


# DRIHM2US

Distributed Research Infrastructure for
Hydro-Meteorology to
United States of America

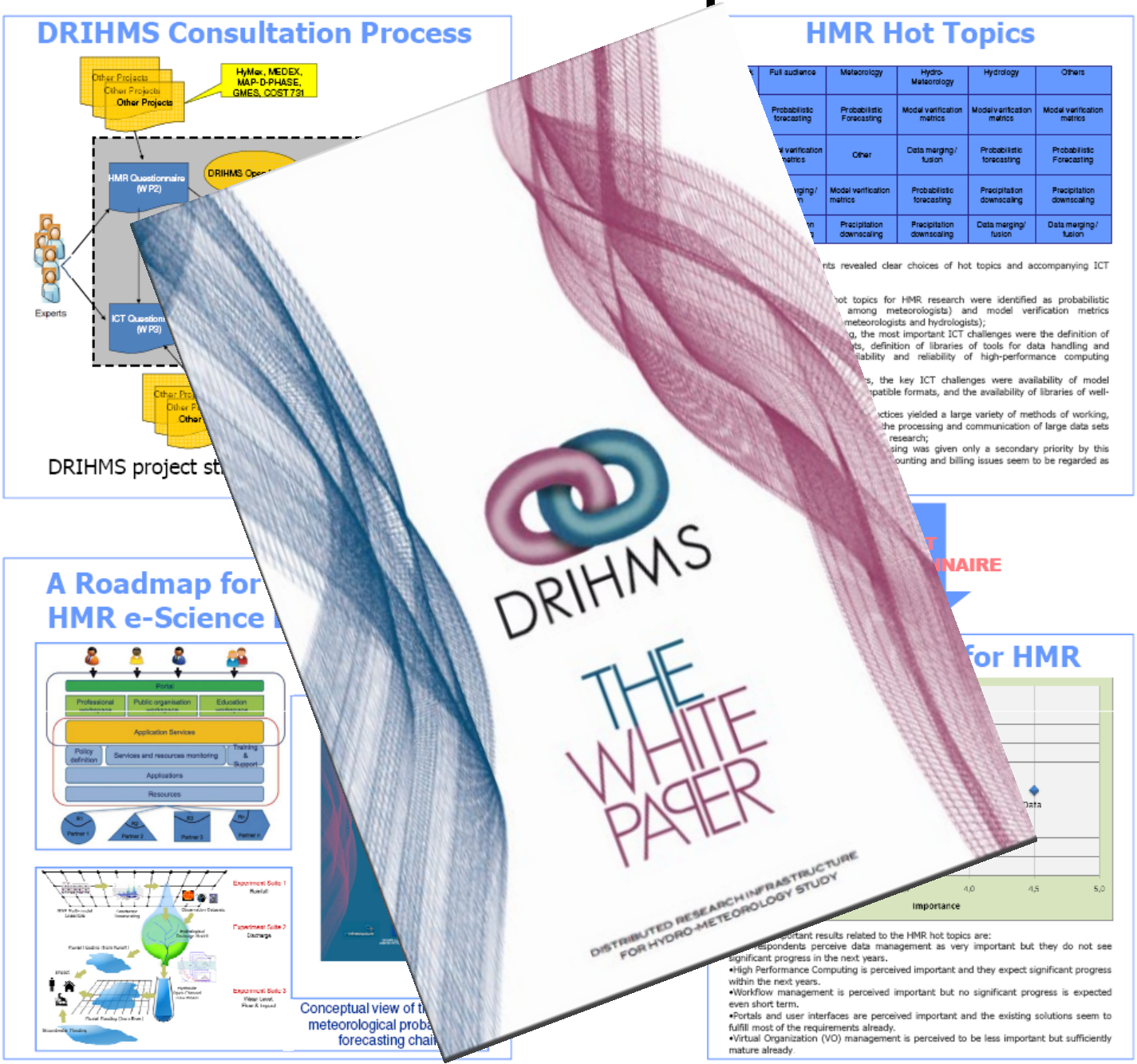
# DRIHM2US Consortium

| Participant no. | Participant organisation name | Part. short name | Country |
|---|---|---|---|
| 1 (coordinator) | CIMA Research Foundation | CIMA | Italy |
| 2 | Ludwig Maximilians University Munich Department for Informatics | LMU | Germany |
| 3 | Institute of Applied Mathematics and Information Technology – National Research Council | IMATI | Italy |
| 4 | HR Wallingford | HRW | United Kingdom |
| 5 | Stichting Deltares | DELTARES | Netherlands |
| 6 | Consortium of Universities for the Advancement of Hydrologic Science | CUAHSI | USA |
| 7 | National Center for Atmospheric Research | NCAR | USA |
| 8 | Rutgers University | RU | USA |

