HYACINTS

- a new Danish research project

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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) ↔ (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)

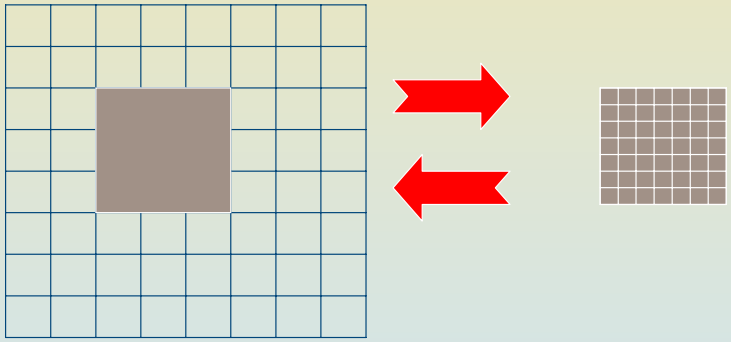
Content

- 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

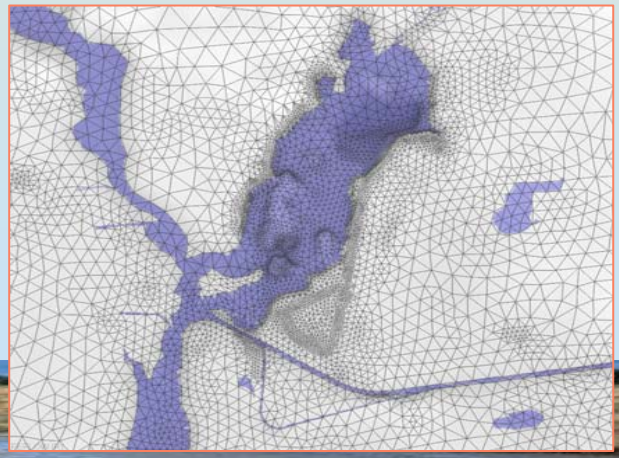
Objectives

- 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



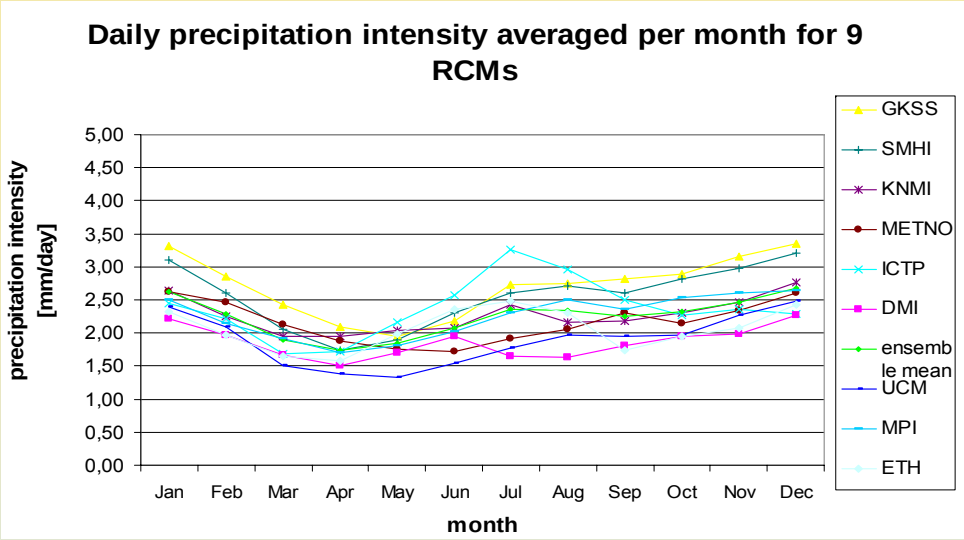
WP4: Uncertainty

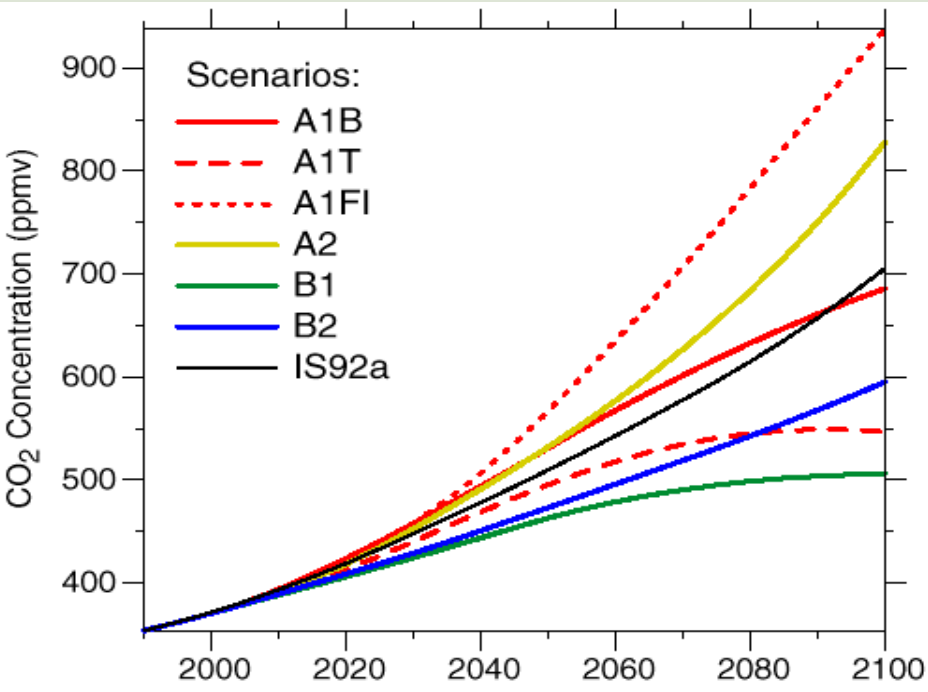
Objective

- 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?)





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