



Towards a theory for hydrological change

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Hydrological change is one of the most important research issues in modern hydrology. Several recent contributions focused on emerging unprecedented patterns therefore pointing out that relevant changes are affecting the fundamental processes related to the water cycle. The above interest is motivated by the impact of hydrological change on natural hazards and therefore on the related risk affecting human settlements and activities. Indeed, water plays a central role for societal systems and therefore any change affecting water security, and water related risks in general, is a matter of concern for society.

However, hydrological change is still "a well known unknown". On the one hand, humans are well aware that environmental systems are continuously changing.

On the other hand, natural variability and the associated change are poorly known. Moreover, a fundamental question remains unsolved on the impact of human activity on environmental change and environmental risks. To what extent humans may affect the global water cycle? How to model the interactions and feedbacks between natural systems and society?

Furthermore, it is still not clear how hydrological change can be understood and modelled. The above lack of clarity is inducing relevant misconceptions, like for instance the conviction that change is a synonym for non-stationarity or the belief that non-stationary approaches are needed to predict the impact of change. As a matter of fact, a theoretical framework for dealing with hydrological change is still lacking.

This talk will summarise ideas for the development of a theoretical framework to support the interpretation and modelling of hydrological change. I am not proposing new concepts, but rather a review of the main approaches that are available for dealing with hydrological change. My objective is to clarify the ways forward to a better comprehension of the changing behaviour of hydrological systems, to improve our capability to support hydrological design in order to provide a more satisfactory reply to the urgent societal issues related to water and water related risks.

Finally, I will put the emphasis on the importance of data to assess hydrological change and to support hydrological analyses in general. In detail, I will report on a recent experience that is carried out by 5 European research groups in hydrology which are setting up a virtual laboratory for hydrological modelling.