Geophysical Research Abstracts
Vol. 12, EGU2010-13773, 2010
EGU General Assembly 2010

Levee breaches and uncertainty in flood risk mapping

Roberto Ranzi (1), Stefano Barontini (1), Michele Ferri (2), and Baldassare Bacchi (1)

(1) Università di Brescia, DICATA, Brescia, Italy (ranzi@ing.unibs.it, barontin@ing.unibs.it), (2) Autorità di Bacino dei fiumi dell'Alto Adriatico, Venezia, Italy

Due to the dense anthropization, to the agricultural and industrial exploitation and to its treasures of art and history, northern Italy floodplain, which is a result of the action of the rivers draining into the northern Adriatic sea, is a land where the mitigation of the flooding risk rises at crucial importance. Most of the major rivers flowing in this area have a long and complex history of training in order to protect the plain and the cities and it is difficult to predict the position where levee breaches can occur and the width and depth of the breaches.

In view of an investigation on the uncertainties in flood risk mapping, with the aim of developing a methodology based on a stocastic approach to model the position, length and depth of the breach coupled with a simplified method to determine the flooded area, we collected information on major floods and statistics of levees breaches occurred in the Po, Adige, Brenta, Piave and Tagliamento rivers. We provide the statistics of 225 historical breaches occurred in the 1801—2000 time windows in the floodplain course of the Po river, which is 324 km long (from upstream to downstream, 80 km are meandering, 100 km are braided and the others are sinuous–straight). The first two stretches are characterised also by lateral inflow, while the last stretch is mainly characterised by routing and floodplain inundation processes.

Three dominant levee collapse mechanisms (overtopping, erosion, piping) were considered. The highest number of breaches was registered in the meandering course, with overtopping strongly (78%) as the most frequent dominant mechanism. Three different samples of historical floods were considered, separated by two important floods (1857 and 1879). A significant decrease in the total number of breaches (per year and per kilometer) was observed since the second half of the 19th century, as a consequence of flood directives issued in that period and to the levees restoration after the floods. A decrease in the percentage of the overtopping was observed in the second period (77% in the first half of the 19th century, 56% in the 1857—1879 window and again 74% up to the 1951 flood) jointly to the increasing of piping (respectively 9%, 32% and 18% in the three time windows). Statistics on the breach occurrences in the Adige, Brenta, Piave and Tagliamento rivers are also presented and discussed.