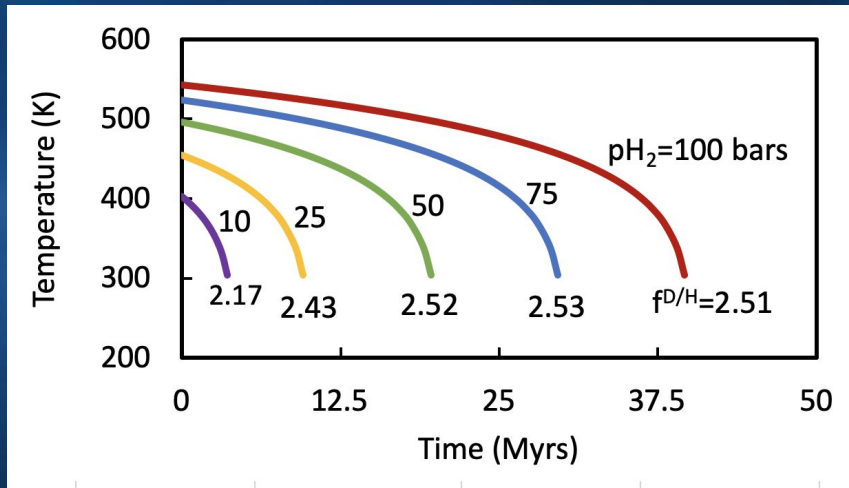


A hydrogen greenhouse on early Mars



Artist conception of a watery, cloudy planet. Courtesy of Planet Volumes.

New results suggest that Mars's atmosphere immediately after its formation was massive (10-100 bars) and composed mainly of molecular hydrogen (H_2). Such an atmosphere would have produced a climate with warm-to-hot oceans on Mars's surface and would have been conducive to the synthesis of prebiotic organic molecules.



Proposed climate histories for Mars immediately following its formation. The climate in this model was determined by the greenhouse gas inventory, which was initially endowed and gradually lost.

- The composition of Mars's initial atmosphere is unknown. H_2 - and H_2O -rich (steam) atmospheres have been proposed.
- This study constrained the mass & composition of the primordial atmosphere ($p_{H_2} > 10$ bars) and climate ($T_s > 400$ K) of Mars using the D/H record inferred from meteorites and data Mars Science Laboratory (MSL) rover Curiosity.
- The new model suggests early Mars started with 10-100 bars of H_2 , with warm water oceans (400-550 K) for millions of years. If correct, the early Mars surface environment would have been analogous to a warm modern Titan.