DRIHM

DISTRIBUTED RESEARCH INFRASTRUCTURE
FOR HYDRO-METEOROLOGY

Overview

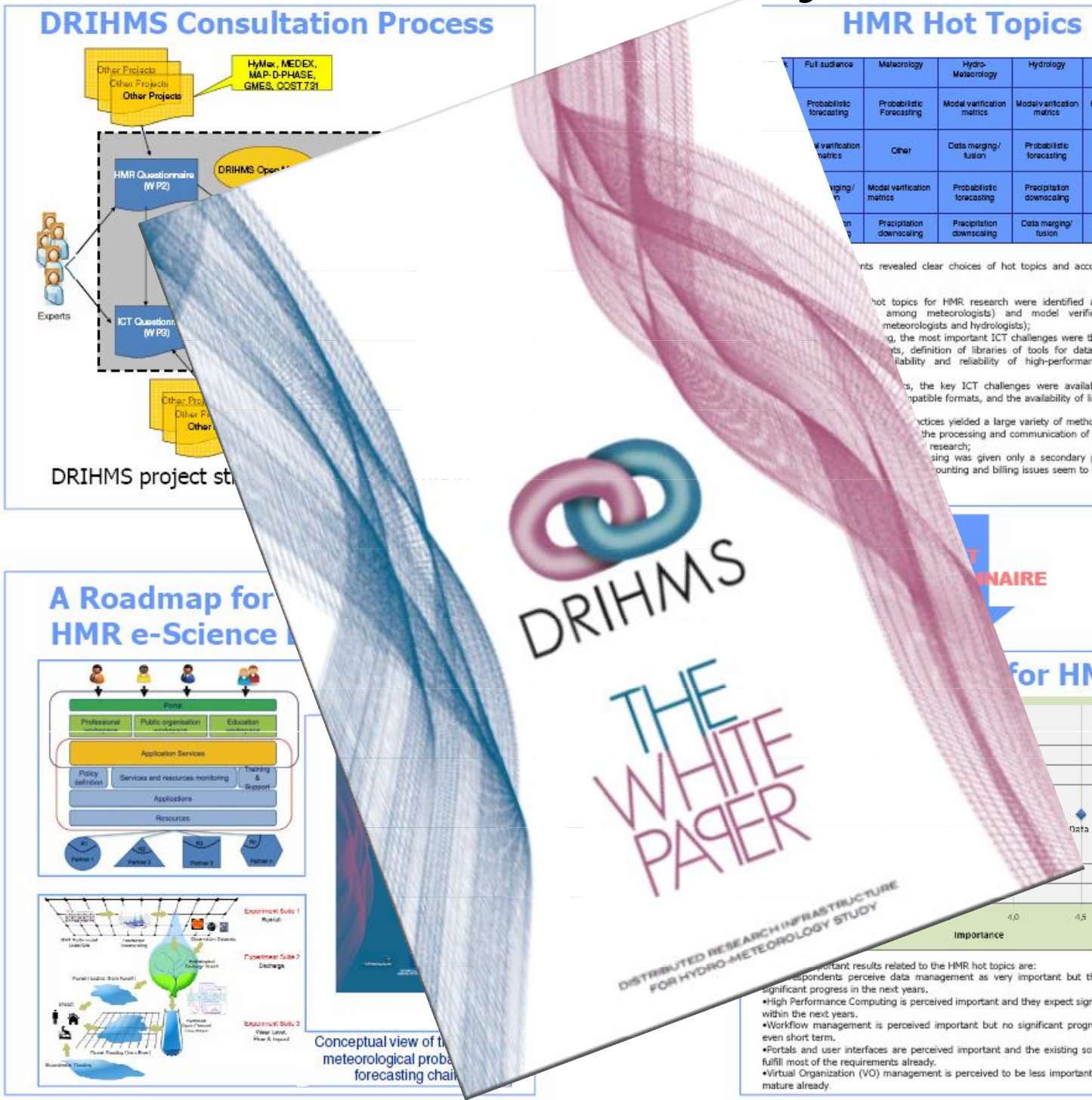
European Commission
Information Society and Media

- The Project
- The Partners
- The Story so Far

DRIHM Objectives

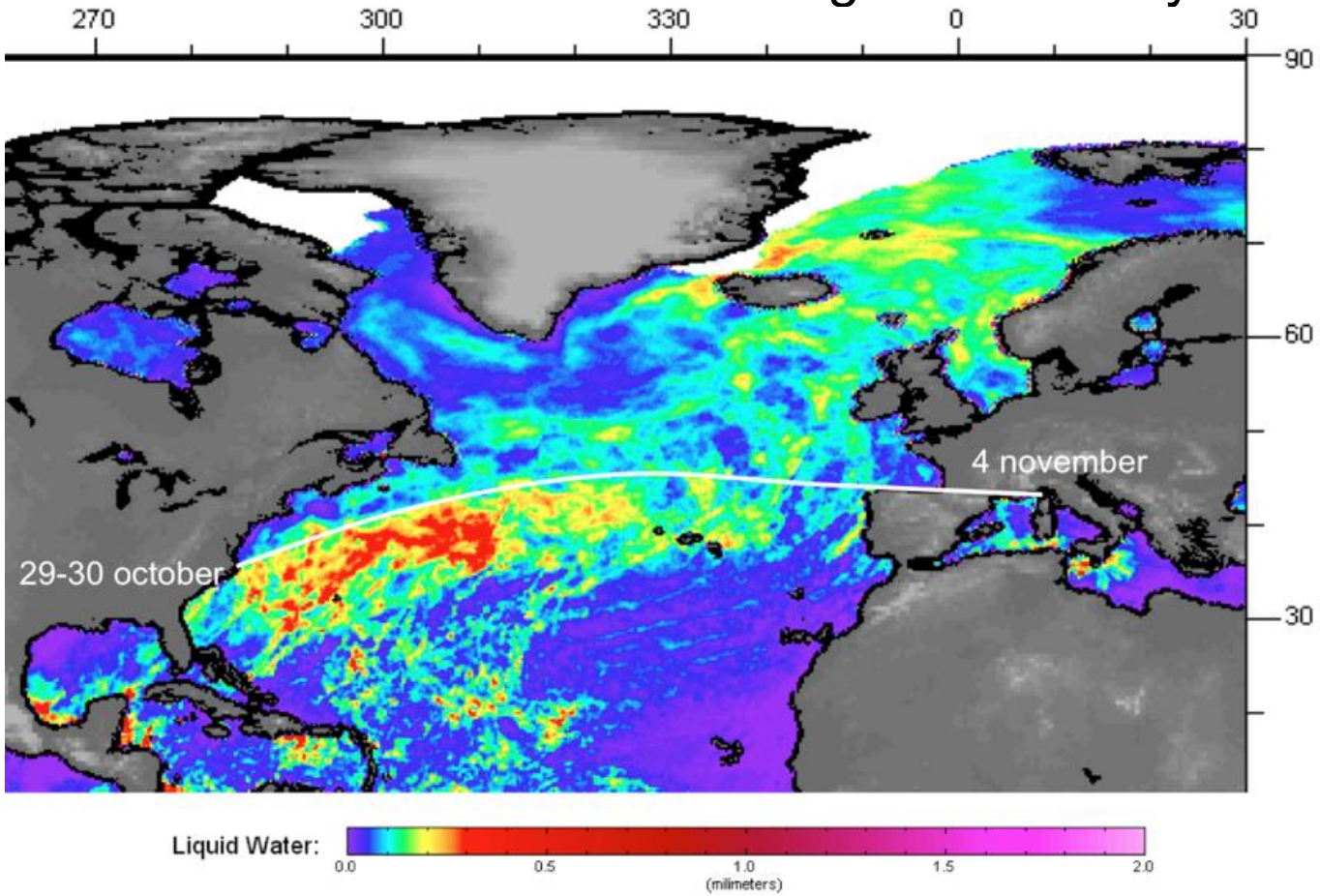
- **To support** the development and deployment of a **HMR e-Science environment**
- **To promote** the establishment and diffusion of a **service-oriented culture** (involving specialist scientist users, members of public services, members of the general public)
- To provide **integrated HMR services**
- To design and deploy **user-friendly interfaces**
- To provide HMR e-Science **support centres** and corresponding **training activities**
- To support hydro-meteorological **forecasting chains**

