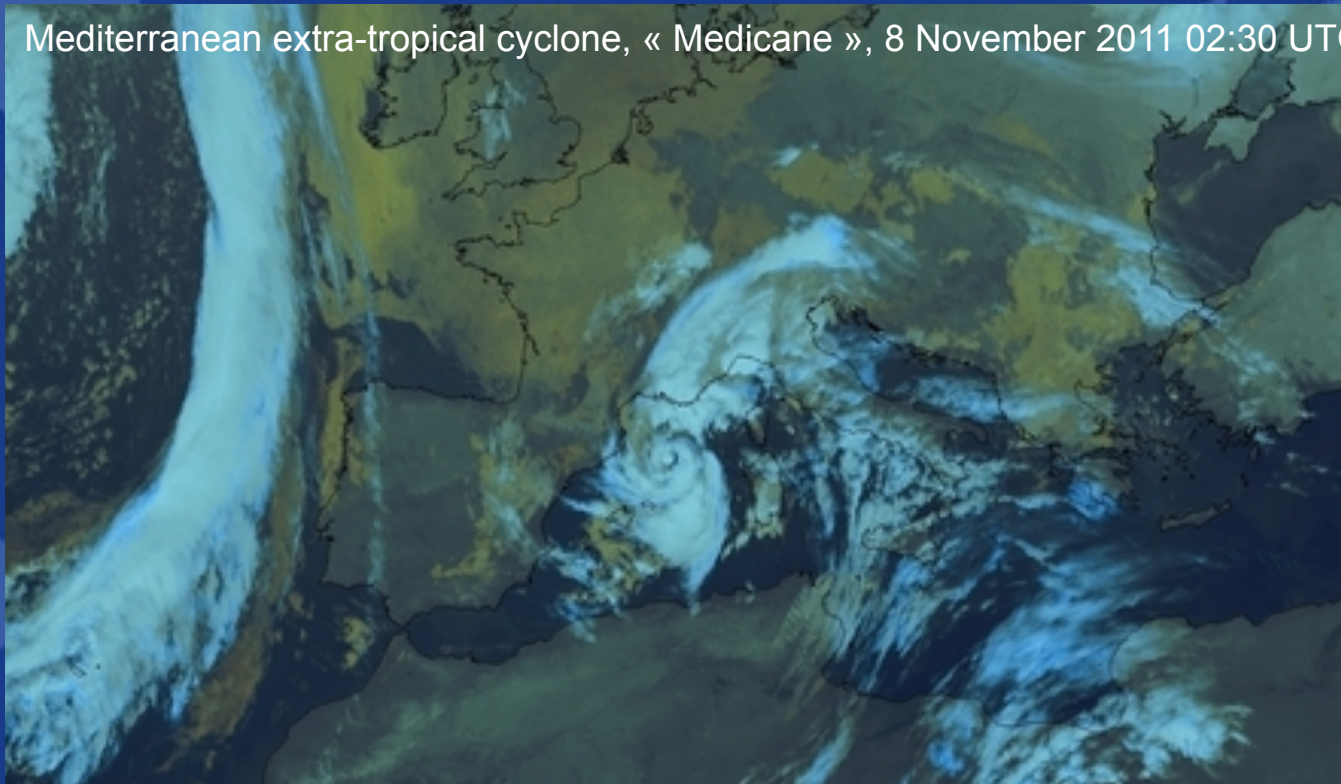


HyMeX

« Hydrological Cycle in the Mediterranean » Experiment

Mediterranean extra-tropical cyclone, « Mediane », 8 November 2011 02:30 UTC



Guy DELRIEU

LTHE / CNRS + University of Grenoble, France

Véronique DUCROCQ

CNRM, Météo France, Toulouse

Philippe DROBINSKI

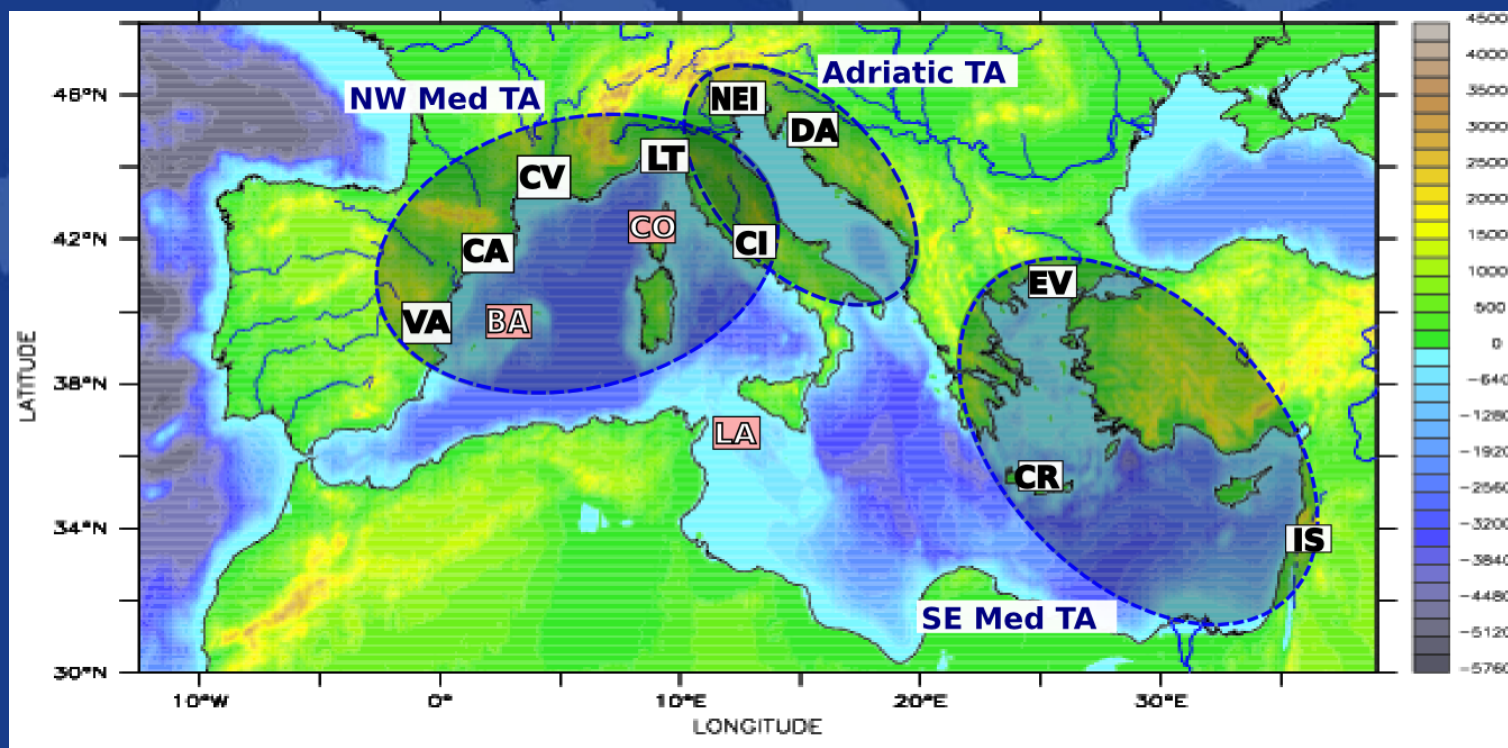
LMD/IPSL, Paris

OUTLINE

- HyMeX
- Enhanced and Special Observation Periods
- Possible synergies with GPM



- ❖ Improve our understanding of the *water cycle in the Mediterranean basin*, with emphases on the *predictability and evolution of intense events*
- ❖ Evaluate the *societal and economical vulnerability to extreme events and water resources issues* and the *adaptation capacity*



