



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

ANTHROPOGENIC AND CLIMATIC CONTROLS ON WATER AVAILABILITY (ACCURACY)

Abstract of the proposed research activity

Today's highly dynamic social development is dramatically dependent on water. Population growth and land-use dynamics are intimately intertwined with freshwater resources. A central problem to address under the *Panta Rhei* umbrella involves improving our understanding of the coupling between societal processes and our freshwater resources. This critical task is made more challenging by the decline of existing streamgauging networks and the paucity of networks in developing countries. Our approach will consider unconventional sources of information (e.g., short data series from mobile/deployable monitoring equipment, historical/geomorphological information, output from large-scale hydrological models) as well as recent advances in remote sensing technologies for monitoring inland water and land surface hydrological fluxes and state variables. The WG brings together researchers with expertise in climatic and anthropogenic controls on hydrological processes, aiming at advancing our understanding of the spatial and temporal dynamics of freshwater availability and their links and impacts on societal processes and resilience.

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

The WG activities will focus on all three Panta-Rhei Targets (i.e.: 1 Understanding; 2 Estimation and prediction; 3 Science in Practice) addressing a number of main science questions enumerated in the Panta Rhei web site (SQ):

SQ - What are the key gaps in our understanding of hydrologic change?

SQ - How do changes in hydrological systems interact with and feedback on natural and social systems driven by hydrological processes?

SQ - How can we advance our monitoring and data analysis capabilities to predict and manage hydrologic change?

SQ - How can we use improved knowledge of coupled hydrological-social systems to improve model predictions, including estimation of predictive uncertainty and assessment of predictability?

SQ - How can we advance our monitoring and data analysis capabilities to predict and manage hydrologic change?

SQ - How can we identify water resource system resilience and vulnerability so that we can optimally allocate limited resources? (not from Panta Rhei website)

Societal impact of the Working Group activity

The primary goal of the research activities is to enhance our capability of predicting streamflow regimes and assessing freshwater availability under dynamically varying anthropogenic controls for different geographical contexts and climatic conditions. The WG research activity will foster the development of innovative tools for supporting the decision-making process of institutions and public bodies in charge of defining and implementing integrated water resources management plans (e.g., improved prediction of surface water availability, also accounting for non-conventional and soft data; improved criteria for defining reference environmental flows; better understanding of the resilience and vulnerability of water-infrastructure in the face of environmental change; improved techniques for representing changing conditions due to hydroclimatic uncertainties and anthropogenic interventions; improved simulation tools for integrated hydrological modelling and water resources management; improved methods for hydro-environmental impact assessment in human-modified basins; improved multiobjective analysis methods to be embedded in optimization based decision support systems; a preliminary assessment of our ability to detect, attribute and manage water availability in a changing world).

Potential connection with a number of stakeholders and agencies is envisaged: Water Resources Commission (Ghana); Volta River Authority (Burkina Faso, Ghana); International Water Management Institute (Offices throughout Asia and Africa); Direcção Nacional de Água (Mozambique); Nile Basin Initiative (International); Panama Canal Authority (International); Ministry of Water Resources (Iraq); Instituto Nacional de Recursos Hidráulicos (Dominican Rep.); Ministère de l’Agriculture, des Ressources Naturelles et du Développement Rural (Haiti); Po River Basin Authority (Italy), Emilia-Romagna Environmental Protection Agency (ARPA-RER, Italy); Environment Agency (UK); Network Rail (UK); United States Geological Survey (USA).

List of Participants (21 participants from: Africa, Austria, Canada/UAE, Greece, Italy, The Netherlands, Slovakia, Spain, Swiss, United Kingdom, USA)

The WG members combine a complex palette of skills enabling the WG to perform investigations at local and regional scales, by using deterministic and statistical approaches in a variety of geographical contexts and climatic conditions .