DRIHM History



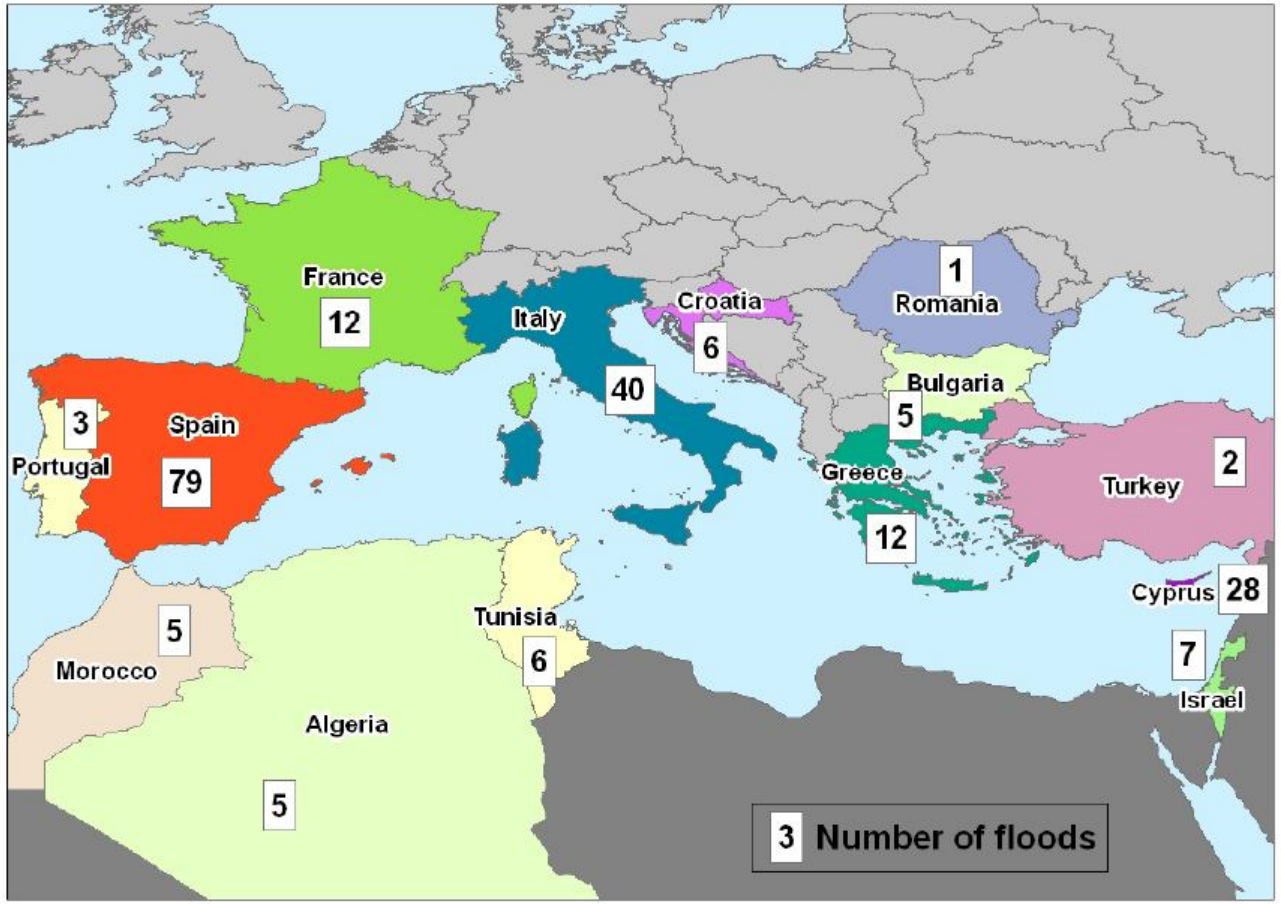
Why DRIHM?

- Forecasting severe storms and floods is a key topic in HMR/early warning
- Storms do not respect country boundaries – a pan-European approach to data access and modeling is necessary



