

Long-term solid Earth degassing, weathering intensity and the carbon cycle

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In the very long-term, solid Earth degassing from mantle sources adds new carbon to the lithosphere-ocean-atmosphere-system. Carbon is not accumulating in the atmosphere since processes like carbonate formation and organic carbon burial remove carbon from the ocean and the atmosphere. The carbon is largely stored in the Earth's crust, as it is thought by now that only little carbon returns into the mantle. Chemical weathering helps to transfer carbon into carbonate minerals in the ocean and releases at the same time geogenic nutrients being essential for fixing carbon in organic matter. Therefore, chemical weathering is an essential driver for removing a large fraction of carbon into long-term storage places. It follows that knowledge about the long-term variation of weathering intensity is useful to understand the long-term driver, the solid-Earth carbon degassing. Based on a weathering index, ranging over three billion years, possible large fluctuations and long-term trends in weathering intensity are discussed and linked with some of the largest carbon perturbations in Earth history (e.g. Snowball Earth or the Lomagundi event). The links between solid Earth degassing and new findings on weathering intensity, nutrient fluxes, provenance of weathering products, and evolution of the upper-most continental crust will be discussed.

Reference:

Hartmann, J., G. Li, A.J. West (2017) Running out of gas: Zircon ¹⁸O-Hf-U/Pb evidence for Snowball Earth preconditioned by low degassing. *Geochemical Perspective Letters*. doi: [10.7185/geochemlet.1734](https://doi.org/10.7185/geochemlet.1734)