

Curriculum vitae and Track Record

PERSONAL DETAILS

Family name, First name: Montanari, Alberto

Researcher unique identifiers: <https://publons.com/researcher/1692841/alberto-montanari/>, <https://orcid.org/0000-0001-7428-0410>, <https://scholar.google.com/citations?user=fqgGMEYAAAAJ&hl=en>

Date of birth: February 3rd, 1966

Nationality: Italian

URL for web site: <https://www.albertomontanari.it>

Education and key qualifications

1993 - 1996 PhD in Hydraulic Engineering and Hydrology
Faculty of Engineering, Dept. of Hydraulic, Environmental and Surveying Engineering,
Politecnico di Milano, Italy

1985 – 1992 Master Degree in Civil Engineering (summa cum laude)
Faculty of Engineering Univ. of Parma, Italy

Current position(s)

From 2012 Full professor of Hydraulic and Maritime Engineering and Hydrology, Department DICAM,
University of Bologna, Italy

Previous position(s)

2001 – 2012 Associate professor of Hydraulic and Maritime Engineering and Hydrology, Departments
DISTART and DICAM, University of Bologna, Italy

1998 – 2001 Assistant professor of Hydraulic and Maritime Engineering and Hydrology, Department
DISTART, University of Bologna, Italy.

1997 – 1998 Post-doctoral Researcher, Department DISTART, University of Bologna, Italy.

1996 – 1997 Post-doctoral Researcher, Department DIAR, Politecnico di Milano, Italy.

RESEARCH ACHIEVEMENTS AND PEER RECOGNITION

Research achievements

The development of my career has been driven by curiosity and enthusiasm about the study of the water cycle and dissemination of related knowledge. I followed a coherent and continuous path with the target of improving the theory of hydrological modelling and prediction with stochastic methods for mitigating flood and drought risk. During my early career studies I understood that processes governing the water cycle are characterised by an inherent and physically justified random component, that should be properly modelled through an innovative stochastic theory of hydrological models. Accordingly, my research activity in the past 25 years has been dedicated to the development of the stochastic physically-based approach for hydrological modelling, through an understanding of the physical reasons for uncertainty and the formulation of an integrated process-based stochastic approach. My target is the development of models entailing a stochastic and statistically tested component, through an improved understanding of the physical basis and patterns of the underlying processes and inherent randomness. By integrating physical and stochastic predictability into a unified approach my objective is to improve hydrological predictions and uncertainty assessment. The basis for the stochastic physically-based theory has been set through the following peer reviewed scientific papers. The list includes a selection of my contributions that are most relevant to RiverFlow. Names of students are indicated in bold.

- 1) Montanari, A., & Koutsoyiannis, D. (2012). A blueprint for process-based modeling of uncertain hydrological systems. *Water Resources Research*, 48(9).

Here, we demonstrated that any deterministic prediction can be converted into a stochastic physically-based formulation through the introduction of a stochastic kernel implying a shift from one to many simulations of the underlying deterministic model. I provided examples of application and tested the results. I proposed the idea of the new theory and coordinated the research. This paper sets the basis for RiverFlow and therefore it is included in this list although it was published more than 10 years ago.

- 2) **Sikorska, A. E.**, Montanari, A., & Koutsoyiannis, D. (2015). Estimating the uncertainty of hydrological predictions through data-driven resampling techniques. *Journal of Hydrologic Engineering*, 20(1), A4014009.

In this paper we proposed a data-driven (nearest neighbour) approach for the estimation of the stochastic kernel defined in the previous paper in gauged basins. I proposed the idea and coordinated the research. The contribution is highly relevant to RiverFlow.

- 3) **Iliopoulou, T.**, Aguilar, C., ... & Montanari, A. (2019). A large sample analysis of European rivers on seasonal river flow correlation and its physical drivers. *Hydrology and Earth System Sciences*, 23(1), 73-91.

In this research, which I proposed and coordinated, we investigated through a large sample analysis the physical drivers for correlation in river flow, thus setting the basis for physical investigation of the random properties and uncertainty of hydrological processes. Paper is highly relevant to RiverFlow.

