



# From PUB To Panta Rhei

Hubert Savenije

President IAHS

Alberto Montanari

Panta Rhei Chair 2013-2015



IAHS - Panta Rhei  
Change in Hydrology and Society  
*IAHS Scientific Decade 2013-2022*



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#### Bologna IAHS 2014-6th IAHS International Symposium on Integrated Water Resources Management

Evolving Water Resources Systems - Understanding, Predicting and Managing Water - Society Interactions

#### Panta Rhei at AGU and the Panta Rhei Poster

Submitted by alberto on Sun, 12/08/2013 - 15:27

The Panta Rhei session at the AGU Fall meeting is going to be held on Tuesday, December 10 and Wednesday, December 11. We will publish a report on the session that counts more than 50 contributions! A Poster on Panta Rhei will be presented in the session to introduce Panta Rhei to the international scientific community. The poster is available for [download here!](#). I am looking forward to see in person all of you that are attending AGU!

#### Tags:

[Panta Rhei](#) [AGU](#) [poster](#)



[Read more](#)

#### Call for Research Themes and Working Groups of Panta Rhei

Submitted by alberto on Wed, 10/30/2013 - 09:57

The call for [Research Themes](#) and [Working Groups](#) of Panta Rhei was published on October 30, 2013. The publication of the call marks the actual start-up of the involvement of the community in Panta Rhei. Please read the call at the above linked pages. We are looking forward to receiving the feedback from the community, through innovative ideas and availability to establish a mutual cooperation. Please do not hesitate to [contact us](#) for any clarification!



**Please beware that the first deadline for proposing Research Themes and Working Groups is fixed at January 31st, 2014.**

# Panta Rhei Everything Flows

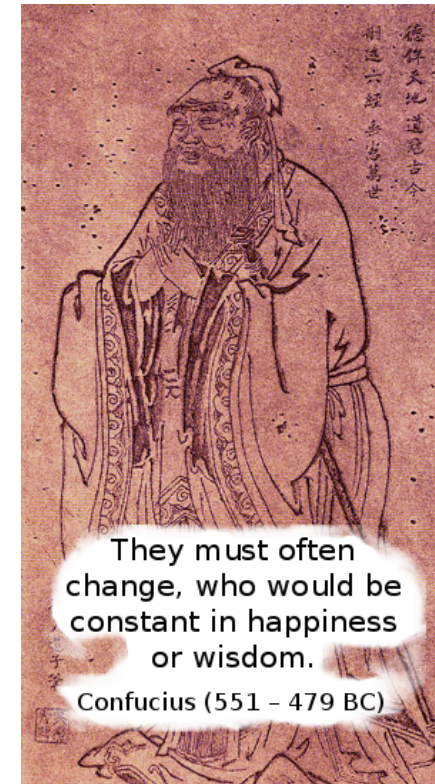
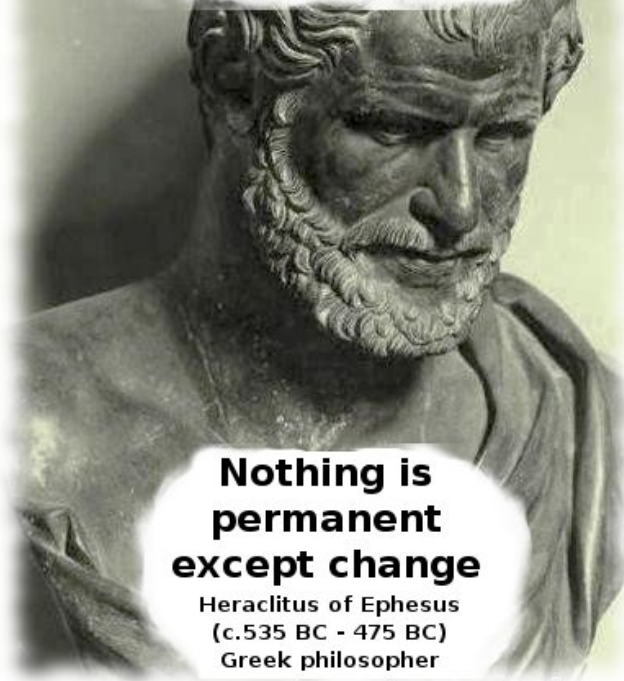
The new Science Initiative of the  
International Association of  
Hydrological Sciences  
(IAHS)  
[www.iahs.info/pantarhei](http://www.iahs.info/pantarhei)

## Panta Rhei: the IAHS Science Initiative 2013-2022

Launched in July 2013 at the IAHS General Assembly  
Montanari et al. (2013)

2013  
Change  
2022

No man ever steps in the  
same river twice, for it's not  
the same river and he's not  
the same man



