



HYACINTS

- a new Danish research project

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(GEUS)



HYACINTS

Hydrological Modelling for Assessing Climate Change Impacts at Different Scales

Coordinator: Jens Christian Refsgaard, GEUS

Objective

- ◆ To develop improved tools and methodologies for assessing the effect of climate change on water resources at both regional and local scales
 - Higher precision
 - Quantification of uncertainty

Funding

- ◆ The Strategic Research Council: 15 million DKK (2 M€)
- ◆ Self financing by partners: 10 million DKK

2008 – 2012

5 PhDs and 3 Post Docs

Partners

- ◆ Geological Survey of Denmark and Greenland (GEUS)
- ◆ Danish Meteorological Institute (DMI)
- ◆ Department of Geography and Geology, University of Copenhagen
- ◆ Geological Institute, University of Aarhus
- ◆ DHI
- ◆ Geographic Resource Analysis & Science A/S (GRAS)
- ◆ ALECTIA Aqua A/S
- ◆ Odense Water Ltd
- ◆ Copenhagen Energy
- ◆ Århus Water & Wastewater
- ◆ Environment Centre Odense
- ◆ Environment Centre Roskilde

Background - problems

- ◆ Climate model → Hydrological model (lack of coupling)
 - No feedback from hydrological model to climate model
 - Hydrological modules in today's climate models very simple
 - ➔ Errors in feedback (LE, H, T_s)
- ◆ Different spatial resolution
 - Regional climate models: 10-50 km
 - Hydrological model: 50 – 1000 m
- ◆ Bias in climate model results
- ◆ Lack of quantification of uncertainty

Work packages

- ◆ WP1: Coupling of HIRHAM and MIKE SHE model codes
- ◆ WP3: Hydrological change
- ◆ WP2: Scaling of hydrological models
- ◆ WP4: Uncertainty



WP1: Coupling of HIRHAM and MIKE SHE model codes

Objective

- ◆ To develop a full dynamic coupling of a climate model and a distributed physically based hydrological model code

Content

- ◆ Exchange of $(P, T_a, V_w, R) \leftrightarrow (LE, H, T_s)$
- ◆ Different platforms (Workstation/Windows)
- ◆ OpenMI coupling

WP3: Hydrological change

Objectives

- ◆ To establish a coupled climate-hydrological model for the entire Denmark
- ◆ New methods for estimation of precipitation from remote sensing data (mountainous regions)

Content

- ◆ Coupling of DK-model (MIKE SHE) and regional climate model (HIRHAM)
- ◆ Geostatistical downscaling and bias correction procedures based on measured data (50 km → 1 km)
- ◆ Downscaling of remote sensing data
- ◆ Test on case from data poor country (e.g. in Asia)

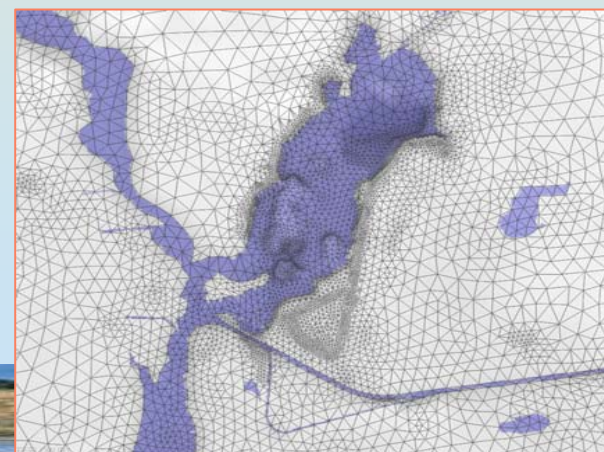
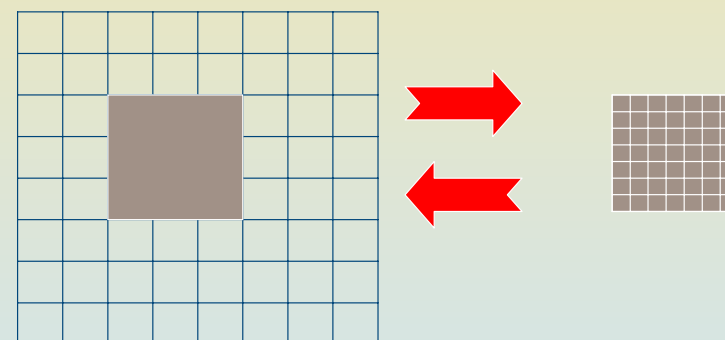
WP2: Scaling of hydrological models

Objectives

- ◆ To develop grid refinements methods
- ◆ To develop methodologies for downscaling of complex geological environments