Heavy Precipitation
Flash-flooding

Hydrological continental cycle

Intense air-sea
exchanges

Vulnerability
and
adaptation

Water budget
of the
Mediterranean Sea

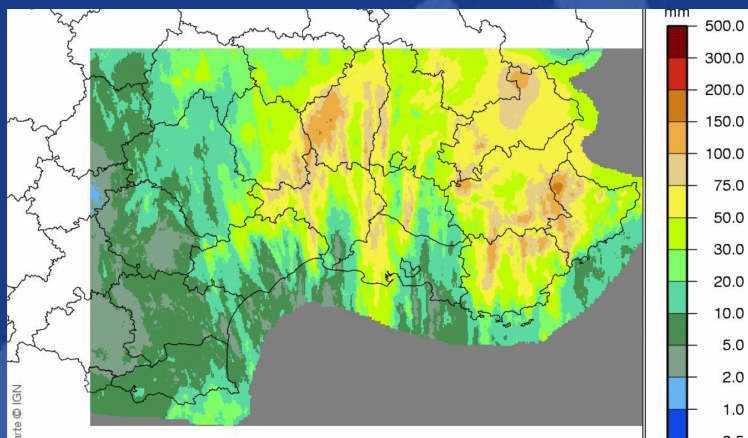
Event

Seasonal

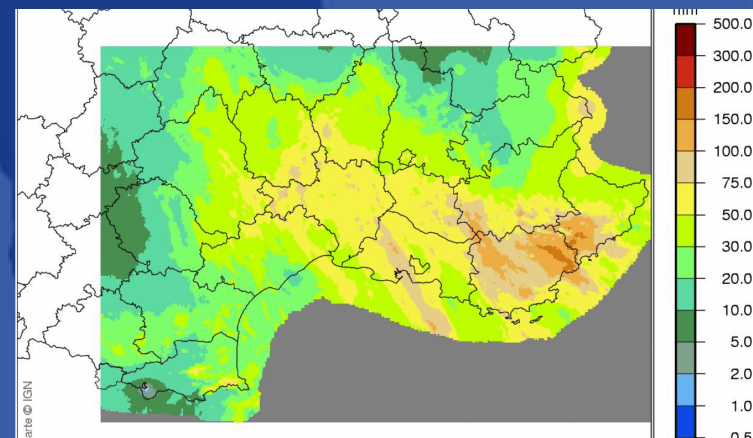
Annual

Century

Heavy Precipitation Flash-flooding



5 November 2011



6 November 2011

Better understanding of the **extreme events**: *processes and impacts*

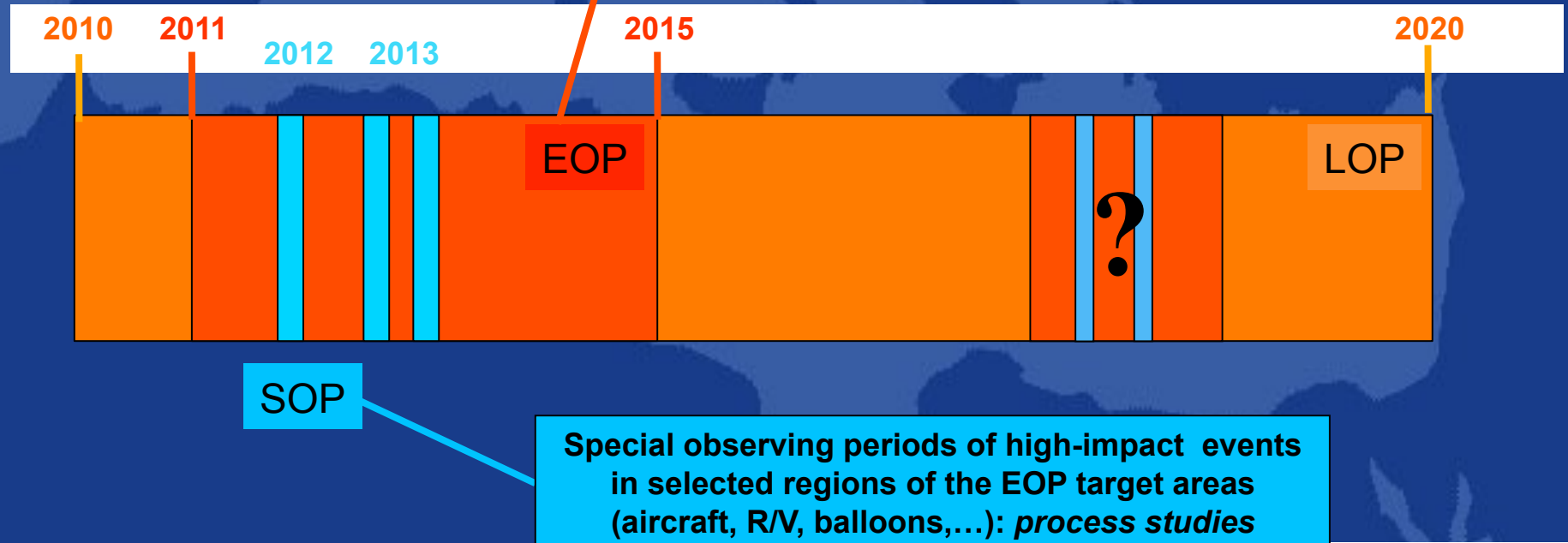
Key questions:

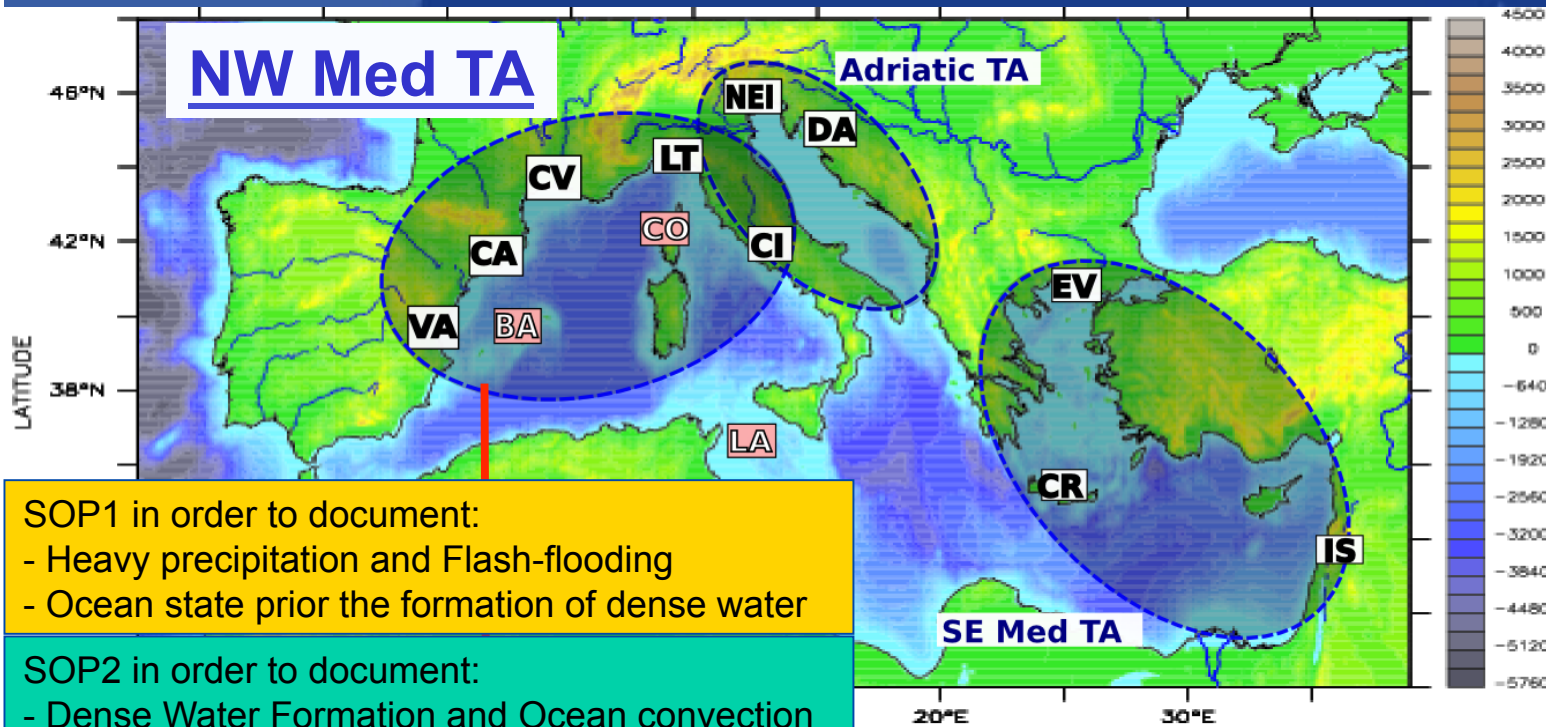
- **What are the ingredients and their interactions necessary to produce extreme hydro-meteorological events ?**
- **How can we improve prediction of extreme events and mitigate their socio-economical impact?**
 - **coupling NH-NWP and distributed hydrological models + data assimilation**
 - **alert systems + education**

