WATCH
Water and Global Change

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evaluating the global water cycle's response to drivers of climate change

SIXTH FRAMEWORK PROGRAMME

6 Monthly Newsletter **May 2008 No. 1**

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EDITORIAL

Dear Reader,

Welcome to the first Newsletter of the WATCH Project! We are a consortium of 25 partners from across Europe and have recently completed our first year. We are supported, for the next 4 years, by the EU's Sixth Framework Program. Our project unites researchers from hydrology, climate and water resources sciences. We have worked hard the past year to engage our researchers and promote good dialogue between partners, all to ensure the goals of this ambitious project are accomplished. Though work in WATCH is structured into 7 Work-Blocks, there is a large amount of cross-over between the working groups. We have developed our communication strategy, data sharing portals, workshops and cross-cutting meetings; also we have set up training courses and established dissemination techniques.
We expect our second year to build on the good experiences of the first and look forward to the upcoming results.
Thanks to everyone working on or associated with WATCH.

The WATCH secretariat

WATCH: PROJECT OBJECTIVES

The Integrated Project (WATCH) aims to bring together the hydrological, water resources and climate communities to analyse, quantify and predict the components of the current and future global water cycles and related water resources states, evaluate their uncertainties and clarify the overall vulnerability of global water resources related to the main societal and economic sectors.

The WATCH project will:

- analyse and describe the current global water cycle, especially causal chains leading to extremes (droughts and floods)
- evaluate how the global water cycle and its extremes respond to climate change
- evaluate feedbacks in the coupled system as they affect the global water cycle
- evaluate the uncertainties in the predictions of coupled climate-hydrological- land-use models using a combination of model ensembles and observations
- develop an enhanced (modelling) framework to assess the future vulnerability of water as a resource, and in relation to water/climate related vulnerabilities and risks of the major water related sectors, such as agriculture, nature and utilities (energy, industry and drinking water sector)
- provide comprehensive quantitative and qualitative assessments and predictions of the vulnerability of the water resources and water-/climate-related vulnerabilities and risks for the 21st century
- collaborate intensively in disseminating its scientific results with major research programmes worldwide
- collaborate the dissemination of its practical and applied results with major water resources and water management platforms and professional organisations worldwide and at a scale of 5 selected river basins in Europe.

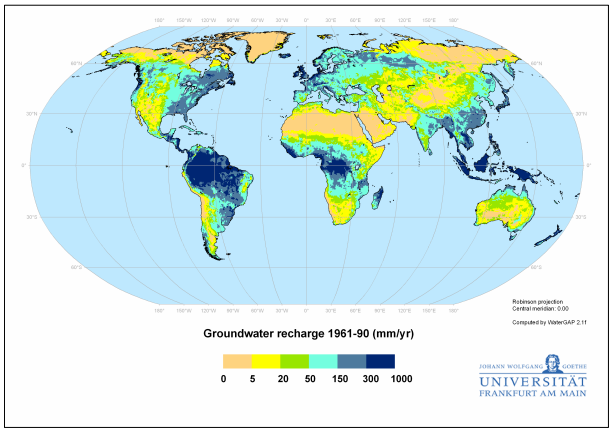
First Year of Collaboration (01/02/2007 – 01/02/2008)

This project is highly interdependent, bringing together different expertise (hydrologists, climatologists, water use experts etc.) divided into different WorkBlocks. Overall the first year of the project has progressed smoothly with the majority of our time spent on establishing links within the WATCH community.

The 20th Century

An important element in WATCH is recreating the near surface weather of the 20th century, to act as driving data for off-line Land Surface Hydrological Models (LSHM) and Global Hydrology Models (GHM). Work has also been carried out to enhance the LSHM so that they represent a wider range of hydrological processes. Global data is also needed to validate the performance of the models. WATCH products in an advanced state of development are:

- new hydrologically relevant satellite products (e.g. inundation, evaporation),
- a driving dataset for a sub-set regional area in Europe,
- a new global, high resolution 20th Century driving dataset,
- a Global Lakes and Wetlands Database (including dams)

