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The high resolution mapping of the Venice Lagoon tidal network

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One of the biggest challenges of the direct observation of the ocean is to achieve a high resolution mapping of its seafloor morphology and benthic habitats. So far, sonars have mapped just 0.05% of the ocean floor with less than ten-meter resolution. The recent efforts of the scientific community have been devoted towards the mapping of both Deep Ocean and very shallow coastal areas. Coastal and transitional environments in particular undergo strong morphological changes due to natural and anthropogenic pressure. Nowadays, only about 5% of the seafloor of these environments † have been mapped: the shallowness of these environments has prevented the use of underwater acoustics to reveal their morphological features. The recent technological development of multibeam echosounder systems, however, enables these instruments to achieve very high performances also in such shallow environments. In this work, we present results and case studies of an extensive multibeam survey carried out in the Lagoon of Venice in 2013. The Lagoon of Venice is the biggest lagoon in the Mediterranean Sea with a surface of about 550 km2 and with an average depth of about 1 m. In the last century, the morphological and ecological properties of the lagoon changed dramatically: the surface of the salt marshes was reduced by 60% and some parts of the lagoon are deepening with a net sediment flux exiting from the inlets. Moreover, major engineering interventions are currently ongoing at the inlets (MOSE project). These changes at the inlets could affect substantially the lagoon environment.
To understand and monitor the future evolution of the Lagoon of Venice, ISMAR within the project RITMARE (a National Research Programme funded by the Italian Ministry of University and Research) carried out an extensive survey, involving a team of more than 25 scientists, to collect high resolution (0.5 m) bathymetry of key study areas such as the tidal inlets and channels. Following a broad multidisciplinary approach, bathymetric and backscatter intensity data are now employed for geomorphologic studies, habitat mapping and modelling of evolution trends of this highly dynamical and complex transitional environment.