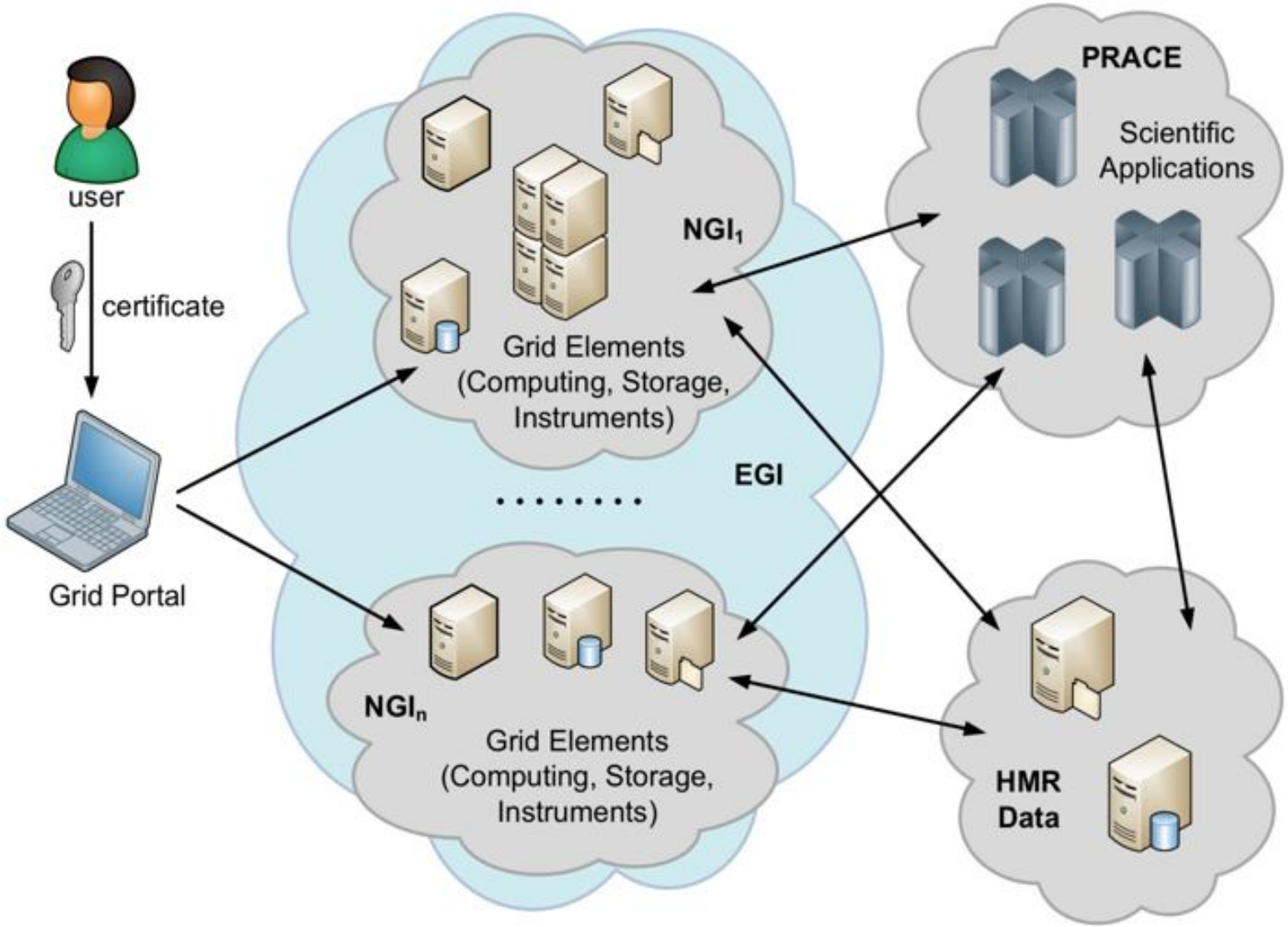
Satellite cloud liquid water composite (week ending 5/11/2011) clearly shows the cyclone track from USA east coast to Mediterranean.

Why DRIHM?

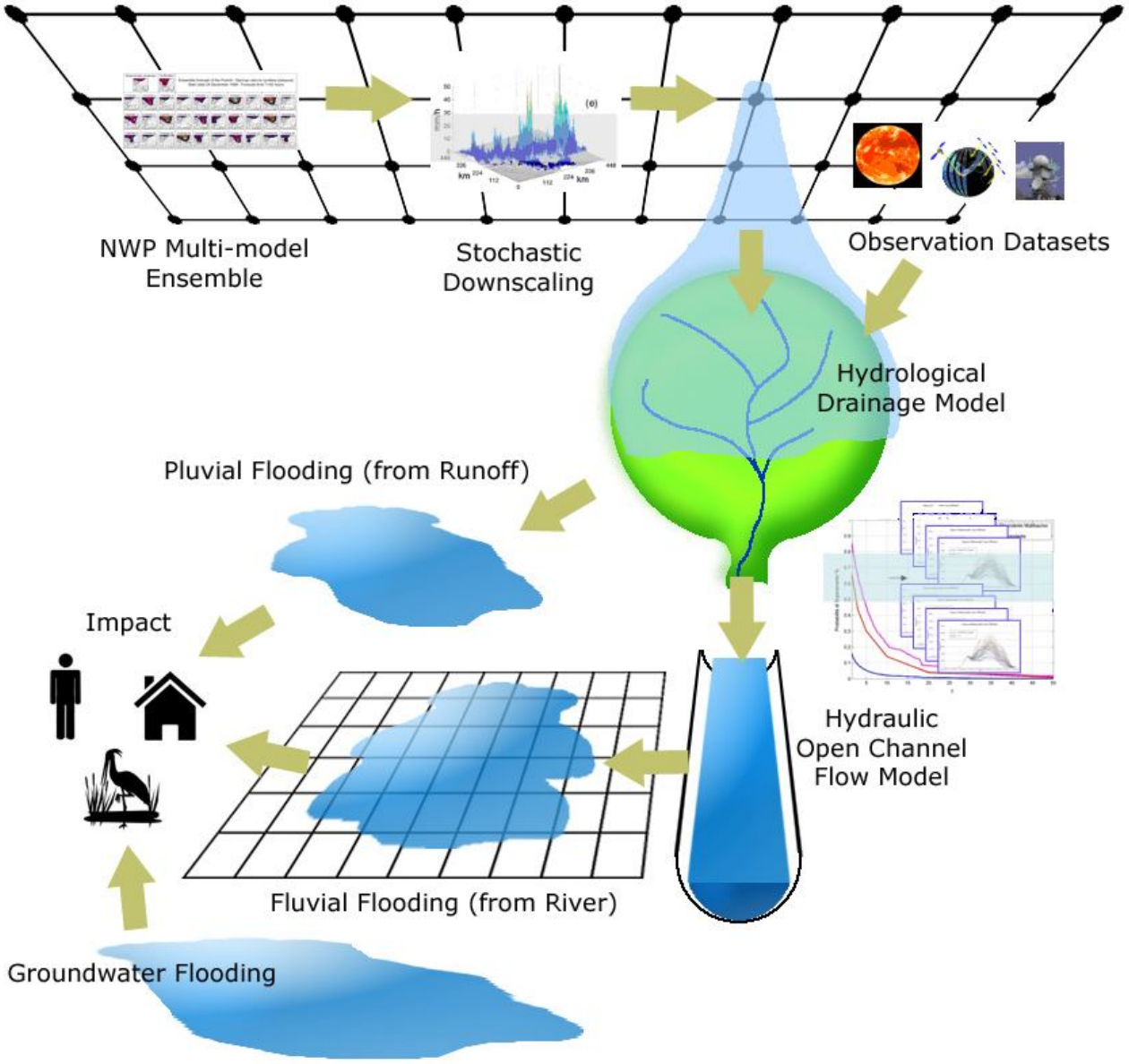


- The FLASH project estimated over 29 billion euros the material damages produced by floods in the Mediterranean region during the 1990-2006 period
- The total number of casualties has been estimated over 4,500, concentrating in the Mediterranean African countries especially

