

MOXXI: Innovation and Multidisciplinarity to sense the Hydrological Cycle

*The Regional Association VI Working Group on
Hydrology*

WMO Hydrology Forum

Flavia Tauro

International Association of Hydrological Sciences

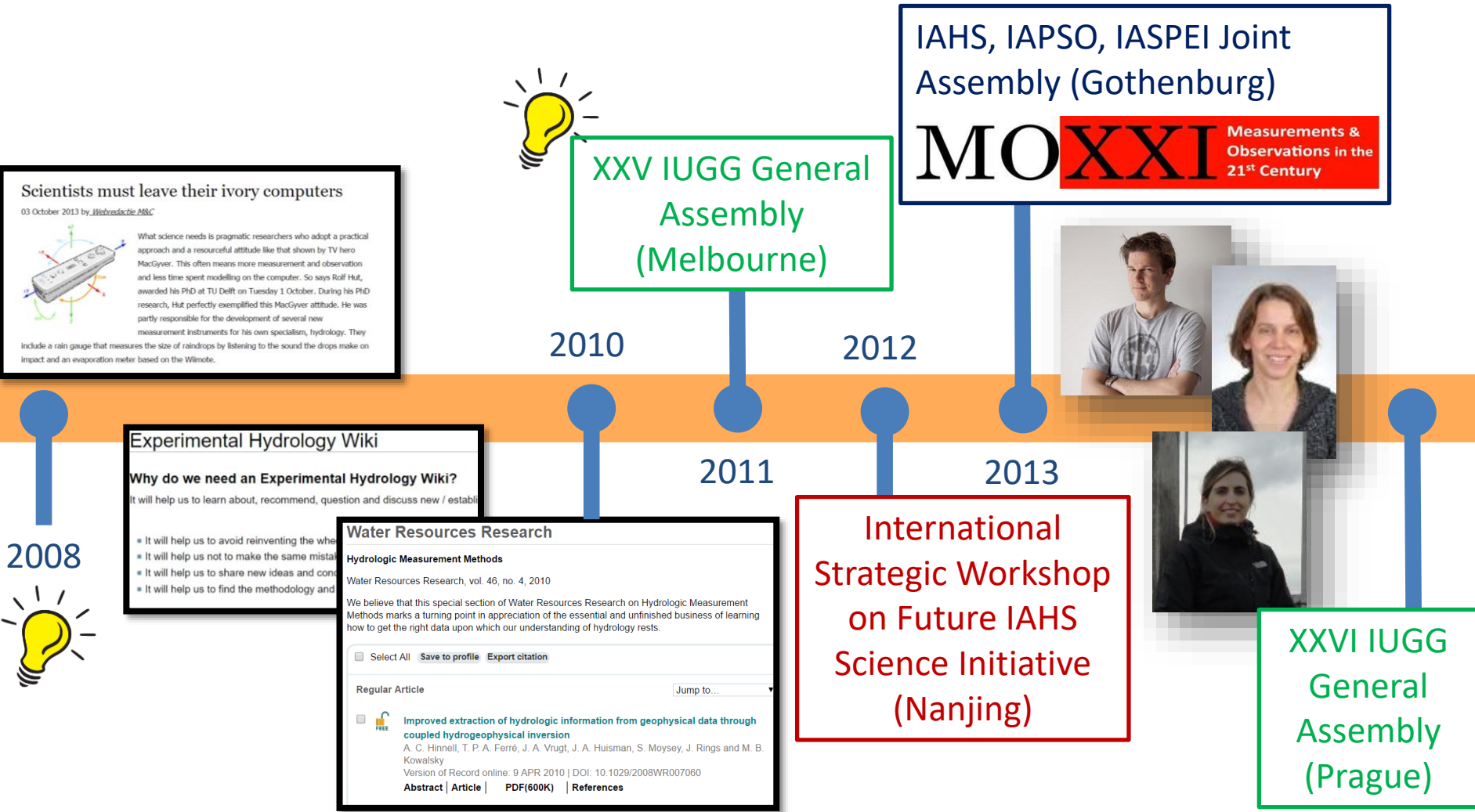
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MOXXI: Introduction

- Measurements and Observations in the XXI Century working group of IAHS
- Established in 2013 (I am Chair since 2015)
- Objectives:
 - What are the key gaps in our understanding of hydrologic change?
 - How can we advance our monitoring and data analysis capabilities to predict and manage hydrologic change?

