Geophysical Research Abstracts
Vol. 16, EGU2014-998-5, 2014
EGU General Assembly 2014

Discretized diffusion models with jumps and Regime-Switching Models: Application to hydrologic processes

André Guy Tranquille TEMGOUA (1), Richard MARTEL (1), Joseph Emmanuel FANTCHO (2), Uta GABRIEL (1), and Jean-Loup ROBERT (3)

(1) Research Associate, INRS-ETE, Quebec, Canada (andre_guy_tranquille.temgoua@ete.inrs.ca), (2) Strategic Researcher, PROCENVI INC., Quebec, Canada (je.fantcho@gmail.com), (3) Professor, ULAVAL, Quebec, Canada (Jean-Loup.Robert@gci.ulaval.ca)

Over the last decade, a major effort has been made to understand hydrologic processes. However, the application of jump-didiffusion in hydrologic processes is not widely implemented in hydrologic data series analysis and especially the forecast of hydrologic parameters. The present study uses jump-diffusion models by adding structural changes to establish periods of floods and groundwater recession. The model implicitly assumes that changes in rivers flowrates can be of three types: (a) normal changes due to perturbation of precipitations, anthropogenic actions and natural regulation that causes major changes in hydrologic processes; this component is modeled by a discrete Brownian motion; (b) abnormal, sudden and non-persistent changes in hydrologic processes are captured using a Poisson jump process; (c) persistent changes are captured and taken into account by structural changes.
The objective of this paper is to add structural changes in diffusion models with jumps, in order to capture the persistence in the changes. Indirectly, the idea is to observe if there is a structural change of the discharge of the studied river (Sanaga) related to climate change. Thus, this paper focuses on the structural changes in diffusion models with discrete jump. The idea is to find a sufficiently flexible model capable of capturing a wide variety of changes in the structure of hydrologic processes. The time of change is determined in hydrologic processes using the method of nonlinear discrete filters. An application is given using sensitive parameters such as baseflow index and recession coefficient to capture discharge fluctuations in rivers in a context of climate change. One historic dataset is examined by the volume spread analysis (VSA) with respect to the changes that occur in the hydrologic network as the time unfolds as well as induced by random perturbations. The application of the method allows to establish optimized hydrologic variables. The impact of this study is perceptible in forecasting periods of floods and groundwater recession.

Keywords: discrete jump, structural changes, forecast, climate change, hydrologic processes