International Association of Hydrological Sciences -IAHS

Activities' Report - Year 2024

Alberto Montanari

1. Introduction

The Italian research activity referring to the International Association of Hydrological Sciences (IAHS) has been carried out by the scientific community that refers to hydrological sciences, hydraulics and hydraulic works. In this context, the most relevant initiative carried out in 202**4** can be identified by the activities of:

a) *International Commission on Water Resource (ICWR/IAHS)*, *https://iahs.info/Commissions--W-Groups/ICWRS-Water-Resources-Systems.do*. *ICWR/IAHS* is aimed to promote research development on the integration of all phases of water resource protection, planning, design, management, operation and utilization. Alberto Viglione (Politecnico di Torino) is vice-president, Alberto Montanari is past president.

b) *International Commission for Ground Water (ICGW)*, *https://iahs.info/Commissions--W-Groups/ICGW-Groundwater.do*, chaired by Prof Aldo Fiori (Università Roma Tre) from 2015 to 2021, past President till 2023, addressed to the advancement of the science of groundwater hydrology, including the scientific basis for groundwater resource assessment and groundwater management. It is also responsible for helping to bridge the gap between science and practice. Antonio Zarlenga (University of Roma Tre) is secretary.

c) *International Commission on Statistical Hydrology(ICSH/IAHS)*, *https://iahs.info/Commissions--W-Groups/ICSH-Statistical-Hydrology.do,* where Prof. Elena Volpi is the past-secretary and since July 2021 she acts as President of the Commission. Eleonora Dallan (University of Padua) is vice-president. The activities of the commission are focused on the development of new statistical methods and tools for hydrological applications.

d) *MOXXI Working Group* (Measurements & Observations in XXI Century), *https://iahs.info/Commissions--W-Groups/Working-Groups/MOXXI.do*, chaired by Prof. Salvatore Manfreda (Università degli Studi di Napoli Federico II), with the task to promote the advancement of novel observational techniques that leads to new sources of information to help better understand the hydrological cycle.

e) *International Commission on Continental Erosion/International Association of Hydrological Sciences* (ICCE/IAHS), https://iahs.info/Commissions--W-Groups/ICCE-Continental-Erosion.do, chaired by Prof. Paolo Porto (University Mediterranea of Reggio Calabria, Italy). The activity of the Commission deals with problems related to soil erosion and deposition at both hillslope and catchment scale, fingerprinting techniques, sediment transport and the use of tracers techniques to establish the sediment budget of large areas.

f) *Citizen AND HYdrology Working Group (CandHy WG), https://iahs.info/Commissions--W-Groups/Working-Groups/Candhy.do,* chaired by Prof. Fernando Nardi till july 2023, aims to stimulate discussion, sharing of knowledge, information, data, ideas fostering scientific and professional exchange of academic, institutional and citizen communities interested in the "Citizen AND HYdrology" topic. CandHy seeks to discover the potential of citizen involvement and crowd sourced data for advancing hydrologic research in water resource and risk management, hydro-climatic risk mitigation and disaster preparedness.

g) *IAHS Academy, https://iahs.info/Initiatives/iahs-academy/.* The IAHS Academy chaired by Prof. Fernando Nardi. The IAHS Academy's mission is to organise summer/winter short schools, training and educational programs to advance and promote hydrological sciences globally. The IAHS Academy events will also serve IAHS's mission in: Engaging, training and valuing the next generation of hydrologists; Supporting young water scientists in achieving an academic or business career supported by state of the art hydrological data, knowledge and tools; Foster transdisciplinarity and diversity merging efforts and capacities of the hydrological community with other disciplines both from earth and environmental sciences as well as from social sciences and humanities; Promote open science, open data,

gender dimension, international cooperation and capacity building across diverse hydro-climate, social, economic and geographic regions of the world.

h) *Società Idrologica Italiana (SII), www.sii-ihs.it,* belonging to the international network of IAHS's scientific associations, *https://iahs.info/Links/National-and-Regional-Hydrological-Associations.do,* Chaired by Prof. Elena Toth , SII aims to advance knowledge in scientific and applied aspects of hydrology and foster members involvement in relevant national and international professional activities.