DRIHM e-Science environment



Experiment Suites



Experiment Suite 1
Rainfall

Experiment Suite 2
Discharge

Experiment Suite 3
Water Level, Flow & Impact

The DRIHM Models

Meteor

Cb-TRAM (DLR)
Arome EPS (CNRS)
Meso-NH (CNRS)
RainFARM (CIMA)
COSMO-Model (CIMA)
WRF-ARW (CIMA)
PhaSt (CIMA)
WxFUSION (DLR)
Rad-TRAM (DLR)
WRF-NMM (RHMSS)

Contiuum (CIMA)
DRiFt (CIMA)
HBV (RHMSS)
RIBS (UPM)
HYPROM (RHMSS)

Impa

SISYPHE (HR Wallingford)
Property Damage (HR Wallingford)
MASCARET (HR Wallingford)
SOBEK-FLOW (Deltares)
TELEMAC-2D (HR Wallingford)
RFSM (HR Wallingford)
Delft3D-FLOW (Deltares)
Inundator (CIMA)

The Workpackages

WP1 Management

Keeping to the plan…

WP2 Dissemination

Targeted information for those who need to know…

WP3 Training

Training end-user to the e-Science environment…

WP4 Sustainability

Making DRIHM lasting forever…

WP5 Infrastructure

Turning DRIHM in production mode…

WP6 Application

Developing and implementing DRIHM services…

WP7 Analysis

Collecting requirements to evolve the e-Science environment…

WP8 Experiment

Have fun with the DRIHM…

DRIHM Workpackages

WP7 (RTD)
Use Case and Application Requirements **Analysis**

WP5 (SA)
Infrastructure Operation and Management, Data and Resource Management

WP6 (SA)
Application Services

WP8 (RTD)
HMR **Experiment** Suites

WP1 (MGT)
Management

WP2 (Coord)
Dissemination and Outreach

WP3 (Coord)
Support, **Training** and Education

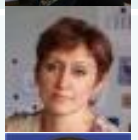
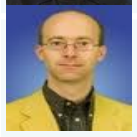
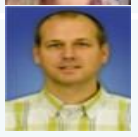
WP4 (Coord)
Policy Management, **Sustainability** and Long Term Vision

The Project

The Partners

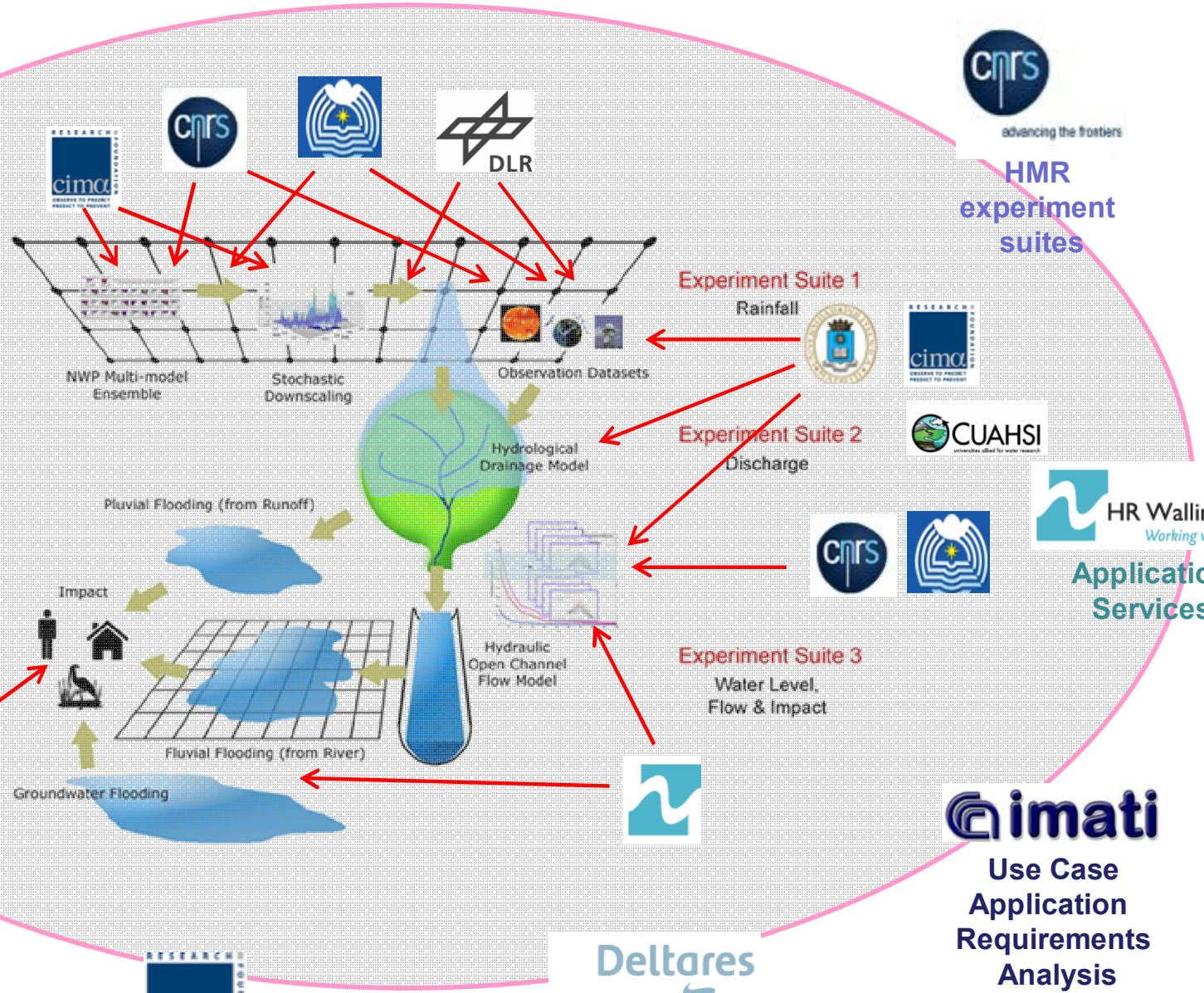
The Story so Far

DRIHM Team

CIMA		Antonio Parodi		Nicola Rebora
LMU		Dieter Kranzlmueller		Michael Schiffers
DLR		Arnold Tafferner		Caroline Forster
IMATI-CNR		Andrea Clematis		Daniele D'Agostino
UPM		Luis Garrote		Maria C. Llasat
CNRS		Veronique Ducrocq		Evelyne Richard
RHMSS		Vladimir Dimitrijevic		Ljiljana Dekic
DELTARES		Bert Jagers		Albrecht Weerts
HR Wallingford		Quillon Harpham		Mike Panzeri
CUAHSI		Rick Hooper		Jennifer Arrigo

Roles and Contributions of Project Partners

Outer shell: work packages – Interior: models and data



Project Management

HMR experiment suites

Infrastructure Operation & Management
Data & Resource Management

Application Services

Support, Training Education

Use Case Application Requirements Analysis

Dissemination Outreach

Policy Management Sustainability Long Term Vision

The Project

The Partners

→ The Story so Far

Elaboration of a common approach

Answer to the question:

How can we make researchers, civil protection and citizen scientists communicate over ICT infrastructure and share model and data?

