



## Long term persistence and uncertainty on the long term

D. Koutsoyiannis (1), A. Montanari (2)

(1)Department of Water Resources, National Technical University of Athens, Greece, e-mail: dk@itia.ntua.gr, (2) Department DISTART, Faculty of Engineering, University of Bologna, Italy , e-mail: alberto.montanari@unibo.it

Today hydrologic research and modeling depends largely on climatological inputs, whose physical and statistical behavior are the subject of many debates in the scientific community. A relevant ongoing discussion is focused on long-term persistence (LTP), a natural behavior identified in several studies of instrumental and proxy hydroclimatic time series, which nevertheless is neglected in some climatological studies. LTP may reflect a long-term variability of several factors and, thus, can support a more complete physical understanding and uncertainty characterization of climate. The implications of LTP in hydroclimatic research, especially in statistical questions and problems, may be substantial, but appear to be not fully understood or recognized. To offer insights on these implications, we demonstrate using analytical methods that the characteristics of temperature series, which appear to be compatible with the LTP hypothesis, imply a dramatic increase of uncertainty in statistical estimation and reduction of significance in statistical testing, in comparison with classical statistics. Therefore, we maintain that statistical analysis in hydroclimatic research should be revisited, in order not to derive misleading results, and simultaneously that merely statistical arguments do not suffice to verify or falsify the LTP (or another) climatic hypothesis.