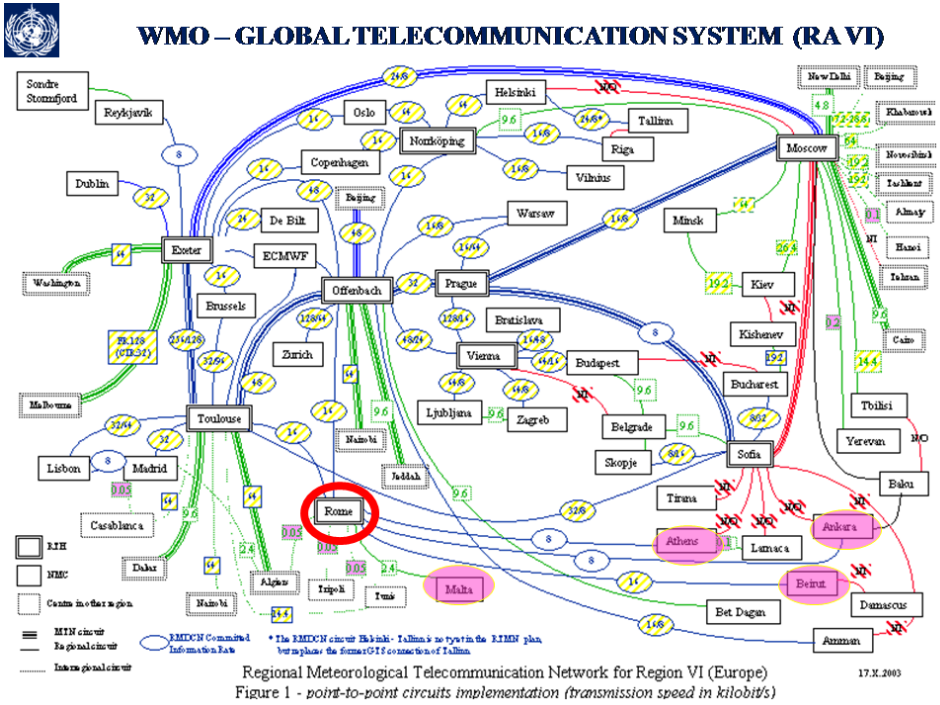
WHIY60 LIIB 170900 FM: CNMCA TO: MARISTAT /MARICOGECAP (DIP-2/3/4/5/CPT) -GALE WARNING ISSUED AT 0900/UTC ON MAY 17 GALE NORTHWESTERLY FORCE NINE OVER CENTRAL ADRIATIC SEA, SOUTHERN ADRIATIC SEA, JONIAN SEA AND CONCERNING COASTAL REGIONS. GALE GRADUALLY WEAKENING TO FORCE EIGHT OVER CENTRAL ADRIATIC SEA AND CONCERNING COASTAL REGIONS. GALE NORTHWESTERLY FORCE SEVEN OVER CENTRAL TYRRHENIAN SEA EAST SIDE, SICILY STRAIT AND OTRANTO CHANNEL. COASTAL REGIONS AFFECTED: CAMPANIA. GALE NORTHWESTERLY FORCE EIGHT OVER SOUTHERN TYRRHENIAN SEA EAST SIDE, MESSINA STRAIT AND CONCERNING COASTAL REGIONS. ISOLATED THUNDERSTORMS WITH LOCAL GUSTS EXPECTED OVER SOUTHERN ADRIATIC SEA AND NORTHERN JONIAN SEA. -

Altre Operazioni Meteo-Marine-Ocean.

- Distribution of Italian Buoy data (RON by ISPRA et al.) and ship-based atmospheric / oceanographic observations (e.g .CNR-Urania in the past) in standard WMO BUFR format over GTS in near real-time
- Collection of atmospheric and marine data from coastal stations in near real-time (ISPRA)
- Collection of Oceanographic data and products made available by cooperating Institutes (INGV, ISPRA, OGS, JRC)
- Support to the Civil Protection Department (e.g. joint activity with INGV on tsunami watch system for Mediterranean sea, making use of GTS infrastructure provided by Italian Met. Service)