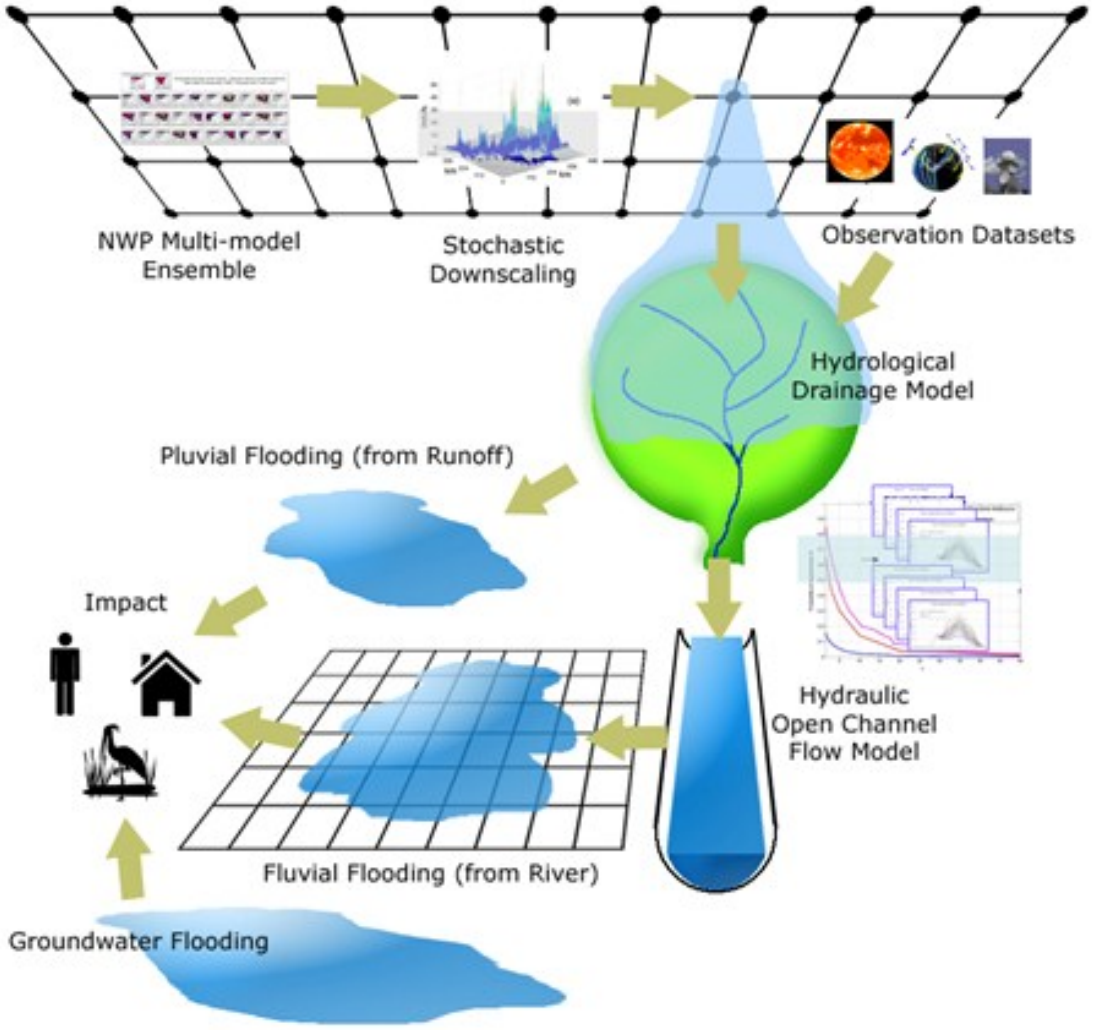
# DRIHM2US rationale

- DRIHM2US pillars
- DRIHM2US motivations
- DRIHM2US objectives
- DRIHM2US approach

