Geophysical Research Abstracts
Vol. 18, EGU2016-16297, 2016
EGU General Assembly 2016

Investigating historical changes in morphodynamic processes associated with channelization of a large Alpine river: the Etsch/Adige River, NE Italy

Simone Zen (1), Vittoria Scorpio (2), Marco Mastronunzio (3), Matteo Proto (3,4), Guido Zolezzi (1), Walter Bertoldi (1), Francesco Comiti (2), Nicola Surian (5), and Elena Dai Prà (3)

(1) Department of Civil, Environmental and Mechanical Engineering, University of Trento, Italy (simone.zen@unitn.it, guido.zolezzi@unitn.it, walter.bertoldi@unitn.it), (2) Free University of Bozen- Bolzano, Bolzano, Italy(Vittoria.Scorpio@unibz.it, Francesco.Comiti@unibz.it), (3) Department of Humanities, University of Trento, Trento, Italy(mastronunzio@gmail.com,elena.daipra@unitn.it , (4) Dipartimento di Storia Culture Civiltà, Bologna, Italy(matteo.proto@unitn.it), (5) Department of Geography, Univeristy of Padua, Padua, Italy(nicola.surian@unipd.it)

River channel management within the last centuries has largely modified fluvial processes and morphodynamic evolution of most large European rivers. Several river systems experienced extensive channelization early in the 19th century, thus strongly challenging our present ability to detect their morphodynamic functioning with contemporary photogrammetry or cartographical sources. This consequently leaves open questions about their potential future response, especially to management strategies that "give more room" to the river, aiming at partially rehabilitating their natural functioning. The Adige River (Etsch in German), the second longest Italian river, is an exemplary case where channelization occurred more than 150 years ago, and is the focus of the present work.

This work aims (i) to explore changes in fundamental morphodynamic processes associated with massive channelization of the Adige River and (ii) to quantify the alteration in river bars characteristics, by using morphodynamic models of bars and meandering.

To fulfil our aims we combine the analysis of historical data with morphodynamic mathematical modelling. Historical sources (recovered in a number of European archives), such as hydrotopographical maps, airborne photogrammetry and hydrological datasets were collected to investigate channel morphology before and after the channelization. Information extracted from this analysis was combined with morphodynamic linear models of free migrating and forced steady bars, to investigate river bars and bend stability properties under different hydromorphological scenarios. Moreover, a morphodynamic model for meandering channel was applied to investigate the influence of river channel planform on the evolution of the fluvial bars.

Results from the application of morphodynamic models allowed to predict the type, position and geometry of bars characterizing the channelized configuration of the river, and to explain the presently observed relative paucity of bars if compared to the previous, less confined, river planform. The application of a meander model allows insight into the properties of bars that were observed in the old historical maps. A threshold range of the imposed channel width can be predicted above which the river may partially restore conditions for bar instability to occur and for their further development, with direct management implications.

Overall the conducted analysis confirms the potential of integrating morphodynamic models with geomorphological and time-series analysis of historical large-scale maps and airborne photogrammetry to increase our understanding and predictive ability of the evolution of rivers with a long-lasting record of morphological regulation.