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Modeling the thickness of marine Holocene sediment in the Gulf of Trieste (Northern Adriatic Sea) from bathymetric, subseafloor and sedimentological data

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The Gulf of Trieste is located in the northeastern part of the Adriatic Sea. After the Holocene trangression marine sediment started depositing on top of Late Pleistocene continental deposits approximately 10,000 years ago in this area. We present the first model of the thickness of Holocene marine sediment in both the Italian and Slovenian parts of the Gulf of Trieste based on geomodeling from extensive high-resolution geophysical datasets along with published sedimentological data and nautical chart data.

Between 2000 and 2015 we acquired various geophysical datasets (multibeam and singlebeam sonar data, Chirp and sub-bottom parametric sonar data and very high resolution boomer seismic data) covering a vast majority of the Gulf of Trieste which we used to infer seafloor depth and the depth of the base of the marine Holocene sediment. Additionally, we used published data from cores/wells and nautical chart data. We imported the extensive datasets into the Gocad software in order to model the surfaces of the seafloor and the base of the marine Holocene sediment. We used the resulting models to calculate the model of the thickness of Holocene marine sediment. In places where the density of our input data was low, we used the Holocene thickness values from the Italian marine geological chart (NL 33-7 Venezia).

In our model the thickness of marine Holocene sediment Gulf of Trieste extends between 0 and 24 meters. In the central part of the gulf generally only thin drapes of Holocene marine sediment can be found. On the contrary, the nearshore parts of the gulf are covered with thick coastal sedimentary wedges often thicker than 10 meters. Additionally, the gulf can be divided into two parts: the western-central part with very thin (sometimes even unresolvable on geophysical profiles) marine Holocene cover and the southeastern part with thicker sequences. In the first part, thicker marine Holocene sequences can be observed only in the vicinity of larger fluvial sources, the Trezza Grande paleodelta and as infill of negative Late Pleistocene paleotopography. In the SE part of the gulf the average thickness of the Holocene marine cover is approximately 5 meters with greater thicknesses near the coast and above buried Late Pleistocene channels. The distribution of the thickness of marine Holocene sediment in the Gulf of Trieste is probably controlled by the availability and deposition of sediment transported into the sea by fluvial transport and surface run-off.

Our work provides a reference for a variety of disciplines studying the Holocene sediment in the area. As our models of the bathymetry and the base and thickness of the marine Holocene sediment are freely available upon registration at the OGS SNAP data repository (https://doi.org/10.6092/6ad9b1e6-c977-cec9-8a2d-db10c7f90adc), they represent a useful tool in future research of the marine sediment as they can be utilised in sampling site and/or survey selection for sedimentological, geomorphological, paleoenvironmental, neotectonic and oceanographic studies of the Gulf of Trieste.