- 4) Papalexiou, S. M., & Montanari, A. (2019). Global and regional increase of precipitation extremes under global warming. *Water Resources Research*, 55(6), 4901-4914.
We investigated with a large sample analysis and statistical inference the impact of climate change on extreme precipitation, for setting the basis for analysing flood change and related uncertainty. I proposed the research and coordinated it.
- 5) **Papacharalampous, G.**, Koutsoyiannis, D., & Montanari, A. (2020). Quantification of predictive uncertainty in hydrological modelling by harnessing the wisdom of the crowd: Methodology development and investigation using toy models. *Advances in Water Resources*, 136, 103471.
Here we investigated methods for uncertainty assessment for hydrological predictions by using machine learning approaches. This research is highly relevant to RiverFlow for the introduction of machine learning to estimate the stochastic kernel.
- 6) Koutsoyiannis, D., & Montanari, A. (2022). Bluecat: A local uncertainty estimator for deterministic simulations and predictions. *Water Resources Research*, 58(1), e2021WR031215.
With this paper we presented an innovative theory and data-driven approach for estimating the stochastic kernel in gauged basins. The innovative idea is to make use of the stochastic physically-based approach to improve the prediction by a given deterministic model and estimate uncertainty of predictions themselves. Results are fully reproducible with open source software. The contribution is highly relevant to RiverFlow for having first demonstrated that predictive capabilities are improved through the proposed stochastic theory. I proposed the research which was jointly managed by the authors.
- 7) **Guo, R.**, & Montanari, A. (2023). Historical rainfall data in northern Italy predict larger meteorological drought hazard than climate projections. *Hydrology and Earth System Sciences*, 27(15), 2847-2863. <https://doi.org/10.5194/hess-27-2847-2023>.
With this paper we proved that – in the presence of climate change – rainfall predictions are significantly improved by combining deterministic and stochastic models. I proposed the research and coordinated it.
- 8) Montanari, A., Nguyen, H., Rubinetti, S., Ceola, S., Galelli, S., Rubino, A., & Zanchettin, D. (2023). Why the 2022 Po River drought is the worst in the past two centuries. *Science Advances*, 9(32), eadg8304. <https://doi.org/10.1126/sciadv.adg8304>.
Here, we explained with physical reasoning changes in seasonality of Po River flows. We also provided a quantification of the impact of a diversity of physical drivers on the formation of river discharge and uncertainty. I proposed the idea and coordinated the research. Contribution is relevant to RiverFlow.
- 9) **Guo, R.**, Nguyen, H. T., Galelli, S., Ceola, S., & Montanari, A. (2025). Bridging information from paleo-hydrological and climate model ensembles to assess long term hydrological drought hazard. *AGU Advances*, 6(2), e2024AV001393.
With this research we demonstrated that river flow predictions are significantly improved by combining physically-based models with paleoclimatic reconstruction and statistical analysis of historical data. I proposed the research and coordinated it. This research is relevant to RiverFlow for assessing the value of paleoclimatic information.
- 10) Montanari, A., & Koutsoyiannis, D. (2025). Uncertainty estimation for environmental multimodel predictions: The BLUECAT approach and software. *Environmental Modelling & Software*, 188, 106419.
With this recent study, that is highly relevant to RiverFlow, we proposed a new method for the estimation of the stochastic kernel by using a combination of multimodel predictions given by an ensemble of deterministic models. We also provided open source software and data to fully reproduce the results. I proposed the idea. Research was jointly managed by the authors.

In the whole course of my career I published 155 papers in peer reviewed scientific journals which garnered more than 12,000 citations (more than 11,500 without self citations). My H-index is 52 (the above numbers are taken from Web of Science in July 2025). I co-authored one paper in *Science* (2017) and one paper in *Nature* (2019), the former focusing on flood seasonality in Europe and the latter focusing on flood changes in the recent past. These two papers were authored by a large group of scientists. I contributed to shaping the ideas of these studies and to analyse the results. 11 of my papers were highlighted by the Editor and/or mass media. In particular, paper #4 and #8 in the above list received an intensive press coverage, the former for the findings on climate change impact on flood risk, the latter for the conclusion that global warming has significantly altered the seasonality of Po River flows. The results presented in my most recent papers are fully reproducible. In particular, two papers (#6 and #10 in the above list) focusing on the development of the stochastic physically-based theory, which is the pillar of RiverFlow, can be entirely reproduced through open source software and data that are publicly available on GitHub along with help facilities. In the past I dedicated a significant amount

of my time to serving the academia and the community. In the final part of my career I decided to devote my full time to research and teaching, to follow my passion for discovery and dissemination.

