Geophysical Research Abstracts
Vol. 20, EGU2018-8102, 2018
EGU General Assembly 2018

Minimization, equivalence and fate of the hydrogeological hazard: a new criterion to manage the flood threats applied to the Padova hydraulic node

Riccardo Mel, Luca Carniello, Elena Crestani, Daniele Viero, and Luigi D'Alpaos
Università degli Studi di Padova, ICEA, Italy (riccardo.mel@dicea.unipd.it)

Until two centuries ago, the Bacchiglione river crossed the city of Padova and the entire neighborhoods were threatened by its floods. In order to solve this problem, in 1830 the Austrian Government established the construction of a new channel, the Scaricatore channel, diverting the Bacchiglione river outside Padova, up to the Roncajette river at Voltabarozzo. However, this artificial channel was not able to convey the maximum flow rates of the Bacchiglione. Therefore, in the 1930s, according to the project of Luigi Gasparini, the Scaricatore was enlarged and the new San Gregorio channel was digged with the aim of diverting the water from the Voltabarozzo node toward the Piovego channel and then to the Brenta river, in order to reduce the hydraulic threat in the Roncajette. The water discharged through both the San Gregorio and the Roncajette is controlled by two different systems of sluice gates, located at the Voltabarozzo node. The management of these gates is actually manual, based on the water level gauged in some sections of the Bacchiglione and the Brenta.
In the present study we first estimated the flow capacity of the San Gregorio channel, depending on the water level both at Voltabarozzo and in the Brenta.
The target of this work is to develop an automatic procedure to define the optimal maneuvers at the gates, according to a criterion that consists in the "minimization, equivalence and fate" of the hydraulic hazard. Five hazard classes have been identified, related to the water level in the Scaricatore and to the flow rates both in the Brenta and in the Roncajette, as result of the regulations at the gates. The definition of these classes has been strongly related to the knowledge of the geomorphological and hydrogeological features of the territory: the key elements we considered are the spatial and temporal propagation mechanisms of the flood waves, the characterization of overflow-collapse triggering mechanisms of the banks and the assessment of the threat to infrastructure and private buildings.
The procedure has been tested over several events, by means of a 2–D shallow water numerical model, based on a finite-element technique where the domain is discretized with triangular elements.
Results show that the automatic procedure can be a powerful tool to manage the Padova node during the floods of the Bacchiglione river. Moreover, this procedure allows to reproduce the regulations at the gates carried out in the past floods events, when the regulations have not been recorded yet. Finally, the procedure has been used to evaluate the effects of some hydraulic interventions, such as the rise of the levees at some locations and the construction of the waterway "Idrovia Padova – Venezia", which should divert part of the flow rates of the Brenta toward the Venice lagoon, just downstream the confluence with the San Gregorio - Piovego system.
Criteria and strategies implemented here for the Voltabarozzo node can be applied to other regulation structures, in order to improve the hydraulic hazard mitigation and decision making process.