



Quantitative characterisation of sedimentary grains

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Analysis of sedimentary texture helps in determining the formation, transportation and deposition processes of sedimentary rocks. Grain size analysis is traditionally quantitative, whereas grain shape analysis is largely qualitative. A semi-automated approach to quantitatively analyse shape and size of sand sized sedimentary grains is presented.

Grain boundaries are manually traced from thin section microphotographs in the case of lithified samples and are automatically identified in the case of loose sediments. Shape and size parameters can then be estimated using a software package written on the Mathematica platform. While automated methodology already exists for loose sediment analysis, the available techniques for the case of lithified samples are limited to cases of high definition thin section microphotographs showing clear contrast between framework grains and matrix. Along with the size of grain, shape parameters such as roundness, angularity, circularity, irregularity and fractal dimension are measured. A new grain shape parameter developed using Fourier descriptors has also been developed.

To test this new approach theoretical examples were analysed and produce high quality results supporting the accuracy of the algorithm. Furthermore sandstone samples from known aeolian and fluvial environments from the Dingle Basin, County Kerry, Ireland were collected and analysed. Modern loose sediments from glacial till from County Cork, Ireland and aeolian sediments from Rajasthan, India have also been collected and analysed. A graphical summary of the data is presented and allows for quantitative distinction between samples extracted from different sedimentary environments.