Peer recognition

- 2024: Peter Loucks lecturer, International Association of Hydrological Sciences. *The lecture, with title “An impossible dream: The deterministic hydrologic prediction” sets the theory for RiverFlow.*
- From 2023: Founding member of the National Academy of Engineering and Technology of Italy. *Was invited to join the Academy in recognition of my contributions to hydrological modelling and mitigation of flood and drought risk.*
- From 2019: Elected member of the Academia Europaea for my merits in hydrological sciences.
- 2019: Dooge Medal of the IAHS, WMO and Unesco, with citation “For pioneering contributions to understanding hydrological systems in the presence of environmental and climatic change”.
- 2018: Kaula Award of the American Geophysical Union, in recognition of “extraordinary efforts in serving the scientific community on behalf of the AGU publications program”.
- 2018: Darcy Medal of the European Geosciences Union, with citation “For groundbreaking contributions to understanding and managing hydrologic change through physically-based stochastic modelling”.
- 2017: Fellow of the American Geophysical Union, with citation: “For groundbreaking contributions to understanding hydrologic change through physically-based stochastic modelling”.
- 2017: Union Service Award of the European Geosciences Union, with citation: “In recognition of his outstanding services to EGU’s awards programme, incorporating the highest ethical standards and transparency in procedures”.
- 2017/18 Rector’s mention for excellence of teaching, University of Bologna, Italy.

As mentioned above, many of the peer recognitions were awarded for setting the basis of the stochastic physically-based theory, which will be completed and globally validated through RiverFlow.

I am principal investigator of two major projects: (1) an Advanced Grant awarded by the Italian Science Fund for exploring the physical reasons for climate change impact amplification (2024-2029, funding: 1,383 Keuro), and (2) I am coordinator of the Spoke “Science Underpinning climate services for risk mitigation and adaptation” of the Extended National Partnership “Human Induced and Natural Environmental Risk” (2023-2025, total funding allocated to the spoke: 10,800 Keuro).

Invited lectures

In the past 15 years I delivered more than 50 invited scientific presentations at major international conferences (including the AGU Fall Meeting, the General Assembly of EGU, IUGG and IAHS conferences), Universities, National Academies, Governmental meetings, public engagement events. My most recent invited presentation is the 2024 Peter Loucks Lecture, hosted by the International Association of Hydrological Sciences, where I delivered a talk titled “An Impossible Dream: the Deterministic Hydrologic Prediction”, Florianopolis, November 2024. More details are available at <https://albertomontanari.it/node/233>. This lecture is relevant to RiverFlow as I presented there the basis for the stochastic physically-based approach.

ADDITIONAL INFORMATION

Supervision and co-supervision of graduate students and postdoctoral fellows

From 2000 Supervisor of 12 PhD students and 3 post-doctoral students. Co-supervisor of 4 PhD students. Four of the above students are now tenured professors. Supervisor of 81 MSc students.

Teaching activities

- From 2001: Teacher of several courses in the Italian and English language at the University of Bologna, for an average number of 150 hours of frontal lecturing/year. The topics of the courses are climate change, floods and droughts, water resources management, hydrology, water engineering, coastal engineering, harbor engineering, climate change and health.
- From 2011: Teacher of “Water Engineering” (in Italian) at the University of Bologna. The course is delivered with 48 hours of frontal lectures.
- 2012-2024: Teacher of “Advanced Hydrology” (later named “Sustainable design of water resources systems” and “Climate Change Adaptation”) at the University of Bologna, 48 hours of frontal lectures.
- From 2017: Teacher of Coastal and Harbour Engineering (in English) at the University of Bologna, 32 hours of frontal lectures.
- From 2021: Teacher of “Science of climate change” (in English) at the University of Bologna, 24 hours of frontal lectures.
- 2019: Teacher of Sustainability, environment and global challenges at the Superior College, University of Bologna. 6 hours of frontal lectures.