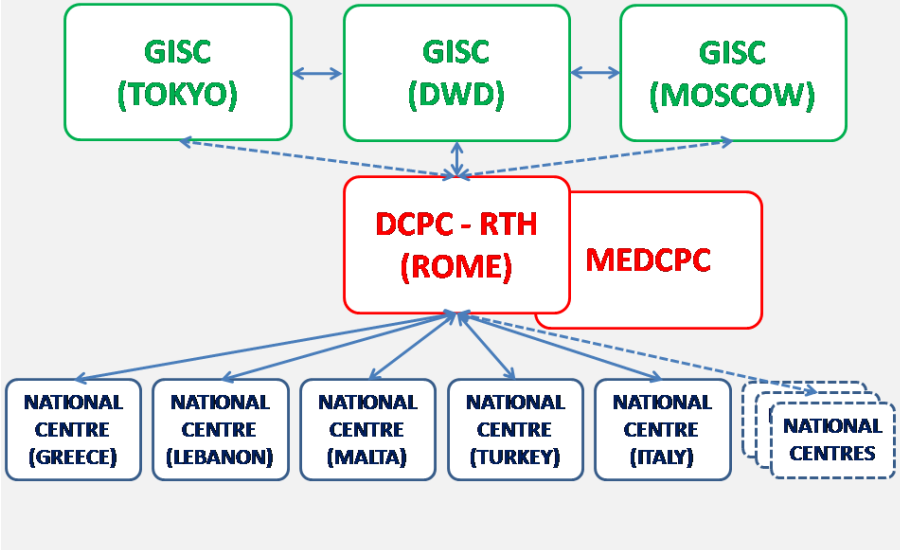
Telecommunication and Data Traffic

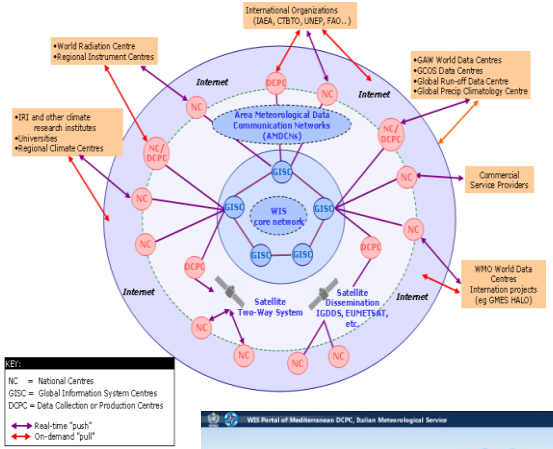


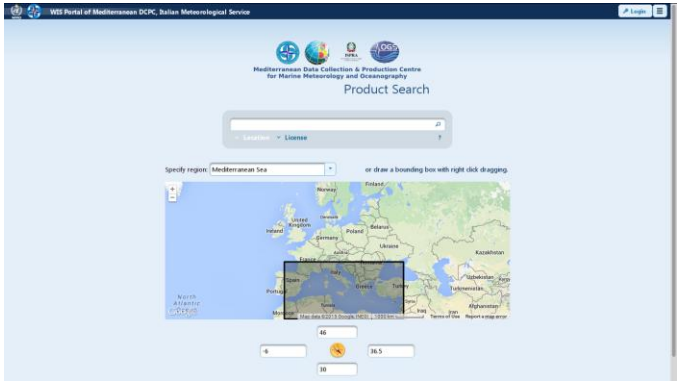


Information Management

WIS network infrastructure

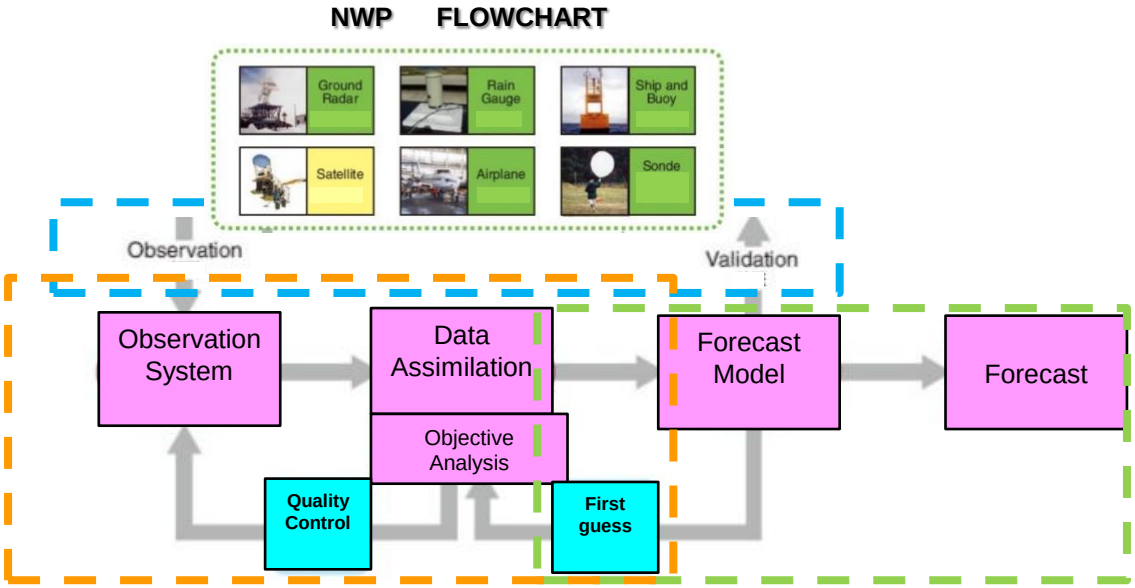






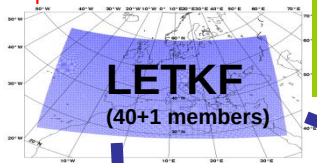
Numerical Weather Prediction Branch

Data Assimilation | **Numerical Modelling** | **Model Verification**



Operational Numerical Weather Prediction System

Ensemble Data Assimilation:
Operational since June 2011



10 km
45 v.l.

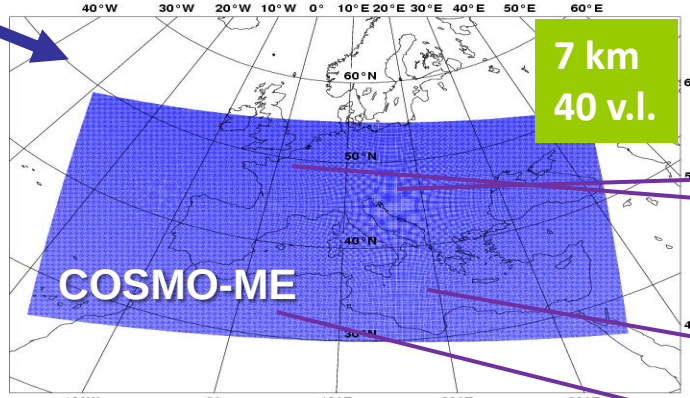
ECMWF Boundary Conditions

Ensemble Analysis

Deterministic Analysis

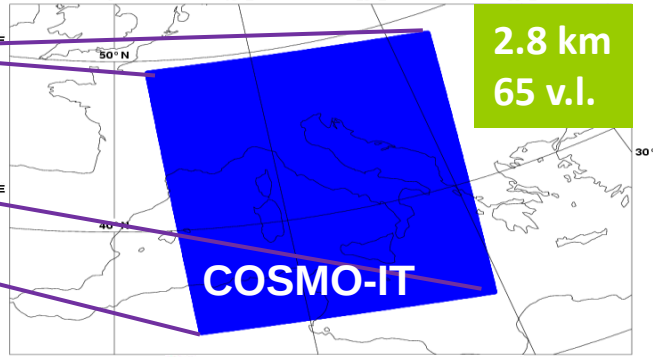
Local Area Modeling:

COSMO-ME (7km) ITALIAN MET SERVICE



7 km
40 v.l.

