# *Global Carbon Cycle*

The European Union of Geosciences held its 9th biannual meeting in Strasbourg, March 23–27, 1997. During this meeting, Symposium N° 18, *Global carbon Cycle*, was held under the sponsorship of the IGCP [1] n°404 on the «Terrestrial Carbon in the past 125 Ka», the INQUA [2] Carbon Commission and the ESCOBA-Biosphere [3] project of the EC Environment and Climate Programme. The «*Global Carbon Cycle*» Symposium attracted 28 oral and poster presentations and about one hundred participants, reflecting the interest of the Earth Sciences community in the global carbon cycle.

The aim of the Symposium was to bring together inputs from diverse sources and disciplines, and from different temporal perspectives in a hope that they can contribute to validation of models of carbon cycle on geological time scales. For present-day carbon cycle, the relative role of the ocean *versus* land vegetation and soils as the possible «missing sink» is still debated. On geological time scales, it is essential that we understand the volcanic and tectonic input fluxes of carbon from the mantle and the lithosphere and the opposing output fluxes due to prolonged storage in carbonates, hydrocarbonates, and disseminated organic matter in sediments. The ice core records show that, during the Quaternary, the concentration of $CO_2$ and $CH_4$ in the contemporaneous atmosphere fluctuated in step with the changes in global climate, although the cause and effect relationship is not yet resolved. These records, nevertheless, suggest that at least for cooling episodes the drop in temperature preceded the $CO_2$ decline. Since both, $CO_2$ and $CH_4$ are greenhouse gases, it is important to understand how and why the global carbon cycle has changed over time, altering the composition of the ancient atmosphere, and how it may change in the future as human activities continue to add ever-greater quantities of these gases into the atmosphere.

A major aim of this Symposium was to contribute to our understanding of dynamics among reservoirs and fluxes of carbon. The presentations focussed mainly on terrestrial system including ecosystem carbon storage, rock weathering, riverine transport, groundwater and lake bed carbon, soil organic matter and carbonates.

This special issue of Chemical Geology groups together 15 papers, with 12 selected from Symposium presentations and 3 submitted subsequently by their authors. The 7 first papers are devoted to the $CO_2$ uptake by continental erosion and riverine carbon transport. The first paper addresses silicate weathering in large river basins, the second focusses on the Ganges-Bramaputra river basin and the subsequent four papers present new results, based on carbon isotopes ($^{13}C/^{12}C$), for carbon cycle in large river systems (Ottawa and St Lawrence in Canada, Rhône in France) and in a small catchment (Strengbach in the Vosges, France). The seventh paper

[1] *International Geological Correlation Programme*
[2] *International Union for Quaternary Research*
[3] *European Study of the Carbon in the Ocean, the Biosphere and the Atmosphere*

shows how a global modelling ($GEM_{CO_2}$ [4]) of the continental erosion and riverine carbon transport into the oceans can be applied to the Last Glacial Maximum. The next section contains two papers dealing with the global reconstruction of carbon storage in the terrestrial biosphere during the Holocene and the Last Glacial/Interglacial Cycle, one using CARAIB [5] model and the other the paleogeographic distribution of vegetation in northern Eurasia. The paper N° 10 quantifies the $CO_2$ fluxes of degassing from the groundwater aquifer in central Italy, probably one of the largest deep-$CO_2$ production systems. The subsequent two papers are devoted to methane production from freshwater sediments in Lake Bled (Slovenia) and Sulistrowiczki and Nowa Cerekiew (Poland), using the carbon isotope tracing. The twelfth paper estimates the amount of terrestrial organic carbon stored in sediments of the Amazon fan during the Last Glacial, utilizing carbon isotopes of the organic matter, organic carbon content and age models based on oxygen isotopes, faunal data and magnetic excursions. The last but one paper in this special issue models the role of the coastal zone for the coupled C-N-P-S biogeochemical cycles during the past three centuries using the TOTEM [6] approach. The final paper utilizes a modified version of an earlier model to sketch the evolution of the carbon cycle from the Archaean to the planetary future.

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[4] *Global Erosion Model*
[5] *Carbon Assimilation in the Biosphere*
[6] *Terrestrial-Ocean-aTmosphere-Ecosystem Model*