Name of Participant	Affiliation (full address and email)	Role in WG (Chair or Member)	Main expertise
Attilio Castellarin (Italy)	DICAM - Univ. of Bologna Viale Risorgimento, 2 40136 Bologna Italy attilio.castellarin@unibo.it	Chair	Surface water resources assessment; anthropogenic effects on hydrological processes and Water-Society interactions; hydrological predictions in ungauged basins (PUB problem); regionalisation of hydrological information; catchment classification; frequency analysis of hydrological extreme events (rainstorms, floods and droughts); s hydrological GIS and open-software applications.
Luigia Brandimarte (The Netherlands)	Dept. of Water Science & Engineering UNESCO-IHE, Institute for Water Education, Westvest 7, 2611 AX, Delft, NL L.Brandimarte@unesco-ihe.org	Member	River structures, flood risk mitigation measures, population dynamics and their impacts on water demand and availability, hydropower potential assessment.
Ann van Griensven (The Netherlands)	UNESCO-IHE, Institute for Water Education, Westvest 7, 2611 AX, Delft, NL a.vangriensven@unesco-ihe.org	Member	Land use change and interactions with climate/hydrological change, as well as effects on water quality and ecology. Integration of models and remote sensing. Water quality and hydrological modelling. Uncertainty analysis of models and optimisation algorithms. Member of the developer team of the open source “Soil and Water Assessment Tool”, board member of the SWAT foundation, member of IAHS group on water quality.
Paolo Paron (The Netherlands)	Dept. of Water Science & Engineering UNESCO-IHE, Institute for Water Education, Westvest 7, 2611 AX, Delft, NL	Member	Hydrological and Fluvial Geomorphology field data collection; Remote Sensing of optical imagery; GIS applications; use of UAV and Kite Aerial Photography for monitoring.

Name of Participant	Affiliation (full address and email)	Role in WG (Chair or Member)	Main expertise
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Jan Seibert (Swiss)	Department of Geography Hydrology and Climate University of Zurich Winterthurerstrasse 190 CH-8057 Zürich Switzerland jan.seibert@geo.uzh.ch	Member	Hydrological modelling at different scales in combination with experimental studies. Catchment models for land-use and climate change impact studies, runoff estimation in ungauged basins, use of runoff models as foundation of water quality models, model calibration and validation as well as uncertainty analysis and risk assessment, relationships between topography and hydrological processes (including hydrological landscape analysis)
Magdalena Rogger (Austria)	Institute of Hydraulic Engineering and Water Resources Management Vienna University of Technology Karlsplatz 13/222 A-1040 Vienna, Austria rogger@hydro.tuwien.ac.at	Member	Catchment hydrology, runoff processes in alpine regions, currently working on the impacts of land use change on the hydrological regime and extreme flood estimation.
Jose Luis Salinas (Austria)	Institute of Hydraulic Engineering and Water Resources Management Vienna University of Technology Karlsplatz 13/222 A-1040 Vienna, Austria salinas@waterresources.at	Member	Catchment hydrology, floods hydrology, regional methods, stochastic modelling, assessment of river training and hydraulic structures on hydrologic change
Alberto Viglione (Austria)	Institute of Hydraulic Engineering and Water Resources Management Vienna University of Technology Karlsplatz 13/222 A-1040 Vienna, Austria viglione@hydro.tuwien.ac.at	Member	Runoff prediction in ungauged basins, catchment hydrology, flood process understanding and flood frequency analysis, analysis of interaction between society and hydrological processes, developer of R-packages for frequency analysis of hydrological time-series
Silvia Kohnová (Slovakia)	Department of Land and Water Resources Management, Technical University of Bratislava, Slovakia silvia.kohnova@stuba.sk	Member	Catchment hydrology, regional flood frequency analysis; seasonality and design value estimation, modelling of hydrological change
Andreas Efstratiadis (Greece)	Department of Water Resources and Environmental Engineering, Technical University of Athens (NTUA.) 5, Heroon Polytechniou, Zografou 15773 Athens, Greece andreas@itia.ntua.gr	Member	Hydrological modelling, systems analysis, stochastic simulation, water management and hydroinformatics (global optimization, multi-criteria analysis, model calibration). Developer of innovative hydrological software (Hydrogeios: semi-distributed hydrological model for human-modified basins and flood simulations; Hydronomeas: decision support tool for optimal management of hydrosystems; Castalia: multi-variate stochastic simulation).
Thomas Kjeldsen (United Kingdom)	Department of Architecture and Civil Engineering University of Bath Claverton Down Bath BA2 7AY United Kingdom T.R.Kjeldsen@bath.ac.uk	Member	Catchment and urban hydrology, stochastic hydrology, regionalization of hydrological information, frequency analysis of extreme events.
Alessio Pugliese (Italy)	DICAM - Univ. of Bologna Viale Risorgimento, 2 40136 Bologna Italy alessio.pugliese3@unibo.it	Member	Surface water availability assessment, geostatistical applications in hydrology, prediction of flow-duration curves in ungauged basins
Luis Mediero (Spain)	Department of Civil Engineering: Hydraulic and Energy, Technical University of Madrid, c/Profesor Aranguren s/n, 28040 Madrid, Spain luis.mediero@upm.es	Member	Impact of climate change on water resources availability; water scarcity diagnosing; reservoir operation during droughts; multiple-purpose reservoir operation; hydrological forecasts; flood frequency analysis.
Ana Requena (Spain)	Department of Civil Engineering: Hydraulic and Energy, Technical University of Madrid, c/Profesor Aranguren s/n, 28040 Madrid, Spain ana.requena@caminos.upm.es	Member	Bivariate local frequency analysis using copulas; bivariate regional flood estimation in ungauged sites based on copulas.