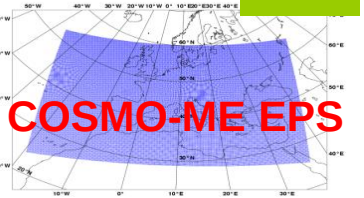
COSMO-IT (2.8Km) ITALIAN MET SERVICE

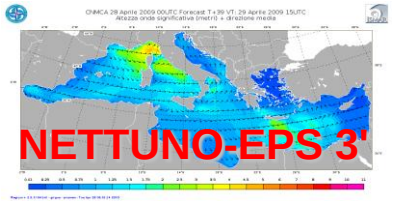


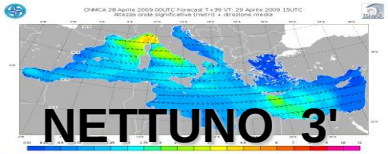
2.8 km
65 v.l.

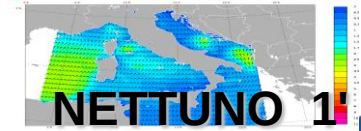
Ensemble Prediction System:

10 km
45 v.l.

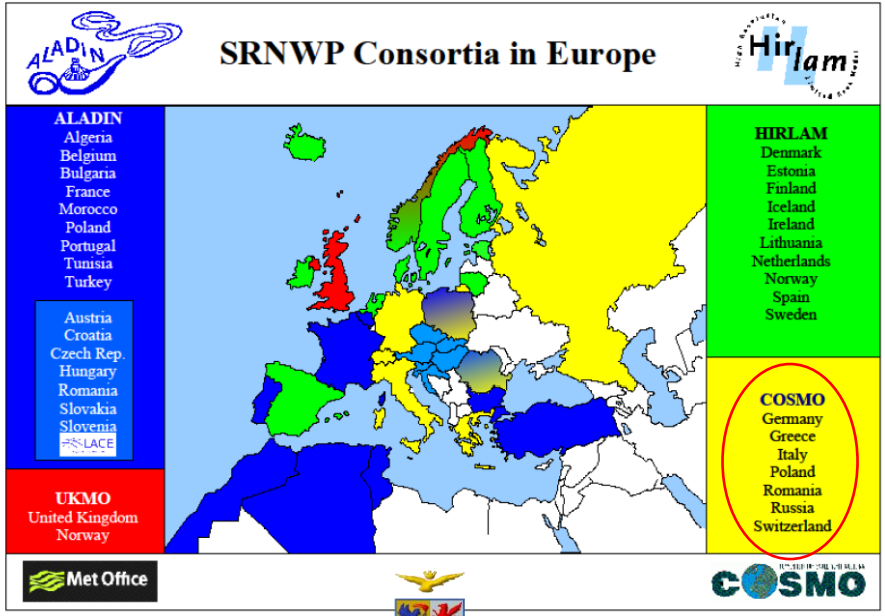


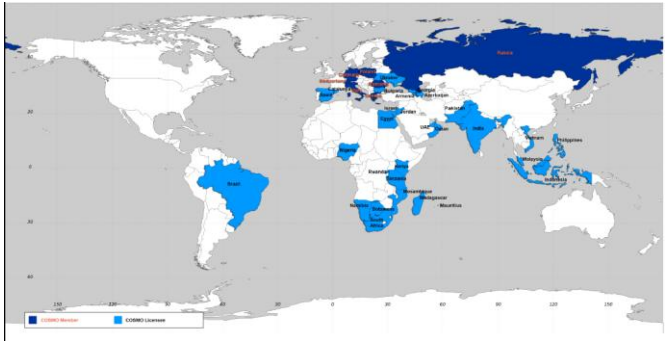






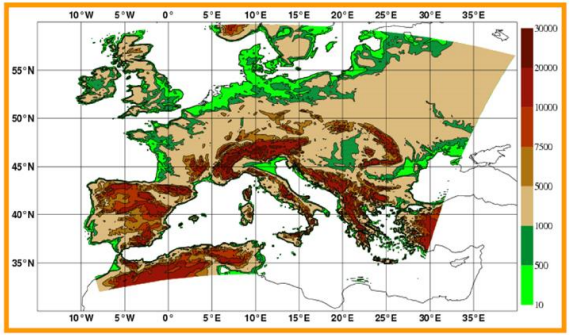
Operational NWP model: COSMO



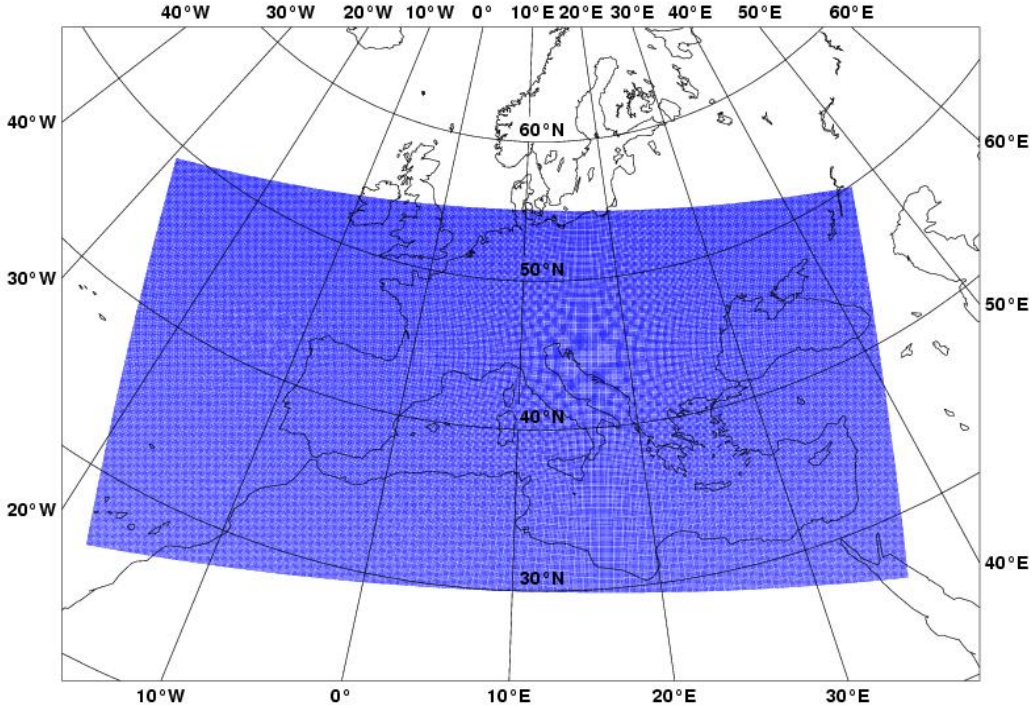


COSMO-LEPS

