HYDRODYNAMIC GRAIN SORTING IN A CONFINED DEEP-MARINE MINI-BASIN (PEÏRA CAVA, SE FRANCE): IMPLICATIONS FOR THE IDENTIFICATION OF ARCHITECTURAL ELEMENTS

Pantopoulos, G.[1]; Kneller, B.C.[2]; De Ros, L.F.[1]; Kuchle, J.[1]

[1]Universidade Federal do Rio Grande do Sul (UFRGS) Instituto de Geociências Porto Alegre Brazil;
[2]School of Geosciences, University of Aberdeen Aberdeen UK

ABSTRACT: Quantitative petrographic analysis was conducted in vertical profiles of 8 turbidite beds of the Eocene-Oligocene Peïra Cava deep-marine mini basin in SE France in order to detect spatial trends in mineralogy related to the hydrodynamic sorting of particles. The analysis was mainly focused on sheet-like confined beds which can be traced through the basin and represent proximal to distal architectural elements. The essential mineralogy of around 30000 grains was quantified in 99 thin sections. The percentage of the grain types in each bed indicates a downcurrent change in mineral abundance from the more proximal to the more distal parts of the confined sheet beds, expressed mainly by a decrease in mean quartz content and an increase in mean mica content. For a selected bed representing a characteristic stratigraphic interval, a detailed grain shape image analysis of grain boundaries in calibrated microphotographs was implemented. Mica grains show changes in the elongation and circularity values from the more proximal in relation to the more distal part of the basin. Mica grains of the distal part of the bed are characterized by lower and more variable circularities, indicating the dominance of more platy mica grains at the more distal part of the studied bed. Circularity values of the other mineral types studied do not show significant downcurrent changes, but are characterized by slightly lower values in the distal part of the studied bed. In order to additionally estimate the role of particle shape as a factor of hydrodynamic fractionation of mineral types, particle settling velocities were also calculated for quartz and mica grains. Results indicate different hydrodynamic behavior of studied grain types between the proximal and distal part of the studied bed. In particular, mica grains are characterized by lower settling velocities in relation to quartz grains, especially at the more distal part of the studied interval. The observed downcurrent increase in mica related to quartz is interpreted as result from hydrodynamic sorting due to the differences in the submerged specific gravity and shape between the two minerals. The latter hypothesis is strengthen by grain shape and settling velocity analysis, which indicates presence of larger amounts of platy mica grains (which are characterized by lower settling velocities) at the more distal parts of the studied stratigraphic interval. The compositional and textural study of turbidite beds in the Peïra Cava confined mini-basin of SE France revealed that the hydrodynamic sorting can be used as an additional tool for the discrimination of different architectural elements (e.g. proximal from distal sheet beds) in turbidite systems.

KEY-WORDS: Grain mineralogy, grain shape, hydrodynamic sorting.