



Cross-stratified calcarenites: Paleo-environmental indicators for a bryomol facies in a mixed carbonate - siliciclastic system (Upper Marine Molasse, Early Miocene) from the North Alpine Foreland Basin

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Mixed carbonate - siliciclastic sediments from the Early Miocene of the central Molasse Basin of the North Alpine Foreland Basin ("Randengrobkalk") allow both sedimentological and paleoecological signals to be applied to interpret the depositional environment. These sediments represent part of the large scale alternation of marine and non-marine conditions constituting the classic Molasse sedimentary sequence. This dramatic fluctuation of sedimentary regimes has been related to the complex interaction of tectonic uplift and erosion of the alpine chain to the south, the varied background geology of the stable European platform to the north, eustatic sea level changes and not the least, paleogeographic developments including the formation of the Paratethys Seaway.

Standard microfacies techniques were applied to the carbonates including component identification, fabric analysis, and multivariate treatment of quantified data. Higher energy, cross-bedded sands are admixed with bryomol type carbonate sediments. The carbonates dominated sediments generally consist of rudstones and packstones dominated by molluscs (bivalves and gastropods), bryozoans, balanid barnacles and echinoids. Coralline algae and benthic foraminifera are rare, coated grains can also be present. The taphonomy of the biogenics shows a wide range preservation which can be correlated to siliciclastic content and grain size. The sediments are separated into different sedimentary facies types based on: 1) the admixture of siliciclastics and carbonates, 2) biogenic content and 3) sedimentary structures. Complex diagenetic path-

ways are also present. The various possibilities for the origin of siliciclastics are also addressed.

The observed vertical and lateral transitions from carbonate to mixed siliciclastic-carbonate deposits are interpreted to represent a change from a distal to proximal environment and thus the southward progradation of the OMM. Interpretations and comparisons of this sedimentary environment are made to regional developments in other areas of the Northalpine Foreland Basin, land based climatic signals from the European continent and Early Miocene global oceanographic signals.