MARS IN THE CONTEXT OF THE SOLAR SYSTEM

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The inner rocky planets formed in the solar nebula following the sweep-out of ices and gas by early solar activity due to early solar activity. This drove out the gaseous and volatile components to a "snowline" around 5 AU, followed by the formation of Jupiter, Saturn and the ice giants. As a consequence of these events, the inner portions of the early inner nebula were both bone-dry and depleted in elements volatile below 1100 K This volatile element depletion occurred close to Tzero (4567 ± 5 m.y.). Formation of planetesimals and asteroidal-sized bodies occurred rapidly with Vesta (450 km diameter) accreting, differentiating and producing basaltic lavas within a few million years of Tzero. Dry Mar-sized bodies formed within 10 m.y. most being swept up into the Earth or Venus. Mars, like Mercury, is a survivor. Following accretion, Mars differentiated into a core of Fe or FeS and a silicate mantle. A small water budget was added from icy planetesimals. A basaltic crust formed very early, now represented in the ancient Cratered Terrain in the Southern Hemisphere. Around 4000 m.y. ago the Late Heavy Bombardment produced Hellas, Argyre and Isidus basins and smaller craters. Basaltic volcanism covered the Northern Plains, built up the Tharsis Plateau and Elysium and has continued to the present. Sulfur and lesser amounts of chlorine from this extended volcanic activity has combined with the small water budget to produce acidic weathering of the basaltic crust that produce sulfates instead of clays. The resulting cold dry acidic surface environment has persisted from the Noachian for around 4 billion years.

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