downscaling of selected ECMWF EPS members

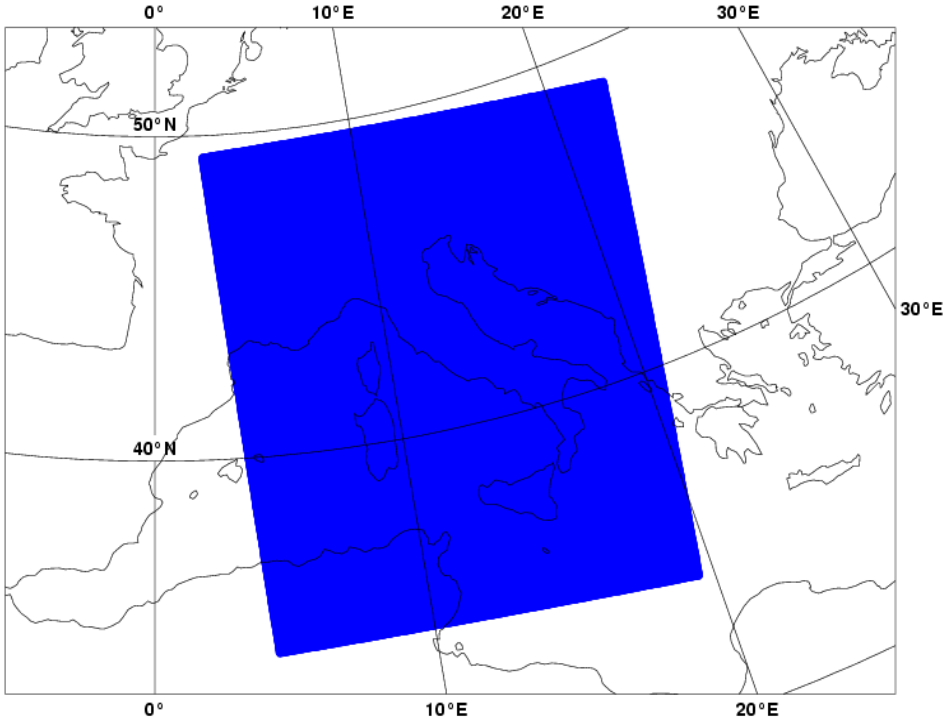


COSMO-ME (7 km)



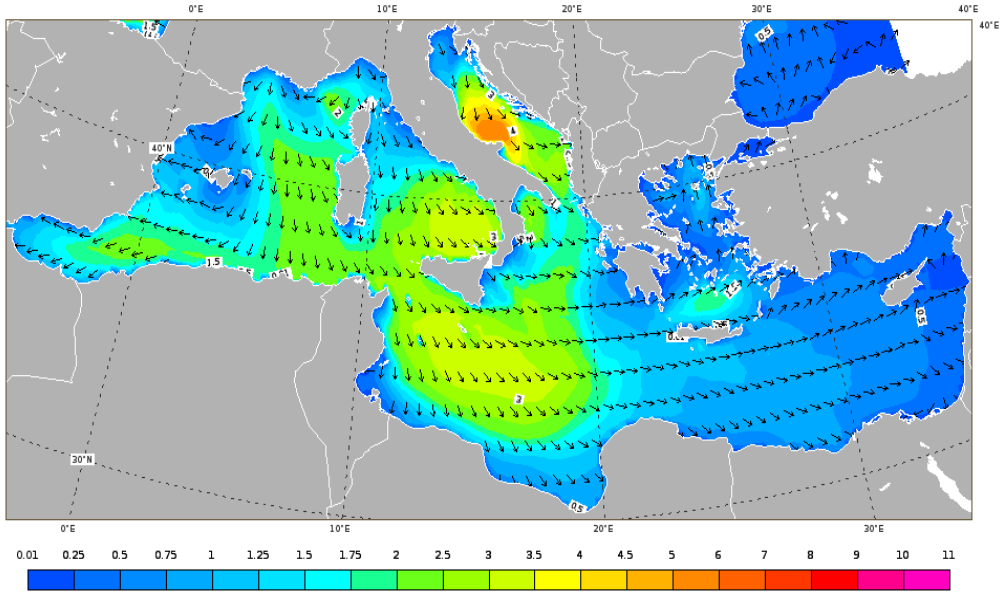
Domain size	779 x 401
Grid spacing	0.0625 (7 km)
Number of layers / top	40 / ~22 km
Time step	40 s
Forecast range	72 hrs
Initial time of model run	00/06/12/18 UTC
Lateral bound. condit.	IFS
L.B.C. update freq.	3 hrs
Initial state	Interpol. LETKF
Initialization	None
External analysis	T,u,v, qv,ps, snow mask
Special features	Filtered topography
Status	Operational

