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Characteristics and short-term changes of the Po Delta seafloor morphology through high-resolution bathymetric and backscatter data

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River deltas are highly dynamical and valuable environments and often undergo strong natural and human-induced actions that need constant monitoring. Whereas remote sensing observations of the sub-aerial part of the delta are very important for the assessment of the morphological changes over long time scales (years-decades), the short time-scale evolution of the submerged part of the system remains often undetermined. In particular, the shallow-water submarine pro-delta front is commonly characterized by active depositional and erosional processes. This area is crucial for the understanding of the fluvial and coastal dynamics.
In this study, we applied geophysical investigations to characterize the very shallow-water area of the Po river delta in the northern Adriatic Sea. The modern Po delta is the result of increased sediment flux derived from both climate change (Little Ice Age) and human impact (deforestation and diversion and construction of artificial levees) and in recent years is suffering erosion. Here, we present the results of two high-resolution multibeam echosounder surveys carried out in June 2013 and in September 2014 on the Po river mouth and delta front in the framework of the Ritmare Project. The Po delta front, as other modern deltas, has a complicated morphology, consisting of multiple terminal distributary channels, subaqueous levee deposits, and mouth bars. The high-resolution bathymetric data show that the prodelta slope has a curved shape with an overall southward asymmetry of the submerged delta due to prevalent longshore currents. The 2013 bathymetric map highlights a number of sedimentary features, such as depositional bars, radiating in the prodelta slope with an asymmetric section, with steeper southward lee side. The new bathymetric map collected in 2014 shows impressive changes: in correspondence with the depositional lobes, we observed extensive collapse depressions with bathymetric changes of over 1 m in 15 months and widespread instability phenomena along the slope. Moreover, the acoustic backscatter intensity data and grab samples collected in the area provided information about the superficial sediment distribution during the two surveys, while the study of the water-column backscatter intensity revealed the presence of gas plume in the water-column. These results contribute to a better understanding the recent sediment dynamics and evolution of the Po Delta system.