Panta Rhei, WG: ANTHROPOGENIC AND CLIMATIC CONTROLS ON WATER AVAILABILITY (ACCURACY)

Name of Participant	Affiliation (full address and email)	Role in WG (Chair or Member)	Main expertise
Alberto Pistocchi (Italy - JRC)	European Commission DG Joint Research Centre Unit H 01 - Water Resources Unit Via Enrico Fermi 2749 I-21027 Ispra Italy alberto.pistocchi@jrc.ec.europa.eu	Member	River basin management planning, integrated water resources assessment and management, hydrological and chemical pollution modelling.
Christian Omuto (Africa)	Department of Environmental and Biosystems Engineering, University of Nairobi, P.O. Box 30197-00100, Nairobi, Kenya thineomuto@yahoo.com cthine@gmail.com	Member	Mixed Effect Modelling, Geostatistics. Programmer of R-packages: http://www.rdocumentation.org/packages/HydroMe http://www.rdocumentation.org/packages/HydroMe/functions/SSgampt
Stacey Archfield (USA)	National Research Program, U.S. Geological Survey MS - 430, 12201 Sunrise Valley Drive, Reston, VA 20192 USA sarch@usgs.gov	Member	Research Hydrologist in the area of stochastic hydrology, prediction in ungauged basins, and quantification of water availability and hydrologic change.
Julie E. Kiang (USA)	Office of Surface Water U.S. Geological Survey, MS-415 12201 Sunrise Valley Drive Reston, VA 20192 USA jkang@usgs.gov	Member	Surface water resources assessment; regionalization of hydrologic information, frequency analysis of peak flows and low flows; hydrological predictions in ungauged basins (PUB problem).
Richard M. Vogel (USA)	Department of Civil and Environmental Engineering Tufts University Medford, MA 02155, USA Richard.Vogel@tufts.edu	Member	Regional hydrology, anthropogenic impacts on water resource systems, hydrologic predictions in ungauged basins, flood and drought frequency analysis, water resource systems, hydrologic design under nonstationarity, natural hazards
Charles N. Kroll (USA)	Environmental Resources Engineering SUNY College of Environmental Science and Forestry 424 Baker Lab 1 Forestry Drive Syracuse, NY 13210 USA cnkroll@esf.edu	Member	Environmental modeling, low streamflow prediction, prediction at ungauged and partially gauged basins, stochastic hydrology, water resource vulnerability, rainfall runoff modeling, environmental systems engineering, anthropogenic impacts on water resources, frequency analysis of extreme events.
Taha B.M.J. Ouarda (Canada & UAE)	Water and Environmental Engineering Masdar Institute PO Box 54224, Adu Dabi United Arab Emirates touarda@masdar.ac.ae	Member	Hydrometeorology, environmental and public health modeling, and risk analysis. Estimation of extreme hydro-meteorological events on local and regional scales, modeling of hydro-meteorological variables under changing environments. Links between climate evolution, the environment, and public health. Developer of computer software that deals with a range of problems in the fields of water resources and environmental engineering.
Daniele Ganora (Italy)	Department of Environment, Land and Infrastructure Engineering Politecnico di Torino Corso Duca degli Abruzzi 24, 10129 Torino, ITALY daniele.ganora@polito.it	Member	Regional methods for high and low flows, flood frequency analysis, anthropogenic effects on streamflow statistics, water availability and flow duration curve prediction, cost-benefit analysis.