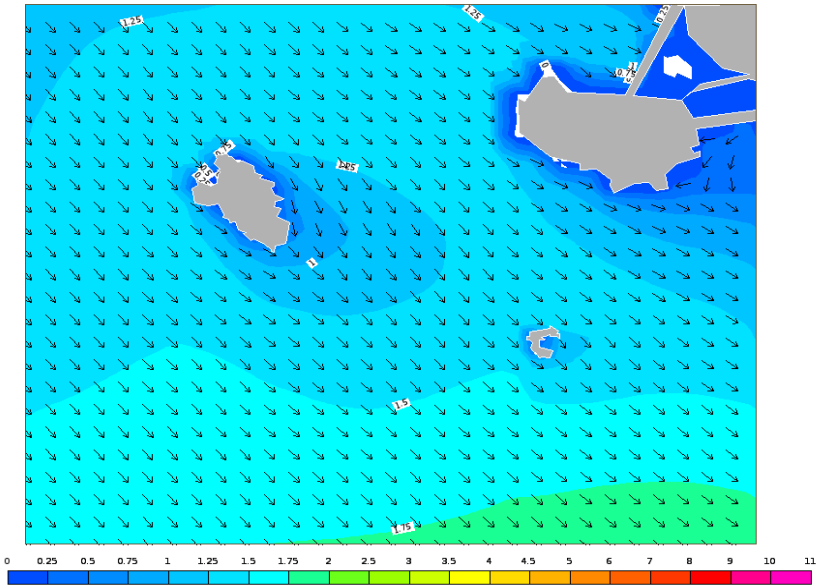
COSMO-IT (2.8 km)



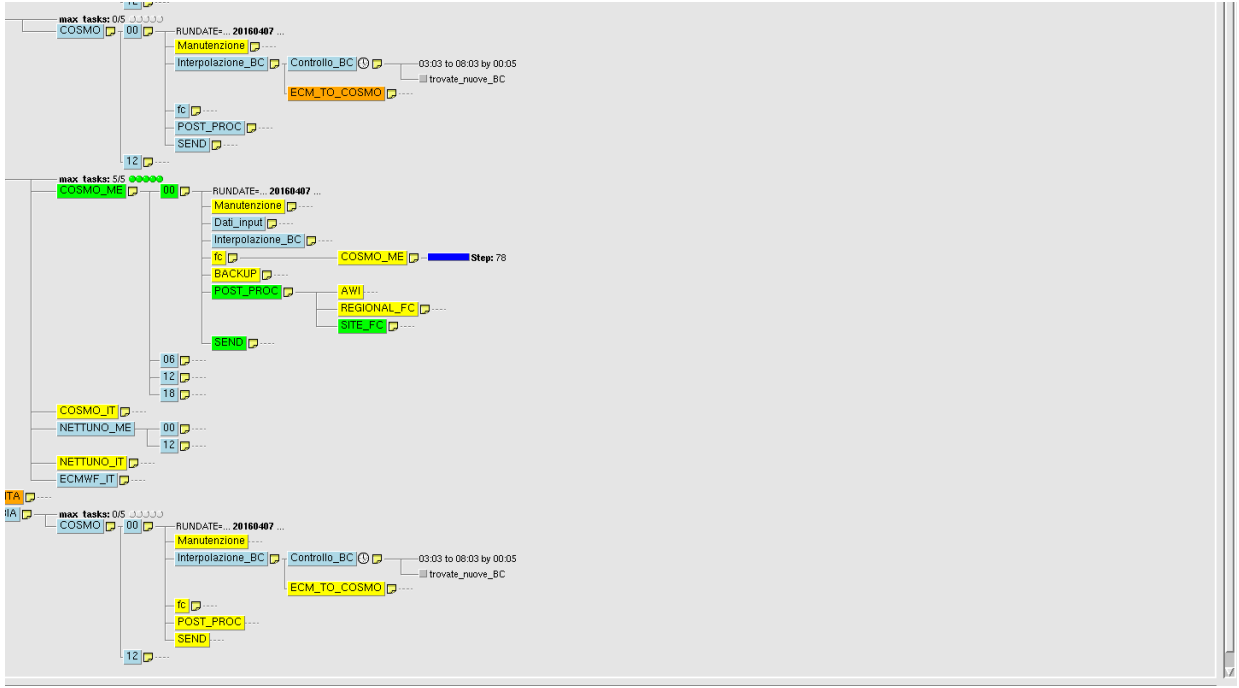
Domain size	542 x 604
Grid spacing	0.025 (2.8 km)
Number of layers / top	65 / ~22 km
Time step and scheme	25 s
Forecast range	24 hrs
Initial time of model run	00/12 UTC
Lateral bound. condit.	COSMO-ME
L.B.C. update frequency	1 hr
Initial state	Nudging
Initialization	None
External analysis	None
Special features	Filtered topography
Status	Operational

COSMO-DRIVEN WAVE MODELS - NETTUNO





NWP operational suites running at COMET



CLUSTER PORDOI

(the past...)

ReSIA – Information Technology Support Unit

SYSTEMS AND WEB DEVELOPMENT SECTION

(managing 19 meteo web sites)

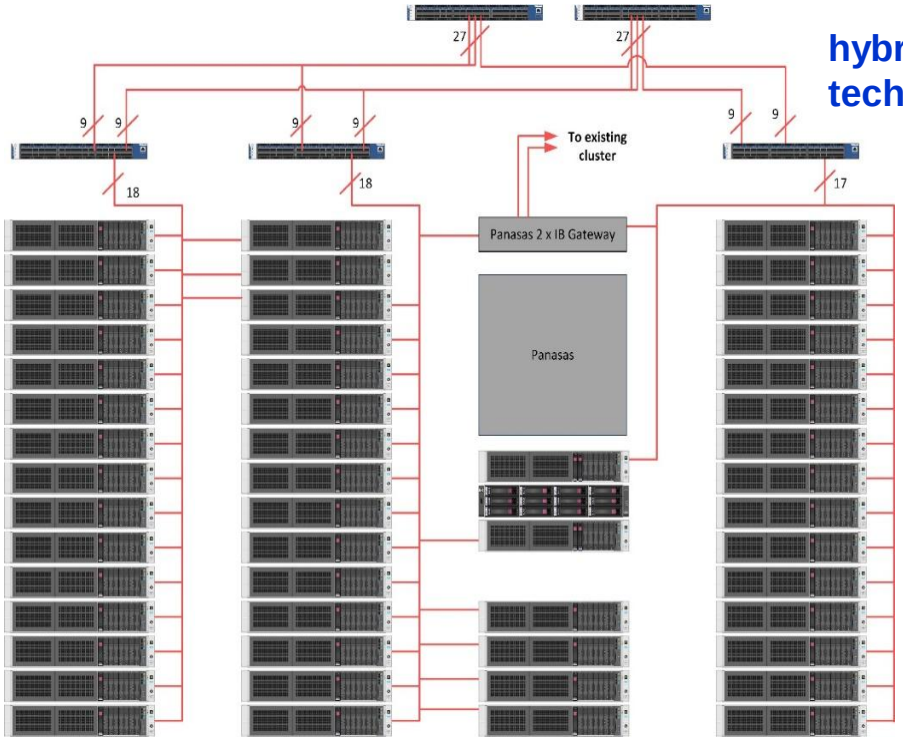
SYSTEM MONITORING AND MANAGEMENT SECTION