# DRIHM2US pillars



# DRIHM2US pillars: DRIHM e-Science environment



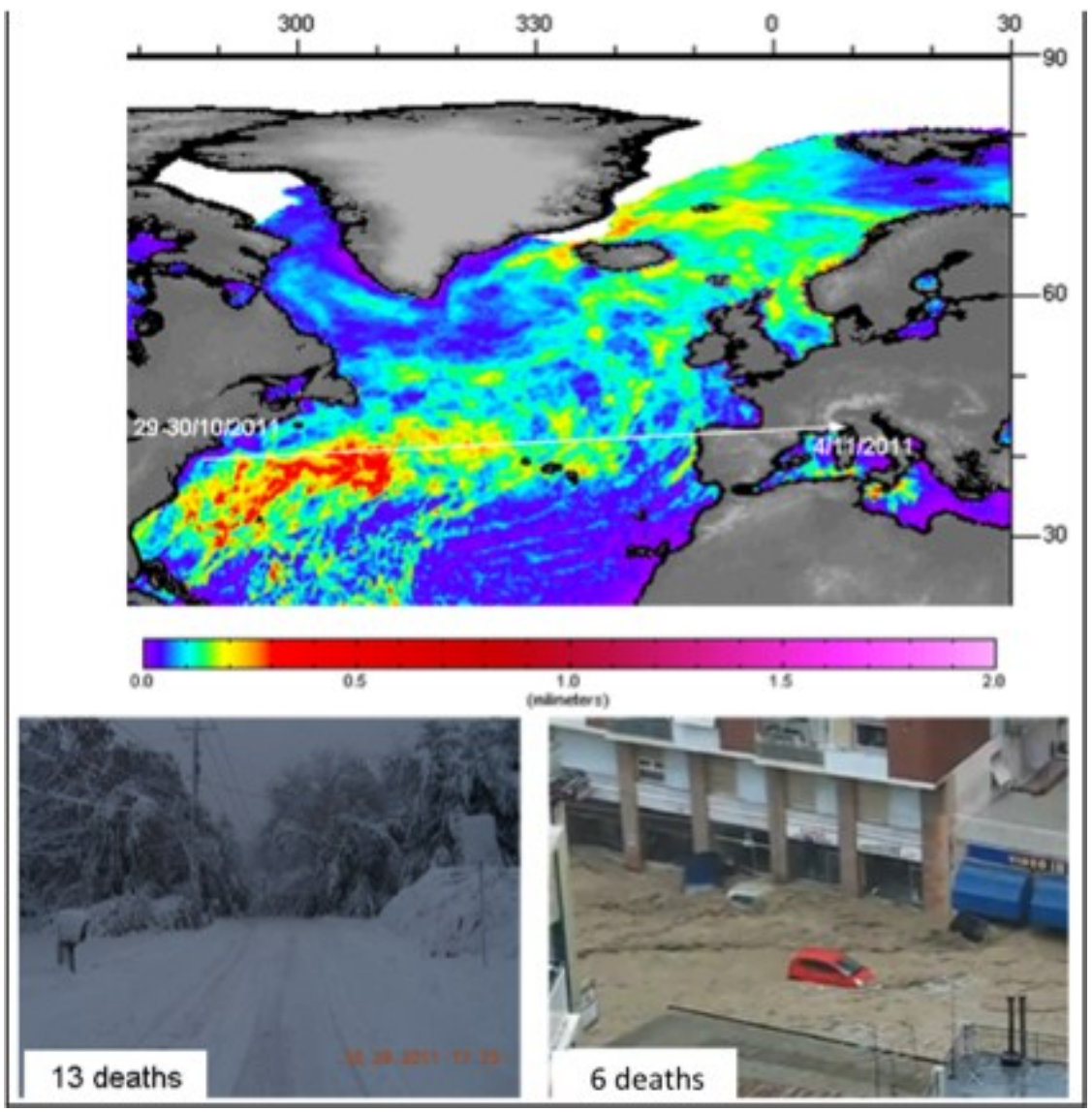

**Experiment Suite 1**
Rainfall

**Experiment Suite 2**
Discharge

**Experiment Suite 3**
Water Level, Flow & Impact

# DRIHM2US motivations

- Scientific progress in the Earth Sciences is heavily based on the ability to share, analyze and archive extreme amounts of data, which are often collected dynamically from widely distributed sources, as well as complex and computationally demanding models/post-processing tools;
- Recent examples of severe hydro-meteorological events (e.g. North America and Western Mediterranean, autumn season 2011) call for a more comprehensive cooperation between Europe and USA in the study of severe hydro-meteorological events and climate changes effects;

