

Motivation

Understanding the functioning of environmental systems is one of the grand scientific challenges. The holistic systems approach is the ultimate prerequisite to understand and may influence the evolution of our environment. Concerning climate change there is no doubt about the importance of the hydrosphere. Combining (“tri-unity”) observation, modeling, and monitoring are important to follow the holistic concept. Observation and monitoring are the major target of the TERENO initiative of the Helmholtz Association (www.tereno.net). H^NBENCH is focused to improve modeling systems. Several benchmarking projects have been initiated in the past to gain a better understanding of the complexity of environmental systems:

- Intraval / Hydrocoin was one of first benchmarking projects dedicated to compare the accuracy of existing numerical codes for modeling density-dependent flow processes in fractured-porous media.
- DECOVALEX is an ongoing international project for code benchmarking in the field of nuclear waste management. The deposition of waste in geological environment will cause physical long-term effects which need to be understood very well (www.decovallex.com, http://www.bgr.bund.de/nn_323320/DE/Themen/Geotechnik/Projekte/Endlagerforschung/DECOVALEX.html).
- CO₂BENCH is a new initiative (UFZ/LBNL) concerning the development of code quality standards for CO₂ sequestration. For the assessment of long-term safety of CO₂ storage in the subsurface the interaction of thermo-hydro-mechanical-chemical (THMC) processes needs to be considered (tessin.ufz.de - <http://www.ufz.de/index.php?en=19234>)

Vision

H^NBENCH is a research initiative to develop and approve modeling methods and simulation tools for hydrological processes under varying climate conditions. Those validated tools will be very important for any questions of integrated water resources management (IWRM) in many regions all over the world. We aim at a better understanding of hydro-climate systems (HCS). We focus on two topics:

- H^NProc: Definition of simplified benchmarks in order to evaluate the importance of coupled processes, i.e. surface / subsurface flow, mass and energy transport.
- H^NCatch: Definition of data-based / catchment-scale benchmarks. Those reality-approaching test cases can be developed based e.g. on data from the TERENO sites. In addition to numerical simulation tools H^NCatch requires the development and provision of hydro-climate/data-management-systems (HCS/DMS).

The H^NBENCH concept will be presented at the AGU 2010 in San Francisco.

H^NBENCH is an open call for contributions! Getting started, we invite the following teams:

- Universities of Waterloo / Laval (Profs. Sudicky, Therrien): HydroGeoSphere.
- Lawrence Livermore National Laboratory (LLNL) / University of Bonn (Profs. Maxwell, Kollet): ParFlow.
- Helmholtz Center for Environmental Research (UFZ) / Universities of Dresden and Jena: OpenGeoSys/aRoot/SWMM/mHM tool box (www.opengeosys.net)
- ...

Scientific Board

- Prof. D. Baldocchi (Berkeley)
- Prof. J. Carrera (Barcelona)
- Prof. P. Kitanidis (Stanford)
- Prof. A. Rinaldo (Padua / Lausanne)
- Prof. Rodrigues (?)

Comment [ok1]: Wer war nochmal unser 5. Kandidat?

The coordination of H^NBENCH is provided by the TESSIN TopicCenter at the Helmholtz Center for Environmental Research (UFZ), Prof. Dr. G. Teutsch, Prof. Dr. S. Attinger, Prof. Dr.-Ing. O. Kolditz.

Web presence for preparation:

tessin.ufz.de (<http://www.ufz.de/index.php?en=19234>)