

Awarding of the 2014 Dooge Medal (International Hydrology Prize) to Professor Demetris Koutsoyiannis

"For fundamental contributions to the theoretical understanding of the long-term behaviour of hydrological, climatic and meteorological processes"

Demetris Koutsoyiannis is *Professor of Hydrology and Hydrosystems at the National Technical University of Athens (Greece)*.

He is a truly ideal candidate for the awarding of the first Dooge medal in view of his great hydrological achievements:

- He provided outstanding contributions to improving our understanding of the time variability of hydrological, meteorological and climatic processes. He advanced our knowledge of the random behaviour of physical systems through a forward-looking perspective and the development of new theories.
- He is an internationally recognized leader in the field. His contributions and his scientific excellence are globally known and were already recognized by the European Geosciences Union who awarded him with the Henry Darcy Medal in 2009. In the past few years he has served on the editorial board of 4 international journals.
- He has provided an extremely relevant service to the international community of hydrologists and in particular to IAHS. In fact, he has been Deputy Editor of the Hydrological Sciences Journal from 2006 to 2009 and Co-Editor since then. He also played an active role in shaping the scientific program of "Panta Rhei". His contribution to the scientific community also includes reviewing and editing over 550 articles submitted to 42 different scientific journals. He strongly promotes eponymous reviewing, and since 1998, all of his reviews have been eponymous.

During his distinguished career, Demetris Koutsoyiannis produced an excellent publication record, including 91 papers in international scientific journals (ISI indexed), 6 books (4 of which are textbooks), 291 publications in conferences and workshops, and 25 series of lecture notes.

Professor Koutsoyiannis focused his career on improving our comprehension of the random behaviour of hydrological and climatic processes, often by courageously tearing down outdated or flawed ideas and rebuilding sections of the discipline anew. His work has addressed problems in frequency analysis of extreme events, trend analysis, disaggregation modelling, characterization of rainfall data, evaluation of model reliability and robustness, coupling of hydrologic models, the role of entropy in hydrologic systems, and, most recently and importantly, interpretation of time series corresponding to long-memory processes and their scaling behaviours. The vision of Prof. Koutsoyiannis was excellently conveyed by the Darcy Medal lecture he gave at the 2009 General Assembly of the *European Geosciences Union*, where he showed the connection among chaotic dynamics, uncertainty, and predictability for environmental processes. It demonstrates that Demetris Koutsoyiannis is an interdisciplinary, open-minded and forward-looking scientist.

Demetris Koutsoyiannis accomplished outstanding research findings on a number of fundamental issues:

- **Principle of maximum entropy**
He introduced the idea of applying the Principle of Maximum Entropy to explain the seemingly peculiar behaviour of geophysical processes, such as: the saturation pressure curve, long-term persistence, fluctuations on large scales, clustering, state and time scaling, and heavy distribution tails. His 2005 contribution on “Uncertainty, entropy, scaling and hydrological stochastics” provided an illuminating theoretical development, where the Principle of Maximum Entropy was used to explain the scaling properties of hydrological processes.
- **Climate stochastics and variability**
Long-memory processes, also known as the "Hurst Phenomenon", present a special theoretical and practical problem in climatic time series analysis. The physical basis for Hurstian long memory continues to elude complete explanation. Demetris Koutsoyiannis tackled this challenging research question with 60 contributions, finally providing an illuminating physical interpretation, which ascribes the Hurst phenomenon to non-linear interactions among changes occurring at multiple time scales. His 2013 paper “Climatic variability over time scales spanning nine orders of magnitude” presents these findings by analysing the natural variability of past climate, as seen from available proxy information, and its attribution to deterministic or stochastic controls. It presents real discoveries on the intrinsic non-linear dynamics of climate processes and their connection with uncertainty.
- **Probabilistic description of extreme rainfall**
Demetris Koutsoyiannis also elaborated new ideas for the analysis and representation of the non-linear properties of rainfall, thereby enhancing our capability to provide a probabilistic description. These ideas are presented in 19 publications spanning from 1994, when he proposed a stochastic disaggregation method for heavy storms, to 2013, when he published a global survey of extreme rainfall series to assess emerging patterns. His paper published in 1996, “Deterministic chaos versus stochasticity in analysis and modelling of point rainfall series” makes an excellent case for the use of stochastic non-linear models for simulation purposes.

Summary

Demetris Koutsoyiannis exhibits extraordinary enthusiasm and passion for hydrology in all of its forms, with a particular emphasis on the study of non-linear dynamics and the integration of stochastic and physically-based methods to advance our understanding of hydrological processes. His research has challenged widely held beliefs, yet it has stood up to scrutiny. Prof. Koutsoyiannis is a true intellectual leader in the field whose contribution to hydrological research has been recognized worldwide. Finally, Prof. Koutsoyiannis is a delightful and brilliant speaker and a very amiable person.

I am delighted to award to Prof. Demetris Koutsoyiannis the 2014 Dooge Medal on behalf of IAHS/UNESCO/WMO, for his lasting contributions to hydrology as an Earth science and his fundamental contributions to the theoretical understanding of the long-term behaviour of hydrological, climatic and meteorological processes.

Hubert Savenije, IAHS President