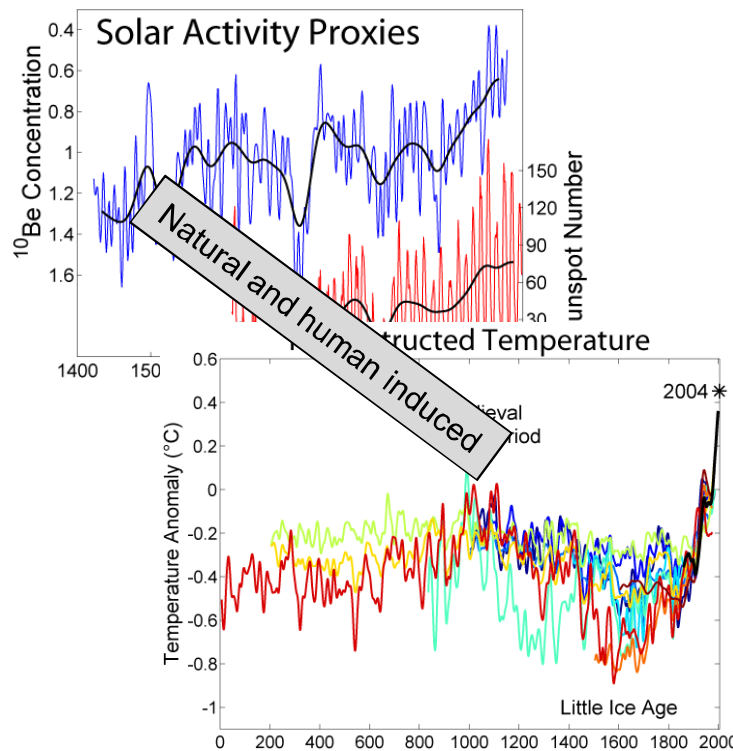
## **Hydrological change: “a well known unknown”**

- Climate change: a significant and lasting change in the statistical distribution of weather patterns over periods ranging from decades to millions of years
- Hydrological change: a change in hydrological processes, either resulting from natural variability or due to anthropogenic catchment modifications

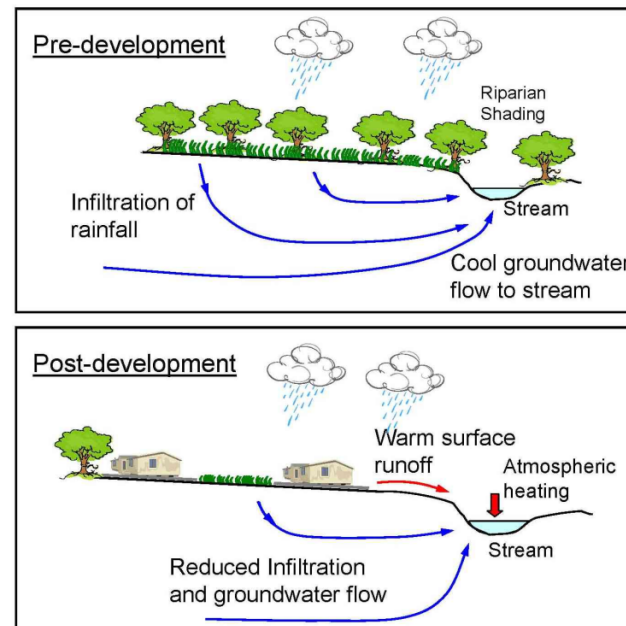


# Hydrological Change

## Climate change



## Land use change



From University of Minnesota  
<http://troutstreamresearch.safl.umn.edu/>

## River training



Genoa – Flood event in 2011



Tunnelling of Seveso River



## International scientific associations in Hydrology



EGU – European Geosciences Union  
([www.egu.eu](http://www.egu.eu))



AGU – American Geophysical Union ([www.agu.org](http://www.agu.org))



IAHS – International Association of Hydrological Sciences ([www.iahs.info](http://www.iahs.info))  
(along with National Hydrological Associations)

### Why a major research initiative?

- Focus on an emerging scientific challenges
- Strengthen international cooperation and competition
- Facilitate international exchange and comparison of research results
- Promote the visibility of Hydrology as a science
- Inspire and create opportunities for young researchers

## Previous IAHS Science Initiatives - PUB



PUB was a great success. The start-up paper (Sivapalan et al., 2003, published on HSJ) received 325 ISI citations already. It is estimated that more than 500 papers made reference to PUB.







# PUB Closure

Delft,  
2012

International Association of Hydrological Sciences  
Association Internationale des Sciences Hydrologiques

**Celebrating 90 years of  
international scientific cooperation  
and activity**



Delft, October 2012



## **A decade of Predictions in Ungauged Basins (PUB)—a review**

M. Hrachowitz<sup>1</sup>, H. H. G. Savenije<sup>1,2†</sup>, G. Blöschl<sup>3†</sup>, J. J. McDonnell<sup>4,5†</sup>, M. Sivapalan<sup>6†</sup>,  
J. W. Pomeroy<sup>7†</sup>, B. Arheimer<sup>8</sup>, T. Blume<sup>9</sup>, M. P. Clark<sup>10</sup>, U. Ehret<sup>11</sup>, F. Fenicia<sup>1,12</sup>, J. E. Freer<sup>13</sup>,  
A. Gelfan<sup>14</sup>, H. V. Gupta<sup>15</sup>, D. A. Hughes<sup>16</sup>, R. W. Hut<sup>1</sup>, A. Montanari<sup>17</sup>, S. Pande<sup>1</sup>, D. Tetzlaff<sup>5</sup>,  
P. A. Troch<sup>15</sup>, S. Uhlenbrook<sup>1,2</sup>, T. Wagener<sup>18</sup>, H. C. Winsemius<sup>19</sup>, R. A. Woods<sup>18</sup>, E. Zehe<sup>11</sup>  
and C. Cudennec<sup>20‡</sup>