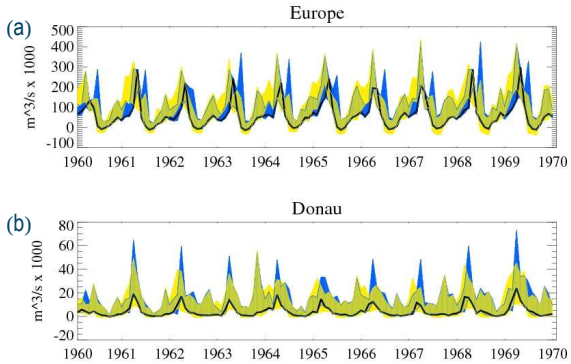


Groundwater recharge (mm/yr) as computed with WaterGAP2.1f, mean value of CRU and GPCC precipitation forced model runs

The 21st Century

WATCH methodologies are developing to adequately handle biases in climate model output and to quantify the resulting uncertainties in estimates of future components of the global water cycle. One of the biggest challenges to analysing the 21st century water cycle is the errors in the modelled rainfall. Comprehensive analyses of projected changes in the rainfall over Europe have been conducted, using global and regional climate models. The global and regional climate model data has been provided to the hydrological modelling groups to produce the initial sets of global and regional gridded hydrological simulations. Achievements have included:

- guidelines for a practical methodology to correct for bias in global climate model
- a methodology for assessing the skill of an RCM in describing the full distribution of intensities of precipitation, and the projected change in the distributions for the IPCC A2 climate scenarios,
- an analysis of climate change signals in the hydrological cycle and the 2m temperature over Europe as projected by the MPI-M global and regional climate models.

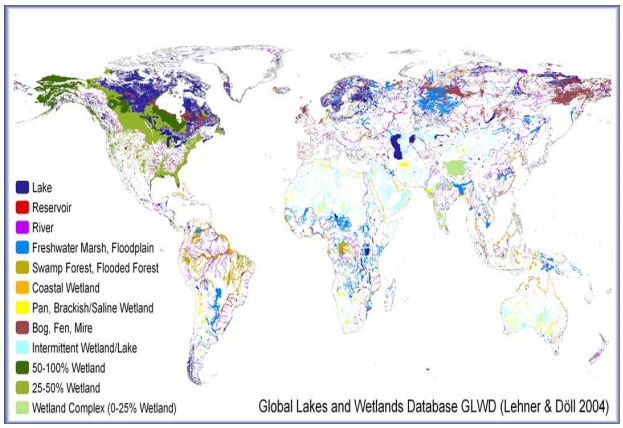


Integrated runoff for whole of Europe (a) and the Donau catchment area (b). Black line obtained using 1960-1970 observations forcing fields. Blue area represents spread obtained from simulations of a 10 year pre-industrial period and yellow area represents spread from a 10 year period with double pre-industrial concentrations.

In addition to climate analysis there are also the pressures on global freshwater. Human population changes will cause changes in land-use and land cover as well as changing water demands. Consistent global datasets of these processes are part of the WATCH framework. Many spatial datasets have been completed within the first 12 months:

- past, present and possible future populations,
- present and possible future GDP,
- gridded, global datasets of current land use shares (irrigated and rain-fed cultivated land,

forest, grassland, barren/sparsely vegetated land, urban built-up land, and other land),



Analysis of 20th Century Floods and Droughts

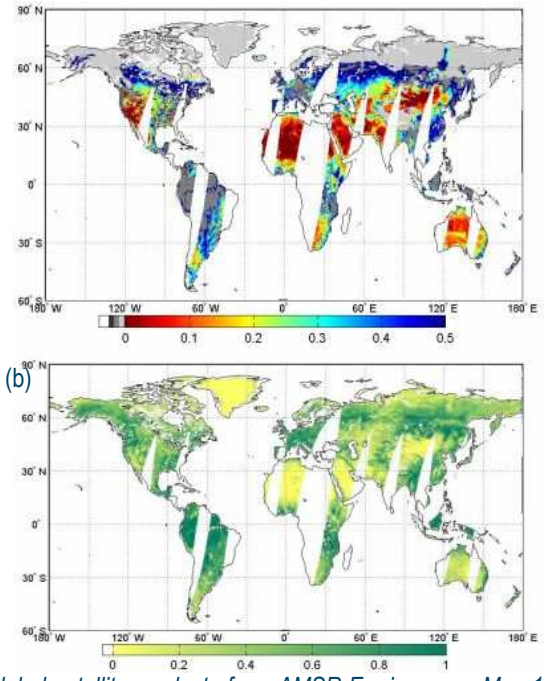
WATCH aims to increase our process understanding of drought and large scale flood development and propagation. We have investigated extreme events under different hydrological and climate controls. The methodology for space-time development of droughts was further advanced by introducing an area threshold for the river basin scale. The likely frequency, severity and scale of droughts at the river basin scale in the 20th century have been studied. Additionally drought generating processes, drought propagation and spatial and temporal development (scale), mainly at the river basin scale, were studied. A Pan-European dataset was prepared to detect whether observed streamflow has become more severe. Major achievements were:

- collated hydrological data for 4 river test basins,
- updated several hundred time series of streamflow data from the European Water Achieve to the year 2004/05 to study trends in hydrological extremes,
- physical indicators (e.g. area threshold, time resolution) were further developed for various types of droughts (e.g. precipitation, streamflow, groundwater) based on data from river basins in Norway, Slovakia and the UK,
- assessed different methods to detect changes in droughts and developed a methodology for studying spatial and temporal development of droughts, particularly at the river basin scale,
- Preliminary work started on the assessment of future changes in major droughts and their main physical aspects

Quantifying Feedbacks in the system

Earth Observation data was used to create global datasets which hold the key to identifying feedbacks. New methods were applied these datasets to identify the global hotspots for land-atmosphere feedbacks. In addition, some new model formulations have been tested, to quantify the impact and feedbacks of natural ecosystem processes on global water cycle components. A new land-surface model has been used to test out the theory that fertilisation of global vegetation would result in an increase in river flow. Finally, a simple 'corrections map' based on GCM results has been proposed which will be refined with observations throughout the project. In particular progress was made in:

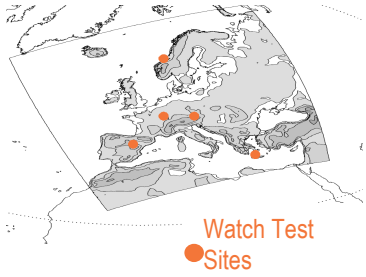
- Global data sets of surface temperature and soil moisture,
- Proposed method definition to assess global hotspots and initial corrections map,
- An assessment of the impact of CO_2 fertilisation, compared to land-use of climate change on global water use,
- New model formulations which account for surface heterogeneity in cold regions have been tested against river flow data,
- Identified issues affecting irrigation and its inclusion in global land surface models.



Global satellite products from AMSR-E microwave May 1 2007 observations; (A) daytime observations of Soil Moisture (B) night time observations of Vegetation optical depth.

Water resources vulnerability

Five test basins, within Europe, were selected to test water resources applications of RCMs. Work in all 5 case study basins has started and the different case studies have built links with the other WATCH members.



Most case studies are involved in the extreme analyses and have communicated with other WATCH partners about forcing data.
This area of work has focussed on:

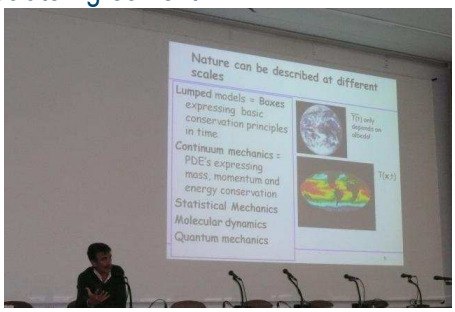
- modelling framework description and design,
- implementation of the GIS system to store WATCH modelling results and to allow different data analyses,
- improvement of the components of the modelling framework especially in terms of surface water availability,
- first steps towards the inter-comparison of global hydrology models,
- improvement of existing tools for estimating groundwater availability on a global basis,
- first steps in the development of a global surface water quality model

Discharge measurement station Metuje river (CZ) (above)

General Assembly meeting
(5-9 Nov. 2007: Barcelona, Spain)

After the WATCH kick-off meeting that was held in March 2007 (Oxford, UK) the G.A. was a time for all members of the WATCH community to meet. The event (hosted by Institute of Earth Sciences Jaume Almera CSIC, Barcelona) was well attended with over 50 attendees representing all 25 partner institutions. At this event representatives from the different working groups in WATCH presented their most recent findings as well as outlining their direction for the coming months. Good discussions developed and a sense of community was formed. This was strengthened by the 4 workshops, which resulted in the establishment of 4 task forces to be active in the areas of: Data continuity, Uncertainty analysis, regional Test Basin representation and Land Surface Hydrological Modelling.