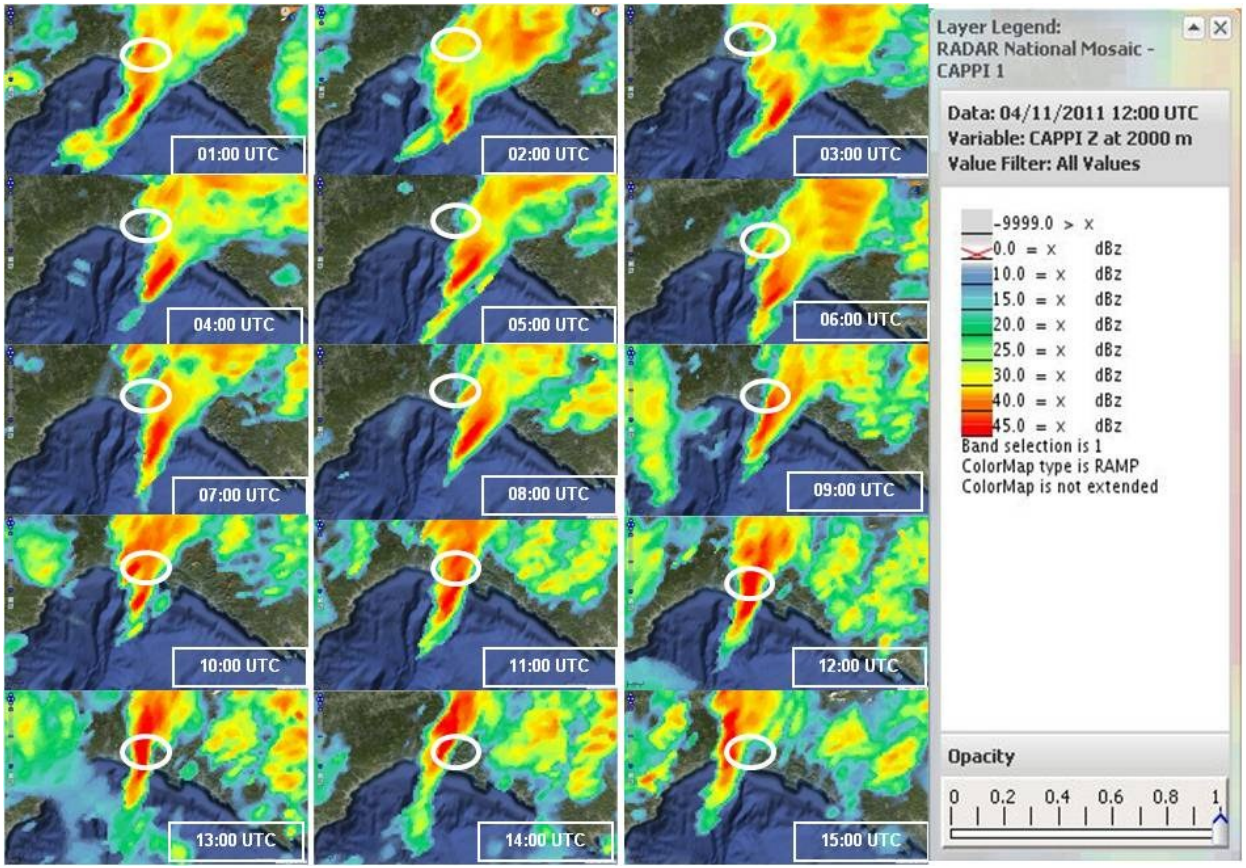



**Upper panel: satellite cloud liquid water composite (week ending 5/11/2011) clearly shows the cyclone track from USA east coast to Mediterranean. Lower left panel: snowstorm impacts example on USA east coast. Lower right panel: Genoa city (Italy) under massive flash-flood event.**

DRIHM2US


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

Radar maps from the Italian radar network showing the intense thunderstorm wandering along the Liguria coastline (1-15UTC): White ellipsoid identifies the mostly affected area



# DRIHM2US objectives

Building on DRIHM (Distributed Research Infrastructure for Hydro-Meteorology) in EU and on CESM (Coupled Earth System Model) in US, DRIHM2US will:

•Promote international cooperation between Europe and the USA for the development of a joint/common e-Infrastructure for Hydro-Meteorological Research (HMR);