<sup>1</sup>*Water Resources Section, Faculty of Civil Engineering and Applied Geosciences, Delft University of Technology, Stevinweg 1, 2600 GA Delft, The Netherlands*  
[m.hrachowitz@tudelft.nl](mailto:m.hrachowitz@tudelft.nl)

<sup>2</sup>*UNESCO-IHE Institute for Water Education, Westvest 7, 2601 DA Delft, The Netherlands*

<sup>3</sup>*Institute of Hydraulic Engineering and Water Resources Management, Vienna University of Technology, Vienna, Austria*

<sup>4</sup>*Global Institute for Water Security, University of Saskatchewan, 11 Innovation Boulevard, Saskatoon, SK S7N 3H5, Canada*

<sup>5</sup>*Northern Rivers Institute, School of Geosciences, University of Aberdeen, Aberdeen, AB24 3UF, UK*

<sup>6</sup>*Departments of Civil and Environmental Engineering and Geography and Geographic Information Science, University of Illinois at Urbana-Champaign, Urbana, USA*



# PUB Conclusions



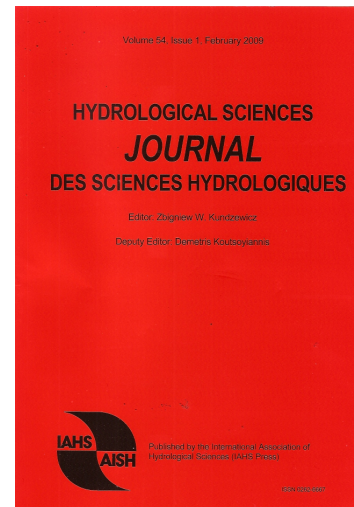
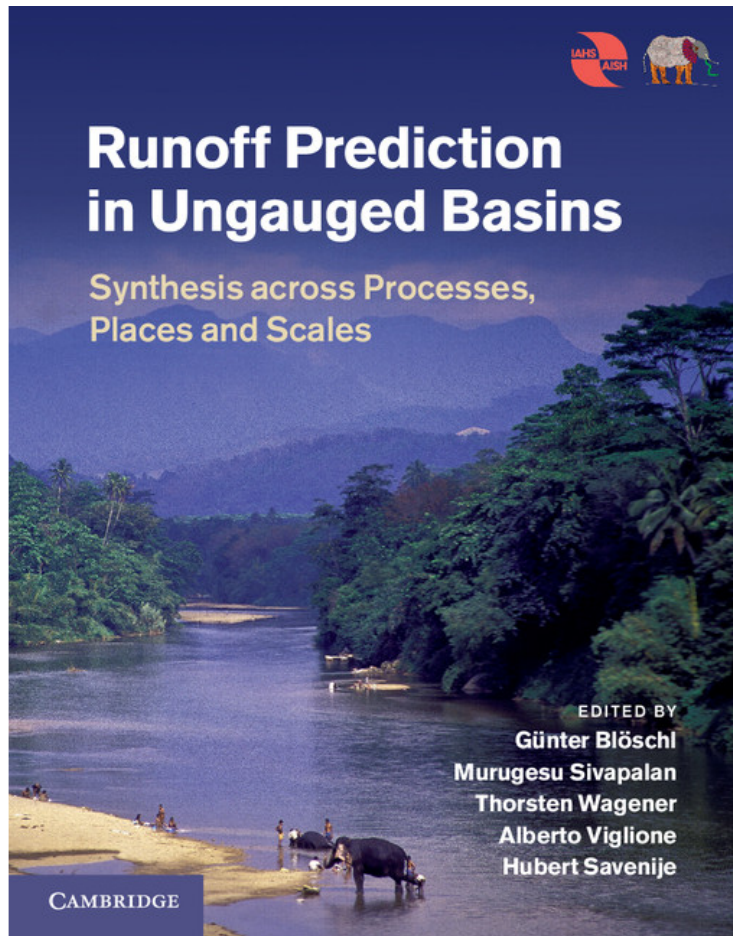
1. Improved process understanding (thresholds)
2. New modelling approaches (landscape)
3. Flexible model structures
4. **Newtonian versus Darwinian**
5. Comparative hydrology
6. Systematic uncertainty assessment
7. Link between Form and Function: Emergent properties, landscape, signatures
8. Co-evolution, organising principles



