

Hydrogen Reservoirs in Mars as Revealed by SNC Meteorites

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The isotopic signatures of three hydrogen reservoirs are now identified based on analyses of Martian meteorites, telescopic observations, and Curiosity measurements: primordial water, surface water, and subsurface water (Usui, in press). The primordial water is retained in the mantle and has a D/H ratio similar to those seen in Martian building blocks (Usui et al. 2012). The surface water has been isotopically exchanged with the atmospheric water of which D/H ratio has increased through the planet's history to reach the present-day mean value of ~5,000‰ (Kurokawa et al. 2014). The subsurface water reservoir has intermediate δD values (~1,000-2,000‰), which are distinct from the low- δD primordial and the high- δD surface water reservoirs. We proposed that the intermediate- δD reservoir represents either hydrated crust and/or ground ice interbedded within sediments (Usui et al. 2015). The hydrated crustal materials and/or ground ice could have acquired its intermediate- δD composition from the ancient surface water reservoir (Usui et al. 2017).

References:

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