Various Meetings:

Munich, Savona … with the aim to discuss initial experiment set-ups proposed by partners → example next slides

Following talks will present achievements with regard to:

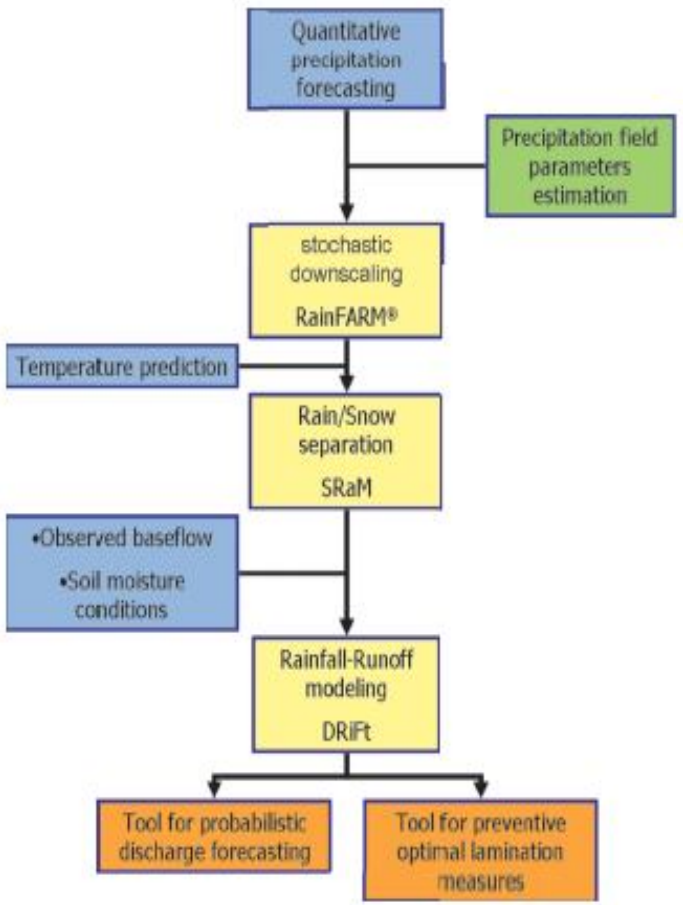
- *Definition of use cases*
- *Definition of requirements*
- *Set-up infrastructure*
- *Dissemination activities*

Identification of HMR critical cases

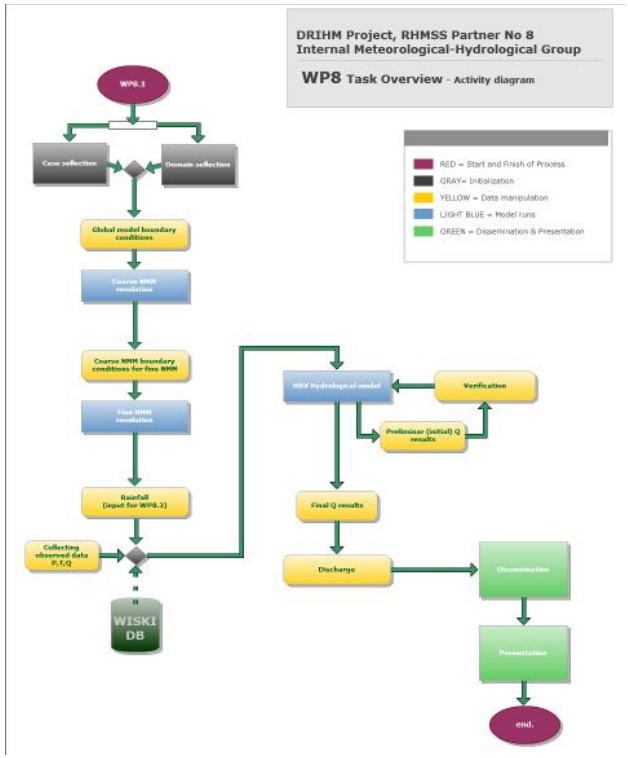
1. *Rain episode of June 22nd – July 5th 2010 in Serbia*
2. *Period of October-November 2011 in the north-western Mediterranean area*
3. *Rain episode of November 1st – 8th 2011 in Catalunya*
4. *Flash flood episode on 4th of November 2011, Genoa, Italy*

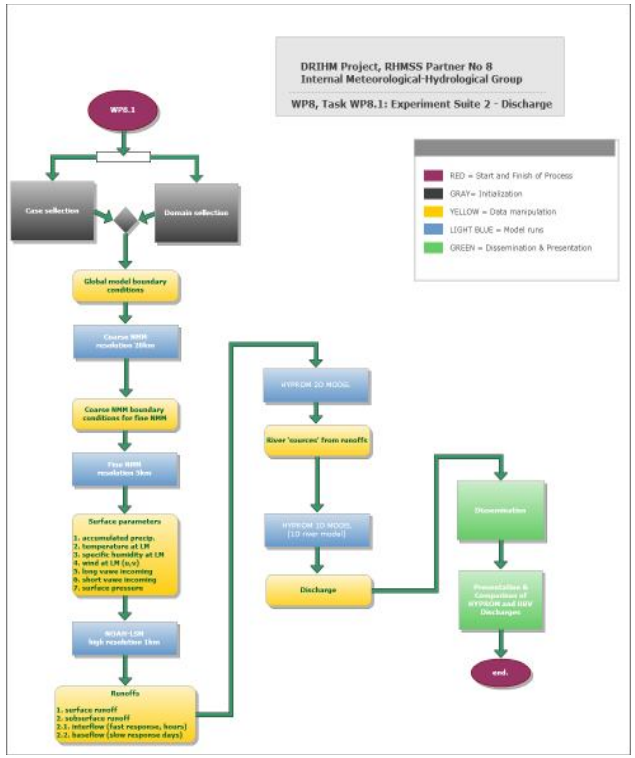
Flash flood of the Genoa town center. Top rigth corner: the similar event of 1970