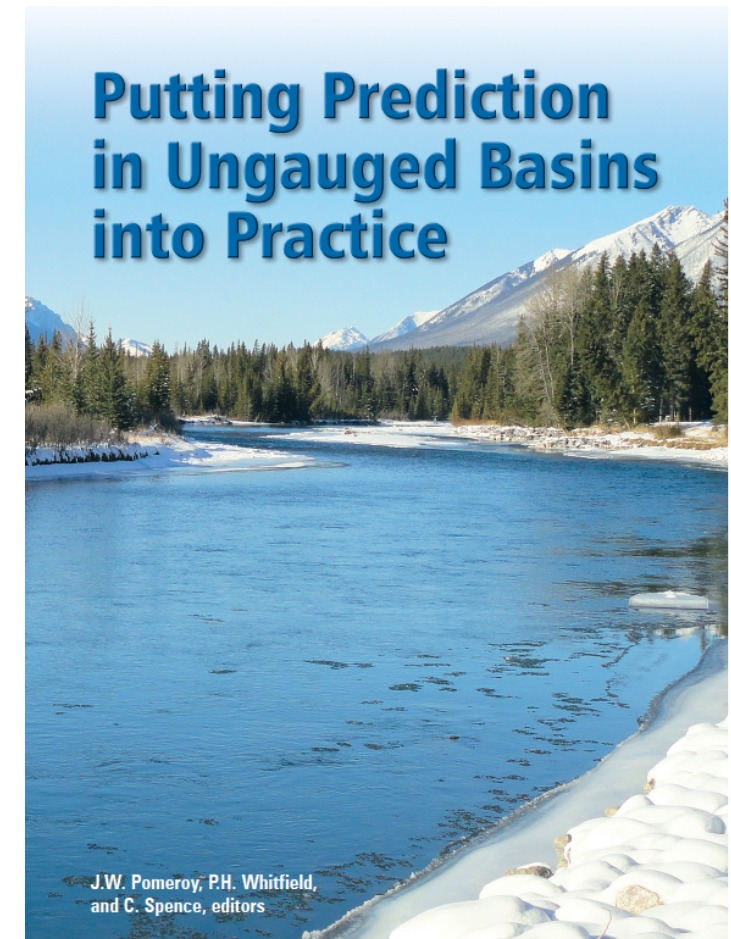
# PUB synthesis



2003-2012



Hrachowitz et al.  
2013







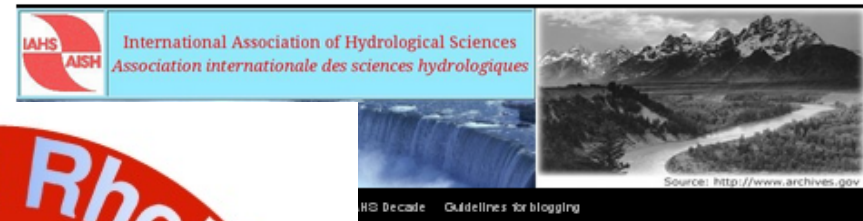
# Next Decade 2013-2022



## The IAHS Science Initiative 2013-2022 The result of a worldwide consultation

A Science Initiative of the International Association of Hydrological Sciences

Open discussion on the next 10 years of research in hydrology

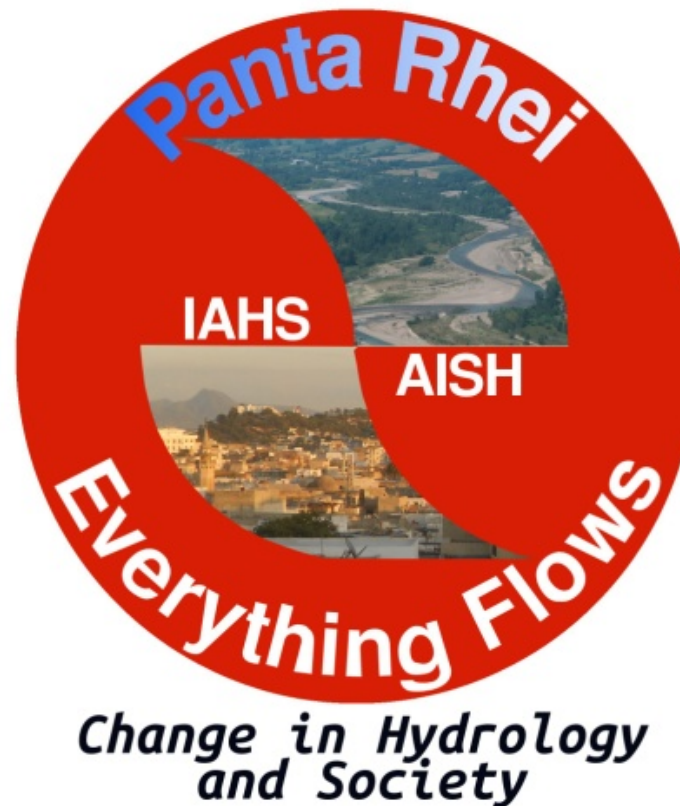


IAHS Task Force lead by:  
**Alberto Montanari**

World-wide consultation process:

<http://distart119.ing.unibo.it/iahs>

About 32000 single visits in 2012  
About 60 comments by 36 different people  
A long series of personal emails



*Change in Hydrology and Society*

Science Plan for the New Decade  
Leave a comment!  
[Please read the instructions first](#)

Decade of IAHS 2013-2022

Panta Rhei

Ready to start!

