Ber. Inst. Erdwiss. K.-F.-Univ. Graz	ISSN 1608-8166	Band 16	Graz 2011
IGCP 596 Opening Meeting	Graz, 19-24th September 2011		

Marine biodiversity dynamics in the mid-Paleozoic oceans and their potential controls

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Marine biodiversity dynamics during Devonian-Carboniferous times are broadly characterized by two modes: one of high turnover in the Devonian-Mississippian and one of low turnover in the Pennsylvanian. Previous work has attributed this dichotomy to long-term climate change, the change from a (super) greenhouse world to the late Paleozoic Ice Age (STANLEY & POWELL 2003). New oxygen isotopic data (JOACHIMSKI *et al*. 2009) and new analyses of global diversity based on the Paleobiology Database suggest that the relationship between climate change and diversity dynamics was much more complex. For example, global marine diversity declined sharply from an Emsian peak up to the Famennian although climate cooled towards the Middle Devonian but then warmed markedly during the Frasnian. Extinction rates were on average greater in the Devonian than in the Carboniferous but the position of extinction peaks varies substantially between raw data and analyses taking sampling incompleteness into account. Only the latter confirm a major extinction spike at the Frasnian-Famennian boundary. Extinctions were highly selective with respect to physiological buffering capacity (KNOLL *et al*. 2007) in three consecutive stages from the Givetian to the Famennian. The preferential extinction of unbuffered organisms such as corals, sponges and brachiopods might indicate chemical insult as a major trigger of Devonian extinctions (KIESSLING & SIMPSON 2011).

Although comprehensive data on marine organisms are already available in the Paleobiology Database for Devonian-Carboniferous times (91200 occurrences), there are still issues with taxonomic and geographic coverage, as well as stratigraphic resolution. Moreover, analysis of terrestrial changes is currently prevented by a lack of data. These issues need to be solved in IGCP 596 if we are to better biodiversity dynamics in this critical interval of time.

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