Baseline experiments suite versions



CIMA baseline chain

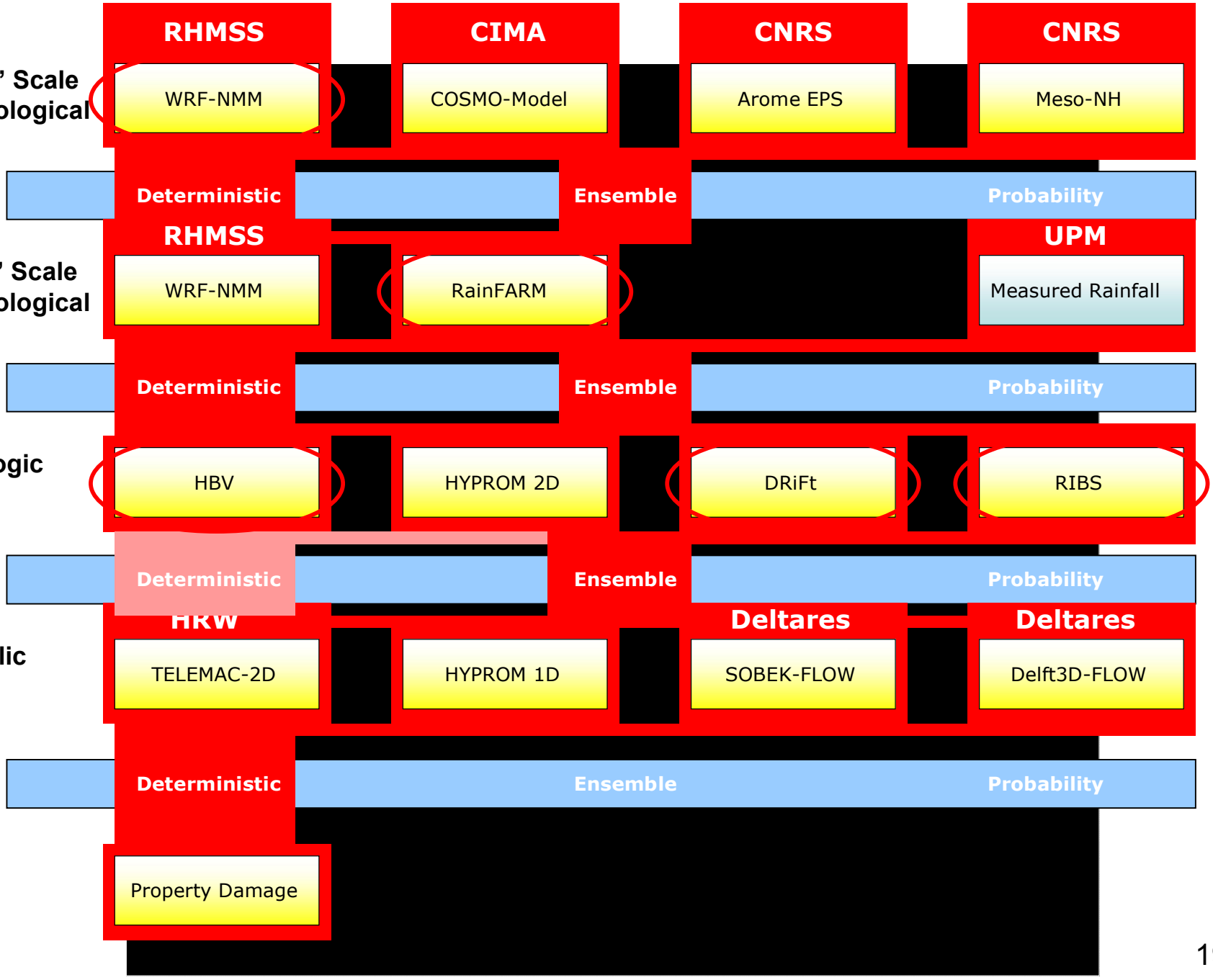




RHMSS baseline chain

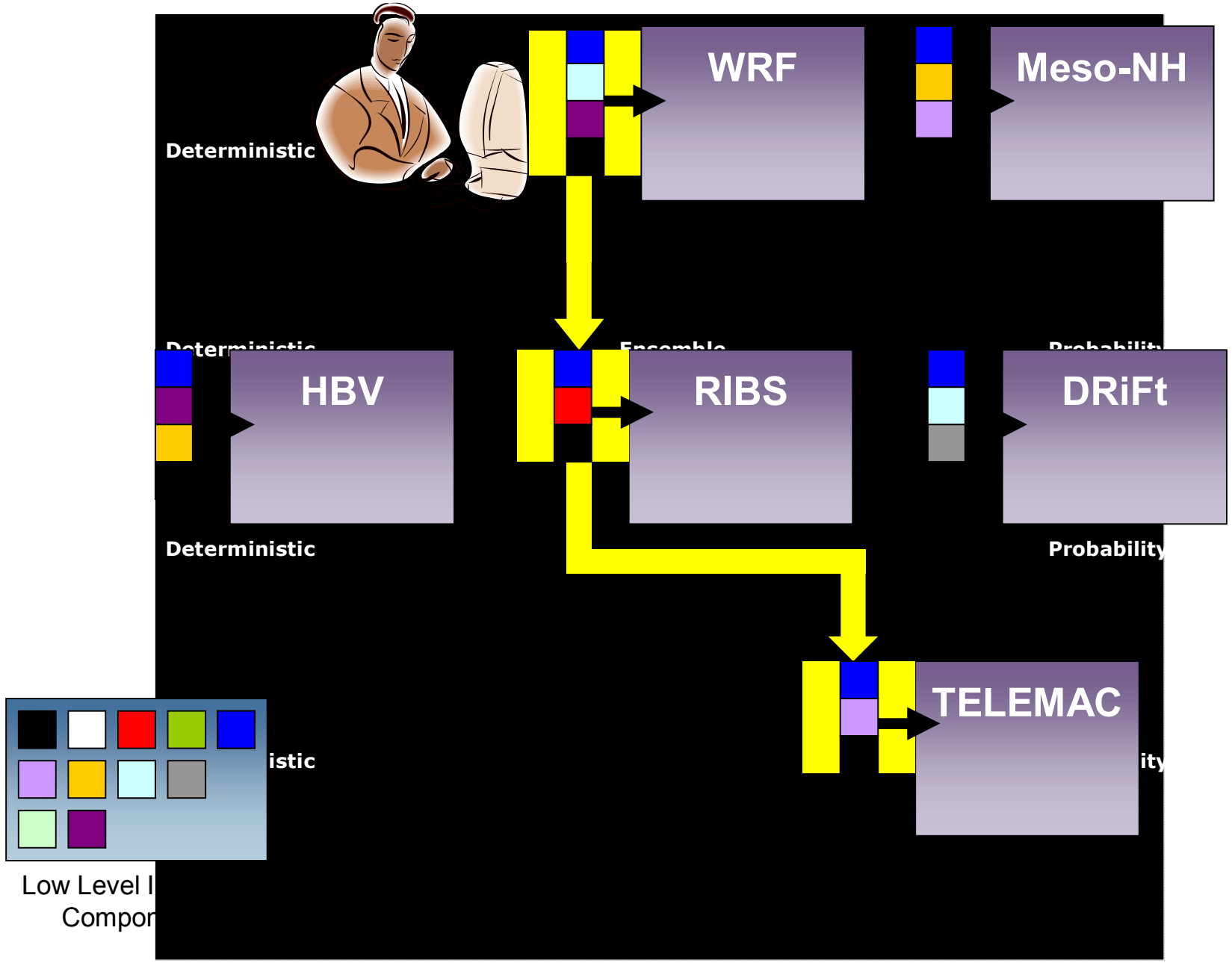
Requirements collection & Limitations today

DRIHM Model Chains



DRIHM Unified Interface Concept:

using tools like those developed within the SCI-BUS project



Outlook

HRM chains are usually clumsily stitched together so that it is ONLY model *i* (of level 1) and model *j* (at level 2) and model *k* (at level 3) that fit together because somebody worked for many years to get it together.