Version of the Science Plan

presenting Panta Rhei (in the International Association of Hydrological Sciences Journal)

new website of Panta Rhei (to be launched in the next few months)

Become a Member of IAHS  
Click [here](#) to become a member of IAHS (line of charge)

Leave a Comment  
Click [here](#) to add a comment to the discussion on the new Science Initiative of IAHS

Contact the moderator  
Click [here](#) to send an email to the moderator

July 2013

M	T	W	T	F	S	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

[« Nov](#)

Blog Sections

- Recent Comments
- [Mariusz Ostrowski](#) on [The Science Plan of the IAHS Decade 2013 – 2022](#)
  - [David Gann](#) on [The Science Plan of the IAHS Decade 2013 – 2022](#)
  - [Salvatore Grimaldi](#) on [The Science Plan of the IAHS Decade 2013 – 2022](#)
  - [Clara Hansen and Sally](#)



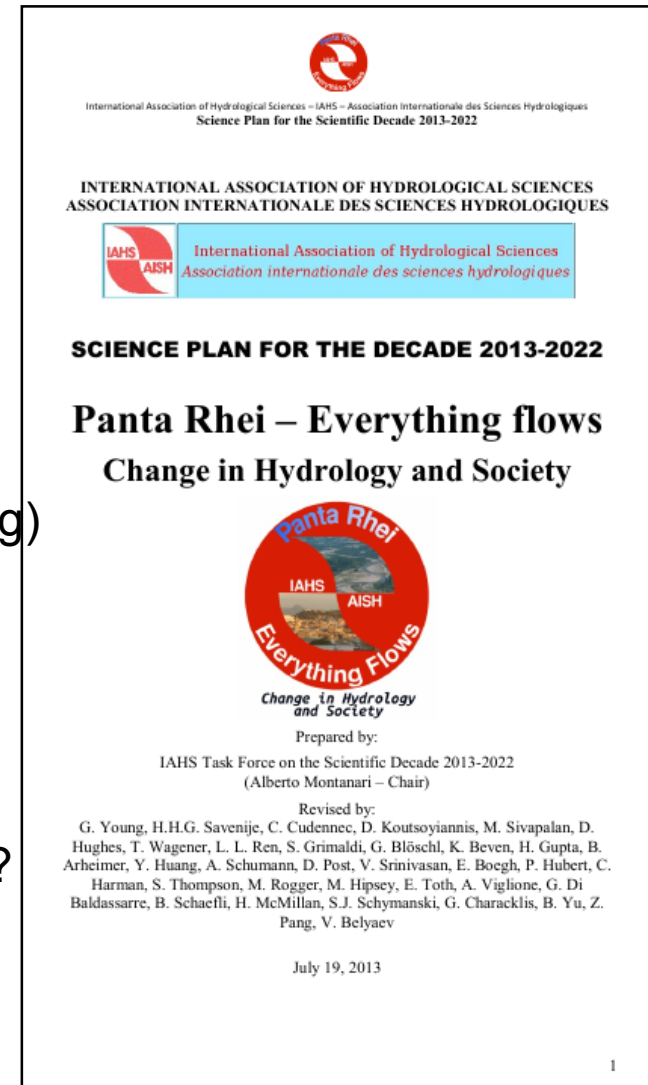
## The IAHS Science Initiative 2013-2022 Change in Hydrology and Society Science Plan

### Targets:

- Understanding (Hillary McMillan, Magdalena Rogger)
- Estimation and prediction (Hafzullah Aksoy, Dominic Mazvimavi)
- Science in practice (Giuliano Di Baldassare, Yan Huang)

### Science questions:

1. How to improve model predictions by incorporating knowledge on coupled hydrological-social?
2. How to advance monitoring and data analysis capabilities to predict and manage hydrologic change?
3. How can we support societies in adapting to change?







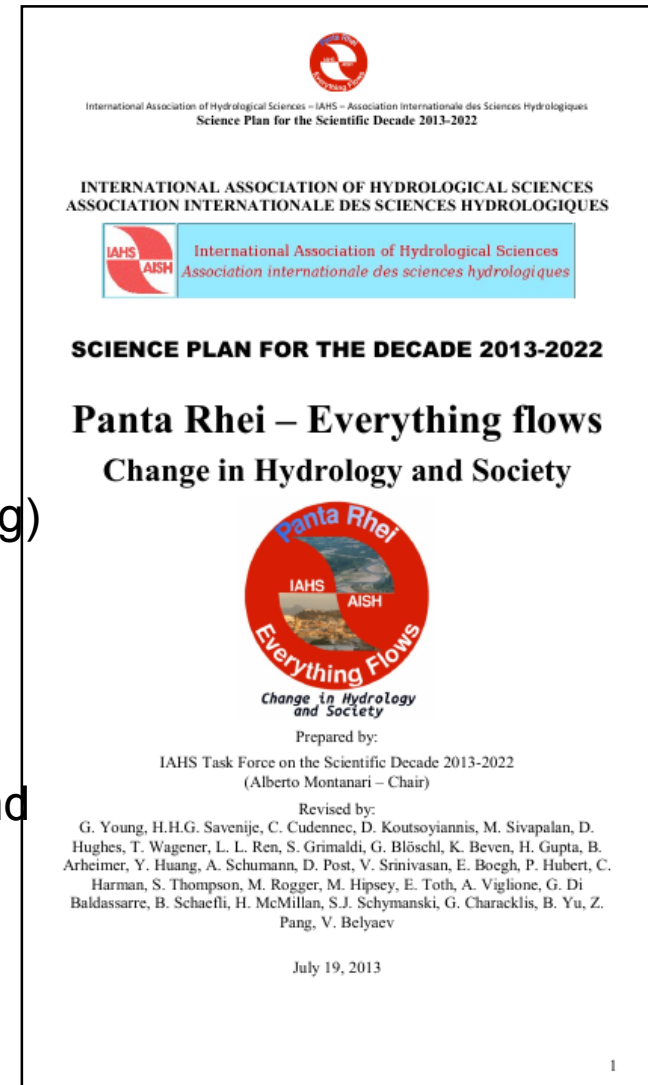
## The IAHS Science Initiative 2013-2022 Change in Hydrology and Society Science Plan

