History of Mars and Mars's Life

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Terrestrial planets, depending on their first-order geophysical parameters and following accretion and differentiation, should evolve though various stages of mantle convection, including magma ocean, plate tectonic, and stagnant lid processes. Anomalous aspects of Martian geology are explained by a theory incorporating such evolution, including the onset and termination of the core dynamo, during the first few hundred million years of the planet's history.An associated early regime of plate tectonics led to very rapid accretion of thickened continental crust, which was modified by concurrent high impacting rates and denudation, ultimately resulting in the southern highlands. Termination of the plate-tectonic regime after the cessation of the dynamo produced the highlands/lowlands dichotomy, but the last stage of this process was modified to form zones of focused subduction in the Tharsis and Elysium areas. The resulting high concentration of water and other volatiles in the Martian deep mantle led to the Tharsis and Elysium superplumes, the long-term persistence of which is responsible for much of the volcanism, tectonism, water outbursts, and climate change that mark the subsequent, post-Noachian history of Mars.

The life on Mars may have been evolved to the level at the onset of Phanerozoic on the Earth, because of the possible presence of plate tectonics, water-covered planet at Noachian time, presence of strong dynamo, and formation of large continental landmass. The surface environment of Mars changed to the oxygenic atmosphere and ocean, presumably by photo-synthesis.