What do shallow cores tell us when drilled in an anthropogenically active delta from northwest Italy?

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This study aims at checking the quality of the sedimentary record preserved on the deltaic seafloor by analyzing the deposits preserved in 4 shallow cores. These have been collected by scuba diving at four different depths (10m, 20m, 30m and 40m) just in correspondence of the delta of the Entella river, in the Gulf of Tigullio (Western Ligurian Sea - Italy).

The Entella river runs through several onshore sites that can have been potential source of pollution or contamination of the marine system in the past and thus potentially preserved in the sedimentary sequence. Among those sites the possible contamination sources could be caused by extensive human activities such as production and processing of thermoplastic material, vegetable oils, junkyards, several quarries (limestone and slate), landfill of solid urban waste.

The core subsampling was directly performed onboard of the support vessel immediately after underwater collection. In total four cores, with a length comprised between 26 and 44 cm, have been collected. Each core was cut into 2-cm slices, which were then further divided in half.

The first half of sediment has been placed in a plastic bag in order to perform the followed analyses: granulometry, content of organic/inorganic matter by thermogravimetric method, XRPD analyses, C14 radiometric dating and chemical component analysis.

The second half of sediment, stored into a glass jar (to prevent plastic contamination), has been used to search for both agglutinated microplastics on picked agglutinated foraminifera and further microplastics on filters. Filters have been prepared using density separation in supersalty aqueous solution and filtration. Investigations have been performed by optical microscopy and µRaman spectroscopy. Since the analysis of the whole filter is extensively time-consuming, due to the high number of items present, we have tested a statistical approach to optimize the filter investigation.

All the data obtained were processed using the statistical software R. Multivariate analyses have been performed for the granulometry dataset as well as for other data. The results seem to point to specific trends characterized by possible seasonal fluctuations registered in the sedimentary sequence. The mineralogy dataset, investigated by cluster analysis, points to a clear separation of the mineralogical composition of the shallower versus the deeper cores. Interestingly, agglutinated foraminifera (i.e., mostly textulariids) seem to agglutinate large amount of carbon
grains and plastics have been not yet observed.