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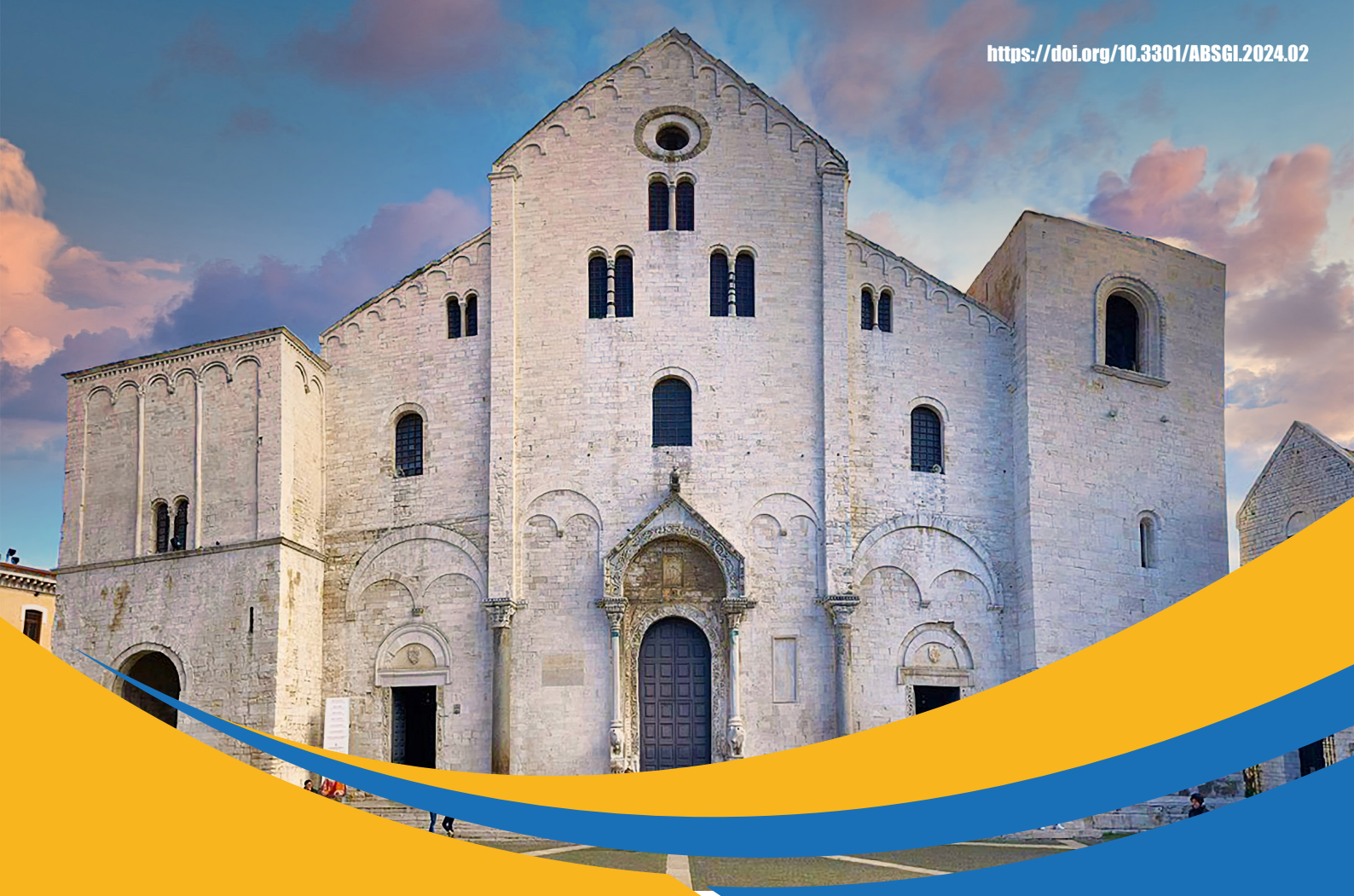

Bari, 2-5 September 2024

ABSTRACT BOOK

a cura della Società Geologica Italiana

BARI 2024

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Integration of microplastic gravimetric separation protocol considering sediment texture and composition

Buoninsegni J.*[1], Tessari U.[2], Marrocchino E.[1] & Vaccaro C.[1]

[1] Dipartimento di Scienze dell'Ambiente e della Prevenzione, Università di Ferrara.
[2] Dipartimento di Fisica e Scienze della Terra, Università di Ferrara.

Corresponding author email: joana.buoninsegni@unife.it

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Coastal-lagoon environments are highly vulnerable and subject to multiple stressors, among which marine litter (ML) is a serious global issue. The predominant category of ML recorded along coasts mainly consists of artificial polymeric materials (Le et al., 2024). In the environment, macro-ML degrades into smaller items due to photo-thermo-oxidative degradation: Large Micro Plastics (LMP, 5 - 1 mm), Small Micro Plastic (SMP, 1 mm – 20 μm), nano Plastics (nP, ≤ 20 μm). These microplastics are defined as secondary. However, primary microplastics can also be found in the environment, which are produced in microscopic sizes for specific purposes and various applications (Saeedi, 2024).

Many protocols have been developed to study and quantify the presence of SMP in various types of coastal environments. Quantifying SMP along the sandy coasts of the northern Adriatic Sea remains challenging due to the very fine dimensions of the sediments in which microplastic items are trapped. Therefore, the gravimetric separation of microplastics from sediments using non-toxic and cost-effective saline solutions presents some practical difficulties. The protocol conventionally used in the Adriatic area for sampling and analysis of SMP (Palatinus et al., 2015) suggests adding 200 mL of saturated NaCl solution (density 1.2 g/cm^3) to 50 mL of sampled sediment. This mixture is then stirred for 2 minutes to suspend the microplastic items embedded in the sediments. According to the protocol, a waiting time of 4 minutes is required for sediment precipitation, and then the supernatant can be collected and filtered in order to collect the microplastics on borosilicate glass fiber filters (Whatman® microfiber filetrs GF/D, mesh size 2,7 μm).

However, the mentioned protocol does not provide information correlating sediment grain size with an optimal waiting time to perform this procedure. From various tests conducted by our team, it has been observed that the indicated waiting times are not sufficient to achieve the complete settlement of non-plastic particles, particularly for samples containing an average of 69% fine sediments, rich in muddy fraction (d < 0.250 mm).

With this work, we suggest a possible integration to the protocol based on preliminary tests useful for verifying the optimal waiting times for collecting the supernatant to be filtered, in relation to the textural and compositional characteristics of the sediments. This integration helps to avoid both the deposition of a compact solid matrix on the filter, which could mask the presence of the microplastics to be observed, and the damage to the equipment used for vacuum filtration.

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