Adding another data set, replacing model j by model j2, finding out sensitivities etc is tedious and thus hampers progress.

DRIHM wants to make it possible to work in a modular environment.

DRIHM will provide an e-science environment for this goal.

DRIHM

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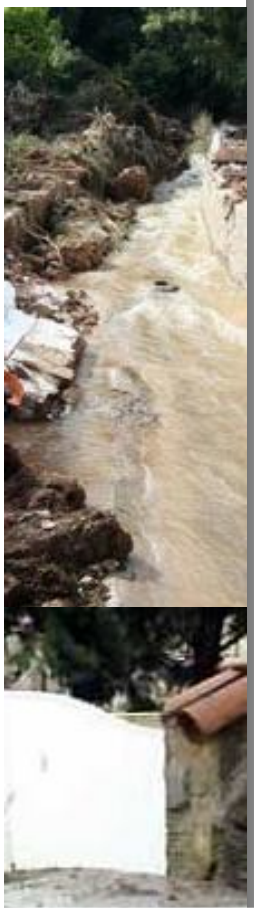
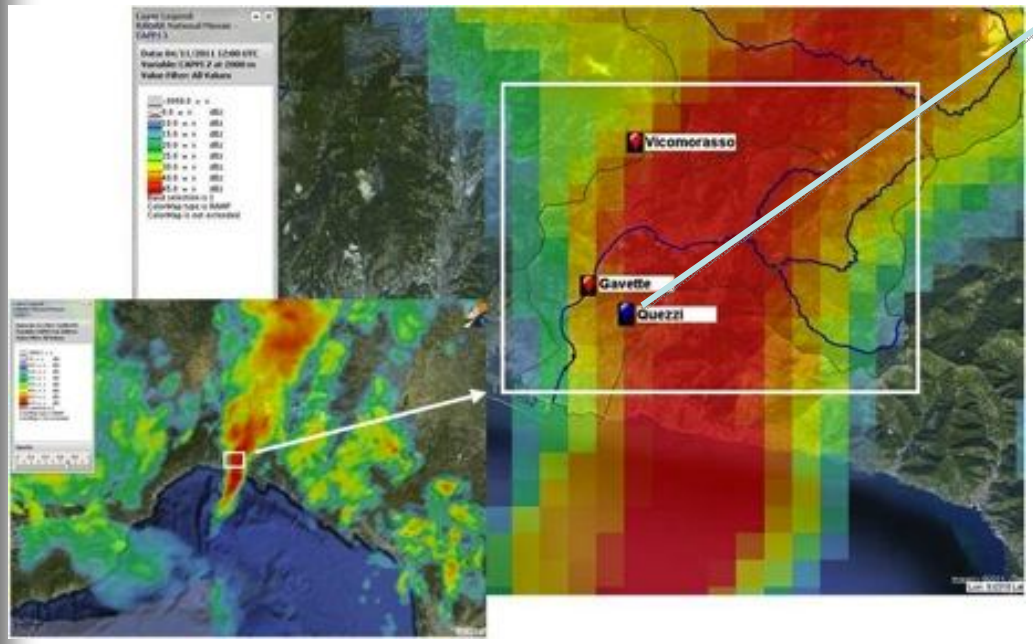
Discussion

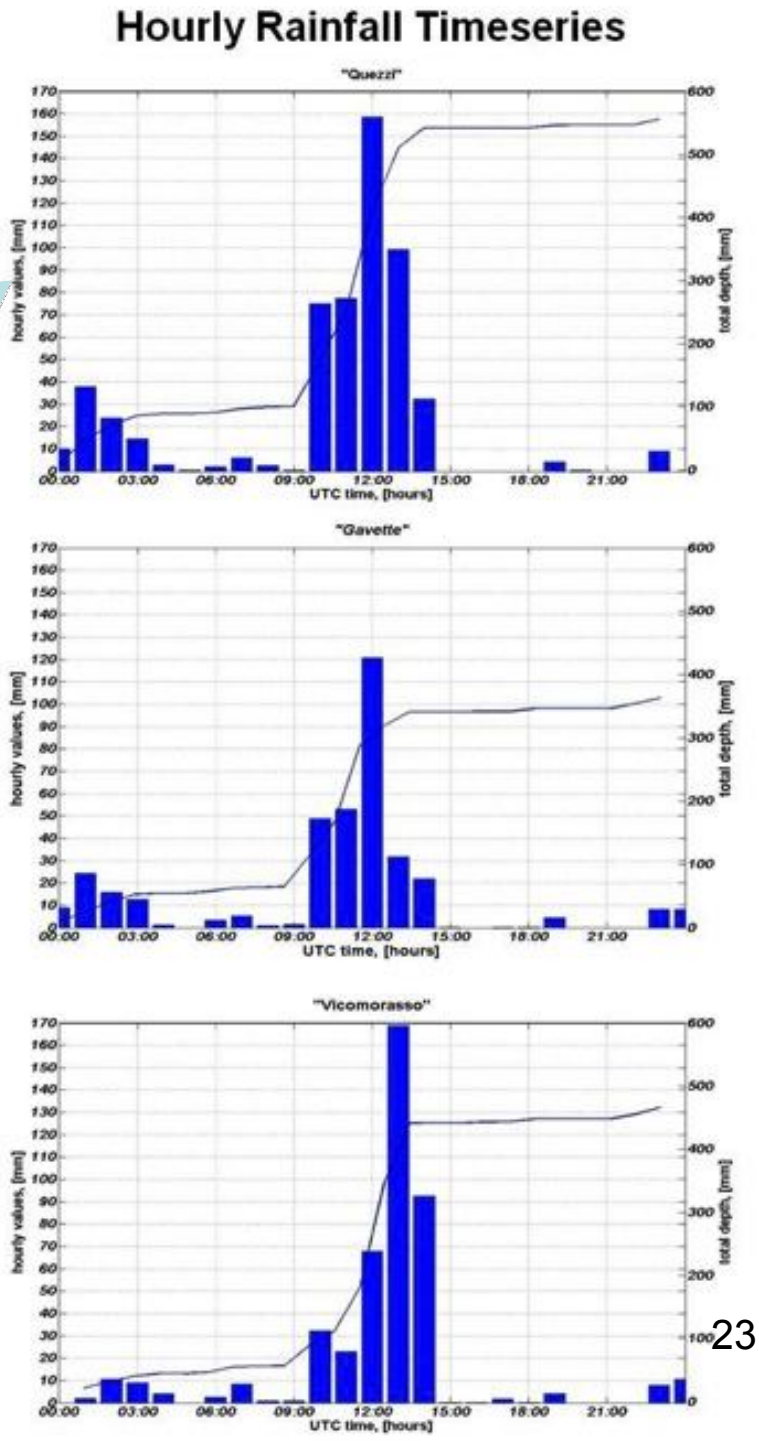
European Commission
Information Society and Media

