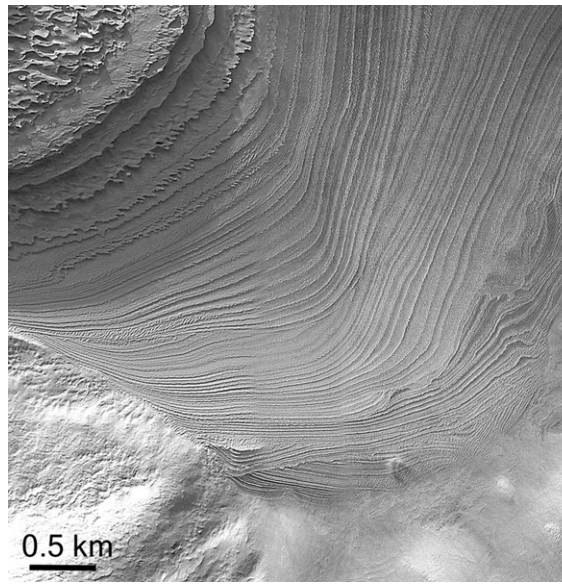

Figure 2.3 Finely layered sediments with unconformities within Galle crater at 52.3° S, 329.9° E. The mode of deposition, whether by water or wind, is unknown, but the regular rhythmic layering suggests that deposition was modulated by changes induced by astronomic motions (MOC).

waterway extending from close to the rim of Argyre into the northern plains. It has been attributed to overflow of a lake in Argyre (Parker et al., 2000), although that interpretation has been challenged (Heisinger and Head, 2002). Another possible Noachian flood feature is Ma'adim Vallis, which Irwin et al. (2002) plausibly argue was formed in part by rapid drainage of a large lake upstream from the main valley.

The widespread dissection of Noachian terrains coupled with surface runoff patterns indicates at least episodic precipitation and temperature and pressure conditions that stabilized water at the surface. Nevertheless, there is considerable uncertainty as to how sustained such conditions were and whether there was ever a global hydrologic system in which precipitation, infiltration, runoff, and groundwater flow were in quasi-equilibrium with evaporation and sublimation from large bodies of water and ice. Despite considerable relief along the dichotomy boundary and around Hellas, large drainage basins analogous to the Mississippi and Amazon did not develop. Seemingly, the cumulative effects of erosion, alluviation, and stream capture were insufficient to result in integration of drainage over large areas and growth of large drainage basins before being destroyed by impacts. There are, for example, no significant valleys draining into Hellas from the north and west despite several kilometers of relief and despite the area having experienced 300–400 My of erosion during the Noachian. Even if Hellas were filled with water to the –3.1 km level as suggested by Moore and Wilhelms (2001) (Figure 2.4, see also Chapter 7), there are still 5 km of relief from the rim crest down to the proposed sea level to enable