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- Science in practice (Giuliano Di Baldassare, Yan Huang)

### Science questions:

4. What are the key gaps in our understanding of hydrological change?
5. How does hydrological change interact with natural and social systems?
6. What are the boundaries of coupled hydrological and societal systems?



## **The IAHS Science Initiative 2013-2022: The Panta Rhei paper (open access)**

*Hydrological Sciences Journal – Journal des Sciences Hydrologiques*, 2013  
<http://dx.doi.org/10.1080/02626667.2013.809088>

1

### **“Panta Rhei—Everything Flows”: Change in hydrology and society—The IAHS Scientific Decade 2013–2022**

A. Montanari<sup>1</sup>, G. Young<sup>2</sup>, H. H. G. Savenije<sup>3</sup>, D. Hughes<sup>4</sup>, T. Wagener<sup>5</sup>, L. L. Ren<sup>6</sup>,  
D. Koutsoyiannis<sup>7</sup>, C. Cudennec<sup>8</sup>, E. Toth<sup>1</sup>, S. Grimaldi<sup>9</sup>, G. Blöschl<sup>10</sup>, M. Sivapalan<sup>11</sup>, K. Beven<sup>12</sup>,  
H. Gupta<sup>13</sup>, M. Hipsey<sup>14</sup>, B. Schaefli<sup>15</sup>, B. Arheimer<sup>16</sup>, E. Boegh<sup>17</sup>, S. J. Schymanski<sup>18</sup>,  
G. Di Baldassarre<sup>19</sup>, B. Yu<sup>20</sup>, P. Hubert<sup>21</sup>, Y. Huang<sup>22</sup>, A. Schumann<sup>23</sup>, D. A. Post<sup>24</sup>, V. Srinivasan<sup>25</sup>,  
C. Harman<sup>26</sup>, S. Thompson<sup>27</sup>, M. Rogger<sup>10</sup>, A. Viglione<sup>10</sup>, H. McMillan<sup>28</sup>, G. Characklis<sup>29</sup>, Z. Pang<sup>30</sup>  
and V. Belyaev<sup>31</sup>

- 30 co-authors that contributed to discussion, paper preparation and revision.
- Presenting a comprehensive summary of the problem and the Science Plan
- Another successful community experience.



# Some first results



Hydrol. Earth Syst. Sci. Discuss., 10, 4515–4536, 2013  
www.hydrol-earth-syst-sci-discuss.net/10/4515/2013/  
doi:10.5194/hessd-10-4515-2013  
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Hydrology and  
Earth System  
Sciences  
Discussions



This discussion paper is/has been under review for the journal Hydrology and Earth System Sciences (HESS). Please refer to the corresponding final paper in HESS if available.

## Socio-hydrology: conceptualising human-flood interactions

G. Di Baldassarre<sup>1</sup>, A. Viglione<sup>2</sup>, G. Carr<sup>3</sup>, L. Kuil<sup>3</sup>, J. L. Salinas<sup>2</sup>, and G. Blöschl<sup>2,3</sup>

<sup>1</sup>Department of Integrated Water Systems and Governance, UNESCO-IHE, Delft, the Netherlands

