

Bathymetry alteration in the Venice lagoon during the last century and mathematical modelling of the possible complex causes.

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Abstract

Venice lagoon bathymetry has been altered by several problems during last century. The high level of the sea originated important problems to the infrastructure, to the monuments and to the fishing farming to mention some examples. In the last three decades the Italian government had to create structures to temporary close of the Venice lagoon inlets from the Adriatic sea when the sea level increases more than 110 cm. This project is called MOSE and it will produce changes in the bathymetry and in the morfo-dynamic structure of the Venice lagoon. The purpose of this study is to understand the influence of anthropic and natural events on its bathymetry. Venice lagoon bathymetry was examined and numerically modelled with arcGIS 9.2 in order to understand the complex reason of the changes of the seabed in the last century. The arcGIS 9.2 program creates maps, interpolates data and besides, greatly reduces the number of points to interpolate. The aim is to take small squares of the Venice lagoon and transfer the bathymetry data point, inside each square with a statistical program. The analysed data were taken in three different years: 1930, 1970 and 2000. The data of these three different years were analysed and interpolated with the arcGIS software. The maps created were divided into five different groups of possible causes, which can be correlated with the evolution of the bathymetry: location (north, centre and south), sediment texture (sand < 25%, sand > 25% and < 50% and sand >50%), high waves (from 0 to 0.17m, from 0.17 m to 0.3 m and from 0.3 m to 0.4 m), different type of habitats (bare tidal flats, sea grass and salt marsh), and finally fishing activity (low, medium and high fishing activity). The use of arcGIS program and statistic complex modelling permitted to understand the most important factors that influenced the evolution of the bathymetry in Venice lagoon from 1930 to the end of the last century. To perform the statistic modelling seven smaller squares have been created inside each different sub-map (105 different squares in total for the entire lagoon). The side size adopted for each square was equal to 1 km to uniform the value for the whole lagoon and the position of the square were positioned randomly. In each square the data were analyzed and modelled to understand the reason of the bathymetry changes. The numerical modelling shows that the anthropic impact altered the bathymetry especially in the area that is particular used by transports. The results show the areas that have been more damaged by anthropic impact. This can be a start for future

protection of particular areas of Venice lagoon. This study can be also correlated with the bathymetry change that will be created by the MOSE construction.

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