



Source regions and multiple water release events in Valley Networks of the Libya Montes region on Mars

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A valley network in the western Libya Montes region from 1.4° N to 3.5° N and 81.6° E to 82.5° E originates at the Isidis basins rim and drains down to Isidis Planitia over a distance of about 400 km. Midstream the valley network splits into a shorter eastern and a longer western part. Most of its length the western valley exhibits an interior channel that allows us to constrain discharge and erosion budgets [1]. The basic valley was formed in the Noachian/Hesperian between 3.7 and 3.3 billion years ago but also shows Amazonian aged activities. The analysis of stratigraphic sequences in the western branch of the valley system in term of crater frequency measurements [2, 3] indicates a series of subsequent volcano-fluvial events. The western Libya Montes valley was episodically active for about 2 billion years with major episodes in the Noachian (> 3.7 Ga), the Hesperian (3.5 to 3.4 Ga) and the Amazonian (1.4 to 1.1 Ga). Whereas the precipitation may have dominated the fluvial activity during the Noachian as indicated by the dendritic drainage pattern in the older eastern branch, the Hesperian and Amazonian aged fluvial activities have been triggered by volcanic processes such as ground ice melting or hydrothermal water release as indicated by the western branch. The Hesperian discharge rate of 4800 m³/s suggests fast erosion of the valley that might have been cut down within a million years [1]. This suggests rather episodic than sustained flows, which is consistent with the observation of volcanically related water release processes.

References: [1] Jaumann, R., et al., *GRL* 32, L16203, 2005; [2] Hartmann, W.K. and Neukum, G., *Space Sci. Rev.*, 96, 165-194, (2001); [3] Ivanov, B.A., *Space Sci. Rev.*, 96, 87-1044, (2001)