- « **Nested** » approach to tackle the whole range of processes / interactions and estimate budgets

Enhanced existing observatories and operational observing systems in the target areas of high-impact events: *budgets and process studies*

Current operational observing system and observatories over the whole Mediterranean basin: *budgets*





SOP1 in order to document:

- Heavy precipitation and Flash-flooding
- Ocean state prior the formation of dense water

SOP2 in order to document:

- Dense Water Formation and Ocean convection
- Cyclogenesis and local winds

Sept. 2011

Mar. 2015



Sept.
Oct.
2012

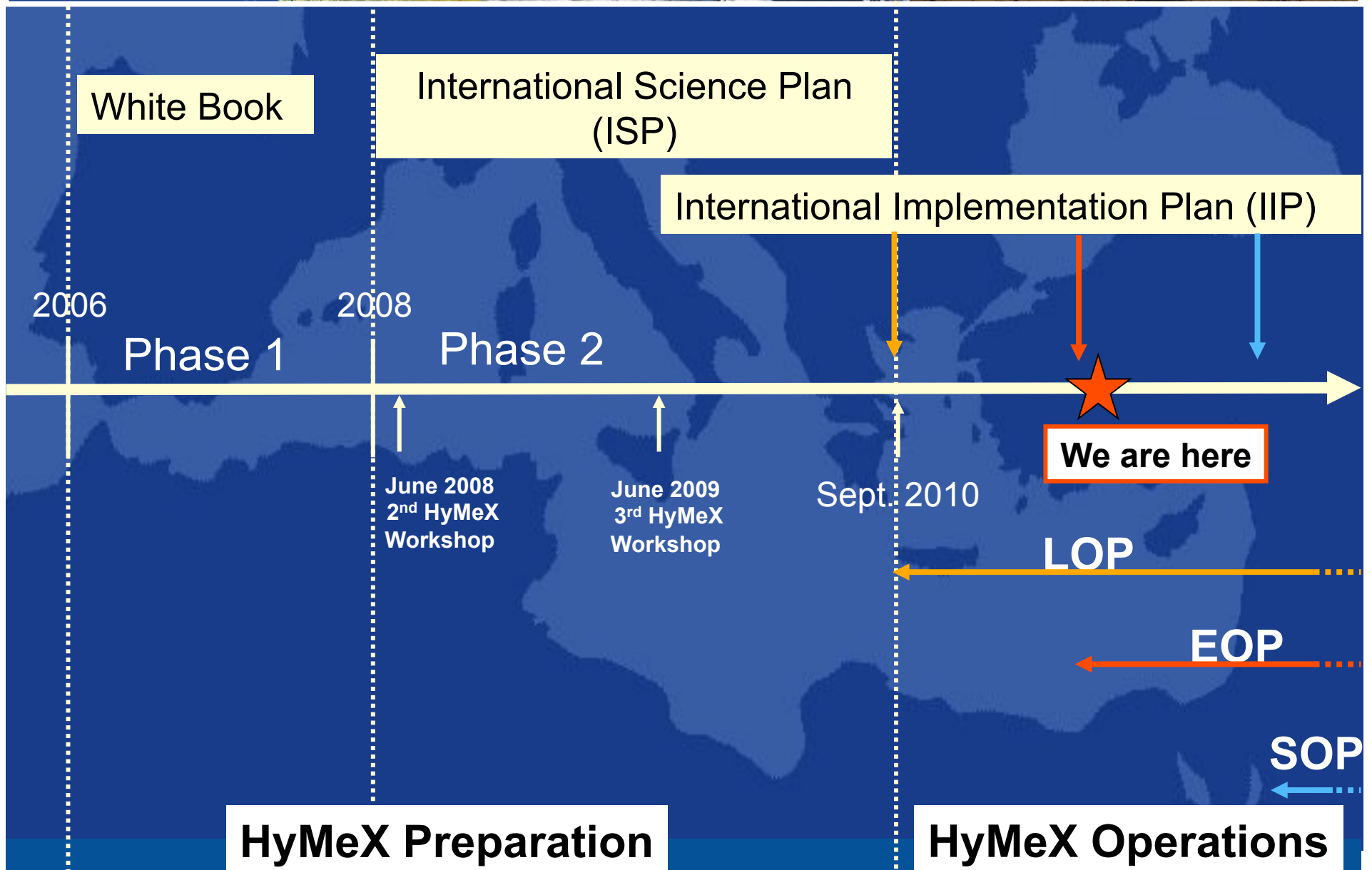
Mar.
Apr.
2013

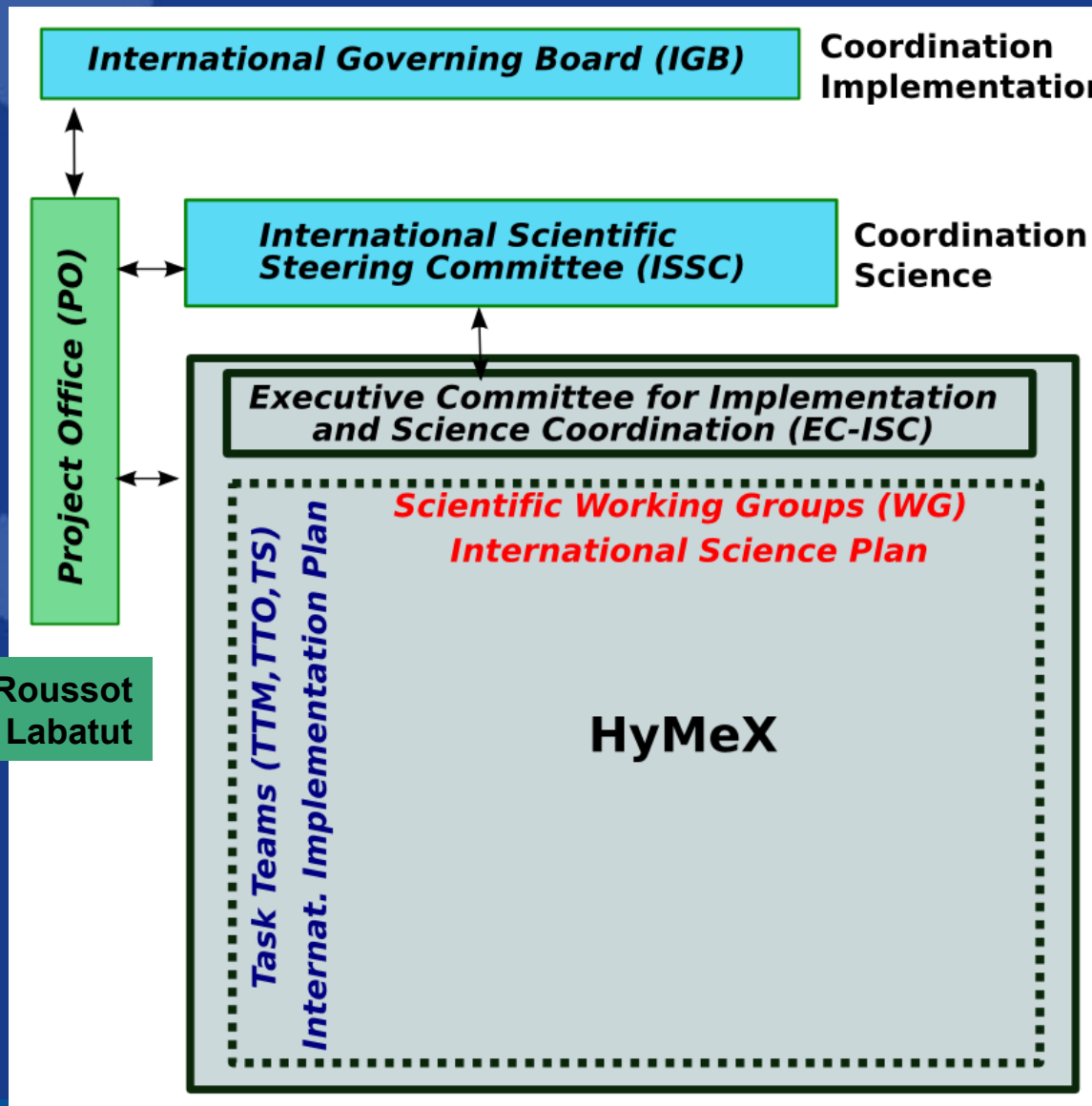
Sept.
Oct.
2013

Mar.
Apr.
2014

HyMeX

Timeline





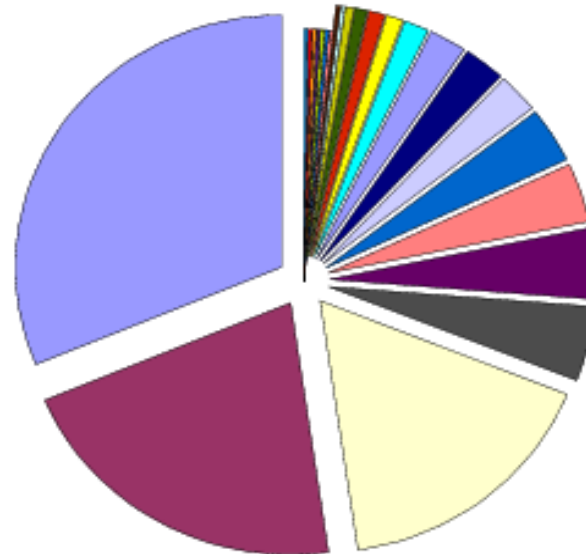
Chair:
P. Lionello
Vice-chair:
P. Drobinski

Chair:
V. Ducrocq

Odile Roussot
Laurent Labatut

More than 350 WG or TT members from more than 20 countries

WG members



France	UK
Italy	Romania
Spain	Egypt
Germany	Algeria
