

DRIHM (Distributed Research Infrastructure for Hydro-Meteorology)

Summary: Predicting weather and climate and its impacts on the environment, including hazards such as floods and landslides, is still one of the main challenges of the 21st century with significant societal and economic implications. At the heart of this challenge lies the ability to have easy access to hydrometeorological data and models, and facilitate the collaboration between meteorologists, hydrologists, and Earth science experts for accelerated scientific advances in hydrometeorological research (HMR).

The proposed DRIHM (Distributed Research Infrastructure for Hydro-Meteorology) project intends to develop a prototype e-Science environment to facilitate this collaboration and provide end-to-end HMR services (models, datasets and post-processing tools) at the European level, with the ability to expand to global scale. The objectives of DRIHM are to lead the definition of a common long-term strategy, to foster the development of new HMR models and observational archives for the study of severe hydrometeorological events, to promote the execution and analysis of high-end simulations, and to support the dissemination of predictive models as decision analysis tools.

DRIHM combines the European expertise in HMR, in Grid and High Performance Computing (HPC). Joint research activities will improve the efficient use of the European e-Infrastructures, notably Grid and HPC, for HMR modelling and observational databases, model evaluation tool sets and access to HMR model results. Networking activities will disseminate DRIHM results at the European and global levels in order to increase the cohesion of European and possibly worldwide HMR communities and increase the awareness of ICT potential for HMR. Service activities will deploy the end-to-end DRIHM services and tools in support of HMR networks and virtual organizations on top of the existing European e-Infrastructures.

Objectives:

- The provisioning of integrated HMR services (such as meteorological models, hydrological models, stochastic downscaling tools, decision support systems, observational data) enabled by unified access to and seamless integration of underlying e-Infrastructures (networking, computing and data infrastructures and services);
- The design, development and deployment of user-friendly interfaces aiming to abstract HMR service provision from the underlying e-Infrastructure complexities and specific implementations, thus enabling multidisciplinary and global collaboration between meteorologists, hydrologists and possibly other Earth scientists;
- The support of an HMR e-Science environment enabling the user-driven “composition” of virtual facilities in the form of hydro-meteorological forecasting chains, composed by different HMR resources (models, post-processing tools, decision support system models and data);
- The establishment of HMR e-Science support centres and corresponding training activities to attract a broad end-user audience comprising of scientists and non-specialists including relevant European Strategy Forum on Research Infrastructures (ESFRI) communities.

Action plan: This interaction between HMR and ICT scientists will be focused on three suites of experiments, as described below, designed to prove the full extent of the DRIHM e-Science environment capability. These address the interdisciplinary and international challenges of HMR in forecasting severe hydrometeorological events over complex orography areas and assessing their impact. They also provide laboratories for the integration of new ICT infrastructure and development of new working practices in the DRIHM e-Science environment. These are:

- **Experiment Suite 1 — Rainfall:** Combination of different Numerical Weather Prediction (NWP) models to form a high-resolution multi-model ensemble together with stochastic downscaling algorithms to enable the production of more effective quantitative rainfall predictions for severe meteorological events



Project acronym:
DRIHM

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Duration: 42 months

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4 809 938 €

Funding from the EC:
3 500 000 €

Total funded effort in person-months:
435

Web site:
www.drihm.eu

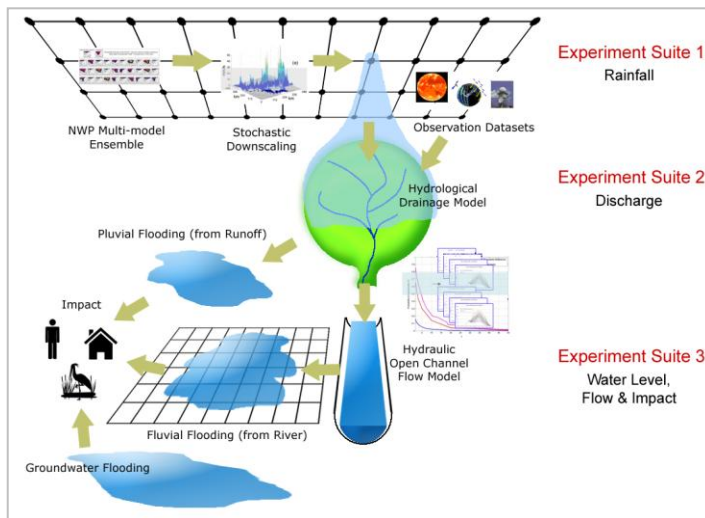
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HRW	UK
DELTAES	NL
CUAHSI	USA

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GENESI-DEC
European Flood Alert System — EFAS
HyMeX



- **Experiment Suite 2 — Discharge:** Fusion of rainfall predictions (potentially from experiment suite 1) with corresponding observations, which are input into multiple hydrological models to enable the production of more accurate river discharge predictions;
- **Experiment Suite 3 — Water Level, Flow and Impact:** Execution of hydraulic model compositions in different modes to assess the water levels, flow and impact

created by the flood events. Indeed, this process can be driven from data produced by experiment suite 2.

Networking activities: A series of Networking Activities (NA) are designed to facilitate the co-operation between the project partners and within/between the HMR and the Earth science as well the ICT related communities, all together constituting the DRIHM Virtual Community and benefiting from the augmented research infrastructure. NA1 will provide the managerial structure and the procedures to ensure effective and successful work of the project as a whole. Over the entire term of the project NA2 coordinates the dissemination and outreaches of the work performed in the Service Activities (SA) and the Joint Research Activities (JRA) in general. While NA2 focuses on the dissemination of results, NA3 will emphasize the support, training and education aspects. NA4 addresses the definition of policies to set up and manage the DRIHM virtual community and the long-term vision by promoting sustainability.

Service activities: The aim of Service Activities (SA) will be to provide a suitable set of services widely used by the project researchers and available for the community of European HMR scientists. SA1 will implement operational services, starting with basic services, respecting general management policies indicated by the Networking Activities, and also referring to practices adopted in relevant European infrastructures, while SA2 will receive input from the Joint Research Activities for the prioritization, creation and integration of innovative services, devoted to empower the vertical dimension of the e-Infrastructure and improve the support to the HMR community.

Joint Research activities: DRIHM Joint Research Activities (JRAs) are focused on the provision of innovative e-Science solutions for making HMR community and neighbouring earth science disciplines benefiting from Grid and HPC services. In this respect, JRAs are organized in two work packages. JRA1 is about e-Infrastructure solutions to integrate HMR models, tools and datasets into DRIHM e-Infrastructure. A set of meteorological, hydrological and hydraulics models, as well as stochastic downscaling and nowcasting tools, will be adapted for the parallel and distributed supercomputing systems available in the participating HPC/Grid centres. JRA2 will setup three HMR experiment suites that will permit to assess the quality of provided service and point out the necessity of new services and their required characteristics.

User communities: the DRIHM e-Science environment user population will be broader than just specialist scientist users, also including members of public services (e.g. operational hydro-meteorological centres) and interested members of the general public.

International aspects: Leading HMR and IC initiatives/Institutions, such as HyMeX (HYdrological cycle in the Mediterranean Experiment), MAP D-PHASE (MAP Forecast Demonstration Project), MEDEX (MEDiterranean Experiment) projects, EGI (European Grid Initiative), OGC (Open Geospatial Consortium), CSDMS (Community Surface Dynamics Modelling System), and WMO (World Meteorological Organization) have already expressed interest in collaborating with DRIHM activities.