WG2 : Hydrological Continental Cycle

- Aim : Improve our understanding of the water cycle components over the mediterranean basin from event to decadal scales :
  - To quantify fresh water inputs (river and groundwater flows) to the Mediterranean sea (link with WG1)
  - To quantify evapotranspiration (coupling with atmosphere)
  - To quantify soil moisture (coupling variable with atmosphere, initial condition for flash flood event)
  - As a basis of water ressources management
  - Drought early warning system
  - Adaptation to global change

The Mediterranean context

- **a water resource which is scarce and unevenly distributed in space and in time** with few short duration heavy precipitation events and long drought periods

- **the physiographic features of the watersheds** with medium to small size catchments, having a mountainous upstream area and a quite flat outlet downstream

- **the anthropogenic pressures**, with recent changes in land use and land cover, strong urbanization and population growth, particularly in the coastal areas

Scientific questions in WG 2

- **WG2-SQ1:** How to set up and develop an hydro-meterorological framework allowing the simulation of the water cycle over the whole Mediterranean basin?

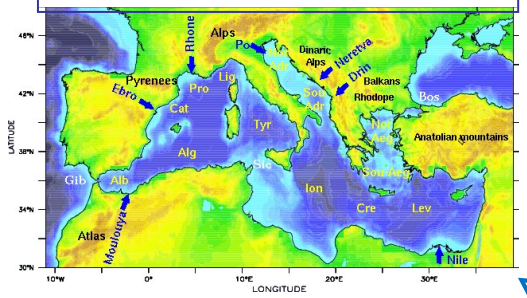
- **WG2-SQ2:** Can we improve the regional simulation of the continental hydrological cycle by better accounting for specific Mediterranean characteristics?

- **WG2-SQ3:** How will the continental hydrological cycle evolve in relation to global change ?

WG2 overview

Data base :
Climate
Surface
Human activity
Hydrology

Hydrometeorological model
Mediterranean Basin



Coupling
Ocean
Atmosphere
Human activity
Global change

Regional Modelling

Experiment

WG2-SQ1 : hydro-meterorological modelling framework of the water cycle over the whole Mediterranean basin/LOP

- Describe the water budget on the whole Mediterranean watershed at high resolution (~1 to 10 km) with the quantification of :
  - the amount of freshwater arriving to the sea from river streamflow, karstic and coastal aquifers.
  - the evapotranspiration
  - the soil moisture
- Considering two levels of investigation
  - The Whole mediterranean area (implementation over the LOP
  - Regional scale (large river basin) to take profit of already implemented models (LOP/SOP)
- Open the modelling framework to updates (process modelling, parameters) from process analysis (SQ2) and experimental results (IIP).
  - Anthropogenic activities (urbanization, irrigation, pumping)
  - Coupling with Ground water
  - Improvement of mediterranean ecosystems parameterization

WG2-SQ1 : Modelling framework at the mediterranean basin scale

- The ARPEGE/SURFEX approach is derived from meteorological models and offers the strongest features between the surface and atmospheric components (CNRM, France, Cf J.-C. Calvet presentation)
    - Improve the spatial resolution of land surface fluxes (ISBA)
    - Use of high quality forcing data
    - Use of near-real time satellite observations
    - Combine to a river routing model

- The LISFLOOD model (basically a hydrological model and so should better represent the stream flows (JRC, Italy)
    - Extend the modelling framework to all mediterranean river basin (restricted now to Po, Ebre and Rhone)

- The CHyM (Univ. L'Aquila, Italy), to be run by MHS Croatia, contact M. Patartic) over the whole Mediterranean area

- Simplified rainfall//runoff models

WG2-SQ1 : Modelling framework at the river basin scale

- The scale of hydrological models ➔ capitalize on existing modelling framework (model, data, parameter estimation)
- Provide reference for hydrometeorological models
- Use of mesoscale site data base and results from process studies
- Upscalling studies to improve parameterization in hydrometeorological data

WG2-SQ1 : Modelling framework at the river basin scale

Model	Area	Simulated processes/**restrictions**	Contact
SIM	France	Surface energy balance, evapotranspiration, soil moisture, streamflow, groundwater flow.	CNRM, France UMR Sisyphe, France
LIQUID platform	Part of Gard river	Evapotranspiration, soil moisture, streamflow.	Cemagref HHLY, France
AFFDEF	Secchia, Reno, Samoggia and Sieve rivers in Italy.	Evapotranspiration, soil moisture, streamflow.	University of Bologna, Italy
SIM	Proposal to set up the system over the Ebro basin	Surface energy balance, evapotranspiration, soil moisture, streamflow, groundwater flow;	Ebro Observatory, Spain

WG2-SQ1 : Data collection

- At the mediterranean basin level : How collecting basic data?
  - Climatic data
    - ECMWF reanalysis (80 km)
    - Solar radiation (SAF land and MSG/SEVERI Products)
    - Vapour pressure products (willing of developping new tools
  - Land use
    - ECOCLIMAP II, POSTEL 300m land Use map
    - Water use by human activities : Irrigation, urban areas
  - Digital Elevation Model
    - American DEM model
  - Soil map
    - European soil map at the 1/1000000 scale (what about non european countries?)
    - FAO map
    - Which strategy to gather existing national or regional soil map?
  - Aquifer geometry (harmonisation at the international level)
  - Hydrological data (harmonisation at the international level)
  - Soil moisture and vegetation
    - satellite products (SMOS, Cyclope, ….)

