

Martian outflow channels and large terrestrial flood features (Baker and Milton, 1974). In addition, the floors of several rubble-filled channel sources (e.g., Juventae Chasma and Aromatum Chaos) are at a much lower elevation than the outgoing channels and yet show no evidence of former lava lakes such as draping of the source depressions by lava. An aqueous origin is also supported by sulfate-rich deposits in several source depressions such as Juventae chasma (Gendrin et al., 2005) (Figure 2.6). Although some of the simpler, rille-like channels, such as Hrad Vallis, may be cut by lava, the following discussion will assume that the larger, more complex outflow channels such as Kasei, Tiu, Simud, Ares, Mangala, and Maja were cut by large floods of water. If this assumption is correct then large bodies of water must have been left in the lows at the ends of the channels when the floods were over.

The abrupt start of outflow channels indicates that they are formed not by surface drainage immediately following precipitation but by the rapid release of large volumes of stored water. The storage medium could be an aquifer, or a lake, as with the Channeled Scablands of Eastern Washington, or ice, as with Icelandic jokulhlaups. All three possibilities may be represented on Mars: (i) several large channels that emerge from rubble-filled depressions south of the Chryse basin, and others elsewhere that start at graben, appear to have formed by eruptions of groundwater (Carr, 1979) (Figure 2.6); (ii) drainage of lakes in the Valles Marineris is suggested by eroded sections of Ganges, Eos, and Capri Chasmas and the mergers of Kasei Vallis with Echus chasma and of Maja Vallis with Juventae Chasma (Luchitta et al., 1992;

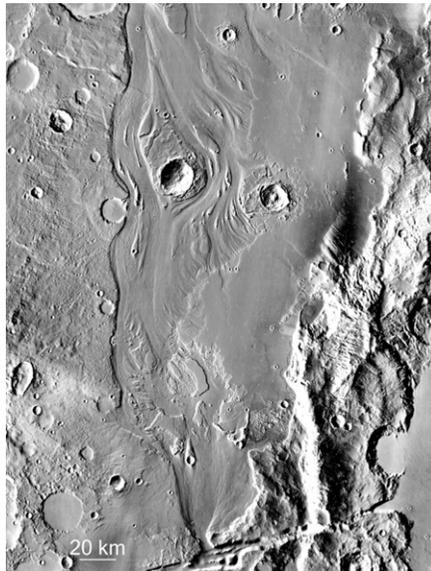


Figure 2.6 The lower reaches of Mangala Vallis at 18° S, 210° E. The channel starts abruptly at a graben and extends for over 1000 km to the north. The graben may have acted as a conduit allowing deep groundwater access to the surface, possibly in combination with injection of dikes (THEMIS).