

Report on Panta Rhei during the year 2015-2016

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May 3rd, 2016

SUMMARY

Panta Rhei is now in its second biennium, and is a highly successful initiative that is helping to shape and motivate the research of the international hydrological community towards the area of “Hydrology, Society and Change”. With more than 400 scientists involved in 31 Working Groups, we represent a significant force in current hydrological research. Even more so now than at the beginning of the Panta Rhei decade in 2013, the impact of humans and environmental change on hydrological systems is recognised as a driving theme in water science.

THE STRUCTURE OF PANTA RHEI

For the Biennium 2015-2017, during the IUGG General Assembly held in Prague, The IAHS Bureau nominated the following officers:

- Chair: Hilary McMillan (National Institute of Water and Atmospheric Research, New Zealand; San Diego State University, USA)

- Target Leaders:

Dr. Heidi Kreibich; Helmholtz Centre Potsdam, Germany

Dr. Junguo Liu; Beijing Forestry University, China

Dr. Anne Van Loon; University of Birmingham, UK

Dr. Alfonso Mejia; Pennsylvania State University, USA

Dr. Dinis Juízo; Eduardo Mondlane University, Mozambique

Dr. Tobias Krüger; Humboldt University of Berlin, Germany

In contrast to the previous biennium, the target leaders were not assigned specific roles, but instead form a leadership team who undertake leadership tasks as required.

PANTA RHEI – ACTIVITIES DURING 2015-2016

Working Groups

Panta Rhei is organised through Working Groups formed by the community, each group representing a specific research area relevant to the overarching theme of “Change in Hydrology and Society”. Each group is responsible for organising their own activities and contributing to wider goals of the Panta Rhei initiative, as well as reporting back to IAHS. Since the previous report to the Bureau, an additional 9 working groups have been formed, giving a total of 31 working groups, as follows:

1. Hydro-meteorological extremes: Decision making in an uncertain environment - Chair: Adrián Pedrozo-Acuña

2. Large dams, society, and environment - Chair: Bellie Sivakumar
3. Thirsty future: energy and food impacts on water - Chair: Ana Mijic
4. Changing biogeochemistry of aquatic systems in the Anthropocene - Chair: Hong-Yi Li
5. Transdisciplinarity - Chair: Tobias Krueger
6. Natural and man-made control systems in water resources - Chair: Ronald van Nooijen
7. Water and energy fluxes in a changing environment - Chair: Maria J. Polo
8. Epistemic uncertainties - Chair: Paul Smith
9. Comparative water footprint studies - Chair: Arjen Y. Hoekstra
10. Hydrologic services and hazards in multiple ungauged basins - Chair: Hilary McMillan
11. Understanding flood changes - Chair: Alberto Viglione
12. Physics of hydrological predictability - Chair: Alexander Gelfan
13. Mountain hydrology - Chair: Shreedhar Maskey
14. Large sample hydrology - Chair: Vazkén Andreassian
15. Socio-hydrologic modeling and synthesis - Chair: Veena Srinivasan
16. Sustainable water supply in a urban change - Chair: Tatiana Bibikova
17. Water footprint of cities - Chair: Alfonso Mejia
18. Evolving urban water systems - Chair: Alfonso Mejia
19. Changes in flood risk - Chair: Heidi Kreibich
20. Anthropogenic and climatic controls on water availability (ACCuRAcY) - Chair: Attilio Castellarin
21. Floods in historical cities - Chair: Alberto Montanari
22. Prediction under Change (PUC) - Chair: Hafzullah Aksoy
23. Data-driven Hydrology - Chair: Elena Toth
24. Modeling Hydrological Processes and Changes - Chair: Yangbo Chen
25. Resilience-based management of natural resources: the fundamental role of water and soil in functional ecosystems - Chair: David Finger
26. Integrating history, social conflicts and hydrology: From semi pristine to highly modified hydrological systems - Chair: Victor Rosales Sierra
27. Drought in the Anthropocene - Chair: Anne Van Loon
28. Water scarcity assessment: methodology and application - Chair: Junguo Liu
29. Improving Hydrological Systems Knowledge - Chair: Jun Xia
30. Process-based hydrologic modeling for decision making - Chair: Chaopeng Shen
31. Status and future of African river systems - Chair: Jörg Helmschrot

Current reports from each Working Group are available at:

<http://iahs.info/Commissions--W-Groups/Working-Groups/Panta-Rhei/Working-Groups.do>

Website

At the start of the 2015 – 2017 biennium, a decision was made to transfer the Panta Rhei webpages directly onto the IAHS webpage where they could find a permanent and secure home. The transfer was made primarily by Claire Lupton, and we thank Claire for her careful work. The webpages can be found at: <http://iahs.info/Commissions--W-Groups/Working-Groups/Panta-Rhei/>. Up to date information on the Panta Rhei structure, news items, working groups, relevant papers etc. can be found on the site.