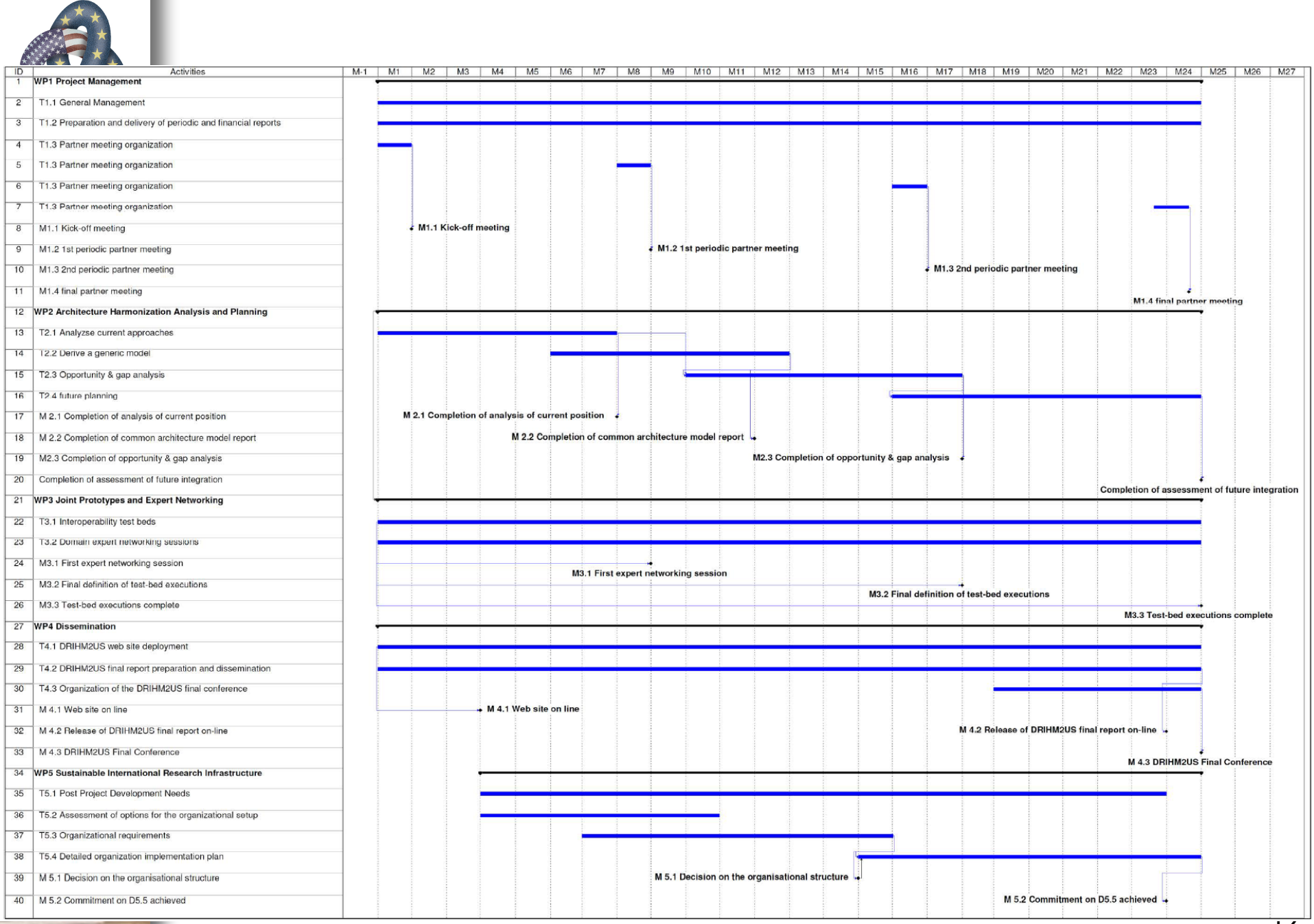
•Put in place key elements to allow persistent availability and effective sharing of data and models across scientific disciplines, institutions and national boundaries, specifically across the Atlantic.

