



Implication of Martian Deuterium for sources of Atmospheric Water Vapour in the planet's recent past

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Hydrogen escape from the martian atmosphere proceeds via processes that discriminate sufficiently between H and D to give a 3 to 4-fold enrichment of deuterium in the upper atmosphere, but not the 5.2 times currently found. Past releases of water via episodic flooding resets the D:H ratio in the atmosphere and mobile ice. If the present atmospheric H₂O is purely a remnant of the Elysium Sea formation, a few Myr ago, the enrichment would be much higher. This implies a series of smaller or continuing sources. I propose these come from the rain of meteorites larger than ~1m which impact with hypervelocity speeds hardly diminished by the thin atmosphere. Crater ejecta from impacts in relic lakes, ground-ice and polar ice all release new H₂O and the largest craters dominate quantitatively. The last big cratering event (> 2km diameter) that reset D:H in mobile ice and the atmosphere would have occurred ~ 10⁴ yr ago.