Organisation of scientific meetings (last 10 years)

- 2025: Chair of the EGU Leonardo Conference “From Science to People: Expecting the Unexpected in Flood and Drought Risk Management”, Bologna, Italy, June 19-20, 2025.
- 2023: Chair of the International Scientific Workshop “Novel concepts for the mitigation of flood and drought risk – Science progress and engineering practice”, Bologna, Italy, September 11, 2023.
- 2021: Chair of the Scientific Workshop “Water of the future. Climate change: new challenges and solutions for water supply” (in Italian), Bologna, Italy, December 15, 2021.
- 2021: Chair of the International Scientific Workshop “Novel hydrological concepts for the engineering practice”, Bologna, Italy, September 29, 2021.
- 2015: Vice-Chair of the Organising Committee of the 10th Alexander von Humboldt Conference, Addis Abeba, Ethiopia, November 18-20, 2015.

Other contributions to the research community

Reviewing activities (selection)

- 2020/22/24 Panel chair (PE10) for 3 calls of the European Research Council Consolidator Grant.
- From 2010: Research proposal reviewer for several international agencies including ERC, NSF, European Science Foundation, Swiss National Science Foundation, Czech Science Foundation.
- From 2021: Editor (Editor in Chief from 2025) of AGU Advances, published by AGU.
- 2017: Panel member (PE10) of the European Research Council Advanced Grant.
- 2013 – 2017: Editor in chief of Water Resources Research, published by AGU.
- 2004 – 2013: Editor of Hydrology and Earth System Sciences, published by EGU.
- From 2000: Reviewer for several international high profile scientific journals including Nature, Science, PNAS, AGU Advances, Journal of Hydrology, Water Resources Research, HESS.

Institutional responsibilities (selection)

- 2018 – 2022 President and Vice-president of the European Geosciences Union, Germany.
- From 2019 National representative for Italy at the International Association of Hydrological Sciences, UK.
- 2015 – 2021 Chair of the Department DICAM, University of Bologna, Italy.
- 2012 – 2015 Coordinator of the master degree program in Civil Engineering, University of Bologna, Italy.
- 2011 – 2015 President of the International Commission on Water Resources Systems, International Association of Hydrological Sciences, UK.
- 2009 – 2016: Chair of the Union Awards and Medals Committee of EGU.
- 2007 – 2011 President of the Hydrological Sciences Division, European Geosciences Union, Germany.

Career breaks, diverse career paths and major life events

Impact of Covid-19 pandemic

- Increased caring responsibility for dependent person, including home schooling of children.
- Adaptation to online teaching.

During the first 3 waves of the pandemic I was Department Chair at the University of Bologna and President of the European Geosciences Union. My working time has been completely dedicated to the mitigation of the emergency and risk for 14 months. I also had to adapt to online teaching and assist my 15-years-old son during remote teaching. Therefore I had a corresponding break of my research and scientific activities, which were resumed from May 2021.

Caring of family members

From 2001 to 2005 I had to continuously take care of my mother who was not independent in her advanced age. I managed to fully complete my teaching duties (I was associate professor with a teaching load of more than 120 hours of frontal lectures per year) but I had to give lower priority to my research activity. This is the reason of the delay in my scientific productivity and career development.

Other contributions to the research community

Through my career I have been a supporter of Equality, Diversity and Inclusivity (EDI) in the scientific community and working environment. As Editor in Chief of Water Resources Research I first included 2 women in the group of Editors. As President of the EGU I established the EDI Committee and the “Champions of EDI” award. I was co-chair of the EGU EDI Committee from 2023 to 2025.

Policy making and public engagement

During the whole course of my career I coordinated several consultancy activities (some of them on a voluntary basis) by the University of Bologna for public administrations, water boards, irrigation boards, National Civil Protection and other public agencies. I also dedicated substantial efforts to public engagement through dissemination to citizens, contributions to public assemblies focusing on environmental hazards, interviews at regional and national television programmes.