MOXXI: the beginning



MOXXI: the group

- More than 150 MOXXI friends from more than 15 countries
- Mostly from universities but also from research centers and private companies
- First Topical Conference November 2016 at ESA campus (Frascati, Italy)
- Second Topical Conference December 2017 at WMO (Geneva, Switzerland)
- Third Topical Conference March 2019 at NYU (NY, USA)

MOXXI: research questions

- Panta Rhei Science Questions 1 and 5:
 - *What are the key gaps in our understanding of hydrologic change?*
 - *How can we advance our **monitoring** and data analysis capabilities to predict and manage hydrologic change?*

Original Articles

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

“Panta Rhei—Tout s’écoule”: Changement hydrologique et sociétal—La Décennie Scientifique 2013–2022 de l’AISH

A. Montanari, G. Young, H.H.G. Savenije, D. Hughes, T. Wagener, L.L. Ren, ...show all

Pages 1256-1275 | Received 18 Mar 2013, Accepted 21 May 2013, Accepted author version posted online: 30 May 2013, Published online: 05 Jul 2013

Original Articles

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

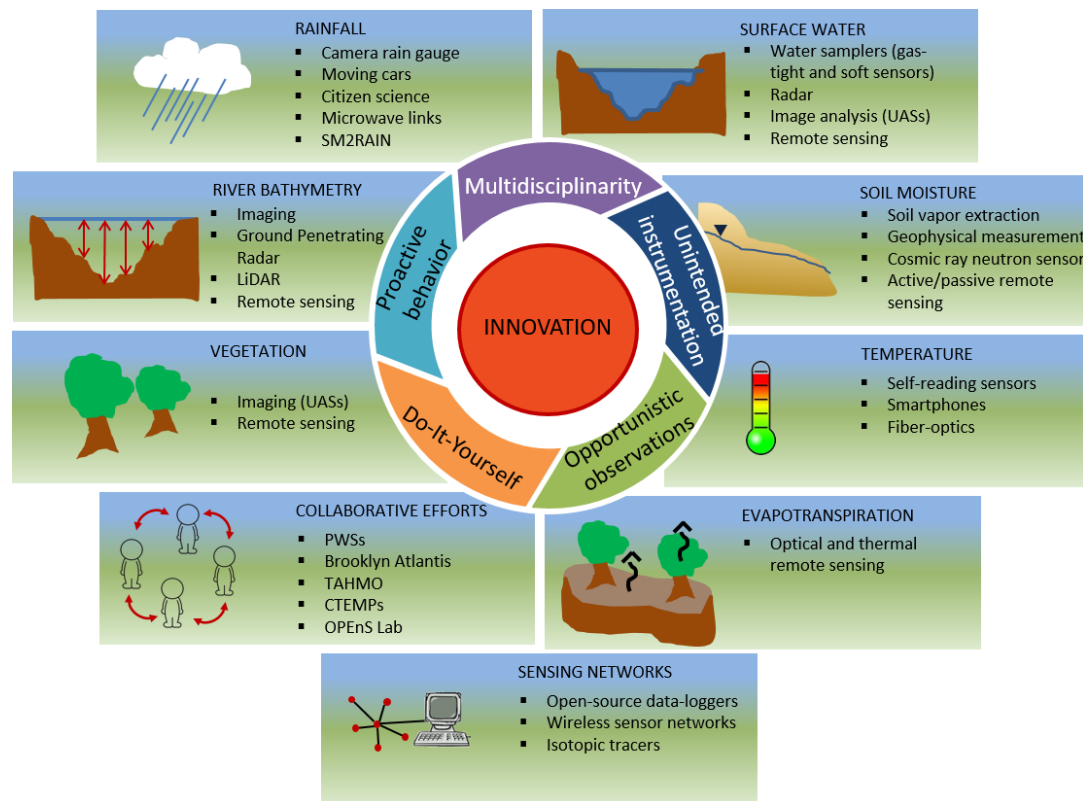
Revue d’une décennie sur les prévisions en bassins non jaugés (PUB)—une revue

