Martian Organic Geochemistry - Defining the Martian Carbon Cycle

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Recent discoveries from Meteorites and Missions have yielded fabulous new insights into the carbon cycle on Mars. From an inorganic and organic (abiotic and possibly biotic) standpoint these observations have enabled a paradigm shift in our understanding of Martian Organic Geochemistry. These discoveries include, high temperature released refractory macromolecular carbon in Martian meteorites (Steele et al., 2012), confirmed by SAM analysis on the Curiosity mission (Eigenbrode et al., 2018). Impact introduced / induced in the Tissint meteorite (Steele et al., 2016), electrochemical produced organics containing organic sulfur and nitrogen (Steele et al., 2018) as well as more recent analyses that tentatively at this point reveal organic material produced during weathering of silicates (pyroxene and production of serpentine) in Martian meteorites (Steele et al., unpublished). More labile compounds have been discovered by SAM (chlorocarbons) and while present in Mars meteorites, their provenance in SAM data has not been revealed until recently (Steele et al., unpublished). We will review the current data on Mars Organic Geochemical cycling from meteorite and mission data as well as place these observations into context with the search for life on Mars. Furthermore, terrestrial organisms contaminating Martian meteorites represent a fabulous analogue for life detection (Steele et al., 2016). How do these new observations fit into our understanding of the carbon cycle of Mars?, what are the implications for finding life on Mars and elsewhere in the solar system? and what are the implications for the origin of life on Earth?

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