Content

- ◆ Dynamic coupling of regional and local MIKE SHE model (OpenMI)
- ◆ Alternative conceptual geological models versus alternative discretization methods



WP4: Uncertainty

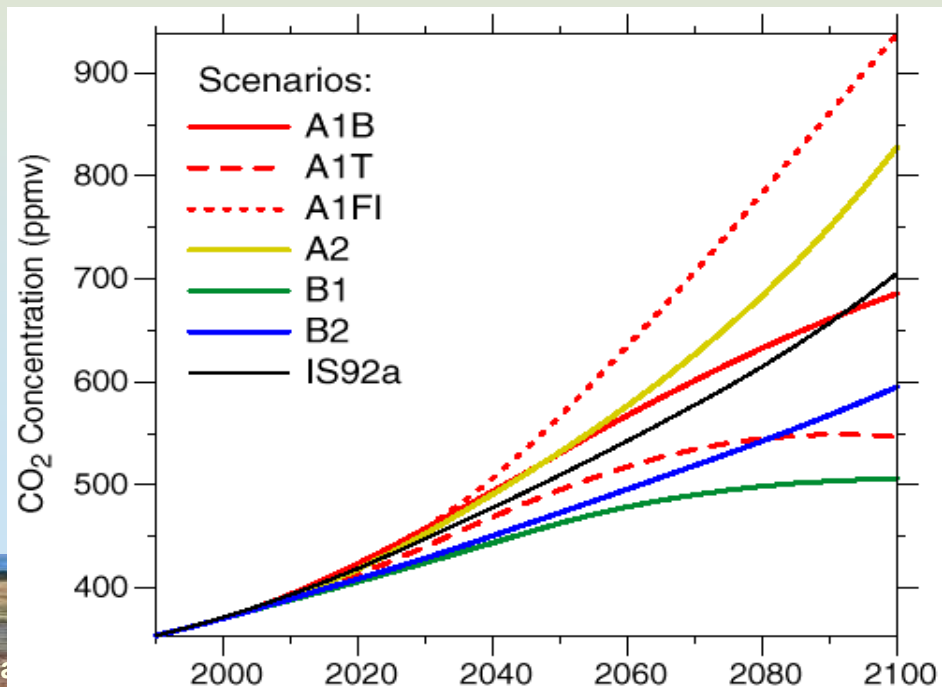
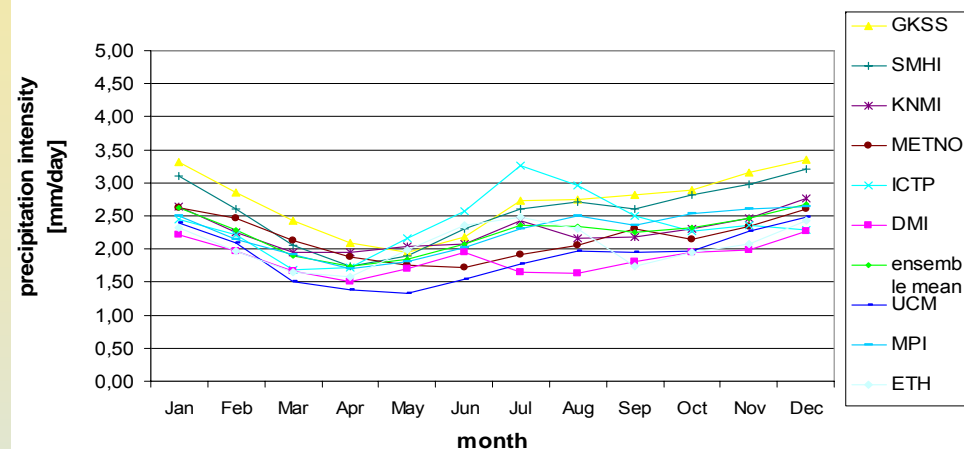
Objective

- ◆ To assess the uncertainties related to prediction of climate change effects

Content

- ◆ Climate modelling
 - Emission scenarios
 - Climate model (choice of GCM and RCM)
 - Downscaling methodology
- ◆ Hydrological modelling
 - Input data
 - Model parameters
 - Geology
 - Model structure (can we use the same models as we do today?)

Daily precipitation intensity averaged per month for 9 RCMs



Conclusions

Expected main project results

- ◆ Coupled code for simulating hydrological change
- ◆ Coupled climate-hydrological model for Denmark (more accurate predictions)
- ◆ Downscaling procedures
- ◆ Assessment of climate change in data sparse (mountainous) catchments
- ◆ Quantification of uncertainties in hydrological change predictions

Further information

www.hyacints.dk