M. Hrachowitz , H.H.G. Savenije, G. Blöschl, J.J. McDonnell, M. Sivapalan, J.W. Pomeroy, ...show all

Pages 1198-1255 | Received 14 Mar 2013, Accepted 02 May 2013, Accepted author version posted online: 16 May 2013, Published online: 14 Jun 2013

MOXXI: the objectives

- Growing community with broad research interests



MOXXI: the objectives

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<https://doi.org/10.1080/02626667.2017.1420191>



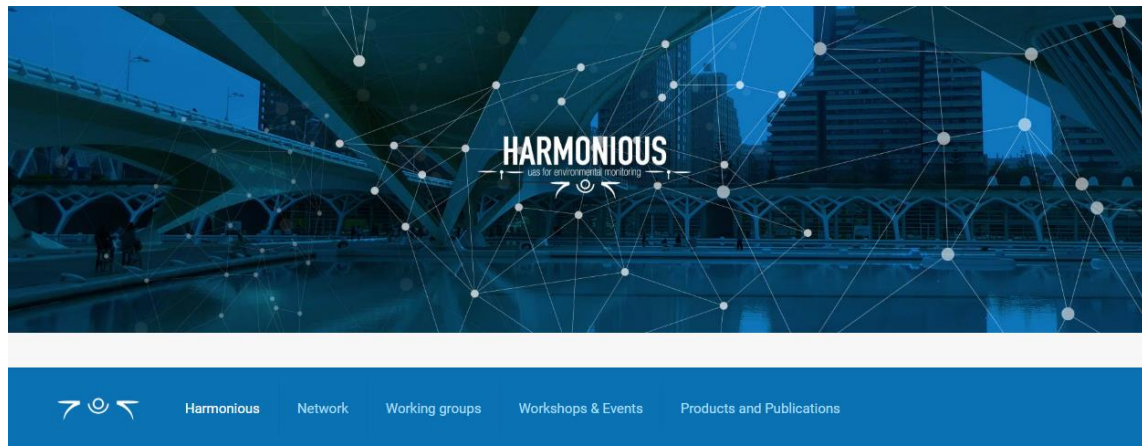
Measurements and Observations in the XXI century (MOXXI): innovation and multi-disciplinarity to sense the hydrological cycle

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MOXXI: sample initiatives

- Participation in a COST Action on the harmonization of drones for scientific observations



On the Use of Unmanned Aerial Systems for Environmental Monitoring

Environmental monitoring plays a central role in diagnosing climate and management impacts on natural and agricultural systems, enhancing the understanding hydrological processes, optimizing the allocation and distribution of water resources, and assessing, forecasting and even preventing natural disasters. On this context, Unmanned Aerial Systems (UAS) are radically evolving offering an extraordinary opportunity to bridge the existing gap between field observations and traditional air- and space-borne remote sensing. Indeed, to leverage the full potential of UAS-based approaches, sensing technologies, measurement protocols, post-processing techniques, retrieval algorithms and evaluations techniques need to be harmonized. In this context, a network of scientists is currently cooperating within the framework of a COST (European Cooperation in Science and Technology) Action named "Harmonious". The intention of "Harmonious" is to promote monitoring strategies, establish harmonized monitoring practices, and transfer most recent advances on UAS methodologies to others within a global network.