USA	Austria
Croatia	Bulgaria
Greece	Cyprus
Israel	Iceland
Tunisia	Luxembourg
Portugal	Netherlands
Maroc	Sweden
Turkey	Switzerland



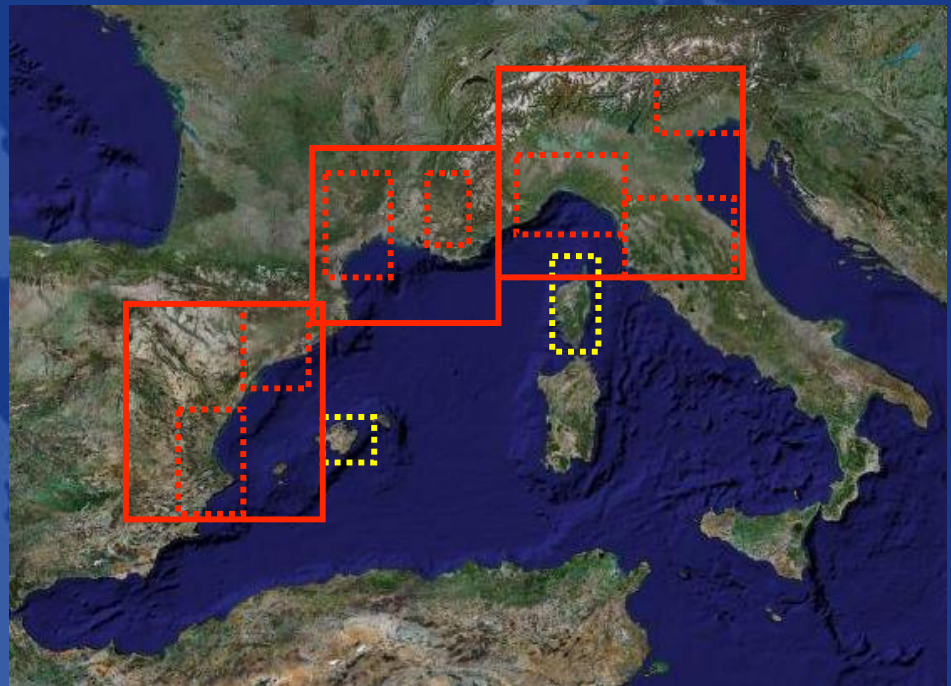
Upstream atmospheric sites and operational + research hydrometeorological observatories

Observations of inflow and precipitating systems,
rivers and continental surfaces

Examples of contributions received for the HyMeX Implementation Plan :

- mobile/fixed radars (LAMP; EPFL, Univ. Honenheim, DLR, NOVIMET, NSSL)
 - water vapour lidar and aerosols (IGN-SA)
- water vapour and Temperature lidars (Univ. Honenheim),
 - Doppler wind lidar (IMK)
 - Cloud radars (IMK, DLR),
 - Micro-rain radars (DLR, LaMP)
 - Sodar (CNRM)
- electricity receiver PROFEO (ONERA)
- CCN/IN measurements (LAMP; CNRM)
 - GPS receivers (GM)
 - Soundings (IMK, CNRM)
- energy budget stations (IMK, CNRM)
- atmospheric surface and soil moisture measurements (CNRM, HSM, IMK)
 - Disdrometers (LTHE, DLR)
 - Ceilometers, photometers (CNRM)
- LS-PIV discharge measurement (CEMAGREF)

- ...



