Extended Abstract
Volume 3:3, 2015

Journal of Biodiversity & Endangered Species

Open Access

Biodiversity - 2014: Global carbon cycle: Interaction of photosynthesis and earth crust processes

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Abstract

The examination of natural carbon cycle is very important for better understanding of evolution of Life and Climate Changes on the Earth as well as for the analysis of the trends in development of the planet itself. These problems are tightly bound. Carbon cycle combining various processes in lithosphere, atmosphere, hydrosphere and biosphere enables to obtain the entire picture of the whole interactions on the Earth. As early as in 1926 famous Russian geochemist V.I. Vernadsky suggests a thought on interconditionality of the biosphere and Earth crust processes. The present work develops his thought. In this context it sounds as follows. Development of photosynthesis, which is a basis for the Life on the Earth, occurred under impact of the movement of lithospheric plates that cover the entire Earth surface and are in permanent motion. The effect of lithospheric plates is realized by means of periodic CO2 injections, arising during plates' collisions. The plates' movement is a firmly established experimental fact though the reason for that is still arbitrary. According to a wide spread point of view this motion is caused by convection of magma in the asthenosphere. Some researchers assert that magma convection is under the impact of celestial bodies in the course of the Earth's motion around the Sun.

The existing views on the natural carbon turnover consider it as a trivial transfer of carbon through geospheres to biosphere, and back. We regard it as a transfer of the element, under an impact of the redox state of carbon. According to new definition, carbon cycle is considered as a conversion of carbon from the oxidized state, presented by CO2, bicarbonate and carbonate species in the "atmosphere – hydrosphere" system, into the reduced state, presented by different biogenic forms, produced in photosynthesis and in the following transformations. The reverse transition is realized via respiration of living organisms and via microbial and chemical oxidations, accompanying transformations of "living" matter after burial. Among them is the oxidation of the buried organic carbon, the key contributor of CO2, by means of thermochemical sulfate reduction in the subduction zone, where lithospheric plates collide. We called this cycle "natural redox cycle of biospheric carbon. Formally the global redox carbon cycle can be presented as a closed loop consisting of the two branches – oxidative and reductive. It has two remarkable points, one among which is photosynthesis, where the oxidized carbon species become the reduced state; another point provides the reverse transition. A new presentation on global carbon cycle is given. Cycle is considered a turnover of this element from oxidizing state presented by CO2 , bicarbonate and carbonate forms, into reducing state presented by various sorts of biogenic carbon and back. The transition of carbon from oxidizing into reducing state occurs by means of photosynthesis. The transition of the carbon from reducing into oxidizing form is fulfilled by means of sulfate reduction in subduction zones where lithospheric plates collide. The global carbon cycle mechanism is predicated on the concept of tectonics which of orogenic cycles. A

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new interpretation of ecological compensation point concept is given. The presentations on global carbon cycle are substantiated by various arguments from different sources (by carbon isotope data on sedimentary organic matter and oils, by model reconstructions of climate, by paleontological data, including data on biodiversity, and others).

This work is partly presented at 3rd International Conference on Biodiversity & Sustainable Energy Development June 24-26, 2014 Valencia, Spain