MOXXI: sample initiatives

- Proposal and paper writing
- Facilitating coordination between National Services and scientists/startups:
 - First call of the HydroHub, the Global Hydrometry Support Facility of WMO

MOXXI: NYC meeting

Source: ESA

MEASUREMENTS AND OBSERVATIONS IN THE 21° CENTURY

MOXXI 2019 Topical Conference
Citizen and Hydrology (CandHy) Kickoff Meeting

11-13 March 2019
New York University, New York , NY, USA



MOXXI: NYC meeting

- Sessions:
 - Innovative sensors
 - Sensing at large scales
 - Sensing with images
 - Citizen science (co-organized with CANDHY)



Overcoming Barriers to Operationalization

IAHS-MOXXI & CandHy, WMO HydroHub, CUAHSI Joint Conference

Moderated for WMO HydroHub by Harry Dixon
 CEH and Chair of the HydroHub Innovation Committee

New York University Kimmel Center
 60 Washington Square South, Suite 605
 New York NY 10012

M.D.B.T.6024.6250.F.P.R.

Monday, 11 March 2019 – Room KC914

Seg.	Time	Content
	09:00 – 09:30 (30')	Registration
#1	09:30 – 10:00 (30')	Welcoming sessions <ul style="list-style-type: none"> • Christophe Cudennec, Flavia Tauro • Harry Dixon, Dominique Berod • Fernando Nardi, Jerad Bales
#2	10:00 – 11:00 (60')	INNOVATIVE SENSORS (Chair: Salvatore Grimaldi) <ul style="list-style-type: none"> • Combining soil water tension and temperature measurement to infer runoff processes in a headwater catchment (Aline de Almeida Mota, Joana Nery Giglio, Fernando Grison, Albert Teixeira Cardoso, Pedro Luiz Borges Chaffe, Masato Kobiyama) • Measuring water levels with low-cost lidar (Wouter Buytaert, Jonathan D. Paul, Neeraj Sah) • Enrichment of the hydrological research results by use of isotope hydrology methods (Parviz Normatov, Richard Armstrong, Inom Normatov, Alice Hill, Rano Eshankulova) • Unmanned Airborne Vehicles (UAVs) for monitoring small streams and optimizing river maintenance (Filippo Bandini, Beat Lüthi, Ole Smith, Inger Klint Jensen, Liguang Jiang, Tanya Pheiffer Sunding, Peter-Bauer Gottwein)
#3	11:00 – 11:30 (30')	Coffee break
#4	11:30 – 13:00 (90')	CITIZEN SCIENCE (Chair: Fernando Nardi) <ul style="list-style-type: none"> • Using a reputation system to produce trustworthy rainfall estimates from crowdsourced data: a case study in Durham, North Carolina (Alexander B. Chen, Jonathan L. Goodall) • Citizens education to hydrogeological risk through the HERASE project results (Maria Cristina Rulli, Daniele Bocchiola, Davide Chiarelli, Marco Gianinetto, Martina Aiello, Federico Frassy, Francesco Polinelli, Renata Vezzoli) • Water level monitoring for everyone (Jerad Bales, Benjamin Ruddell, Chris Lowry) • Increasing engagement in environmental citizen science with application to telerehabilitation (Roni Ventura, Maurizio Porfiri)
#5	13:00 – 14:30 (90')	Lunch



MOXXI: NYC meeting

- Objectives:
 - Sharing ideas among scientists
 - Pointing out challenges/needs of national services worldwide
 - Propose novel solutions and foster new collaborations

- Numbers:
 - More than 50 participants
 - 26 research presentations

Instrumentation issues & needs:
low-cost, long battery life,
environmentally-resilient,
long-range
communication...

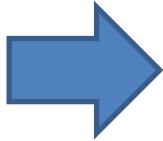
National Services
- Data network
management and
maintenance
- Data validation and
processing



Scientists
- Novel sensors and
algorithms

MOXXI
WMO

**NEW STANDARD
INSTRUMENTATION and METHODS**



**SAFER and
BETTER
WORLD**



**ENHANCED
KNOWLEDGE OF
WATER CYCLE**

MOXXI: future perspectives

- Participate in IAHS Forum on Unsolved Questions in Hydrology
 - MOXXI is taking a leading role in the forum
 - Every friend has been asked to participate

Contact info

- <https://iahs.info>
 - Commissions>Working-Groups>MOXXI

- Please contact me if you have questions:
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