# DRIHM2US approach

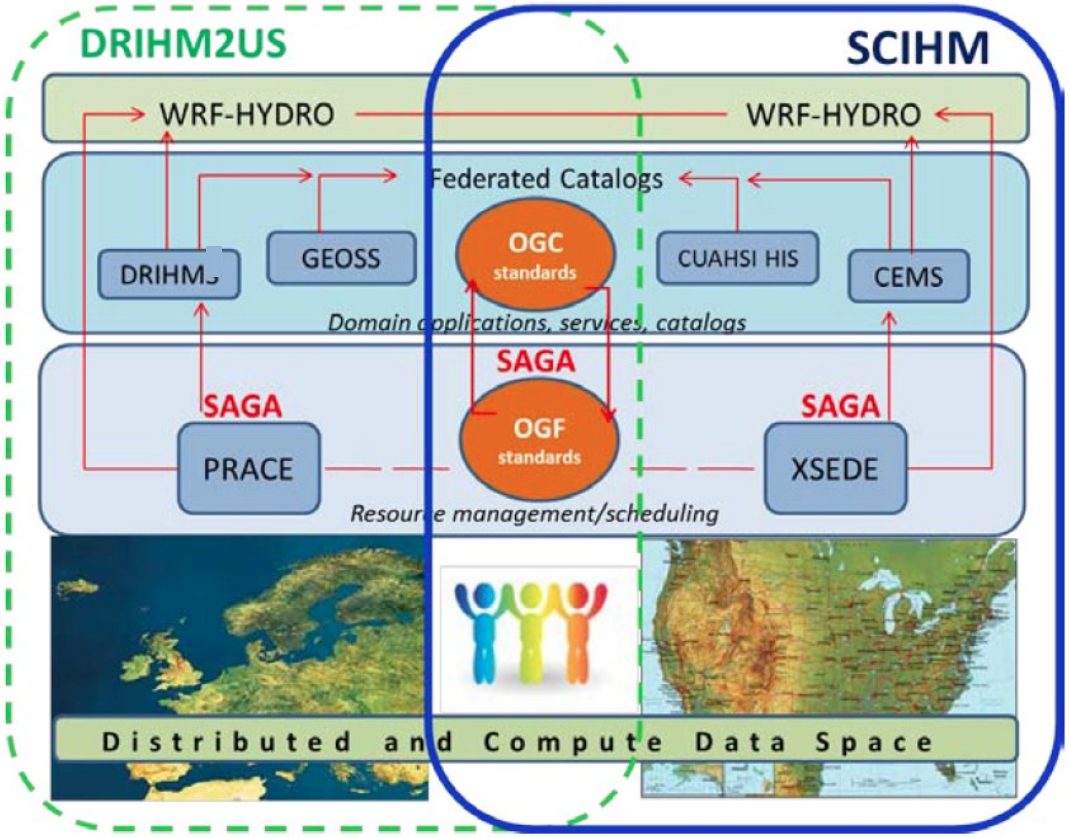
- Analyzing requirements of the HMR community towards common e-Infrastructures within the EU and USA
- Inviting selected experts from both the HMR and ICT to perform hands-on plug-in tests between current EU and USA HMR e-Infrastructures
- Organizing training events involving EU and USA participants for international networking and educational activities
- Summarizing the results of these workshops and providing an outlook into the future based on the respective findings

# DRIHM2US Workpackages

| No | Work package title | Type of activity[1] | Lead partic. no.[2] | Lead partic. short name | Person months[3] | Start month[4] | End month[3] |
|---|---|---|---|---|---|---|---|
| WP1 | Project Management | MGT | 1 | CIMA | 10 | 1 | 24 |
| WP2 | Architecture Harmonization Analysis and Planning | COORD | 2 | LMU | 18 | 1 | 24 |
| WP3 | Joint Prototypes and Experts Networking Sessions | COORD | 4 | HRW | 16 | 1 | 24 |
| WP4 | Dissemination | COORD | 3 | IMATI | 15 | 1 | 24 |
| WP5 | Sustainable International Research Infrastructure | COORD | 5 | DELTARES | 17.5 | 4 | 24 |
| | | | | | | | |

