AOGS 2005

Ancient Mars: Some Parallels with Early Earth

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Mars was most active during its first billion years. The core, mantle, and crust formed within ~50 million years of solar system formation. A magnetic dynamo in a convecting fluid core magnetized large areas of the ancient crust, and the global field shielded a more massive early atmosphere against solar wind stripping. The Tharsis province became a focus for volcanism, deformation, and outgassing of water and carbon dioxide in quantities possibly sufficient to induce episodes of climate warming. Surficial and near-surface water contributed to regionally extensive erosion, sediment transport, and chemical alteration of crustal material. Deep hydrothermal circulation accelerated crustal cooling, preserved variations in crustal thickness, and modified patterns of crustal magnetization. Cessation of the dynamo, widespread reduction in the crustal field, and waning of interior outgassing allowed the early atmosphere to dissipate and the planet's surface to cool; substantial quantities of subsurface liquid water may persist to the present. This early history of Mars provides important points of comparison to the early Earth.

Keywords: Mars; comparative planetology