WG2-SQ2: Can we improve the continental hydrological cycle simulation through a better account of Mediterranean specificities? => Associated with EOP

Q1: Water balance of typical Mediterranean vegetation covers

Q2: Water and energy budget of urbanised areas

Q3: Improving the water balance of karstic aquifers

Q4: Quantify the contribution of karstic sources and coastal aquifers to the Mediterranean

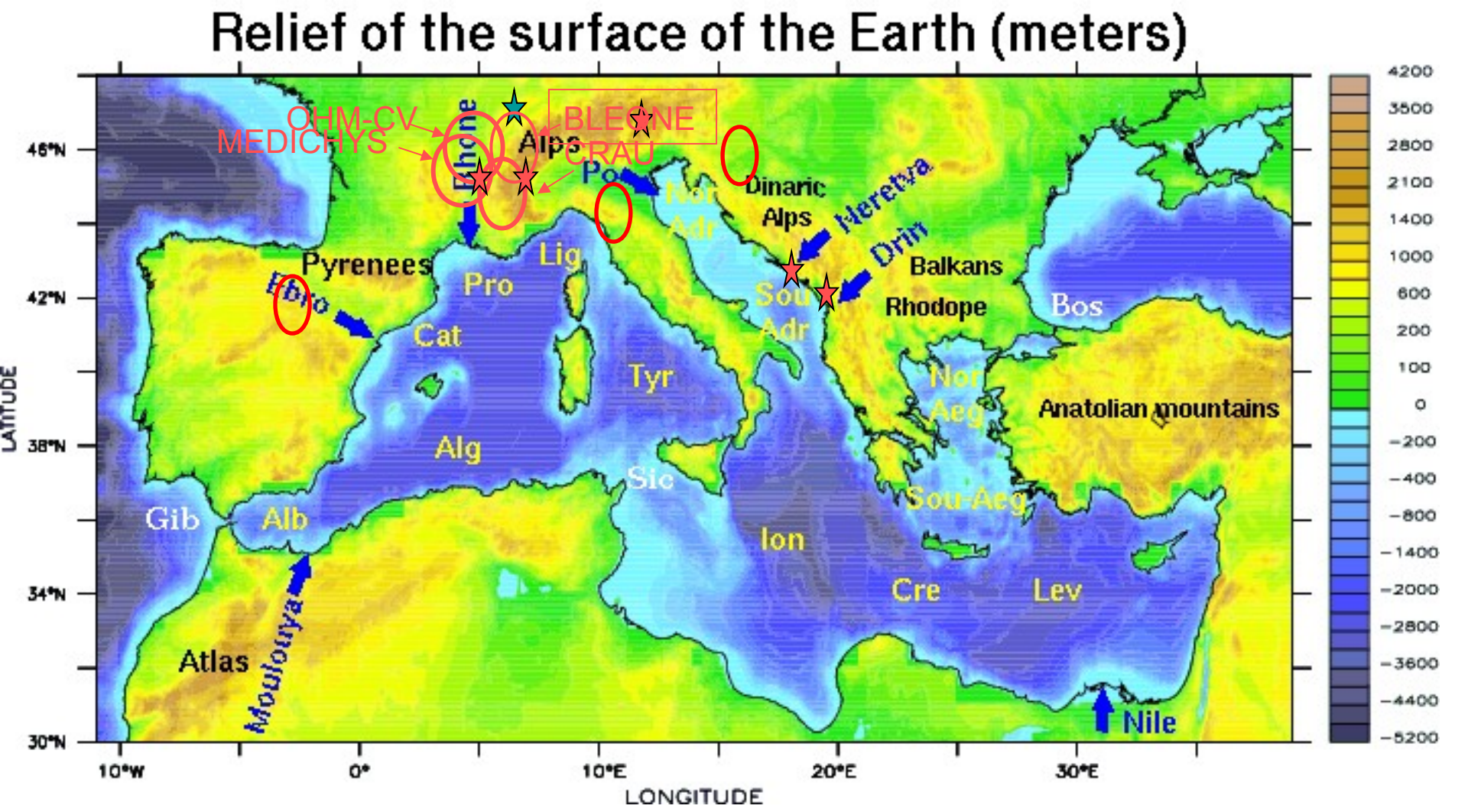
Q5: Impact of soil moisture redistribution by topography on the water balance

Q6: Snow processes

Q7: Anthropogenic influence (irrigation, groundwater pumping, water consumption)

EOP: Sites and supersites

- Observation strategy based on nested sub-catchments



Location of sites and super-sites for the EOP
(from the recieved contributions)

WG2-SQ3 : Impact of Global change on continental hydrological cycle

- Build a database of high resolution regional climate scenarios for the region, in order to run impact models.
- Improve our knowledge on socio economic feed backs induced by global change.
- Provide land-use change scenarios (and past-reconstruction) consistent with the socio-economic scenario
- Improve impact models on both physical and socio economic aspects.

- Climate change : A warm topic ➔ A lot of proposals
- Nothing on the socio economy side
  - Socio-economic feed back
  - Land-use change scenarios

Conclusions

- The implementation plan guide lines are defined but there are still many uncertainties at the operational level (who do what?)
- LOP: International joint effort between projects to gather the necessary data. Collection of some crucial data is still vague
  - Contribution of all countries to a shared data base
  - Data on anthropogenic influence (irrigation, pumping, water consumption,)
- EOP: a cluster of projects (process, areas) ➔ Criteria to belong to the Hymex program?

  synergy to be establish with other connected programs (SICMED) to reach the objectives (shared sites)