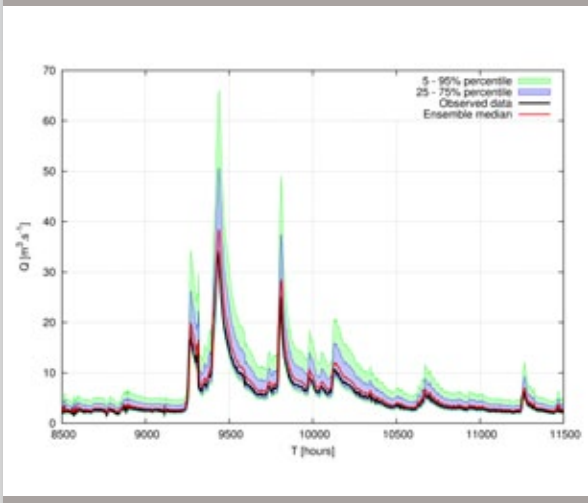
Czech University of Life Sciences Prague
Faculty of Environmental Sciences

MODELLING OF HYDROLOGICAL PROCESSES UNDER CHANGING CLIMATIC CONDITIONS

Abstract and team introduction

The modelling of hydrological processes significantly contributes to water resource management and planning in EU member states. Large and significant floods and droughts have appeared in Europe during the last two decades. It is expected that these natural phenomena will escalate due to ongoing climate change, which could have adverse impacts in many sectors ranging from agriculture, forestry and ecosystems (damage to crops, soil erosion), water resources (effect on surface and ground water quality), human health to industry, human settlements and society. This underscores the need to ensure the sustainability of water resource management, mainly through flood and drought protection, prediction and mitigation in urban and rural areas and the surrounding environment.

Our research team has long-term experience with research on hydrological process modelling with applications in water resource management, specifically with the following topics: flood forecasting, drought propagation and prediction, the impact of climate change on hydrological extremes, modelling qualitative and quantitative groundwater properties, etc.



Team members:

The team consists of experienced academic researchers, assisted by young researchers and PhD students. The members of the research team are:

prof. Ing. Pavel Pech, CSc. – Head of team
(e-mail: pech@fzp.czu.cz)
doc. Ing. Martin Hanel, PhD.
doc. Ing. Michal Kuráž, Ph.D.
doc. Ing. Petr Máca, PhD.
RNDr. Ing. Jan Kyselý, Ph.D.
Ing. Radek Roub, Ph.D.
Ing. Jiří Pavlásek, Ph.D.
5-7 PhD. students

Contacts

Address:
Faculty of Environmental Sciences, Czech University of Life Sciences Prague

Kamýcká 129
165 21 Prague 6 – Suchdol

Tel. +420 224 382 147
e-mail: projekty_fzp@fzp.czu.cz

Most significant recent publication and other results by team members:

Maca, P. Pech, J. Pavlasek, Comparing the Selected Transfer Functions and Local Optimization Methods for Neural Network Flood Runoff Forecast," Mathematical Problems in Engineering, 2014. Art. Nu. 782351.

Kuráž, M. Mayer, P. Pech,P. 2015. Solving the nonlinear and nonstationary Richards equation with two-level adaptive domain decomposition (dd -adaptivity). Applied mathematics and Computation. vol. 267. Sept. s. 207-222

Hanel M., Pavlásková A., Kyselý J., 2015: Trends in characteristics of sub-daily heavy precipitation and rainfall erosivity in the Czech Republic. International Journal of Climatology, doi 10.1002/joc.4463.

Solin, P., Kuráž, M. 2011. Solving the nonstationary Richards equation with adaptive hp-FEM, Advances in Water Resources, roč. 34, č. 9, s. 1062 - 1081.

Hanel, M., Buishand, T. 2015. Assessment of the Sources of Variation in Changes of Precipitation Characteristics over the Rhine Basin Using a Linear Mixed-Effects Model. Journal of Climate, roč. 28, č. 17, s. 6903-6919.

Software applications:
Drutes, PONS2train, Stehfest, FiltIII

Applied outcomes of our research:

- Hydrological modelling of floods and droughts under climate change.
- Methodology for flood forecasting in small headwater catchments.
- Methodology for using laser scan mapping in flood inundation.
- Modelling transport processes in porous media.
- Software application development.

Potential applications of the research:

- Software applications focused on modelling various hydrological processes.
- Methodological tools for groundwater assessment.
- Educational, advisory and decision making support materials for state and local authorities..

***Keywords**: hydrological processes, water resource management, flood and drought protection, modelling of hydrological and hydraulics processes*