24/7 OPERATIONS AND MANAGEMENT SERVICE SECTION

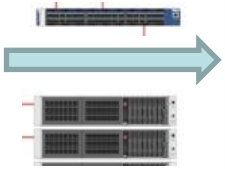
COMMUNICATION AND IT SECURITY SECTION

HPC PLATFORM SECTION

The future: new HPCF environment



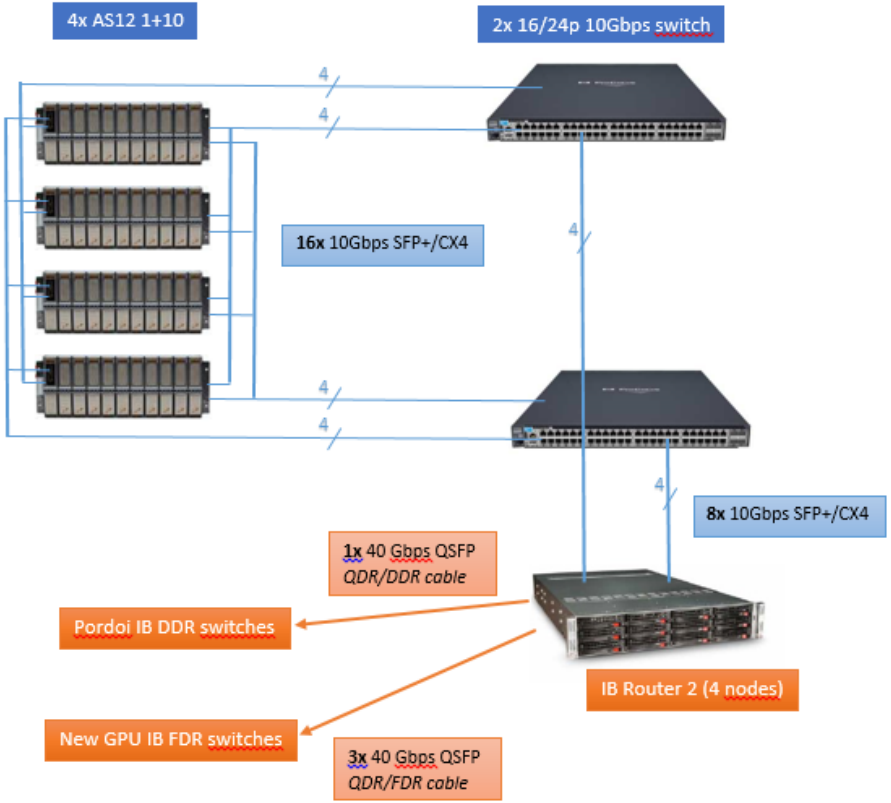
hybrid CPU/GPU technology



- 51x DL380 G9 Computing Nodes
- 2x DL380 G9 Management Nodes (2x12 Haswell cores - 64 GB)
- 1x MSA2040 DAS
- 6x Infiniband 36p FDR switches
- 102x Kepler K80 GPUs (24 GB) (204 GPU units ≈ 500K GPU cores)
- 9 TB RAM

- 190 TFLOPS peak
- 308 TFLOPS peak (BOOST)
- → #300 TOP500 world
- → #5 in Italy
- → #1 in Italy with GPU

New HPCF – I/O subsystem



- 4x AS12 1+10 w/ 40 TB
  → 160 TB RAW
- 2x 16p 10 Gbps switches
- 4x Infiband Router2 nodes
- PANFS + NFS over Infiniband QDR

