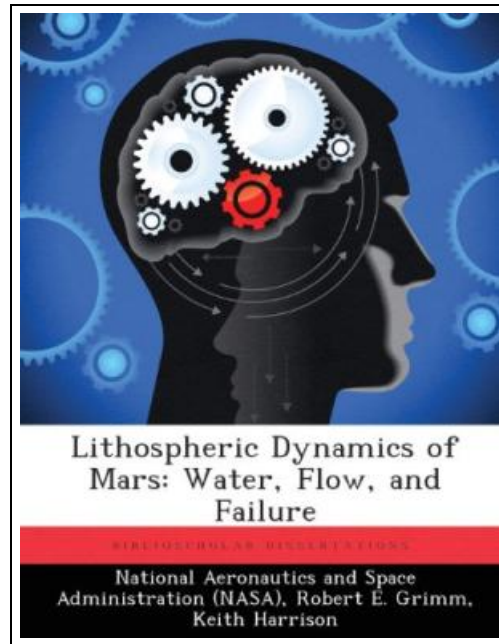


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Biblioscholar, United States, 2013. Paperback. Condition: New. Language: English . Brand New Book \*\*\*\*\* Print on Demand \*\*\*\*\*. Some of the largest Martian erosive features were influenced by groundwater, and include valley networks, outflow channels, and possibly landslides. We argue that hydrothermal systems attending crustal formation processes were able to drive sufficient groundwater to the surface to form the Noachian southern highlands valley networks, which show a spatial correlation to crustal magnetic anomalies, also results of crustal formation. Hydrothermal activity is quantified through numerical simulations of convection in a porous medium due to the presence of a hot intruded magma chamber. The parameter space includes magma chamber depth, volume, aspect ratio, and host rock permeability and porosity. For permeabilities as low as  $10(\exp -17)$  sq m and intrusion volumes as low as 50 km, the total discharge due to intrusions building that part of the southern highlands crust associated with magnetic anomalies spans a comparable range as the inferred discharge from the overlying valley networks. The Hesperian circum-Chryse outflow channels are further manifestations of groundwater discharge and Clifford and Parker (2001) suggest that the large volumes of water required for their formation flows beneath a confining cryosphere from the South Pole where meltwater beneath an ice cap recharges a global aquifer. We argue that recharge occurs instead over the nearby Tharsis aquifer at high obliquity, assisted by cryosphere melting due to volcanic activity. Numerical simulations quantify the strength and duration of outflow discharge given either South Polar or Tharsis recharge. The contribution of South Pole recharge given Clifford and Parker aquifer properties is negligible compared to that of the initial Tharsis inventory. Tharsis recharge, despite the restrictions of improved aquifer properties, makes a significant contribution and, unlike South Pole recharge under the same conditions, fulfills discharge requirements.



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