i) Young Hydrological Society-IT (YHS-IT), founded by SII, aims to stimulate the interaction and active participation of young hydrologists within the Italian hydrological community, fostering the synergy between research grant holders, PhD students and postdocs and professionals working in the private and public sector.

j) *President-elect of IAHS. During the IUGG General Assembly, held in Berlin in July 2023,* Prof. Salvatore Grimaldi, Università degli Studi della Tuscia, has been elected as President of IAHS. His mandate will be in the quadrennium 2025-2029, in the meanwhile he will serve as President-elect.

k) IUGG Union Commission on Mathematical Geophysics (CMG). Prof. Salvatore Grimaldi, Università degli Studi della Tuscia is the Commission member for the IAHS.

l) *REHYDRATE (REtrieve historical HYDRologic dATa and Estimates).* Working group of the IAHS Science for Solutions Scientific Decade 2023-2032 HELPING (Hydrology Engaging Local People IN one Global world), coordinated by Paola Mazzoglio and Miriam Bertola.

Finally, there has been a very relevant research activity carried out by Italian institutions within IAHS and in particular within IAHS research initiatives, including an active participation in the preparation of the IAHS Science for Solutions Scientific Decade 2023-2032 HELPING (Hydrology Engaging Local People IN one Global world). The Italian community is also playing an important role in the writing of the synthesis book of the IAHS Decade 2013-2022 " Panta Rhei – Everything Flows".

2. Main activities carried on by IAHS during 2024 relevant for Italy and for CNR

The most relevant activity developed during 2024 is related to the activities mentioned in section 1. Specifically, the main actions can be identified as follows.

2.1 Organization of conferences, workshops 2024

- 2024 EGU General Assembly HS7.8, Spatio-temporal extremes in the hydroclimatic system: understanding and modeling, Convener: Elena Volpi | Co-conveners: András Bárdossy, Manuela Irene BrunnerECS, Raphael Huser, Simon Michael Papalexiou.
- 2024 EGU General Assembly HS7.4 | PICO, Future hydroclimatic scenarios in a changing world, Convener: Theano Iliopoulou | Co-conveners: Serena Ceola, Christophe Cudennec, Harry Lins, Alberto Montanari.
- 2024 EGU General Assembly EOS3.1, Promoting and supporting equality, diversity and inclusion in the geosciences Co-organized by AS6/BG1/GM12/SSS1, co-sponsored by AGU and JpGU, Convener: Claudia Jesus-Rydin | Co-conveners: Pallavi Anand, Alberto Montanari, Hori, S. Rie, Billy Williams.
- Joint conference between the IAHS International Commissions on Statistical Hydrology (STAHY) and the Water Resources System (ICWRS) held in collaboration with the Brazilian Water Resources Association in Florianópolis, Brazil, 4-7 November 2024. Eleonora Dallan, Elena Volpi and Alberto Viglione were members of the scientific committee. Alberto Montanari delivered a distinguished lecture.
- The Hydrology Days of the Italian Hydrological Society (SII-IHS) 2024 were held in Udine, Italy, June 24-26, with the participation more than 150 members. The main theme of the Hydrology Days 2024 was "Water management under climate emergencies: the response of the hydrological community to the local needs" In addition to the memory of Prof. Pasquale Versace on the occasion of the conferral of the title of honorary member in memory, 32 oral

contributions and 66 posters were presented. The book of abstracts with summaries of all presentations is available on the zenodo repository with the following DOI: doi.org/10.5281/zenodo.13149408.. The round table, titled "Water management under climate emergencies: the response of the hydrological community to the local needs" was attended by representatives of reclamation consortia and regional authorities, as well as representatives of the IHS and YHS-IT (Young Hydrological Society-Italy) and the University of Udine. A specific workshop dedicated to young researchers belonging to YHS-IT was also organized during the event (morning and lunch on the 24th).