- 6.0 GB/s sustained READ
- 6.4 GB/s sustained WRITE

- FULLY REDUNDANT Configuration

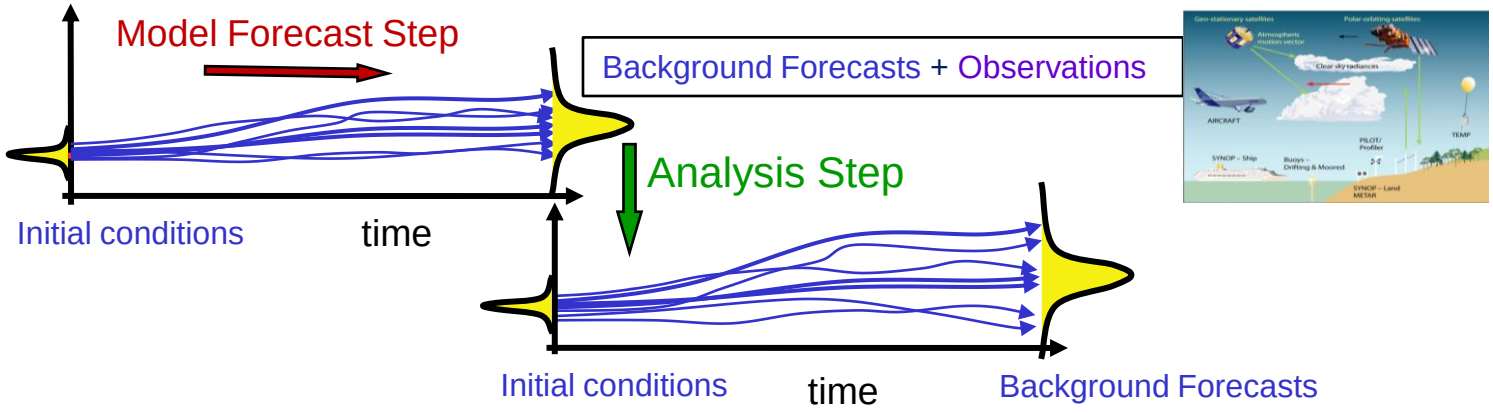
Progresses on Data Assimilation

Optimal Interpolation (OI) — 3D-VAR* — Local Ensemble Trasform Kalman Filter (LETKF)

1999 — 2002 — 2011

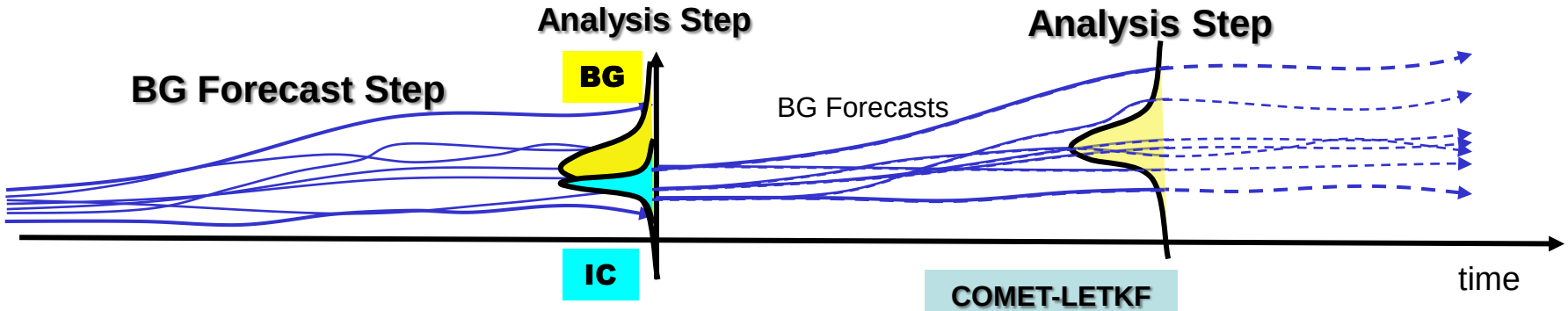
* 3D-VAR: 3 Dimensional Variational Assimilation

Ensemble Data Assimilation System (LETKF)



Competitive alternative to variational methods providing "optimal" analysis errors estimates for ensemble forec.

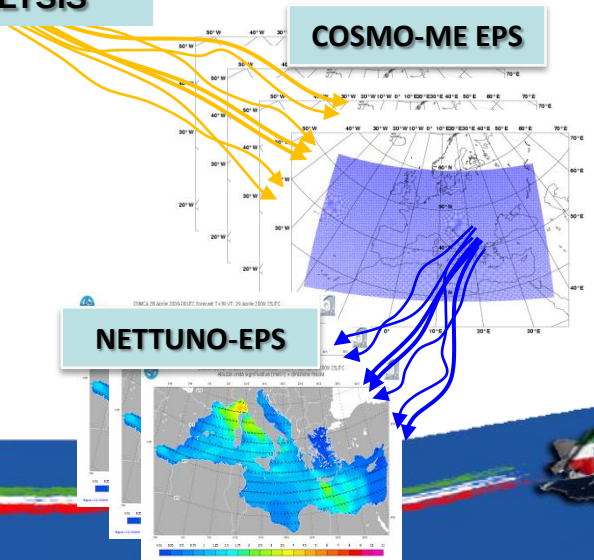
Ensemble Prediction System



COMET-LETKF ANALYSIS

COSMO-ME EPS (running since july 2013)
IC and BC: initial conditions are derived every 6 hours from the COMET-LETKF system.
Lateral boundaries conditions are from IFS deterministic run perturbed using ECMWF-EPS
Model error: stochastics physics perturbation tendencies is switched on from 1 May 2014
Forecast range: the 40+1 COSMO forecast members will run up to 72 hours at 00/12 UTC

NETTUNO EPS (In cooperation with ISMAR-CNR of Venice)
NETTUNO is a high resolution local scale wave forecast system operational in the Mediterranean Sea based on the COSMO-ME and WAM models
The sea state probabilistic forecast is obtained driving the wave model using the hourly COSMO-ME EPS wind forecast members

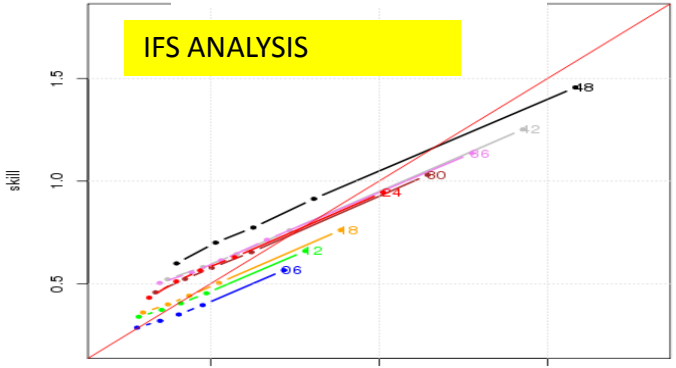


COSMO-ME EPS

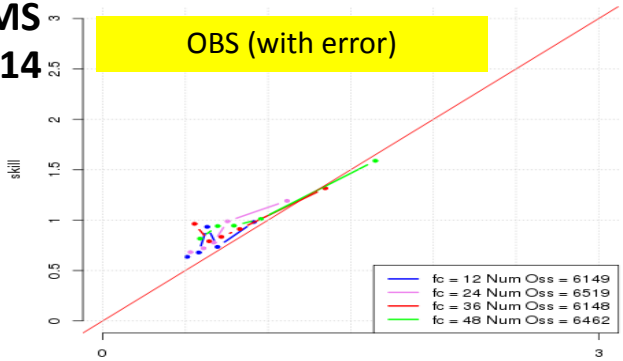
SPREAD-SKILL DIAGRAMS
1 JAN 2014 – 31 DEC 2014

