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A new model of global redox carbon cycle and photosynthesis development

The combination of actualism principle, recent findings on carbon isotope fractionation in photosynthesis with data on isotopic ratio of carbon in sedimentary rocks in the form of carbonates and coeval organic matter allowed suggesting a new model of redox carbon cycle. The model claims that carbon turnover via biosphere and geospheres is a conversion of the element from the oxidized state to the reduced one, and back. The direct transfer is realized through photosynthesis, the reverse transfer occurs via numerous microbial and inorganic oxidation reactions in sediments. Among them thermochemical sulfate reduction plays a dominant role. It proceeds in subduction zone where moving lithospheric plates collide and provide heat for sulfate reduction. CO_2 injections, which accompany the reaction, exert impact on photosynthesis development, causing irregular periodicity of photosynthesis and related processes, such as climatic cycles, changes in the rate of biodiversity, uneven stratigraphic distribution of organic matter in sediments, and oil fields stratigraphic distribution, sea level changes, etc. Arguments supporting the validity of the model are given. The redox carbon cycle is a self-organizing system due to negative feedback between CO_2 assimilation and photorespiration in response to oxygen growth. It made carbon cycle shift to ecological compensation point. In this point, the system becomes sensitive to separate plates' collisions what results in short-term climatic oscillations.

Biography

A A Ivlev has completed his PhD from Chemical Technology University of D I Mendeleev and got his 2nd PhD from Institute of Chemical Physics of RAS. In 2005, he has discovered a link between carbon isotope distribution and temporal organization of cell processes and was awarded with the medal "To Author of Scientific Discovery" by Russian Academy of Natural Sciences. Since 1995, he is a Professor of Russian State Agrarian University of K.A. Timiryazev. He has published 66 papers in reputed journals and 4 monographs. The field of his scientific interests includes isotope fractionation in metabolism, photosynthesis, plant physiology, cell mechanisms, evolution and climatology.

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