Upstream atmospheric sites and hydrometeorological observatories

Observations of inflow and precipitating systems, rivers and continental surfaces

Observations over the Sea:

Observations of the atmosphere and ocean boundary layers, air-sea fluxes (annual cycle, intense events), dense water formation and propagation



Examples of contributions received for the HyMeX Implementation Plan :

- mooring, buoys
- ARGO free-drifting
- glider transect
- GPS and XBT on-board ferries
- research vessels with air-sea fluxes measurements, soundings, ocean soundings, X-band radar ?
- Boundary layer Pressurised Balloons
- Aeroclippers for measuring air-sea fluxes ?
- aircraft (DO128-IMK ?) for measurements in the marine boundary layer

Upstream atmospheric sites and hydrometeorological observatories

Observations of inflow and precipitating systems, rivers and continental surfaces

Observations over the Sea:

Observations of the atmosphere and ocean boundary layers, air-sea fluxes (annual cycle, intense events), dense water formation and propagation

Observations of the free troposphere:

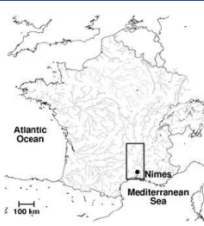
Observations of the Mediterranean cyclogenesis and precipitating systems over Northwestern Med and their environment



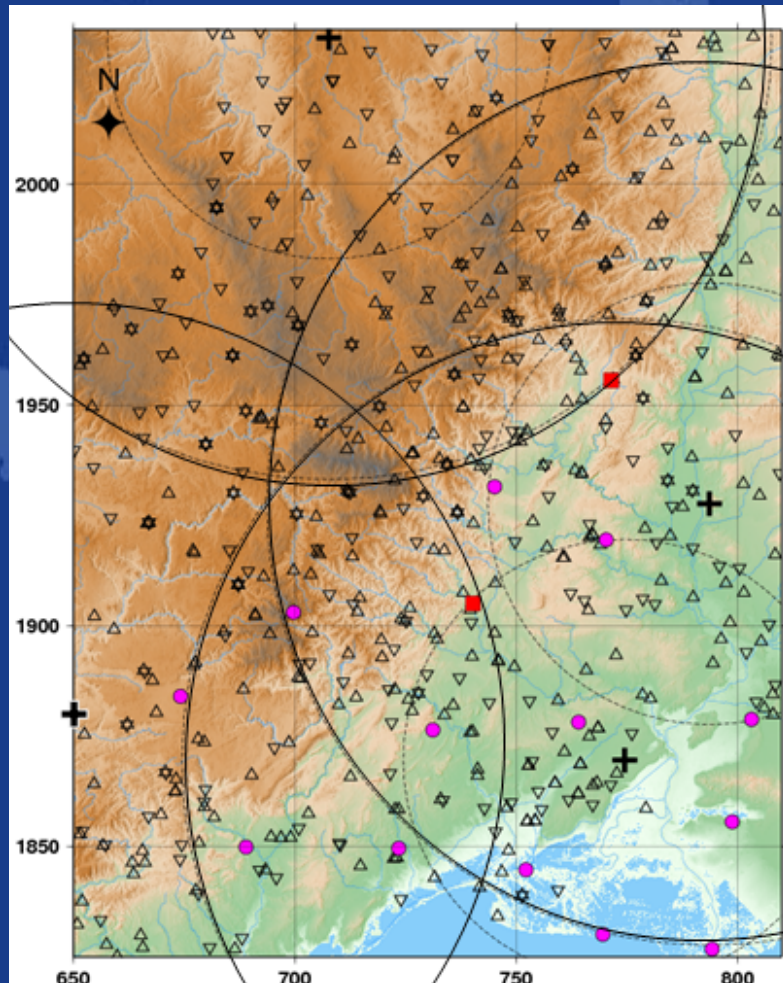
Examples of contributions received for the HyMeX Implementation Plan :

- soundings (enhancement of existing and additional soundings) – link with EUCOS-MEDEX
- French research aircrafts : ATR42 (Leandre+aerosol) & Falcon20 (Rasta W-band cloud radar + micro-physics)
- HALO-NEPTUNE ??

+ Satellite products (METEOSAT, METOP,...)



Cévennes Hydrometeorological Observatory (OHM-CV; since 2000)



OHM-CV window:
32000 km², 0-1800 m asl

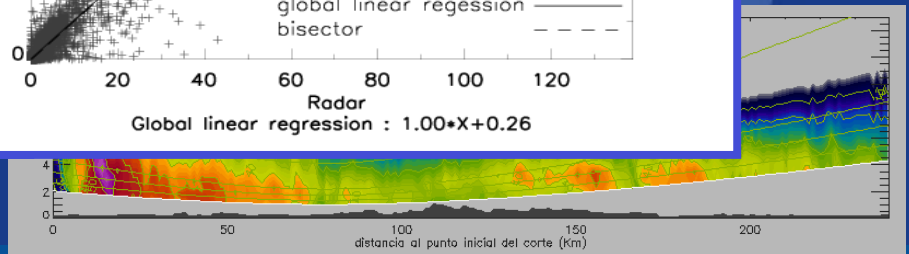
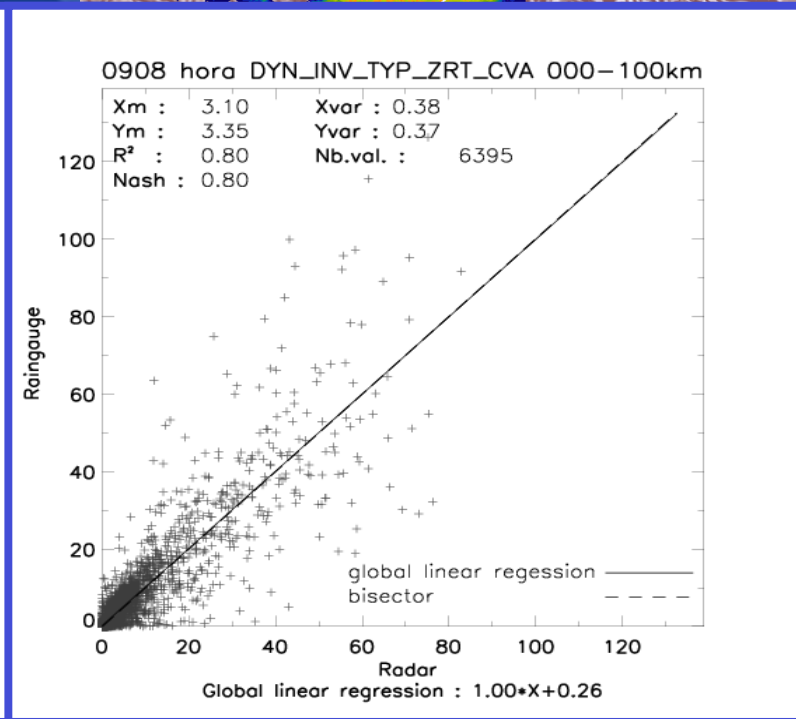
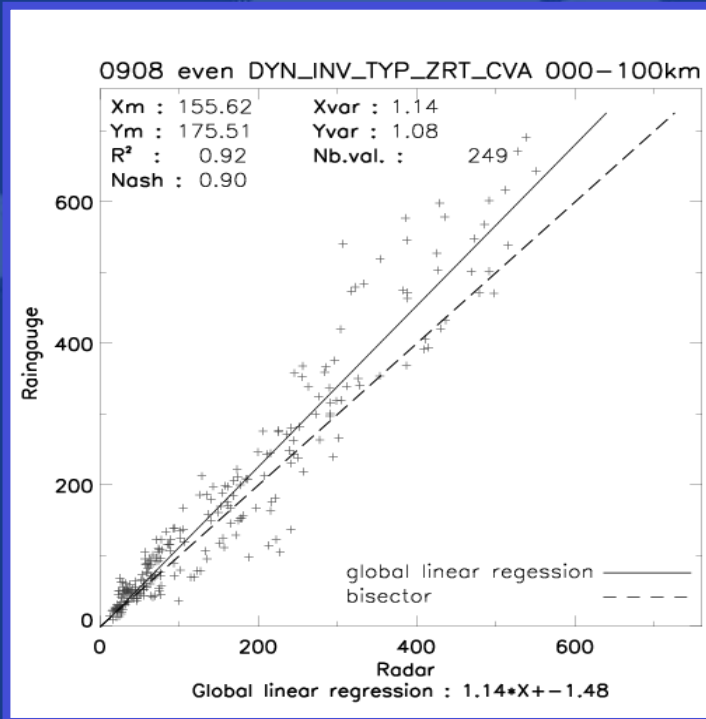
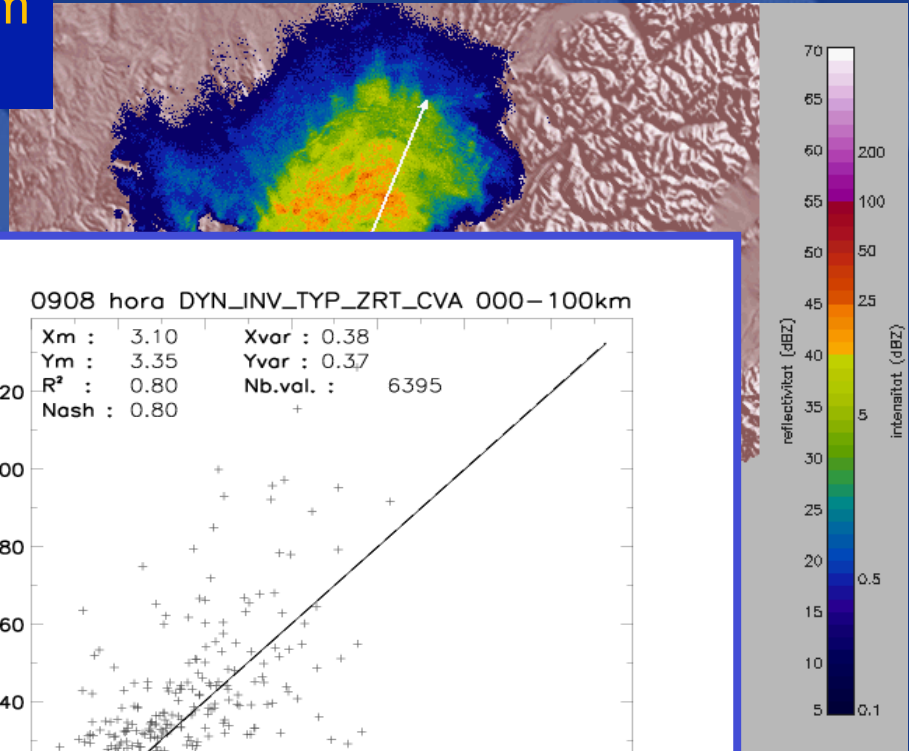
Existing rain obs system:

- 2 S- and 2 C- band radars
- ~ 400 rain gauges
- 2 disdrometers
- 11 GPS stations

8-9 September 2002

V-shaped mesoscale convective system

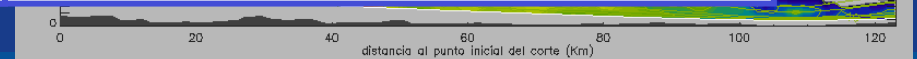
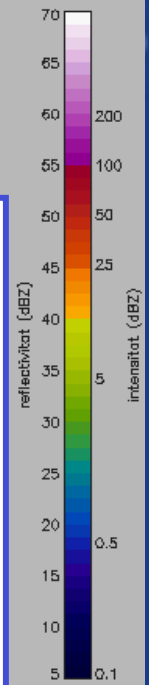
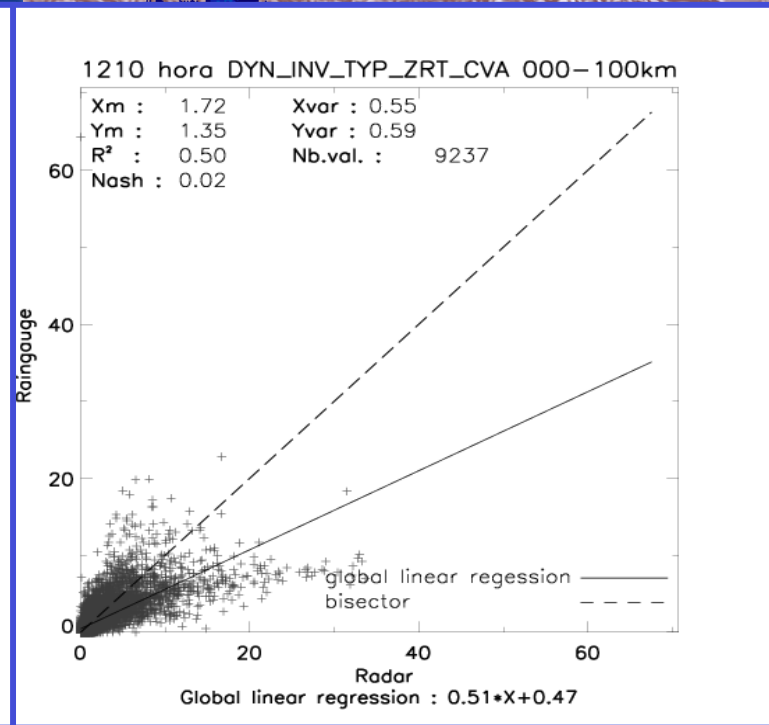
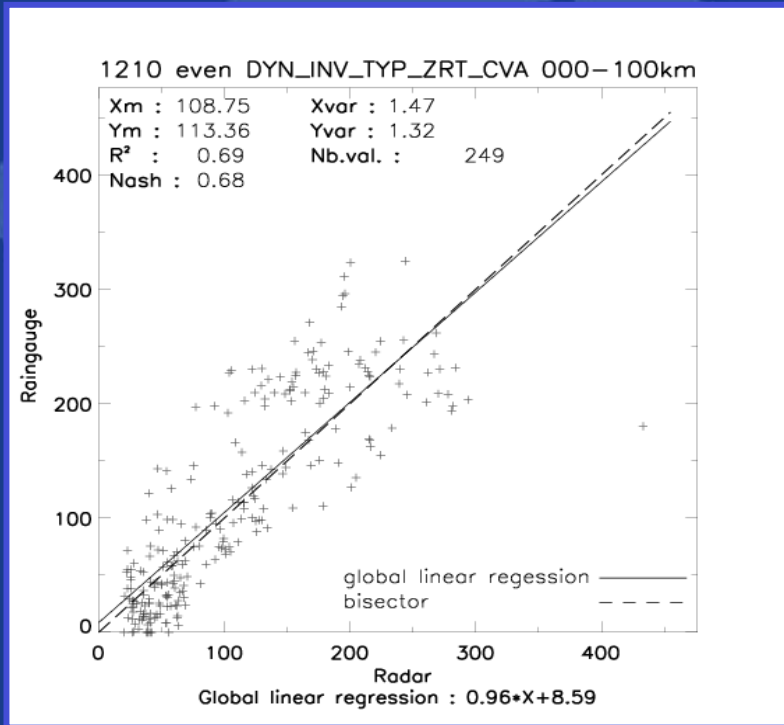
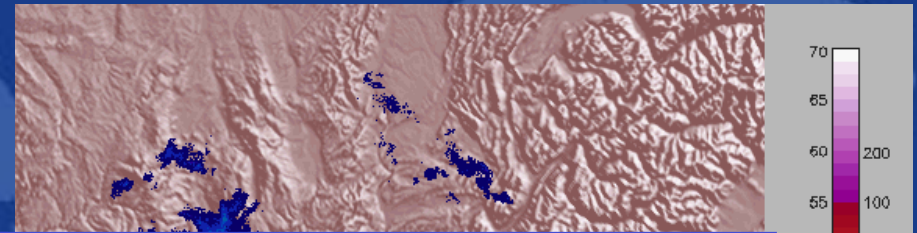
Max: 700 mm in 28 hours