by S.Sebastianelli

T@500hPa



T@500hPa



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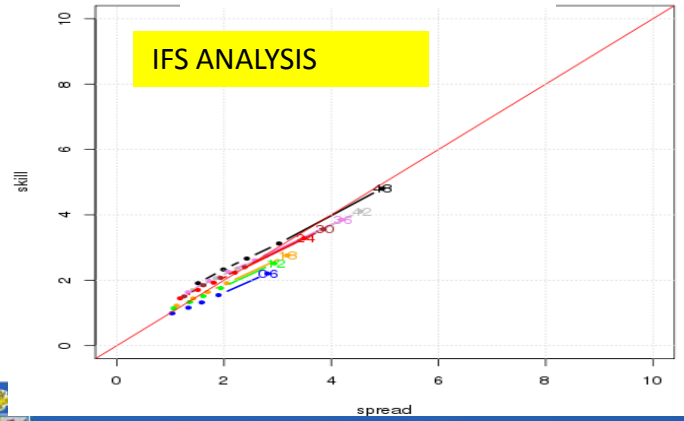

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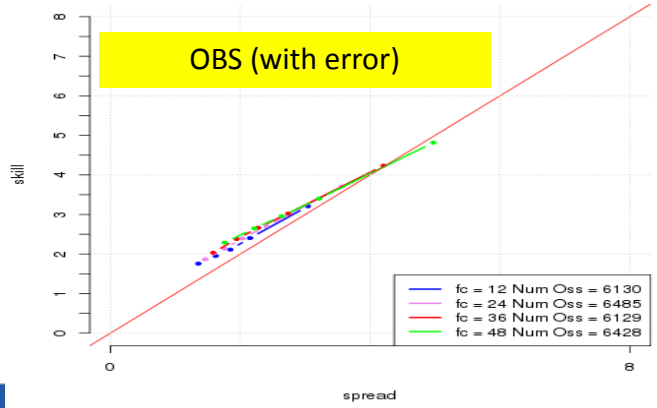
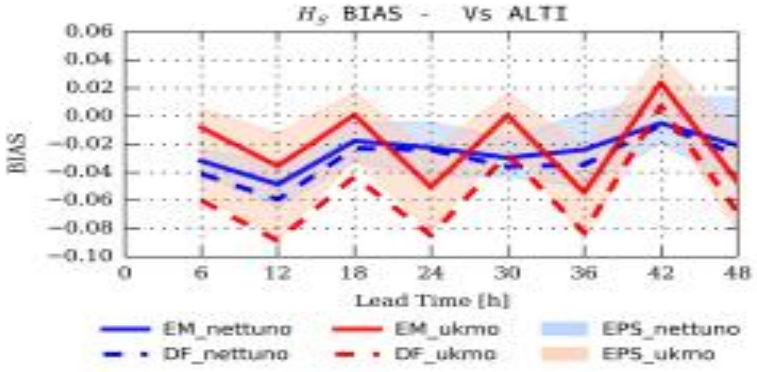


NETTUNO - EPS

Courtesy of P. Pezzutto (ISMAR-CNR)



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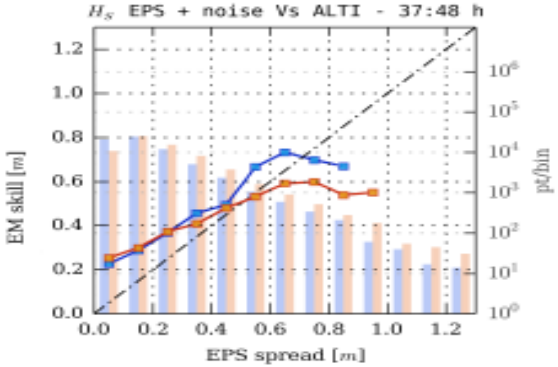

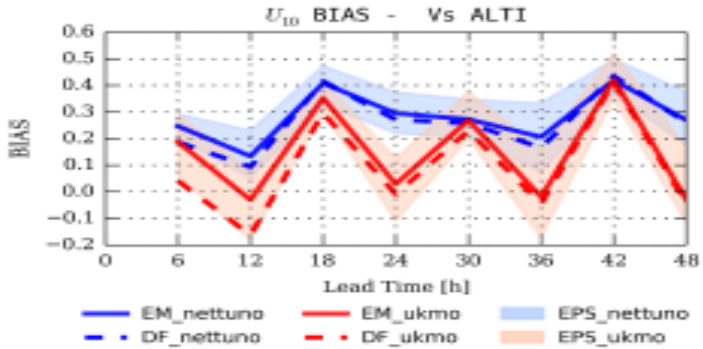

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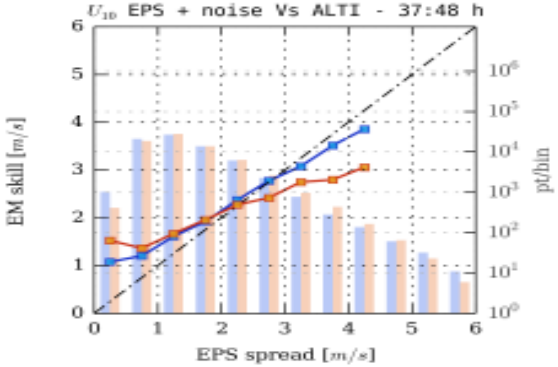

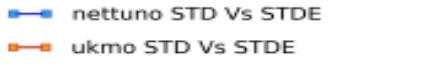


Q&A