

ICT-based hydrometeorology science and natural disaster societal impact assessment

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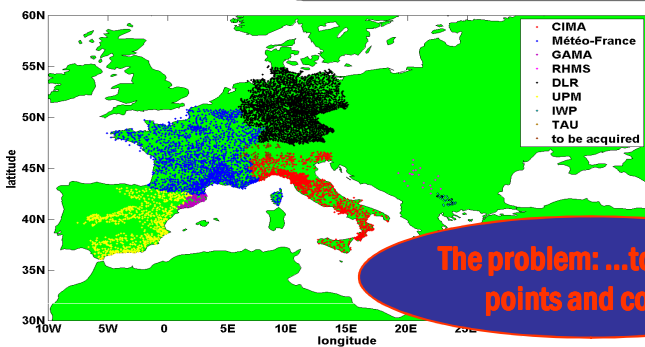
ABSTRACT

In the Lisbon strategy, the 2005 European Council identified knowledge and innovation as the engines of sustainable growth and stated that it is essential to build a fully inclusive information society. In parallel, the World Conference on Disaster Reduction (Hyogo, 2005), defined among its thematic priorities the improvement of international cooperation in hydrometeorology research activities. This was recently confirmed at the joint press conference of the Center for Research on Epidemiology of Disasters (CRED) with the United Nations International Strategy for Disaster Reduction (UNISDR) Secretariat, held on January 2009, where it was noted that flood and storm events are among the natural disasters that most impact human life.

Hydrometeorological science has made strong progress over the last decade at the European and worldwide level: new modelling tools, post processing methodologies and observational data are available.

Recent European efforts in developing a platform for e-science, like EGEE (Enabling Grids for E-sciencE), SEEGRID-SCI (South East Europe GRID e-Infrastructure for regional e-Science), and the German C3-Grid, provide an ideal basis for the sharing of complex hydrometeorological data sets and tools. Despite these early initiatives, however, the awareness of the potential of the Grid technology as a catalyst for future hydrometeorological research is still low and both the adoption and the exploitation have astonishingly been slow, not only within individual EC member states, but also on a European scale.

With this background in mind, the goal of the **Distributed Research Infrastructure for Hydro-Meteorology Study (DRIHMS)** project is the promotion of the Grid culture within the European hydrometeorological research community through the diffusion of a Grid platform for e-collaboration in this earth science sector: the idea is to further boost European research excellence and competitiveness in the fields of hydrometeorological research and Grid research by bridging the gaps between these two scientific communities. Furthermore the project is intended to transfer the results to areas beyond the strict hydrometeorology science as a support for the assessment of the effects of extreme hydrometeorological events on society and for the development of the tools improving the adaptation and resilience of society to the challenges of climate change.



The problem: ...too many points and colors

Too many points:

- Large data sets
- Demanding high computational power
GRID technologies

Too many colors:

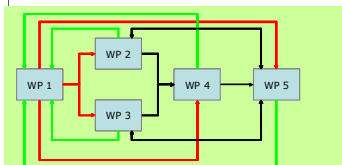
- Heterogeneous data
- Demanding for knowledge integration tools
Standards & Knowledge integration technologies

DRIHMS main goals

- 1) To promote the GRID culture within the European hydrometeorological research community
- 2) To boost European research excellence and competitiveness in hydrometeorological research and Grid research by bridging the gaps between these two communities

DRIHMS objectives are "SMART"

- ✓ **Specific:**
-DRIHMS builds a bridge between the *Hydro-Meteorology Research (HMR)* and ICT communities;
- ✓ **Measurable:**
-The methodology of DRIHMS is based on:
 - Two small meetings of expert groups, involving the proposers and invited experts (HMR and Grid communities). Surveys and questionnaires leading to a draft version of a white paper delineating a new strategy for Grid and other e-science technologies in hydrometeorology
 - An open conference discussing the results of the consultation phases and the draft version of the white paper with the stakeholders
 - A final public open conference presenting the DRIHMS white paper to the scientific community.
- DRIHMS identifies requirements of HMR users and match them to capabilities of the newly developed ICT infrastructure.
- ✓ **Attainable:**
-DRIHMS is organized by two leading institutions from each of HMR and ICT, but is driven by a broader group of hydrometeorological researchers
- ✓ **Realistic:**
-DRIHMS represents the best path towards adoption and exploitation of the developing e-science infrastructure by this community
- ✓ **Timely:**
-DRIHMS is a first but vital step towards a new paradigm for hydrometeorological research



Work package No	Work package title
WP 1	Project Management
WP 2	HMR hot topics identification
WP 3	Grid Support for HMR
WP 4	Prioritization and white paper production
WP 5	Dissemination and networking

Possible Hydro-Meteorology Research hot topics

Data fusion – Optimal combination of hydrometeorological models

Optimal combination of precipitation observations (satellite, radar and rain gauge), numerical weather prediction products and hydrological models for study and prediction of high-impact hydrometeorological events in the Mediterranean basin.

The main challenge from an ICT/Grid viewpoint is the sharing of models and datasets (including models outputs), the management of complex workflows and the need for strong flexibility in the coupling of the various components, both of them asking for a strong collaboration and partnership with the related service activities.

Methods for probabilistic forecasting of high-impact hydrometeorological events

The goal is the provision of methods for probabilistic forecasting of high-impact hydrometeorological events, by comparing and combining forecasts from different models and ensemble systems

From an ICT/Grid viewpoint this is possible through the sharing of forecasting models using a Grid infrastructure by means of simple interfaces for running models developed and configured by groups in other countries.

The main challenge is the provision of effective access to the different models at multiple supercomputing facilities through the federation and the cross-fertilization of the competent service activities.

Also the creation and provision of tools that will allow researchers to search, find, compose and operate models made of one or more of these components is a major challenge.

Observational data processing and integrated observational systems

The goal is to provide observational data (rain-gauge, meteorological radar and satellite) for a library of events representative of extreme hydrometeorological processes over a given area and to generate new products (e.g. rainfall maps) from the combination of observations from all the sensors available

This requires the sharing of datasets from observational sensors and again the networking support for collaboration. In this case, the main challenges faced is the presence of large datasets, data conversion and heterogeneous multi-sensor data and models characterized by specific/non-standard data formats and models.