PS1 Round table

Hydrological continental cycle

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PROPOSED ORGANISATION OF THE ROUND TABLE

1) Start from the objectives (simulate the regional hydrological water balances)
2) Define the target simulated variables and their spatial and temporal scales
3) Identify:
    1) The models to be run
    2) The input and output data
    3) The required model improvements
    4) The small scale process studies and model development and the associated observations
4) Classify, hierarchize according to LOP/EOP/SOP, model development, instrument development

Objectives of HyMeX Hydrological continental cycle chapter

- Quantify and simulate the various natural and anthropogenic components of the water cycle (**quantity**, *quality => to be addressed in SiCMED as impact on ecosystems and management of water ressources*)
- At the regional scale, with studies at smaller scale for improvement of process knowledge
- From the rainfall event to a few years or decades

Which simulated variables at which spatial and temporal scale?

- Streamflow
- Evapotranspiration
- Groundwater recharge/discharge, groundwater/sea interaction
- Soil moisture
- Water consumption/rejection (drinking water, irrigation, dams, waste water) => include anthropogenic pressure in the water budget

- At a resolution of about 1 km^2 (grid or sub-catchment) and one day for streamflow, diurnal cycle for evapotranspiration

Scientific questions to address for the regional water budget (from the WB)

⇒Development of regional hydrological modelling including the aquifers (MODEL DEVELOPMENT)

- Development of near surface atmospheric analysis on the Mediterranean region (OBSERVATIONS LOP: input data)
- Improvement of land cover description (100m) (OBSERVATION, SATELLITE)
- Anthropogenic fluxes and their evolution (link with socio-economic questions)
- Sub-grid scale parameterization for the land-surface models (MODEL DEVELOPMENT) => small scales studies (OBSERVATIONS EOP/SOP)
- Transversal issues: interfaces and databases (description of the continental surface, monitoring of hydrological variables) (OBSERVATION LOP/EOP/SOP, Satellite)

Process studies and small catchment scale modelling of the water and energy balance (from the WB)

- Integrated modelling for catchments of a few km^2 to tens of km^2: reference models for larger scale parameterization and evaluation (MODEL DEVELOPMENT)
- Understanding and modelling water pathways at the hillslope scale, linked with flash-flood (EOP/SOP OBSERVATION + MODEL)
- Understanding and modelling the role of vegetation in the water and energy budget. Modelling of burnt vegetation. Urban areas (EOP OBSERVATION + MODEL)
- Understanding and modelling karstic, coastal aquifers. Integration of heterogeneity and scarcity data (EOP/SOP OBSERVATION + MODEL)
- Monitoring evapotranspiration over complex terrains (EOP OBSERVATION + INSTRUMENTATION DEVELOPMENT)
- Snow processes (EOP OBSERVATION + MODEL)

Model development

- Regional scale hydrological models including aquifers and vertical and lateral soil water transfer
  - Open question to be discussed with other groups: extension of the modelling
    - Whole Mediterranean area?
    - Choice of representative catchments?
- Small scale (about 10 km^2) integrated hydrological model including landscape heterogeneity and anthropogenic features
- Link between both scales(upscaling): parameterization of regional scale models, spatialization of land surface properties

Which models?

- Regional scale
  - SIM
  - Others?
- Small scale
  - Models based on the SEVE working group recommendations
  - Others?
- General recommandation:
  - Use multiple model structures to address model uncertainty
  - Develop open source environments for model predictions to encourage participation from all Mediterranean regions
  - Provide a spatial model framework that contains ‘key hydrological drivers’ to allow people to develop ‘modules’ for simulating hydrological responses?

Multi-scale observation strategy

- Monitoring of nested catchments
  - Small catchments with intensive monitoring of all components (experimental closure of the water budget) + instrument development and test of new monitoring techniques (geophysics, lidar, VHR satellite…)
  - Intermediate scales with “lighter” measurements and use of satellite data (Validation, upscaling, model spatialization)
  - Regional scale based on “operational” networks
- Description of landscape characteristics (static/dynamical)

LOP	Implementation of regional models	Climate data (reanalyses of surface variables 1 km2, climate change), Rainfall (1 km2) Groundwater levels, Streamflow, water use Satellite (land use, LAI, soil moisture.. Soil and groundwater geometry and properties
EOP	Distributed measurements of Energy Balance and Water Balance $\Rightarrow$ Evaluation of models (small and intermediate scale).	Process studies: Mediterranean vegetation; hillslope studies (role of topography in lateral redistribution and evapotranspiration, interaction groundwater-river; burnt areas, karstic and coastal areas,evapotranspiration over hilly terrain…. Topography (lidar..Soil hydraulic properties Enhanced rainfall measurement
SOP	Acquisition of accurate observations relevant for upscaling assessment	Land use practices (Very High Resolution satellite, field survey) Enhanced evapotranspiration, rainfall