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Cluster analysis of downhole logging data from Promess 1 Gulf of Lion site

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The EC project PROfiles Across Mediterranean Sedimentary Systems part 1 (Promess 1) facilitated the drilling and coring of several boreholes in the Mediterreanean Sea at sites in the Adriatic Sea and the Gulf of Lion. Cores and logs between 30 and 300 metres from four sites have been successfully recovered, penetrating sediments deposited during the last 500 ka. Records of climate variability, sea-level changes and slope stability will be provided by this exceptional data set.

In order to support physical and stratigraphical borehole analysis downhole logging data were recorded at site PRGL-1 in the Gulf of Lion. Collected data sets include spectral natural gamma ray (K, Th & U), electrical resistivity, sonic velocity, magnetic susceptibility and geochemical elements (H, C, Fe, Ca, O & Si). Open hole measurements of these parameters were carried out between 65 and 213 mbsf. Thanks to the exceptionally good core recovery at the site ($>$ 95%) physical and geological description of the interval had been established from the cores already. In order to reveal underlying information about provenance, stratigraphic units and depositional regimes, statistical analyses have been performed on the log data.

Within the family of un-supervised learning algorithms, cluster analysis can be utilised as a means of classifying a data set without prior information given to the algorithm (hence unsupervised). The number of clusters though has to be determined by the expert based on experience and the classification problem at hand. The above 12 log curves have been used as input for the hierarchical conglomerative Ward cluster algorithm. Seven clusters have been established, showing a more detailed picture of differences in physical parameters of accumulated sediments. Interpretation of these statistically derived classes will be in closed co-operation with other disciplines within the Promess 1 community. With support from EC project EVR1-CT-2002-40024.