- 20-27, July, 2024. IAHS Academy, Egypt, Cairo. This first edition has been organised by IAHS, UNESCO (IHP), WMO and National Water Research Center of Egypt (NWRC) Panafrican Center for climate change adaptation (PACWA) of Egypt.
- 17-20 September, 2024, at 19th Biennial ERB Conference, Mallorca. A MOXXI session: Advancing Catchment Hydrology for a Sustainable Future! has been organized.
- Workshop “Eventi naturali potenzialmente pericolosi: modelli, incertezze, comunicazione”, Sala Marconi of the Headquarters of the National Research Council (CNR), September 25-26, organised by the National IUGG Commission of CNR.
- ICCE 2024 International stand-alone Symposium on: Sensitivity of erosion and sediment transport to recent climate change - (https://www.ku.de/mgf/geographie/physische-geographie/icce2024). The Symposium took place during the period 23-25 July 2024, Eichstätt, Germany with a large participation of attendants coming from different geographic contexts. A book of abstract of the presentations is available at the following website (https://www.ku.de/fileadmin/150301/ICCE/Documents/ICCE_Book_of_abstracts_final.pdf).

2.2 Organization of scientific initiatives 2024

- Florisa Melone Prize 2024 awarded by the Italian Hydrological Society to a collaborative research project proposed by young Italian researchers (up to 35 years old). The Prize is dedicated to the memory of Florisa Melone, CNR Head Researcher of the the Research Institute for Geo-Hydrological Protection. The Prize consists of a sum of €5,000 and was awarded by the appointed committee to the project “IDRATARE: IDrologia, idRAulica, e geomeTriA a supporto dell’iRrigazione a scorrimento superficialE”, proposed by Cosimo Peruzzi (ISPRA) and Fabiola Gangi (Università degli Studi di Milano).
- Paolo Bernardi Prize 2024 awarded by the Italian Hydrological Society to a collaborative research project proposed by young Italian researchers (up to 35 years old). The Prize is dedicated to the memory of Paolo Bernardi, founder of CAE spa and expert in meteo-hydrologival monitoringn. The Prize consists of a sum of €5,000 and was awarded by the appointed committee to the project “Sviluppo e integrazione di tecnologie basate su acquisizione di immagini per il monitoraggio dei piccoli bacini idrografici: la MagicHydroBox”, proposed by Simone Noto (Università degli Studi della Tuscia) and Nicola Durighetto (Università degli Studi di Padova)
- CANDHY working group activities has developed since its 2017 July inception by increased participation and involvement in thematic conferences and workshops involving experts through person-to-person invitations (currently, CANDHY includes 60+ “friends” from more than 10 countries).
- IAHS Academy events are being organized to be held in Egypt and China with ongoing efforts to organize four parallel summer schools gathering a critical mass of 100+ phd students and postdoc and 10+ lecturers. Events co-organized with WMO and UNESCO IHP and co-hosted by relevant authorities and organizations sharing IAHS mission to promote advanced training events on hydrological sciences.

2.3 Editorial Board Participation and editorial awards

IAHS *Hydrological Sciences Journal*

- Attilio Castellarin: Editor in Chief dal 2017 (Co-Editor dal 2015), Università di Bologna
- Aldo Fiori, Co-Editor, Università Roma Tre
- Brunella Bonaccorso, Università di Messina
- Alessio Domeneghetti, Associate Editor, Università di Bologna
- Fernando Nardi, Associate Editor, Università di Roma Tor Vergata
- Daniele Penna, Università di Firenze
- Simone Persiano: Associate Editor, UnipolSAI, Bologna
- Andrea Petroselli: Associate Editor, University of Tuscia
- Ilaria Prosdocimi: Associate Editor, Università Cà Foscari, Venezia
- Maria Cristina Rulli: Associate Editor, Politecnico di Milano
- Flavia Tauro: Associate Editor, University of Tuscia
- Elena Volpi: Associate Editor, Università Roma Tre

Journal of Soil and Sediments (Springer)

- Paolo Porto: Associate Editor since 2019

Pedosphere (Elsevier)

- Paolo Porto: Editorial Board Member Participation since 2015

Awards, Editorial Awards and special mentions

Hydrological Sciences Journal papers labelled as "Featured Articles" in 2024 with Italian authors:

- Event-based soil erosion and sediment yield modelling for calculating long-term reservoir sedimentation in the Alps - Konstantinos Kaffas, Giuseppe Roberto Pisaturo, Georg Premstaller, Vlassios Hrissanthou, Daniele Penna & Maurizio Righetti, Hydrological Sciences Journal, 69(3), 2024.
- Feature importance measures for flood forecasting system design - Francesco Cappelli, Flavia Tauro, Ciro Apollonio, Andrea Petroselli, Emanuele Borgonovo, Elena Volpi & Salvatore Grimaldi, Hydrological Sciences Journal, 69(4), 2024.
- The legacy of STAHY: milestones, achievements, challenges, and open problems in statistical hydrology - Elena Volpi, Salvatore Grimaldi, Amir Aghakouchak, Attilio Castellarin, Fateh Chebana, Simon Michael Papalexiou, Hafzullah Aksoy, András Bárdossy, Antonino Cancelliere, Yuanfang Chen, Roberto Deidda, Uwe Haberlandt, Ebru Eris, Svenja Fischer, Félix Francés, Dmitri Kavetski, Thomas Rodding Kjeldsen, Krzysztof Kochanek, Andreas Langousis, Luis Mediero Orduña, Alberto Montanari, Sofia D. Nerantzaki, Taha B. M. J. Ouarda, Ilaria Prosdocimi, Elisa Ragno, Chandra R. Rajulapati, Ana Isabel Requena, Elena Ridolfi, Mojtaba Sadegh, Andreas Schumann & Ashish Sharma, Hydrological Sciences Journal, 69(14), 2024
- Hydrological Sciences Journal Reviewer Award 2024: Ciro Apollonio (Università degli Studi della Tuscia)

2.4 Goals, priorities and plans for future Scientific Initiative

For 2025 the plan is to continue to actively participate to IAHS initiatives through targeted activities. To date, various initiatives are being planned, among which:

Conferences:

- 27 April, 2 May 2025, the EGU General Assembly.
- IAHS 2025 Scientific Assembly, Roorkee, India, 5-10 October, 2025.
- During the Symposium ICCE 2024 the selection of the next candidate for the stand-

alone Symposium ICCE 2026 was made. The activities for the organization of the upcoming Symposium are still running. The Symposium will take place in Italy, during Settembre 2026 (precise dates are to be defined) and the logistic organization will be covered by the University of Pavia.

2.5 Scientific Publications (peer-reviewed papers)

A Magnini, M Lombardi, TBMJ Ouarda, A Castellarin (2024) AI-driven morphoclimatic regional frequency modelling of sub-daily rainfall-extremes, Journal of Hydrology 631, 130808

Bahmanpouri F, Termini D , Barbetta S, Gualtieri C, Dionigi M. 2024. Investigating hydrodynamics and turbulent effects in rivers for different flow conditions using spatial complexity metrics. Journal of Hydrology 641, 131790

Bahmanpouri F., Lazzarin T., Barbetta S., Moramarco T., Viero D.P.. 2024. Hydrology and Earth System Sciences, 28, 3717–3737, 2024

Castellarin, A.; Magnini, A.; Kyaw, K.K.; Ciavaglia, F.; Bertola, M.; Blöschl, G.; Volpi, E.; Claps, P.; Viglione, A.; Marinelli, A.; et al. Frequency of Italian Record-Breaking Floods over the Last Century (1911–2020). Atmosphere, 15, 865. https://doi.org/10.3390/ atmos15070865, 2024

Claps P., Evangelista G., Ganora D., Mazzoglio P., Monforte I. (2024). FOCA: a new quality-controlled database of floods and catchment descriptors in Italy. Earth System Science Data, 16, 1503–1522. https://doi.org/10.5194/essd-16-1503-2024.

Clerc-Schwarzenbach, F, Selleri, G, Neri, M, Toth, E, van Meerveld, I, Seibert, J, (2024). Large-sample hydrology – a few camels or a whole caravan?, Hydrology and Earth System Sciences 28, 4219-4237.

Collins A.L., Walling D.E., Golosov V., Porto P., Gellis A.C., da Silva Y.J., Chalov S. (2024). The International Commission on Continental Erosion (ICCE): a brief overview of its scientific focus and example outputs. PIAHS 385, 489-497.

