Response of the ocean/atmosphere system to past global changes: An introduction to IGCP Project 386

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The evolution of our planet and its ecosystems has frequently experienced dramatic changes affecting the lithosphere, hydrosphere, atmosphere and biosphere. Potential causes include geotectonic as well as extraterrestrial events. Consequences include globally recognized geochemical pertubations of the ocean/atmosphere system as well as biotic crises.

The phenomenon of global events has been the center of studies for decades. In that respect, IGCP Project 386 builds upon a long research history, both in the fields of palaeontology and geochemistry. Research is focussing on four prominent time windows in the Palaeozoic with known global geochemical changes: the Lower Cambrian, the Ordovician-Silurian boundary, the Middle Devonian to Lower Carboniferous, and the Permian-Triassic boundary. Within the context of this program, scientific objectives include:

(1) Establishing a comprehensive geochemical database for each of the four selected time windows, covering all depositional facies; analytical data should be constrained with respect to time, lithofacies, palaeolatitude, degree of diagenesis;

(2) Quantification of changes in global chemical fluxes through mass balance calculations and computer modelling of geochemical data; thereby, observed short-term (less than one biozone), long-term (several biozones) and even permanent changes in seawater chemistry and atmospheric composition will be considered in order to determine possible causes (e.g. volcanism, impact, ocean turnover, etc.)

(3) Relating such global geochemical changes to palaeoecological changes in marine and terrestrial ecosystems and investigating possible feedbacks between biota and palaeoenvironment including interaction of biotic crisis and geochemical cycles.

A central part of this IGCP project is an integrated evaluation of the available data for the selected time windows. As such, its primary scientific objective is not so much the geochemical (re-)investigation of boundary sequences, but rather the characterization and quantification of known geochemical variations across a certain time interval. However, identified gaps in the available records will be filled through further sampling and geochemical studies. The ultimate objective is to quantify chemical fluxes as a result of global processes which have affected the lithosphere, hydrosphere, atmosphere and biosphere during the Palaeozoic.