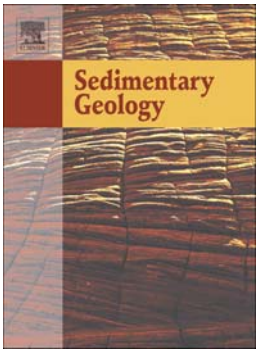

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Assessing automated image analysis of sand grain shape to identify sedimentary facies, Gran Dolina archaeological site (Burgos, Spain)

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Abstract

Gran Dolina is a cave (Sierra de Atapuerca, Spain) infilled by a 25 m thick sedimentary record, divided into 12 lithostratigraphic units that have been separated into 19 sedimentary facies containing Early and Middle Pleistocene hominin remains. In this paper, an automated image analysis method has been used to study the shape of the sedimentary particles. Since particle shape is interpreted as the result of sedimentary transport and sediment source, this study can provide valuable data about the sedimentological mechanism of sequence formation. The shape of the sand fraction in 73 samples from Gran Dolina site and Sierra de Atapuerca was analyzed using the Malvern Morphologi G3, an advanced particle characterization tool. In this first complete test, we used this method to the published sequence of Gran Dolina, defined previously through field work observations and geochemical and textural analysis. The results indicate that this image analysis method allows differentiation of the sedimentary facies, providing objective tools to identify weathered layers and measure the textural maturity of the sediments. Channel facies have the highest values of circularity and convexity, showing the highest textural maturity of particles. On the other hand, terra rossa and debris flow samples show similar values, with the lowest particle maturity.

Keywords: Gran Dolina, particle shape, image analysis, convexity, circularity, aspect ratio