E Volpi, S Grimaldi, A Aghakouchak, A Castellarin, F Chebana, ... (2024) The legacy of STAHY: milestones, achievements, challenges, and open problems in statistical hydrology, Hydrological Sciences Journal 69 (14), 1913-1949

Kechnit D, Tshimanga RM, Ammari, …. Moramarco T. 2024 Bathymetry and discharge estimation in large and data-scarce rivers using an entropy-based approach, Hydrological Sciences Journal 69 (15), 2109-2123

KK Kyaw, E Baietti, C Lussana, V Luzzi, P Mazzoli, S Bagli, A Castellarin (2024) Private sensors and crowdsourced rainfall data: Accuracy and potential for modelling pluvial flooding in urban areas of Oslo, Norway, Journal of Hydrology X 25, 100191

Lucaora, T., Annis, A., Nardi, F., Rulli, M. C., & Chiarelli, D. D. (2025). Distributed hydrodynamic modelling for assessing flood impacts on crops: Assessing flood-resilient crop management in a coastal basin of central Italy. Agricultural Water Management, 309, 109352.

M Bertola, A Castellarin, A Viglione, E Valtancoli, G Blöschl (2024), Frequency and Spatial Variability of European Record Floods, Water Resources Research 60 (10), e2023WR036767

Manfreda, S.; Miglino,D.; Saddi,K.,C.; Jomaa,S.; Eltner,A.; Perks,M.; Peña-Haro,S.; Bogaard,T.; van Emmerik,T.; Mariani,S.; Maddock,I.; Tauro,F.; Grimaldi,S.; Zeng,Y.; Gonçalves,G.; Strelnikova,D.; Bussettini,M.; Marchetti,G.; Lastoria,B.; Su,B.; Rode,M., Advancing hydrological monitoring using image-based techniques: challenges and opportunities, 2024, (accepted and in print on Hydrological Sciences Journal).

Mazzoglio, P., Butera, I., and Claps, P.: Rainfall data augmentation in Northern Italy through daily extremes and the Hershfield factor, Proc. IAHS, 385, 147–153, https://doi.org/10.5194/piahs-385-147-2024, 2024.

Merheb, M., Cudennec, C., & Nardi, F. (2024). Can we use indicator-based farm sustainability assessment tools for the WEFE Nexus?. Proceedings of IAHS, 385, 91-96.

Porto, P. (2024). Using radiotracers 137Cs and 210Pbex to document climate change in mountain areas through the estimate of soil erosion rates. PIAHS 387, 41-46.

Porto, P., Fulajtar, E. (2024). Step-By-Step Protocol to Apply the 137Cs Resampling Approach to Assess Soil Erosion During Chosen Time Periods. Environmental Science and Engineering, 129-137.

Porto, P., Fulajtar, E. (2024). Using 137Cs Resampling Method to Estimate Mean Soil Erosion Rates for Selected Time Windows. Introduction. Environmental Science and Engineering, 1-13

Porto, P., Fulajtar, E. (2024). Validating 137Cs Resampling Approach by Comparing with Conventional Erosion Plot Measurements: An Example of Cultivated Site in Italy. Environmental Science and Engineering, 111-127.

Porto, P., Fulajtar, E., Heng, L.K (2024). Using 137Cs Resampling Method to Estimate Mean Soil Erosion Rates for Selected Time Windows. Preface. Environmental Science and Engineering, v-vi.

Porto, P., Fulajtar, E., Walling, D.E., Callegari, G., Cogliandro, V., La Spada, C., Gaspar, L., Navas, A., Yu, H.Q., Liu, W.X., Chappell, A., LI, Y., Benmansour, M., Moustakim, M., Damnati, B., Moussadek, R., Nouira, A., Amenzou, N., Mrabet, R., and Kheng Heng, L. (2024). Geographical Overview of 137Cs Resampling Studies. Environmental Science and Engineering, 15-109.

Sarigil G, Neri, M, Toth, E, (2024). Evaluation of national and international gridded meteorological products for rainfall-runoff modelling in Northern Italy, Journal of Hydrology. Regional Studies, 56, 102031, 1-18.

Vyas JK , Perumal M , Moramarco T . 2024. Non-contact discharge estimation at a river site by using only the maximum surface flow velocity. Journal of Hydrology 638, 131505

Zarei, R., Khaledi Darvishan, A., Porto, P., Zare, M.R. (2024). Using radiotracers and topographic metrics for sediment budgeting at pixel and hillslope scales: A case study from western Iran. Ecological Indicators, 167, 112711.

