Panta Rhei – Everything Flows
Change in Hydrology and Society
IAHS Scientific Decade 2013-2022
www.iahs.info/pantarhei

Details of the Proposal

Title of the Working Group

Drought in the Anthropocene

Abstract of the proposed research activity

Drought severely impacts societies and ecosystems around the world. So far most drought research has focused on natural processes in pristine catchments. In the current era, termed the Anthropocene, the human aspect can no longer be neglected. One major challenge is the quantification of impacts of drought on society, i.e. finding the relation between physical drought characteristics and wildfires, crop yields, electricity production, navigation, etc. This is a basic prerequisite for the prediction of changes in risk and vulnerability in the future.

The opposite process, the influence of society on drought, is even more a white space on the map. In many regions, humans might be regarded as additional driver of drought for example through massive groundwater abstraction for irrigation or reduced recharge as a result of extensive urbanisation. Due to complex feedbacks between drought, hydrology and society, the effects of human influence and climate cannot simply be added; a major scientific challenge lies in finding their interaction and how this changes in the future.

The objective of this working group is studying the human aspects of hydrological drought at various scales, including impacts of drought on society and influence of society on drought. The working group focusses on process understanding and prediction. The outcome is an assessment of changes in drought-society-interactions at local, regional and global scale, which is an important step in our scientific understanding and a contribution to international environmental programmes.

Panta Rhei Research Themes, Targets and Science Questions addressed by the Working Group

Themes:

- Transdisciplinarity
- Mountain hydrology
- Water and energy fluxes in a changing environment
- Hydro-meteorological extremes: Decision making in an uncertain environment
- Global Change in Hydrology and Society
- Reservoirs impact

Targets:

- Understanding
- Estimation and prediction
- Science in practice

Science Questions:

1. What are the key gaps in our understanding of hydrologic change?
2. How do changes in hydrological systems interact with and feedback on natural and social systems driven by hydrological processes?
3. How can we use improved knowledge of coupled hydrological-social systems to improve model predictions, including estimation of predictive uncertainty and assessment of predictability?
4. How can we advance our monitoring and data analysis capabilities to predict and manage hydrologic change?
5. How can we support societies to adapt to changing conditions by considering the uncertainties and feedbacks between natural and human-induced hydrologic changes?

Societal impact of the Working Group activity

The outcomes of this working group are an important step towards more sustainable management of water resources. Therefore, they are of direct relevance for international programmes on global water security. Possible interested organisations on the global scale are international institutes, such as FAO, UNESCO, UNEP, WMO. On the local scale, policy makers and water managers are expected to be actively involved in this working group. Additionally, they can directly use the methods and data developed in this working group and apply the results in their own region. Possible stakeholders on the local scale include water boards, ministries of water (or environment or energy), drinking water companies, (groups of) farmers, the energy sector, the waterborne transport sector, etc. Current connections with stakeholders on the European scale and in a number of case study regions are available through the EU-project DROUGHT-R&SPI (www.eu-drought.org). The working group will also interact with stakeholders in Latin America, Asia and Africa through the UNESCO-IHP programme G-WADI (www.gwadi.org).

List of Participants

Name of Participant	Affiliation (full address and email)	Role in Working Group (Chair or Member)	Main expertise
1 Anne Van Loon	(Wageningen University, the Netherlands)	Chair	hydrological drought, water scarcity, drought propagation, catchment scale data-analysis & modelling
2 Giuliano Di Baldassarre	Uppsala University, Sweden	Co-chair	human impact on water resources, hydrological extremes, risk management under uncertainty
3 Henny Van Lanen	Wageningen University, the Netherlands	Member	drought, catchment hydrology, modeling, monitoring, groundwater, hydrogeology
4 Tom Gleeson	McGill University, Canada	Member	Global groundwater processes, sustainability and connections to surface waters, including drought
5 Niko Wanders	Utrecht University, the Netherlands	Member	drought, hydrological modelling, data assimilation, microwave remote sensing
6 Yoshihide Wada	Utrecht University, the Netherlands	Member	Hydrology and Climate, Global Hydrological Modeling, Water Scarcity, Human Impacts on Global Water Resources, Groundwater Resources Sustainability, Hydrological Drought, Irrigation
7 Alexandra Nauditt	Cologne University of Applied Sciences	Member	drought management, river basin assessment and management, hydrological modelling, interactions between land use, water resources and climate
8 Koen Verbist	UNESCO Santiago, Chile	Member	Climate Risk Management, Decision Support Systems for Drought Management at the national/regional scale.
9 Boud Verbeiren	Vrije Universiteit Brussel, Belgium	Member	groundwater drought, remote Sensing supported hydrological modeling
10 Okke Batelaan	Flinders University, Australia	Member	recharge estimation, regional scale surface-groundwater modelling
11 Floris Van Ogtrop	The University of Sydney, Australia	Member	hydrological data driven modelling, climate modelling

12 Willem Vervoort	The University of Sydney, Australia	Member	hydrological simulation, interactions between landscape, climate and vegetation
13 Thorsten Wagener	University of Bristol, UK	Member	Hydrology, Water resource management, Global change, Uncertainty and risk, Ecosystem services
14 Jurgen Vogt	JRC, Italy	Member	European Drought Observatory
15 Elena Toth	University of Bologna, Italy	Member	Rainfall-runoff modelling, Real-time flood forecasting, rainfall remote sensing, Time-series analysis, Classification of watersheds
16 Shreedar Maskey	UNESCO-IHE Delft, the Netherlands	Member	hydrological modelling, hydrological and agricultural droughts, climate change impacts and uncertainty assessment
17 Albert Kettner	University of Colorado, USA	Member	hydrological extremes, Dartmouth Flood Observatory
18 Kimberly Rogers	Institute of Arctic and Alpine Research, University of Colorado, USA	Member	fresh water management and irrigation practices, coastal and deltaic sedimentation
19 Lena Tallaksen	University of Oslo, Norway	Member	Hydrological drought characterisation and analysis, climate drivers, drought impacts, climate change
20 Justin Sheffield	Princeton University, USA	Member	global land surface hydrological cycle, historic and future drought, soil moisture memory, precipitation recycling, teleconnectivity
21 Marjolein Van Huijgevoort	University of Aberdeen, UK	Member	Drought, catchment hydrology, hydrological modelling
22 Jamie Hannaford	CEH, UK	Member	Hydrological drought, drought indicators, drought monitoring and early warning, long-term trends and variability, climate drivers
23 Simon Parry	CEH, UK	Member	Drought, drought termination, floods, hydrological extremes,

			hydrometric data, hydrological modelling
24 Christel Prudhomme	CEH, UK	Member	drought propagation, recovery, catchment properties, seasonal forecasting of low flows, climate change