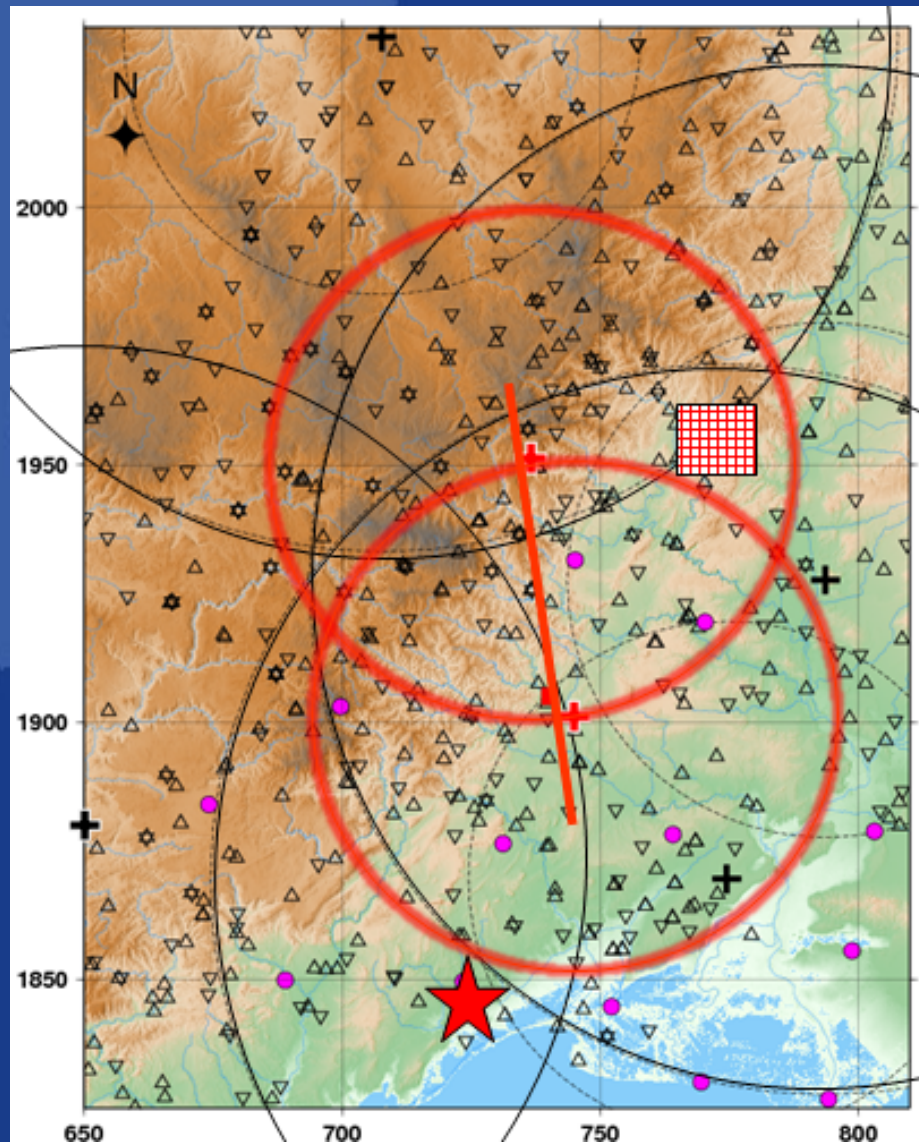


10-12 December 2002

Shallow convection; orographic forcing

Max: 300 mm in 2 days





OHM-CV window:
32000 km², 0-1800 m asl

Existing rain obs system:

- 2 S- and 2 C- band radars
- ~ 400 raingauges
- 2 disdrometers
- 11 GPS stations

Additional instrumentation:

- 2 Xpol radars (NSSL-USA, EPFL-CH)
- TARA (S-Band fcmw radar, UDelft-NL)
- MRRs and disdrometer transect(s)
- A micronet : disdrometers + raingauges
- POLDIRAD (DLR-D) ?

Improve our knowledge of the 4D storm structure of Mediterranean heavy precipitation systems

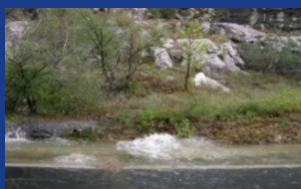
Improve NWP models ... and satellite rainfall estimation algorithms:

- MW radiances – R conversion over land
- DF PR profiling algorithms
- vertical structure and NUBF

Develop radar (satellite) QPE error models with respect to high-quality raingauge (radar-raingauge) QPE:

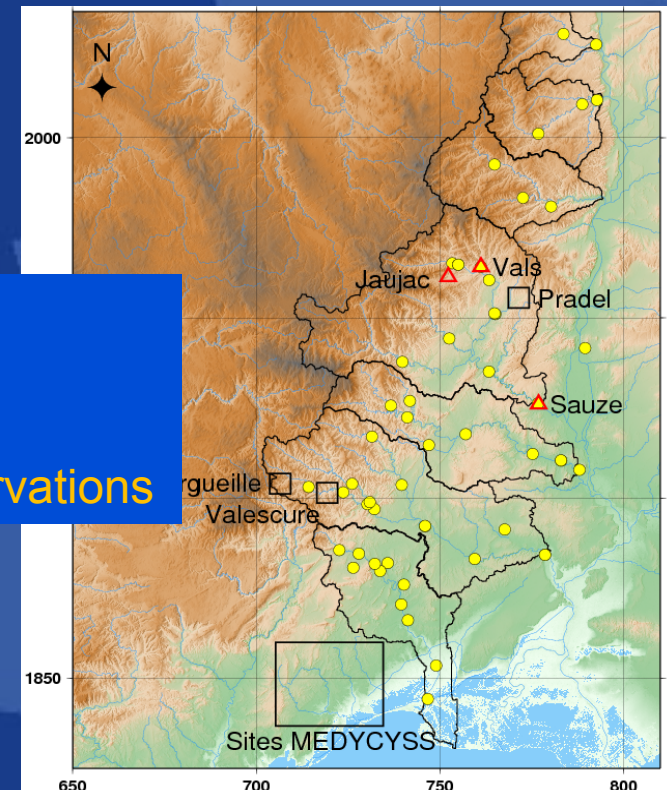
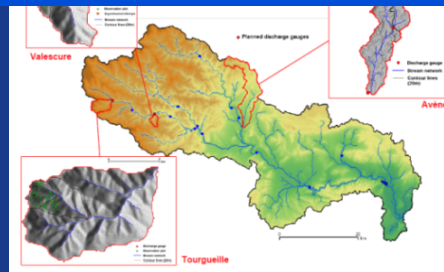
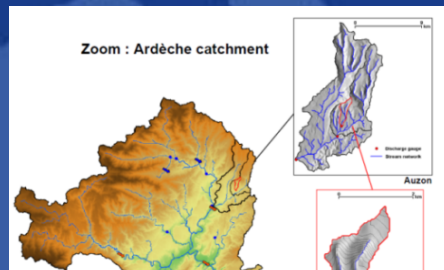
- sampling errors
- algorithmic and calibration errors

Hydrological process studies at the plot / hillslope scales for typical Med landscapes



« prediction for ungauged basins »
« change of scale problem »

