

The role of the mantle in the biogeochemical evolution of the Earth System

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The operation of plate tectonics is often considered to be essential for habitability, but we do not have a mechanistic understanding of the main volatile constituents of the oceans, atmosphere, and mantle. An emerging view is that the history of plate tectonics is intrinsically connected to the secular evolution of the atmosphere and oceans, through both sea-level changes caused by ocean-mantle interaction (subduction), and volatile element exchanges. Accordingly, understanding such fundamental topics as the co-evolution of life along with the atmospheric budgets of nitrogen and oxygen appears to be intrinsically related to the understanding the long-term dynamical transfer of materials between the mantle and the surficial environments.

This talk will introduce session contributions that investigate the co-evolution and interactions of the mantle, crust and atmosphere-ocean-biosphere systems, with emphasis on the volatile mass balance of the ocean-atmosphere-mantle across major transitions in Earth history. A review of attempts to address the problem will be summarized, and areas ripe for collaboration between 'deep Earth' and 'Earth systems scientists' will be proposed.