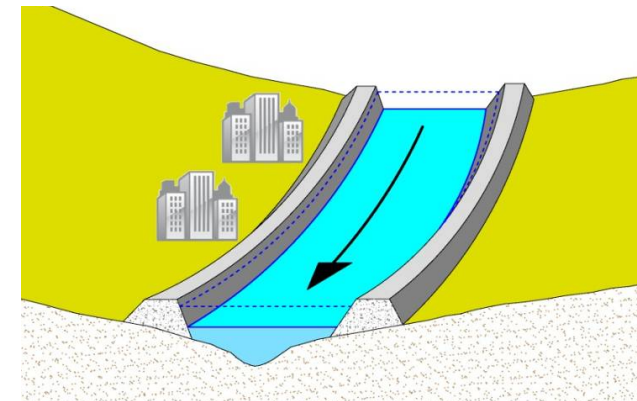
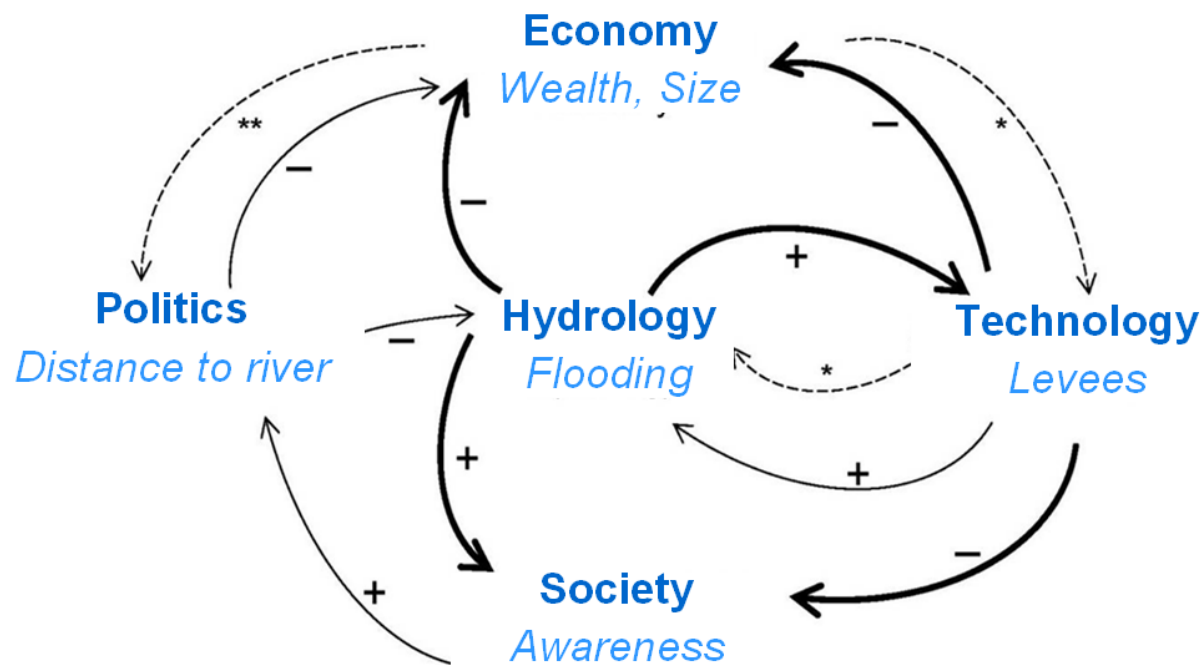
<sup>2</sup>Institute of Hydraulic Engineering and Water Resources Management, Vienna University of Technology, Vienna, Austria

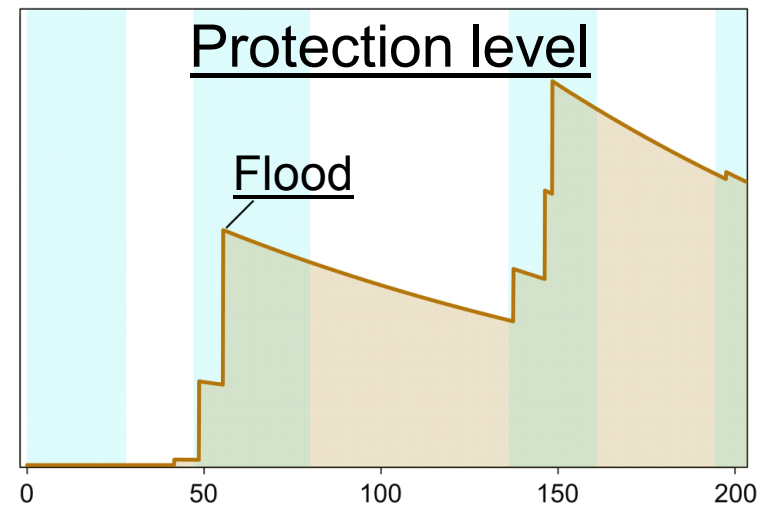
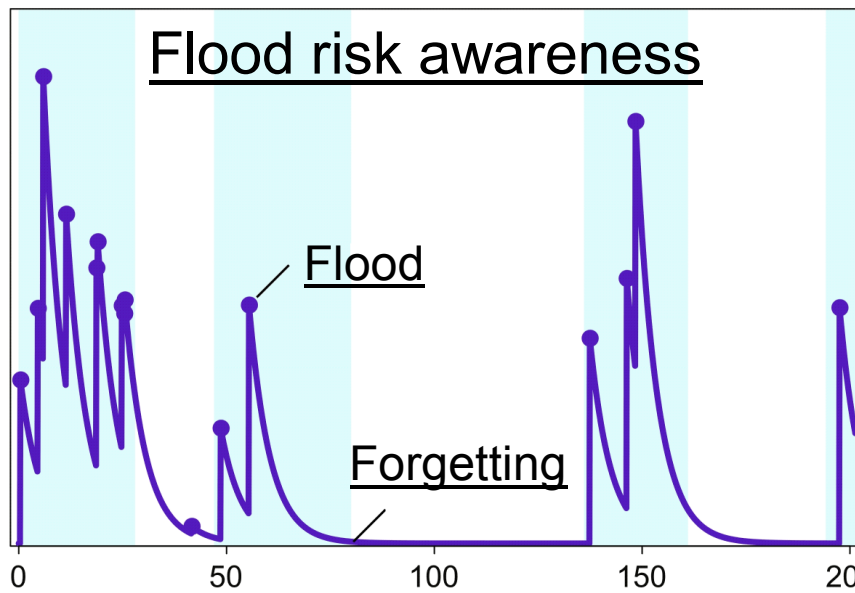
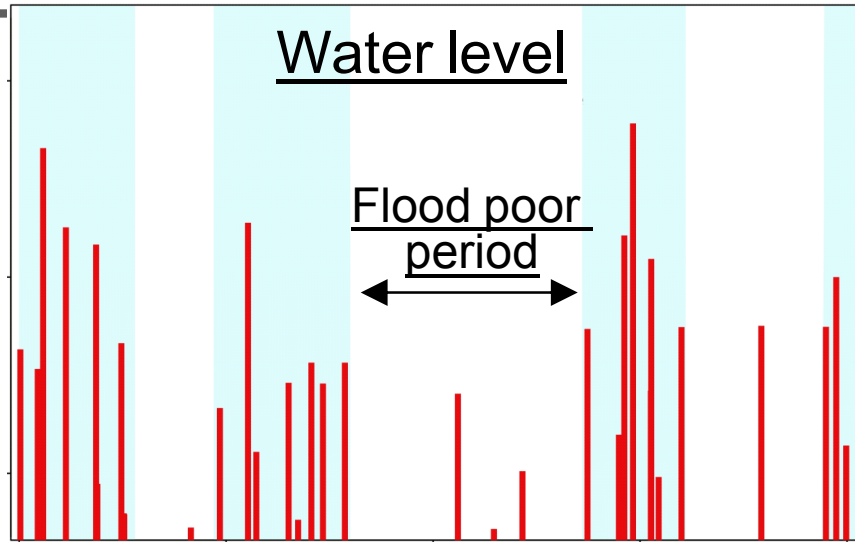
<sup>3</sup>Centre for Water Resource Systems, Vienna University of Technology, Vienna, Austria