Operational streamgauge network

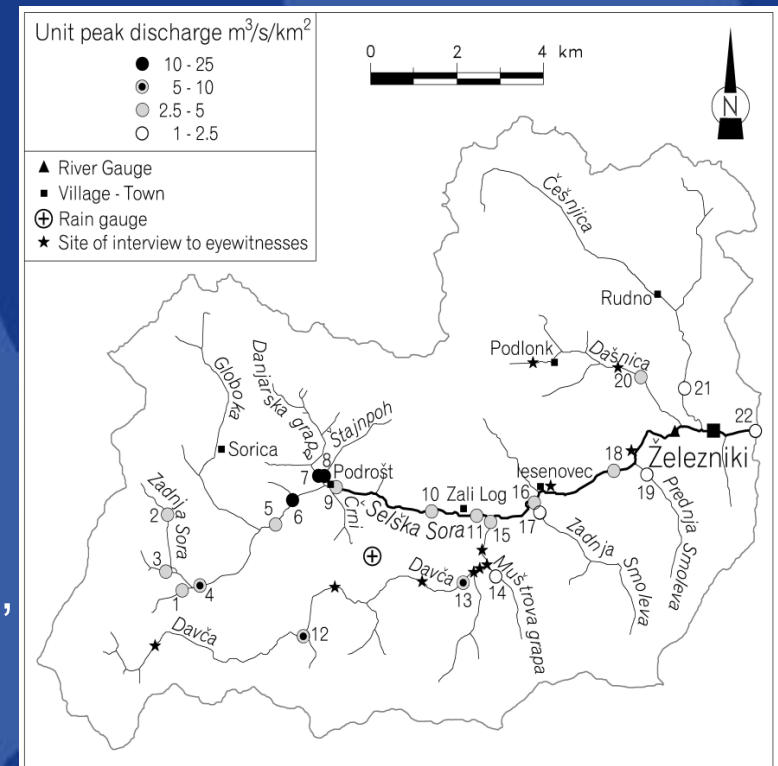


- For the HyMeX EOP:
- Nested watersheds
 - Distributed hydrometry
 - Targetted / « participative » observations

Perform physical and sociological **post-event surveys** after the most extreme events wherever they occur in the Mediterranean during the EOP/LOP.

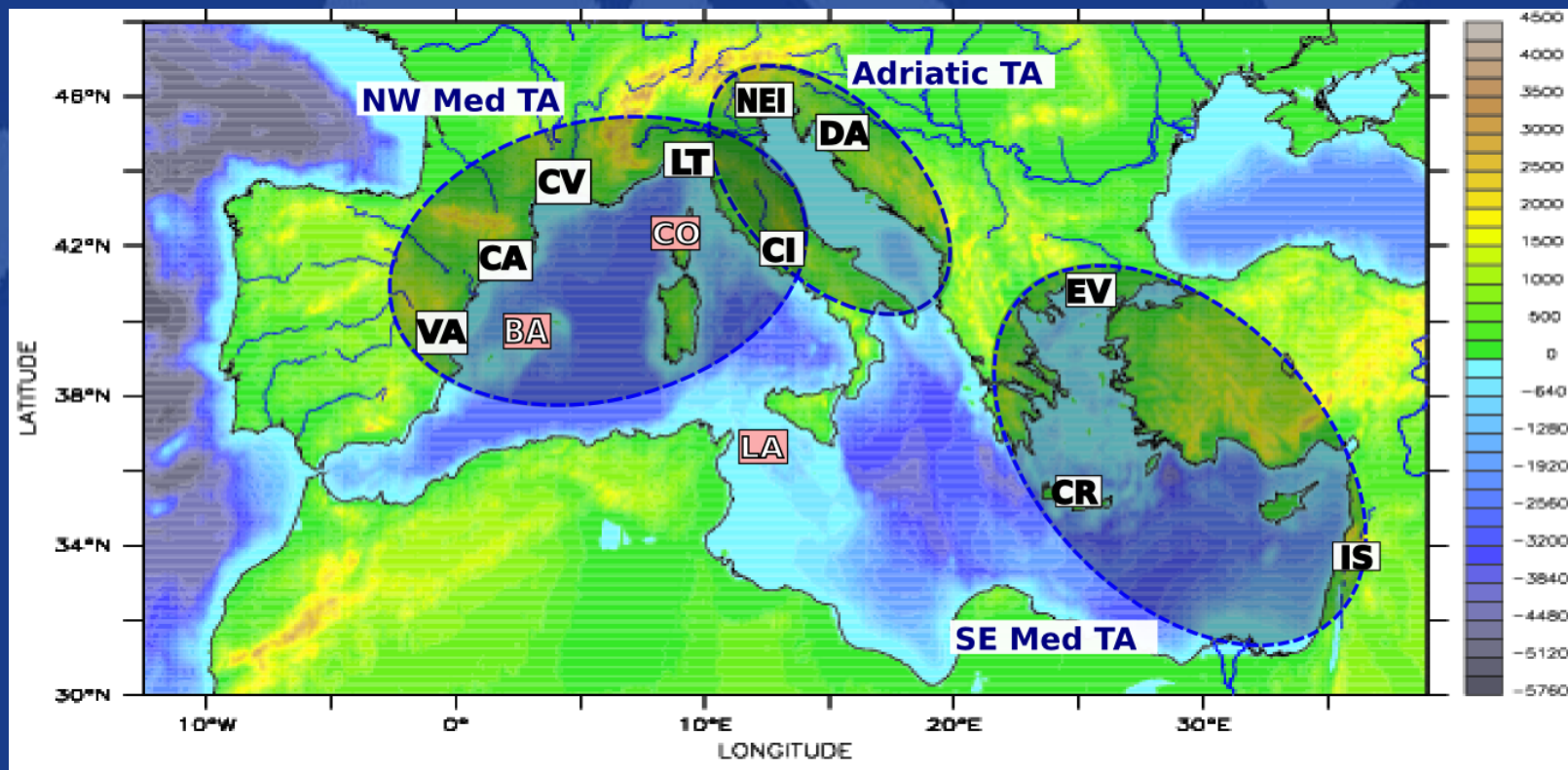


- Hazard characterization (rainfall, discharges, flood dynamics, initial conditions...)
- Document vulnerability (land-planning, traffic, alert systems, media...)



18 September 2007
 in Zelezniki, Selska Sora river
 Slovenia ; HYDRATE project

- HyMeX offers long-term (2010 -> 2020) high-quality observations of HPEs in complex terrain suitable for GPM-GV
- HyMeX critically needs GPM to address its scientific objectives by filling in rainfall observational gaps over the Med Sea and its southern shore



How to proceed?

Establish a joint GPM-HyMeX Science Team;
contacts: **Manos Anagnostou** and **Guy Delrieu**

First task: define a possible NASA/NOAA contribution
to the 2012-2013 HyMeX SOPs

In the context of this policy:

- *Data owners* are the agencies or institutes funding the data collection.
 - *Principal investigators* are associated with an instrument or site from instrument deployment and data collection, to data processing and transfer to the database. A principal investigator is the scientist responsible for the instrument or site or any person (collaborator, student) that he/she may suggest.
 - *Data providers* provide data to the database. They are either data owners or principal investigators.
 - *Core users* are HyMeX data providers and scientists from institutions providing funding or in-kind support to HyMeX, according to the criteria set by the HyMeX ISSC. *Core users* can access all the data. They are granted exclusive access to the HyMeX data for a default period of 2 years from data deposit deadline on the database.
 - *Associated scientists* are not directly involved in HyMeX but in scientific studies designed to meet HyMeX objectives and educational activities related to the dissemination of HyMeX science. They can access data open to research activities and HyMeX data once the period of exclusive access is over.
- Core users and associated scientists are granted royalty-free access to the data through an on-line registration process on the database. They will be referred to as registered users.

Only metadata and public domain datasets can be accessed by non-registered users.