Degassing of hydrogen from the Earth's core and related phenomena of system Earth

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It is argued that fluxes of hydridic fluid from the Earth's core provide a causative link between many phenomena of system Earth. The fluxes have sustained a redox gradient between the relatively oxidized outer layers of the Earth and a highly reduced core. The gradient has sustained many redox-related phenomena through Earth history, including large-volume magma eruptions, global anoxia, green house - ice house cycles, mass extinction events, metallogenic epochs including formation of oil and gas deposits and diamond growth in the mantle. Linking redox-controlled phenomena and processes of the mantle, crust, hydrosphere, atmosphere and biosphere, both catastrophic and uniformitarian, provides a more holistic model of system Earth. Hydrogen has potential to complex with almost all elements of the periodic table. The alkali and most alkali earth elements form ionic hydrides. Group 3 through 7 elements (e.g. Al, Si, N, S, Cl) form covalent hydrides. The formation of hydrides by most transition elements, lanthanides (REEs) and actinides allows the possibly of transport of a wide range of elements at high temperature and pressure within the mantle by fluids other than silicate melts. Such fluids have the potential to metasomatise the crust. At low pressure hydridic fluids are likely to evolve to low density HSCO gases dominated by H_2 with components of H_2S, CH_4, HCl, CO and trace metals.

It is envisaged a background flux of hydridic fluids is related to the known flux of primordial He from the inner Earth. This background flux may have existed through much of Earth history. Epochs of enhanced but episodic flux of hydridic fluids may last 100s of millions of years but extreme flux was short lived; possibly lasting less than a million years. The high diffusivity of H_2 means it is not possible to directly measure the paleo-flux by measuring concentrations of H_2 in fluids trapped in rocks and minerals. However, there is abundant paleo-redox evidence, recorded by mineral assemblages, fluid compositions and stable isotopic compositions of fluids and minerals that permit the H_2 flux to be assessed. Hydridic fluid fluxes of the Late Archean through Palaeoproterozoic are evidenced by the growth of diamonds within the upper mantle, global development of major gold deposits and provinces within the crust, including the Witwatersrand deposits, partial reduction of seawater carbonate (recorded as positive deviations in $\delta^{13}C$) and the first global anoxia event. This period of Earth history may represent a unique phase of enhanced to extreme flux of hydridic fluids, extending for over a billion years.