Received: 22 March 2013 – Accepted: 31 March 2013 – Published: 9 April 2013

Simplified dynamic model to analyse – long term feedbacks between humans and water

e.g. Feedbacks between humans and floods in cities





Di Baldassarre et al. (2013) *HES*





# Convergence of Publishers



## Major hydrological journals have committed themselves to Panta Rhei

- References will be collected and highlighted
- Community papers as an effort to raise the impact of research in hydrology
- Please attend the Panta Rhei web site to stay informed in publishing initiatives. Panta Rhei is a community effort.



## Research themes and working groups

- A call for research themes and working groups was issued with deadline Jan 31st, 2014.
- 22 [Working Groups](#) have been proposed and approved including about 250 researchers! Call for WG is permanently open.
- 10 [Research themes](#) have been adopted so far.



Flood in Florence in  
November 1966



# **Panta Rhei at EGU 28/4/2014-2/5/2014**



HS1.1

**Panta Rhei: a vision and an agenda for the next 10 years of hydrological research in support of society**

Convener: Gerrit H. de Rooij

Co-Convener: Alberto Montanari

HS5.8

**Stakeholders, public involvement and collaborative processes in hydrology research and water management**

Convener: Tobias Krueger

Co-Convener: Gemma Carr

HS7.4

**Change in climate, hydrology and society**

Convener: Demetris Koutsoyiannis

Co-Conveners: João de Lima , Harry Lins , Xiaolan L. Wang , Manfred Mudelsee , C. Cudennec , Carmen Maftai



# Panta Rhei in Bologna June 4-6 2014



## Bologna IAHS 2014 6th IAHS-EGU International Symposium on Integrated Water Resources Management Bologna 4-6 June 2014

With the patronage of:



HOME

INVITED SPEAKERS

THE LOUCKS LECTURE

VISION PAPER

ABSTRACTS/PAPERS SUBMISSION

REGISTRATION

ACCOMMODATION

TRIPS

THE CONFERENCE

FINANCIAL SUPPORT

CONTACT US



Erosion of the river bed after reservoir building

### Evolving Water Resources Systems - Understanding, Predicting and Managing Water - Society Interactions

[Bologna, June 4-6 2014](#)

News

News





# Join Panta Rhei !!



- The success of Panta Rhei depends on your participation
- Working groups and research themes can be proposed anytime
- Attending Panta Rhei means:
  1. To be informed on initiatives (conferences, workshops, summer schools, etc.)
  2. To have opportunities of being involved in research initiatives and project proposals
  3. To participate in writing community papers
  4. To get visibility of your papers

[www.iahs.info/pantarhei](http://www.iahs.info/pantarhei)





# Everything flows!



# Thank you!

Panta Rhei web site: [www.iahs.info/pantarhei](http://www.iahs.info/pantarhei)



## Panta Rhei Research Themes



1. Transdisciplinarity - Proposer: Tobias Krueger
2. Mountain hydrology - Proposer: Shreedhar Maskey
3. Large scale water projects and society - Proposer: Bellie Sivakumar
4. Physics of changes - Proposer: Alexander Gelfan
5. Water footprint assessment - Proposer: Saket Pande
6. Water and energy fluxes in a changing environment - Proposer: Maria J. Polo
7. Epistemic uncertainties - Proposer: Paul Smith
8. Hydro-meteorological extremes: Decision making in an uncertain environment - Proposer: Adrián Pedrozo Acuña
9. Global Change in Hydrology and Society - Proposer: Jos Timmermans
10. Reservoirs impact - Proposer: Aleksandr Tskhai



# Panta Rhei Working Groups



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