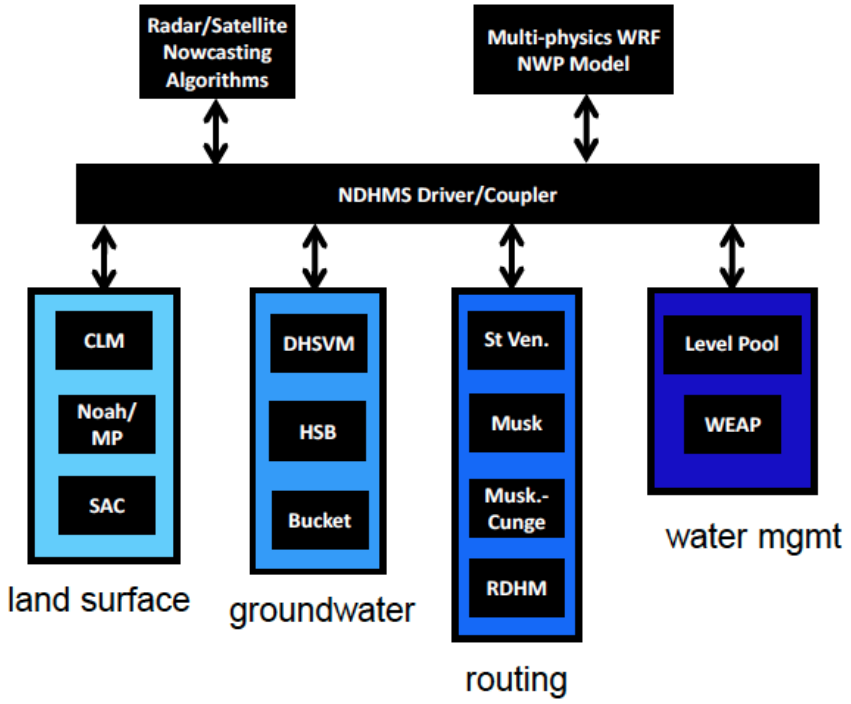

ID
Activities
M-1
M1
M2
M3
M4
M5
M6
M7
M8
M9
M10
M11
M12
M13
M14
M15
M16
M17
M18
M19
M20
M21
M22
M23
M24
M25
M26
M27
1 WP1 Project Management
2 T1.1 General Management
3 T1.2 Preparation and delivery of periodic and financial reports
4 T1.3 Partner meeting organization
5 T1.3 Partner meeting organization
6 T1.3 Partner meeting organization
7 T1.3 Partner meeting organization
8 M1.1 Kick-off meeting
9 M1.2 1st periodic partner meeting
10 M1.3 2nd periodic partner meeting
11 M1.4 final partner meeting
12 WP2 Architecture Harmonization Analysis and Planning
13 T2.1 Analyzse current approaches
14 T2.2 Derive a generic model
15 T2.3 Opportunity & gap analysis
16 T2.4 future planning
17 M 2.1 Completion of analysis of current position
18 M 2.2 Completion of common architecture model report
19 M2.3 Completion of opportunity & gap analysis
20 Completion of assessment of future integration
21 WP3 Joint Prototypes and Expert Networking
22 T3.1 Interoperability test beds
23 T3.2 Domain expert networking sessions
24 M3.1 First expert networking session
25 M3.2 Final definition of test-bed executions
26 M3.3 Test-bed executions complete
27 WP4 Dissemination
28 T4.1 DRIHM2US web site deployment
29 T4.2 DRIHM2US final report preparation and dissemination
30 T4.3 Organization of the DRIHM2US final conference
31 M 4.1 Web site on line
32 M 4.2 Release of DRIHM2US final report on-line
33 M 4.3 DRIHM2US Final Conference
34 WP5 Sustainable International Research Infrastructure
35 T5.1 Post Project Development Needs
36 T5.2 Assessment of options for the organizational setup
37 T5.3 Organizational requirements
38 T5.4 Detailed organization implementation plan
39 M 5.1 Decision on the organisational structure
40 M 5.2 Commitment on D5.5 achieved
M1.1 Kick-off meeting
M1.2 1st periodic partner meeting
M1.3 2nd periodic partner meeting
M1.4 final partner meeting
M 2.1 Completion of analysis of current position
M 2.2 Completion of common architecture model report
M2.3 Completion of opportunity & gap analysis
Completion of assessment of future integration
M3.1 First expert networking session
M3.2 Final definition of test-bed executions
M3.3 Test-bed executions complete
M 4.1 Web site on line
M 4.2 Release of DRIHM2US final report on-line
M 4.3 DRIHM2US Final Conference
M 5.1 Decision on the organisational structure
M 5.2 Commitment on D5.5 achieved

