Geophysical Research Abstracts
Vol. 17, EGU2015-10404-1, 2015
EGU General Assembly 2015
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Microfacies quantification: Assessing component diversity among circumalpine Paleogene and Neogene carbonates

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Quantification of highly cemented shallow-water marine carbonates allows for the analysis of component and facies distributions along environmental and paleogeographic gradients as well as between time slices. The analyzed data is gained by point counting of numerous thin sections from a wide spectrum of stratigraphical profiles. The limitations of such analysis lie in the wide range of taxonomic ranks that can be distinguished in thin section ranging from species to phylum level. Identification to taxonomic rank depends on the presence diagnostic morphological features, preservation potentials as distinguished by microtaphofacies analysis as well as diagenetic trajectories of differential shell mineralogies. It is also explored how taxonomic resolution is affected by factors affecting facies distribution patterns such as terrigenous input or exposure gradients on the carbonate ramps. Bivariate analysis including component relationships can be discerned with correlations suggesting similar or divergent ecological requirements or direct dependencies such as substrate relationships. These analyses also allow the ecology of subordinate components to be explored. Multivariate analyses distinguish microfacies types based on component distributions with facies characterized by the respective dominant component or components. The quantified data of thin sections originate from detailed studies of carbonates from three time slices (Early Oligocene, Late Oligocene and Early Miocene) carbonates from the circumalpine area including localities south (Northern Italy, Slovenia) and north (Southern Germany, Austria) of the Alps. These time periods are of interest due to variations in local environmental variations including terrigenous influx, regional paleogeographic developments within the Mediterranean Tethys and Paratethys as well as global climatic change. Lower Oligocene sediments show mud rich deposits dominated by coralline algae, larger foraminifera including Nummulites, smaller benthic foraminifera and corals. Upper Oligocene sediments are highly differentiated depending on locations dominated again by diverse coralline algae and larger foraminifera (Nummulites and Miogypsinoides). Lower Miocene sediments show a switch to bryomol sediments within mixed terrigenous/carbonate settings dominated by bryozoans, barnacles, coralline algae, various foraminifera and bivalves. Diversity gradients can also be followed with respect to coralline algae and larger foraminifera.