

FORENSIC SEDIMENT ANALYSIS: AN EXAMPLE FROM LAGOONAL BEACHES IN RIO GRANDE DO SUL

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ABSTRACT: The number of violent crimes in Rio Grande do Sul increased in recent years, highlighting the need to develop more efficient techniques to help solve these crimes. Geological techniques are being used for forensic investigators with increasing success. Samples such as sediments, soils and microfossils can be collected in crime scenes and studied to reveal information about the crime itself. Most previous studies focused on fine-grained sediments, so the forensic potential of coarse-grained sediments is currently underinvestigated. Therefore, this work investigated the forensic applications of sandy sediments from the coastal plain in Rio Grande do Sul. The main objective during this first phase of the project is to test the discrimination (localization) potential of sedimentological characteristics like mineral and biomaterial composition, and granulometric characteristics. The study area was delimited in accordance with the region governed by the Instituto Geral de Perícias in Pelotas, and three regions with lagoonal beaches were selected: São Lourenço do Sul, Pelotas and Arroio Grande. Sediments from São Lourenço do Sul and Pelotas are located on the shores of Lagoa dos Patos and are both sourced by sediments derived from the Batólito Pelotas under similar conditions of sediment transport. In contrast, Arroio Grande is located further south at the shores of Lagoa Mirim and sourced by lithologically diverse rocks transported under lower energy conditions. The sampling strategy was designed considering the sedimentological patterns present in the locations. Three parallel transects were sampled and four points in each line were chosen based on sedimentological patterns: one point near the landward beach edge, one point in storm zones, one point in high tide zones, and one point in low tide zones. Each point was delimited by 1 m² where superficial sediment samples were collected to a depth 0.05 m. The samples were subsequently dried, and a sieve tower with nominal sieve openings of 2, 1, 0.500, 0.250, 0.125, and 0.063 mm was used to measure differences in granulometric characteristics. The obtained data were treated in an Excel spreadsheet to calculate size fraction and homogeneity parameters using specific methods for statistical processing. Our preliminary results indicate that sedimentological characteristics are capable to distinguish between the three regions. This is relevant for forensic applications as coarse-grained sediments found at crime scenes can help to answer questions like what, where and how the crime occurred in a real criminal case.

KEYWORDS: FORENSIC GEOLOGY, PARTICLE SIZE ANALYSIS, CRIME SCENES