

# Long-Term Evolution of the Geobiosphere

Siegfried Franck

Potsdam University, Germany

## *Abstract*

We present a minimal model for the global carbon cycle of the Earth containing the reservoirs mantle, ocean floor, continental crust, continental biosphere, and the kerogen, as well as the aggregated reservoir ocean and atmosphere and obtain reasonable values for the present distribution of carbon in the surface reservoirs of the Earth. The Earth system model for the long-term carbon cycle is specified by introducing three different types of biosphere: procaryotes, eucaryotes, and complex multicellular life. From the Archaean to the future there always exists a procaryotic biosphere. In contrast to the eucaryotes the first appearance of complex multicellular life starts with an explosive increase in biomass connected with a strong decrease in Cambrian global surface temperature at about 0.54 Gyr ago. The biological colonization of land surface by metaphyta and the consequent increase in silicate weathering rates causes a reduction in atmospheric carbon dioxide and planetary cooling. After the Cambrian explosion there is a continuous decrease of biomass in all pools. The ultimate life span of the biosphere is defined by the extinction of procaryotes in about 1.6 Gyr.