

Community Modeling in Hydrologic Science

Community Hydrologic Modeling Platform (ChyMP) Scoping Workshop
Washington DC, 26-27 March 2008

Community modeling -- the development, distribution and technical support of common simulation software designed to serve the diverse needs of a community, and to be advanced through contributions from the community -- has a rich tradition in the atmospheric and oceanic sciences, but less so in hydrology. Perhaps the best-known community modeling effort in the geosciences is based at the National Center for Atmospheric Research (NCAR). NCAR has a long history of developing, maintaining and supporting community atmosphere, ocean, land-surface and coupled climate models. These models supply the necessary simulation environment for numerous research groups around the world, and have provided the foundation for scores of fundamental scientific advances over the past three decades. The contributions of these models to weather, climate and global change research cannot be overstated.

As one of two new major initiatives for its next 5-year phase, the Consortium of Universities for the Advancement of Hydrologic Science, Inc. (CUAHSI) is proposing to launch a major effort towards the development of a Community Hydrologic Modeling Platform (CHyMP). Recently, the National Science Foundation (NSF), the National Academy of Sciences (NAS) and CUAHSI jointly sponsored the *Scoping Workshop on a Community Hydrologic Modeling Platform (CHyMP)* on 26-27 March, 2008. The goal of this first workshop was to survey the range of perspectives on the need for community modeling in hydrology, as well as on the scope, form and requirements of such an activity. Planned outcomes from this meeting are the establishment of a CHyMP working group with a report to the community on the rationale and preliminary strategy for undertaking community modeling in hydrology. This working group will also be responsible for the development of two larger, community-based workshops that will lead to the development of a formal proposal to the NSF for the development and implementation of the platform.

Twenty-five participants attended the first workshop, which was held at the NAS in Washington, DC. The format of the workshop included several brief presentations and discussion in plenary and in breakout groups. The group addressed several important themes and questions, including:

- The need for community modeling in hydrology
- Potential applications of a CHyMP
- Technological readiness and potential obstacles
- Current community modeling activities in hydrology and other disciplines and existing model components upon which a CHyMP can build
- Grand challenges in hydrology that could only be addressed with a CHyMP
- A national water modeling framework as a key application of the CHyMP
- Linking the CHyMP to process models from other disciplines
- Ties to and support of other CUAHSI and WATERS activities

- A strategy for moving forward

Findings and Recommendations

Key findings and recommendations from the workshop, which will be described in detail in the Rationale Report, are described briefly here. Importantly, there was unanimous agreement among participants that the hydrologic community should embrace a CHyMP activity. The group agreed that CHyMP should be a systematic, community-based effort to develop modular components of the water cycle that could be: a) linked together to provide a framework for integrated water cycle modeling; b) implemented across scales and; c) utilized to address complex hydrologic research questions that could not be attempted in its absence. Other attributes of the platform are that it should:

- Significantly advance hydrologic and related science
- Link to atmospheric and ocean general circulation models and fully-coupled Earth system models
- Link to biogeochemical, ecological, surface dynamics and environmental engineering models
- Provide capabilities for forward and inverse modeling, optimization, and stochastic analyses.
- Represent processes at scales from pores to continents
- Readily interface with data in the CUAHSI Hydrologic Information System
- Guide observatory and network design
- Provide the basis for a national water cycle model for integrated, long-term prediction under conditions of changing climate, land use and land cover dynamics
- Contribute substantively to environmental decision making, management and policy
- Serve as an educational tool

Specifically, the group enthusiastically recommends

- The near-term development of a CHyMP from existing model components and software packages
- A longer-term commitment to explore the role of multiphysics modeling as key component of a CHyMP
- That an important use of the CHyMP will be a framework for national water cycle modeling that will serve as a critical focal point for the hydrologic communities.

Next Steps

Next steps for the CHyMP effort include the writing and delivery of the Rationale Report and planning for follow-on workshops in the Fall, 2008 and Spring, 2009. Following these workshops, and with input from CUAHSI, the NSF and other sponsors, the CHyMP Working Group will refine its strategy to move towards the implementation phase.

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Scoping Workshop on a Community Hydrologic Modeling Platform (CHyMP)

March 26-27, 2008

National Academy of Sciences

500 Fifth St., NW

Washington, DC 20001

Rooms 201 (Wednesday) and 204 (Thursday)

AGENDA

March 26, 2008, Room 201

8:30 – 9:00 *Opening remarks from organizers*
Goals of workshop
Charge to participants, speakers, breakout and discussion group *leaders*
Logistics

Topic 1: *Why we need community modeling in hydrology*

9:00 – 9:20 Chris Duffy
9:20 – 9:40 Peter Kitanidis
9:40 – 10:00 Venkat Lakshmi

10:00 – 10:30 Coffee break and poster viewing

Topic 1 (continued): *Potential applications of community hydrologic models*

10:30 – 10:50 Jay Famiglietti
10:50 – 11:20 Ed Sudicky
11:20 – 11:40 Larry Band
11:40 – 12:30 Discussion of morning talks and posters (Jay Famiglietti)

12:30 – 1:30 Lunch

Topic 2: *The time is right for community hydrologic modeling: exploiting today's technology and building from existing components*

1:30 – 1:50 Scott Peckham
1:50 – 2:10 Zong-Liang Yang
2:10 – 2:30 Alexy Voinov
2:30 – 2:50 Jon Goodall
2:50 – 3:00 Discussion of breakout groups

3:00 – 3:30 Coffee break and poster viewing

3:30 – 5:00 Breakouts
Rooms 201, 205, 206

An integrated water cycle/national water model (Ken Potter)
Grand challenges in hydrology (Jim Shuttleworth)
Technological and scientific barriers (Hari Rajaram)

5:00 – 6:00 Breakout summaries and discussion (Venkat Lakshmi)

7:00 Dinner and continued discussion

March 27, 2008, Room 204

8:30 – 8:50 Summary of previous day and charge for the day

Topic 3: *Potential structure of a community hydrologic model*

8:50 – 9:10 Larry Murdoch

9:10 – 9:30 David Maidment

9:30 – 9:50 Christa Peters-Lidard

9:50 – 10:10 Reed Maxwell

10:10 – 10:40 Coffee break and poster viewing

10:40 – 11:40 Breakouts

Rooms 204, 205, 206

Needs and requirements for a CHyMP (Binayak Mohanty)

Linkages to other disciplines (Barbara Minsker)

Blueprint for a CHyMP (Ron Falta)

11:40 – 12:30 Breakout summaries and discussion (Larry Murdoch)

12:30 – 1:30 Lunch

Topic 4: *Strategy for moving forward*

1:30 – 2:30 Jay Famiglietti, Larry Murdoch, Venkat Lakshmi and Rick Hooper

2:30 – 3:30 Complete writing assignments and adjourn workshop