

Role and agenda of data-driven modelling

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ABSTRACT

Many bloggers highlighted the crucial role of observations and the importance of understanding the value and the limitations of what data can tell us; this is even more true for new types of data, obtainable through modern monitoring technologies. Improving the understanding and the detailed modelling of the physical processes will certainly, in prospective, improve predictability, but the first, fundamental contribution must in fact come from the full exploitation of our data, in order to identify the signatures of catchments' functional responses, quantifying the characteristics of the hydrologic response that provide insight into the behavior of the catchment. The available observations - of both traditional and innovative types - of hydrological response variables may be seen as a description and a synthesis of the main features of the complex reality of the catchment and they may help us to understand it better. The good predictions that may be obtained with data-driven models are a proof of the relevance of the information that is embedded in the available observations and such kind of models may be used also with the objective of assessing the meaningfulness of the data themselves. Data-driven models, such as neural networks, are in fact powerful extractors of informative content, due to their ability to flexibly reproduce the highly non-linear nature of the relationship between hydrological variables, also when such relationship is not fully known nor explicitable a priori. If such models, provided they are correctly set up, calibrated and validated, do not allow a performance improvement when making use of additional types of data, then the significance or/and reliability of such information should be questioned. The presentation will summarize the content of a recent paper by a panel of hydro-informatics researchers (Abraham et al., *Progress in Physical Geography*, 36: 480-513, 2012) that offers a thematic view of emerging trends in neural network river forecasting modeling and delivers a set of outstanding challenges, thereby shaping a coherent research agenda over the next decade that may hold also for other data-driven techniques and, as far as many of the raised issues, for hydrological modeling in general.