We were also privileged to have two motivating key-note speeches, the first on Climate Change in Spain by Jesus Carrera (CSIC, Spain) and the second on Applications of Macroscale Hydrologic Simulations: Past, Present, and Future from Dennis Lettenmaier (University of Washington, USA). Their input at our meeting was greatly appreciated and constructive. The G.A. meeting was also a time to finalise the operating format of WATCH especially as we voted in the WATCH publication policy and Associate Agreement.



Talk by Jesus Carrera (CSIC, Spain)

Presentations

Partners of WATCH have been active in representing the project at many international conferences and meetings. A number of WATCH members contributed to the IPCC Fourth Assessment Report, also the WATCH project was presented at the EU-IPCC meeting (Brussels, Nov. 2007) and the United Nations Climate Change Conference (Bali, Dec. 2007). These events as well as the registration of our project website have helped to increase awareness of the project.
At the recent EGU meeting in Vienna (Austria) WATCH was well represented with talks on: Trends in low flows and droughts in small undisturbed rivers across Europe.
(http://www.cosis.net/members/meetings/sessions/accepted_contributions.php?p_id=306&s_id=5334)

Workshops

Within the first year six WATCH workshops were held that have greatly advanced communication between partners and resulted in stimulated dialogue. Four of these workshops took place at the G.A. meeting, but in November 2007 a joint workshop was held with NE-FRIEND Project Group 3 (UNESCO-IHP).

Most recently in April 2008, a joint WATCH-GWSP Model Intercomparison Workshop was held in Wageningen (NL) and resulted in profound discussions of the 12 models being used in WATCH. The goal of the model intercomparison initiative is to unite LSHM and GHM in order to improve the representation of the global hydrological cycle. Key decisions were taken at this workshop on the model physics such as spatial scale, forcing data, and global land areas.

During the workshop it was decided to have three more sets of model intercomparisons. In the next phase the intercomparison group will focus on comparing the physics of the models but will not include human influences such as dams, reservoirs and irrigation. The second phase will focus on the 20th century with human impacts. The last phase will focus on the future, looking at the impacts of climate change on the global hydrological cycle and water resources.

Also involved in this workshop were the American and Japanese partners of Watch. Taikan Oki and Noata Hanasaki represented the University of Tokyo and the National Institute for Environment Studies. Balazs Fekete represented the MacPDM model from the University of New Hamspire. Both the Japanese and American partners will participate with their models, in the intercomparison.

Links & Associates

The WATCH project has setup a cooperation agreement with the Global Runoff Data Centre (Koblenz, Germany) to utilize their data. Additionally WATCH has close ties with other EU projects notably SCENES (Water Scenarios for Europe and for Neighbouring States), ENSEMBLES (Ensembles-Based Predictions of Climate Changes and Their Impacts) and FRIEND. WATCH also has close ties with the GWSP and is seeking their endorsement.

Partners in WATCH are free to engage individuals or organisations from outside to consortium who wish to align their work with WATCH. CSIC has recently introduced the University de Castilla-La Mancha (Spain) as a new WATCH Associate partner and we look forward to this new working partnership.

Upcoming Events in 2008

26-28 May: European Water Archive Workshop UNESCO-FRIEND Database Group, in Koblenz, Germany

1-8 June: WATCH International summer school on Climate Change and the Water Cycle, in Trieste, Italy

22-27 June: WATCH International Summer School on Hydrological Drought & Global Change, in Trieste, Italy.

June: GLASS - WATCH Workshop, de Bilt, Netherlands; involving CEH, GEWEX and GLASS community.

3-4 November: joint WATCH-GWSP Model Intercomparison Workshop, Bratislava, Slovakia.

4-7 November: WATCH General Assembly meeting and Work Block meetings, Bratislava, Slovakia.

10-12 November: Low Flow and Drought Workshop, Bratislava, Slovakia.

Glossary

CEH: Centre for Ecology and Hydrology (UK)
CSIC: Consejo Superior de Investigaciones Cientificas (Spain)
FRIEND: Flow Regimes from International Experimental and Network Data
GCM: Global Climate Model
GEWEX: Global Energy and Water Cycle Experiment
GHM: Global Hydrology Model
GLASS: Global Land-Atmosphere System Study
GWSP: Global Water Systems Project
IPCC: Intergovernmental Panel on Climate Change
LSHM: Land Surface Hydrological Model
MPI-M: Max Planck Institute for Meteorology
RCM: Regional Climate Model

Contact

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