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Fuzzy logic approach of hydrological modelling

A W Jayawardena

The University of Hong Kong, Hong Kong

In recent years, flood disasters resulting from extreme rainfall have been on the increase in many regions of the world. In developed countries, the usual practice of mitigating flood disasters is by structural means which are unaffordable in most developing countries. The alternative then is to look for non-structural means that involve, among other things, early warning systems. The basic technical components of an early warning system involves a measurable input data set that trigger floods, a measurable output data set that quantify the extent of flood and an appropriate mathematical model that transforms the input data set into a corresponding output data set. The crux of this paper is on one type of data driven mathematical models, namely the use of fuzzy logic approach. Fuzzy logic models are conceptually easy to understand, flexible, tolerant to imprecise data and can handle nonlinear functions of arbitrary complexity and built on the experience of experts. This approach is applied to forecast discharges in several flood prone rivers in Sri Lanka, China and Fiji using Mamdani, Larsen and Takagi-Sugeno-Kang Fuzzy (TSK) Inference Systems. Basin averaged daily rainfall and discharges at upstream gauging stations were considered as input data. Comparison of the performance indicators indicated that that the approach was capable of forecasting reasonably accurate downstream discharges. Attempts to develop hybrid models using wavelet decomposition, fuzzy logic and neural networks are also highlighted.

Biography

A W Jayawardena obtained his PhD degree from the University of London. He is a Chartered Engineer, a Fellow of the UK Institution of Civil Engineers, a Fellow of the Hong Kong Institution of Engineers, and a Life Member of the American Society of Civil Engineers. His research publications (over 165) include a recent published book (Environmental and Hydrological Systems Modelling by Taylor and Francis Group), book chapters, and several journal and conference papers. He was the recipient of the 2013 International Award of the Japan Society of Hydrology and Water Resources.

hrecjaw@hkucc.hku.hk

Variability of water masses properties in the Central Mediterranean Sea

Sana Ben Ismail

National Institute of Marine Science and Technology (INSTM), Tunisia

Several hydrological observations were made in the Central Mediterranean Sea (Tunisia-Sicily Channel and surrounding area), from 1995 to 2009, that allowed to identify the various water masses in the region and to estimate the interannual variability of their hydrological characteristics. Besides the well known AW (Atlantic Water) and LIW (Levantine Intermediate Water), other water masses have been identified even if their presence is not as steady and as stable as for AW and LIW. The WIW (Winter Intermediate Water) flows beneath the AW to the eastern basin while the IW (Ionian Water), which has a high intermittent character, flows in the subsurface layer to the western basin. The flows of subsurface water (WIW and IW) are affected by intense a mixing phenomena which modify water masses and tend to make them disappear. The detailed pathways of these water masses are not well documented in the central Mediterranean. Then to assess the mesoscale and seasonal variability of these water masses in this area, it was compared the high sampling *in situ* data with a high resolution numerical simulation. Moreover, the same hydrological series have yielded an interesting result concerning the increase of temperature and salinity in the Tunisia-Sicily Channel. This trend regards particularly the deep layer (LIW and tEMDW) and hypothesized that this is a direct response to a climatic change occurred in the eastern basin.

Biography

Sana Ben Ismail has completed her PhD at the age of 30 years from University of Tunis and ENSTA-Paris-Tech (France). She was recruited in 2012 as Researcher at the National Institute of Science and Technology of the Sea. She is responsible for the acquisition, processing and analysis of hydrological data since 2005 in the Tunisian Channel and off the Tunisian coast. She is interested in the variability of water masses and circulation in the Central Mediterranean. She has published more than 10 papers in reputed journals and has been active in several regional and international research projects.

sana.benismail@instm.rnrt.tn

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