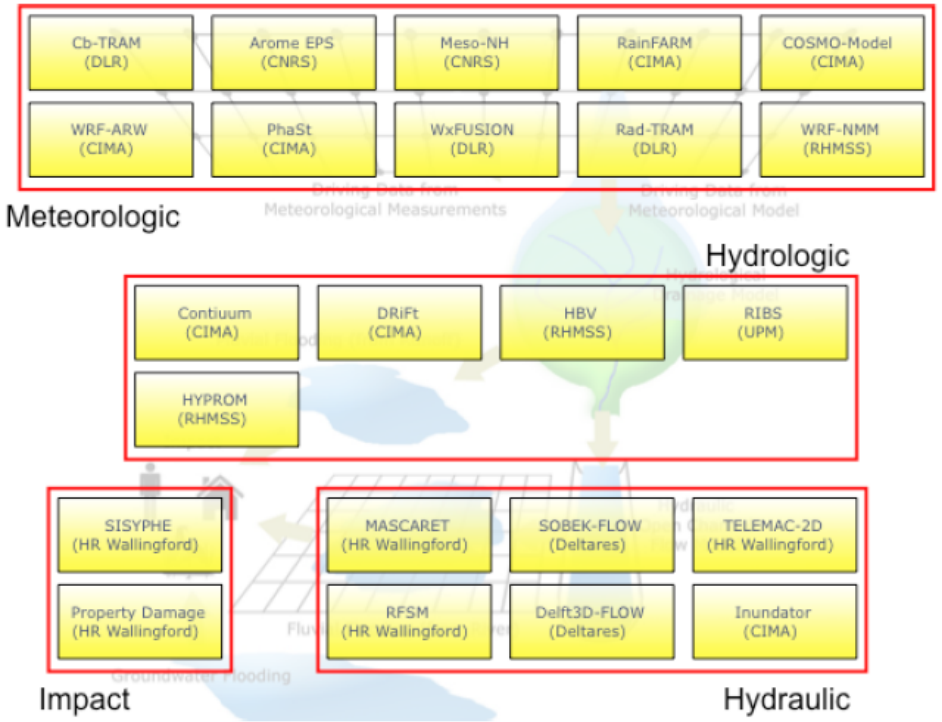
# DRIHM2US interoperability testbeds




Main components of our multi-layer design and the interactions between collaborating projects in the US and Europe, in particular as organized under DRIHM2US and its US counterpart, SCIHM (Standards-based CyberInfrastructure for HydroMeteorology). The two projects overlap in their reliance on open community standards developed for high performance resource management and for domain services and catalogs, and on joint use of the data and services infrastructure, as well as parallel institutional development and community engagement.

# DRIHM2US interoperability testbeds




Schematic showing the suite of multi-physics options available for experimentation in the SCIHM use cases from WRF-Hydro (left) or from DRIHM (right).

# DRIHM2US key topical areas

DRIHM2US key topical areas are identified by the following questions:

- Where does a lack of data federation (i.e. use of data of differing standards) impede the rapid discovery, evaluation, processing, and use of data for hydrometeorological prediction? *(See WP3, Task 3.1)*
- Are there key points of failure or key bottlenecks in workflow timing related to the interoperability of the various components? *(See WP2, Task 2.3)*
- How efficiently does the entire prediction problem scale from a computational perspective and what opportunities exist to reduce specific bottlenecks in data discovery, transfer, processing, model execution and final evaluation? *(See WP2, Task 2.4 and WP3, Task 3.2)*

# DRIHM2US & Earth Science

- DRIHM2US already features, through DRIHM services, strong connections with the wider earth-science community (geology, oceanography, biology)
- DRIHM2US benefits through SCIHM of new NSF EarthCube initiative in terms of:

✓ "Collaborative Research: Developing a community computational infrastructure for Earth system model research and applications" (PI David Gochis, UCAR)

✓ "EAGER: Readiness of Disciplinary Data Systems for Cross-Domain Interoperability within a Standards-Based EarthCube Reference Framework" (Ilya Zaslavsky, University of California, San Diego)

# DRIHM2US & Standardization bodies (1)

A chief transatlantic link within DRIHM2US is through the Open Geospatial Consortium (OGC):

•Certain Task 3.1 interoperability test beds are planned to take place within the OGC Hydrological Domain Working Group (*See WP3 Objectives)*;

•Data interoperability and discovery will utilise WaterML: just adopted as OGC standard. It is the first international standard for exchanging water data;

•OpenMI, a supporting standard for DRIHM, is currently being taken through the OGC standardisation fast-track process by HR Wallingford and Deltares.

# DRIHM2US & Standardization bodies (2)

Also, ISO standards will play an important role in DRIHM2US:

- Cataloguing interoperability will build on previous interoperability work at the OGC with ISO standards such as ISO 19115 and 19139;
- Extensions to ISO standards identified through DRIHM2US will be requested through domain expert links;
- Potential utilisation of Observations and Measurements (ISO 19156) will also be explored.

# DRIHM2US & Standardization bodies (3)

From an ICT perspective DRIHM2US will leverage work from and contribute to standardization bodies like:

- the Open Grid Forum Working Groups and Research Groups where appropriate
- the forthcoming Science Gateway activities of the NSF funded Extreme Science and Engineering Discovery Environment (XSEDE) initiative
- the Research Infrastructures (RI) of the European Strategy Forum on Research Infrastructures (ESFRI) Roadmap

# Questions?

DRIHM2US