The citizen scientist role



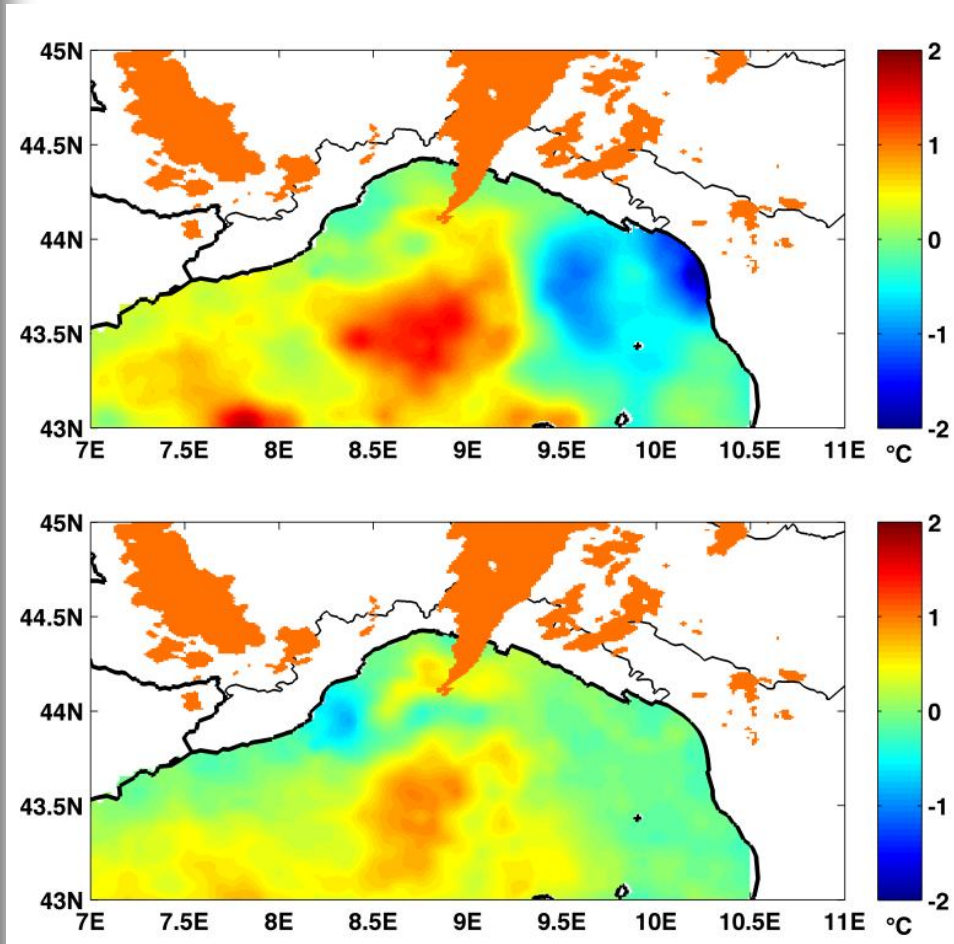
About 90 Personal Weather Stations (PWS) are available in Liguria region





- PWS were useful in the real-time monitoring of the Genoa flash-flood event together with official weather stations
- A PWS, “Quezzi”, owned by a citizen-scientist, registered the peak rainfall depth over 6 hours (about 450 mm) observed during the torrential event
- PWS data will be published on the DRIHM e-Infrastructure
- Contribution of citizen-scientists to the DRIHM User Forum

And the climate change...



The orange areas represent the pixels with reflectivity values larger than 25 dBZ (Italian Radar Mosaic, November 4th at 11:00 UTC). Sea Surface Temperature Anomaly by G1SST (upper panel) and GMES MyOcean (lower panel).

EXtreme PREcipitation and Hydrological climate Scenario Simulations (EXPRESS-Hydro) project: WRF dynamical dowscaling of EC-EARTH scenarios.

These simulations are being included in the CMIP5 archive and in DRIHM, thus making possible to attract also climatologists towards the forthcoming DRIHM services.

Outlook

FOCUS ON

How DRIHM can help Mark?

Mark is an Hydro-Meteo Researcher.
He has just designed a modification to his meteo model, but he would like to validate the new model.
There are two tasks required to validate a model:

- compare the prediction computed by the model with measured data
- cross-check the prediction computed by the model, with those computed by other models.

Let's focus on the second task: compare at least two meteo models on the same events, and cross-check the results. Mark already has its new model, but has to fetch, install and use some alternatives.

Required steps are summarized in the following list:

1 Install, compile and optimize the HMR simulation models, possibly developing data converters, connector to further models and visualization tools (hours to days)
2 Find and retrieve input data from other repositories, via ssh, ftp and other command line tools/scripts, learning the process and all the flags (hours)
3 Select and retrieve large data (like static data)
4 Execute convert and pre-process operations on the data (hours)
5 Set execution parameters
6 Select the executable resources
7 Move all the data and ancillary files
8 Launch the execution
9 Monitoring of possible execution faults and re-submit in case of failure
10 Results retrieval
11 Visualization or further processing

For the first execution of a model, Mark need to perform all the eleven steps. Subsequent model runs requires steps from 2 to 11. This means days for testing against a single alternative meteo model. Moreover the IT resources required (SW tools, HW resources, IT expertise) are to be taken into account. DRIHM infrastructure can help Mark in speed-up the whole process, providing him ready to run hydro-meteo models, tools for managing data and high performances computing resources.

In a DRIHM scenario, the eleven steps become:

1 Select one of the provided models
2 Find input data from other repositories via graphical user interface
3 Select large data
4 Select the conversion and pre-processing operations
5 Set execution parameters
6 --
7 --
8 Launch the execution (the system will take care of selecting the resources, moving converting and pre-processing the data, re-submit in case of failure)
9 --
10 --
11 Visualization or further processing (the system will take care of results retrieval)

Now Mark can squeeze (from days to minutes) the time required to run a simulation on an alternative model, and can focus on improving the new Hydro-Meteo model and accurately validate it.