ABSTRACT
Hydrokinetic energy is one of the renewable energies that gain much global attention recent years. Hydrokinetic turbine is used to extract energy from the flowing river water. Reliability is a critical issue that needs to be addressed during the development process of hydrokinetic turbine systems. In this work, a new reliability analysis method is proposed for the hydrokinetic turbine blades under random river velocity field. A river velocity field is established first. The critical working position of turbine blades is then identified by using the blade element momentum (BEM) theory. The river velocity is modeled as a random field with variations and correlations both in spatial and temporal domains. The time-dependent characteristics of river flow loading are captured by time series models. The effect of time-dependent river velocity field on the reliability of turbine blades is investigated. The proposed method is compared with the Monte Carlo Simulation (MCS) in the case study. The results demonstrate that the developed method can predict the time-dependent reliability of turbine blades efficiently and accurately.