3 Scientific activities carried on during 2022 and impact on the Italian scientific community

The activity can be identified, first, in the dissemination among Italian Universities and Research Institutions of the IAHS/IUGG programs. Moreover, it has been promoting a direct cooperation between IAHS and the Hydrological Sciences Division of the European Geosciences Union (EGU) so that the Italian community may benefit of exchange of information and possible joint activities concerning educational opportunities, student programs, and professional services for members of both organizations. In addition, through the Italian Hydrological Society, initiatives are addressed to foster the synergy among the Italian scientific community, the national authorities and firms for activities linked to water resources management and natural hazards. Details of activities are summarized as follows.

- Participation to the CNR-IUGG Commission.
- Dissemination of activities of IUGG among Italian Universities and Research Institutions for the meetings participation and IUGG Research Grant applications.
- Coordination of the activities related to the Florisa Melone award of the Italian Hydrological Society.

4 Evaluation of the participation in terms of benefits and membership cost

The benefits of the participation in the Union are certainly relevant for the Italian Scientific Community both for the resources made available by IUGG for the various initiatives promoted and which foster the attendance to Congresses and Research Grant applications and for the activities

developed by the various groups operating in IAHS/IUGG and chaired by Italian researchers, as can be also inferred from the Section 2 of the document.

5 Evaluation of Italians' attendance and how to improve interest and involvement

The participation of Italian scientists to initiatives organized under the IAHS umbrella is already significant as proved from different Courses, Conference and Meetings organized by the Groups/Commissions leaded by Italian scientists. However, the interest towards the IAHS activities can be improved if more financial resources are made available from IUGG, and it would be great from CNR as well, for international activities in the field of hydrological sciences, involving Italian scientist and in particular the youngest ones.

6 Italian experts with important roles within the Union or within related Commissions and Programs

- Prof. Alberto Montanari. National Representative IAHS/IUGG, member of the CNR/IUGG Commission.
- Dr. Tommaso Moramarco. Alternate National Representative IAHS/IUGG and President of Italian Hydrological Society.
- Prof. Attilio Castellarin. Editor in Chief of IAHS Hydrological Sciences Journal . Member of the IAHS Management Team.
- Prof. Aldo Fiori. CoEditor of the Hydrological Sciences Journal.
- Prof. Salvatore Grimaldi. President-elect of IAHS.
- Dr. Fernando Nardi. Chair IAHS Academy
- Prof. Salvatore Manfreda. Chair MOXXI Working Group (Measurements & Observations in XXI Century);
- Prof. Elena Toth, President of the Italian Hydrological Society.
- Prof. Elena Volpi. President of the International Commission on Statistical Hydrology of (ICSH/IAHS)
- Prof. Alberto Viglione, President of the Division on Hydrological Sciences (HS) – EGU
- Dr. Eleonora Dallan. Vice-president of the International Commission on Statistical Hydrology of (ICSH/IAHS)
- Prof. A. Zarlenga, Secretary of ICGW/IAHS.
- Prof. Salvatore Manfreda member of the Think Tank HydroHub of WMO.
- Prof. Paolo Porto. President-elect della International Commission on Continental Erosion/International Association of Hydrological Sciences (ICCE/IAHS).
- Prof. Paolo Porto. Vice-Presidente della IASWS (International Association for Sediment Water Science) dal 2017. Nell'ambito della suddetta associazione scientifica internazionale, il Prof. Porto, oltre a promuovere le varie attività condotte dall'ICCE, cura l'organizzazione di Symposia internazionali con cadenza triennale (https://www.ufz.de/iasws/index.php?en=43796)
- Prof. Paolo Porto. Responsabile nazionale IAEA del Coordinated research project (CRP) "Nuclear Techniques for a Better Understanding of the Impact of Climate Change on Soil Erosion in Upland Agro-ecosystems" (D1.50.17) lanciato dall'International Atomic Energy Agency (IAEA). Tale attività si è concretizzata nella pubblicazione del testo edito dalla Springer 'Using ^{137}Cs Resampling Method to Estimate Mean Soil Erosion Rates for Selected Time Windows', i cui dettagli sono forniti nella lista delle pubblicazioni ed al seguente link (https://link.springer.com/book/10.1007/978-3-031-52807-1).

Acknowledgments

I would like to thank the Italian experts above listed for their enthusiastic and constant activities under the IAHS umbrella. Moreover their contribution to this report is highly acknowledged.

IAHS National Representative
Prof. Alberto Montanari

Bologna, May 3, 2025