Summary Paper

The Panta Rhei science leaders and all of the working group leaders prepared a paper describing science progress during the first biennium, "Panta Rhei 2013-2015: Global perspectives on hydrology, society and change", published in Hydrological Sciences Journal in March 2016. The paper is available open access at: <http://www.tandfonline.com/doi/abs/10.1080/02626667.2016.1159308>. The paper provides an excellent summary of the extremely diverse research being undertaken by the working groups, and is recommended to anyone who would like further details on this point.

Scientific symposia

Panta Rhei Day workshop

On 16 April 2016 we held a 'Panta Rhei Day' workshop at TU Vienna. The aim of this workshop was to bring together motivated Panta Rhei scientists to meet each other, discuss common research and plan future initiatives for Panta Rhei. The day was a great success with 23 attendees and much discussion and sharing of ideas. In the morning, invited presentations were given by Siva Sivapalan, Tobias Krueger, Heidi Kreibich and Anne van Loon. In the afternoon, participants chose from three workshop sessions:

- 1. *Panta Rhei library*:** Develop bibliographies of key papers on relevant themes such as water scarcity, global water cycle, water use assessments
- 2. *Panta Rhei stories*:** Create an online Panta Rhei map with overview information of projects undertaken by working groups
- 3. *HSJ Panta Rhei opinion paper*:** Develop an outline for an opinion paper on the theme: "*Panta Rhei includes working groups looking at mountain hydrology, rural hydrology and urban hydrology. What new insights can we gain by bringing these different perspectives together?*"

Each of these workshop sessions has led to a new Panta Rhei project for the coming year, led by Hilary McMillan (Panta Rhei library), Tobias Krueger and Anne Van Loon (Panta Rhei stories) and Heidi Kreibich (Panta Rhei opinion paper).

EGU 2016

Several conference sessions at EGU 2016 were organised through Panta Rhei.

HS1.1 Panta Rhei: Early career scientists' vision and progress for research in hydrology, society and change. PICO Session. Convener: Hilary McMillan | Co-Conveners: Tobias Krueger, Anne Van Loon, Heidi Kreibich. This was an interactive PICO session, designed as a forum for discussion of Panta Rhei future directions. It included invited talks by 4 young scientists and a lively audience discussion.

HS7.4 Change in climate, hydrology and society. Convener: Demetris Koutsoyiannis | Co-Conveners: João de Lima, C. Cudennec, Yannis Markonis.

Other relevant sessions were organised through the working groups Transdisciplinarity, Drought in the Anthropocene and Changes in Flood Risk.

Panta Rhei meeting space at AGU 2015

Panta Rhei working groups were invited to use the AGU conference as an opportunity to meet up with fellow working group members to plan future activities or papers. We booked a private room within the AGU conference for Panta Rhei discussions, as a free space to meet Panta Rhei colleagues within and across working groups.

International workshop on hydrology-biogeochemistry

The International workshop on hydrology-biogeochemistry was held at Wuhan, China in the last week of October, 2015. This workshop was initialized under the umbrella of the Panta Rhei working group, "Changing biogeochemistry of aquatic systems in the Anthropocene", and co-organized by Dr. Chongxuan Liu and Dr. Hongyi Li. Funding and logistic support for this workshop was primarily from China University of Geosciences (Wuhan).

Upcoming workshops

Groundwater quality IAHS conference organised by water scarcity working group members

The Conference organizing Committee from the Southern University of Science and Technology (SUSTech) is pleased to welcome you to the 9th International Association of Hydrological Sciences (IAHS) Groundwater Quality Conference (GQ16) to be held at SUSTech, Shenzhen, China, July 24-28, 2016.

International Workshop on Hydrological Knowledge Innovation and its Practices in Developing Countries

Panta Rhei scientists in China and the Chinese National Committee of the Panta Rhei Program are organising an International Workshop on Hydrological Knowledge Innovation and its Practices in Developing Countries on November 13-17, 2016, Shenzhen & Wuhan, China.

Ongoing initiatives

Panta Rhei opinion articles in HSJ

To encourage discussion and interaction between Panta Rhei working groups, and from scientists outside Panta Rhei, the Panta Rhei leadership team are organising a series of invited opinion articles in HSJ. The initiative is being coordinated by Heidi Kreibich with the assistance of the HSJ editors. We plan to bring together diverse opinions on some of the hot topics of hydrology in a changing world, with early articles planned on

'Uncertain socio-hydrologic futures' (in preparation, led by Veena Srinivasan)

'The role of experimental hydrology in the Anthropocene' (in preparation, led by Theresa Blume)

'Attribution of extreme flood/drought events to human influence on hydrology'

'The water-energy-food nexus'.

Panta Rhei HESS Special Issue

We have invited each of the Panta Rhei working groups to prepare a paper for a special issue of HESS (Hydrology and Earth System Sciences journal) "Panta Rhei: Opinions and progress towards

hydrology for a changing world". The special issue is open for submissions from 1 Oct 2015 - 1 Oct 2016.

See also

The ongoing projects *Panta Rhei library*, *Panta Rhei stories* and *Panta Rhei opinion paper* under the Panta Rhei Day section above.

The Panta Rhei leadership team thanks IAHS for their continued support and encouragement.