Ares Vallis: Flood Geomorphology of Mars Pathfinder Landing Site: G. Komatsu[1)2)], V.R. Baker[1)3)], and J.R. Johnson[1)]: 1) Lunar and Planetary Laboratory, University of Arizona, Tucson, AZ 85721: 2) School of Geology, University of Tokyo, Tokyo, Japan: 3) Department of Geosciences, University of Arizona, Tucson, AZ 85721

The Mars Pathfinder project has selected a candidate location for the landing site. We mapped the local geology of the region in order to identify features which may be imaged by the lander. The landing ellipse encompasses part of the outwash plains of the Ares Vallis (Fig. 1), one of the largest outflow channels on Mars. This region contains a variety of flood-related features, and the lander instrument may provide insights to understand Martian paleohydrology. For comparison, we used the experience from terrestrial analogs: the Channeled Scabland of eastern Washington State [1] and flood-modified valleys in Altai Mountains [2]. These landscapes were formed by cataclysmic floods caused by the failures of glacier-dammed lakes in Pleistocene. The scales of the terrestrial floods were probably an order of magnitude smaller than their Martian counterparts [3], but they provide the best available terrestrial comparisons.

From the western edge of the image, mottled terrains extend westward (Fig. 2a). The upper strata (lower albedo) seem to be stripped away, exposing either lower strata or trapped eolian materials (higher albedo). These terrains are probably scabland formed by the erosion of high-energy flows. Scabland in eastern Washington State is formed by the stripping of loess caprock and eroding into the underlying basaltic bedrock [1]. Basalt is considered to be the most common volcanic rock on Mars and it is like that the stripped strata are basaltic. This process explains the very rugged terrains, very similar in texture to terrestrial scabland (Fig. 2b). The high-discharge flows can also produce longitudinal grooves [1] (Fig. 3). Impact craters comprise one of the primary landscapes of the region (Fig. 4). Many craters larger than several kilometers in diameter are modified by the floods. This indicates craters up to several kilometers in diameter and which seems pristine must postdate the flood events. Work is in progress trying to estimate the size range of craters removed or modified by the flood flows. Streamlined hills are also commonly developed by catastrophic floods [1] (Fig. 5a). Streamlined hills are among the most predominant landforms in the region (Fig. 5b). Many hills seem to be either terraced or layered, or both. This indicates either that the flood had multiple stages or that it differentially eroded layers to make terraces.

Flood-transported boulders one to ten meters in diameter are expected to have been deposited in this region [4]. This scale is smaller than the resolution limit of the highest resolution Viking images. Hills tens of meters to a few hundreds meters across exist in the region. Their morphologies and sizes indicate that these hills are probably the erosional remnants of the bedrock rather than transported boulders, but this point needs more investigation. Depositional bars and giant current ripples are also common features observed in association with terrestrial catastrophic floods [1 and 2], but preliminary mapping has not identified these features in the study area.

REFERENCES: [1] Baker, V.R. and Nummedal, D. (1978) *The Channeled Scabland.* [2] Baker, V.R. et al. (1993) *Science*, **259**, 348-350. [3] Baker, V.R. (1982) *The Channels on Mars.* [4] Komatsu, G. et al. (1995) *LPSC* **XXVI**, this volume.

FLOOD MORPHOLOGY OF MARS PATHFINDER LANDING SITE: G. Komatsu et al.

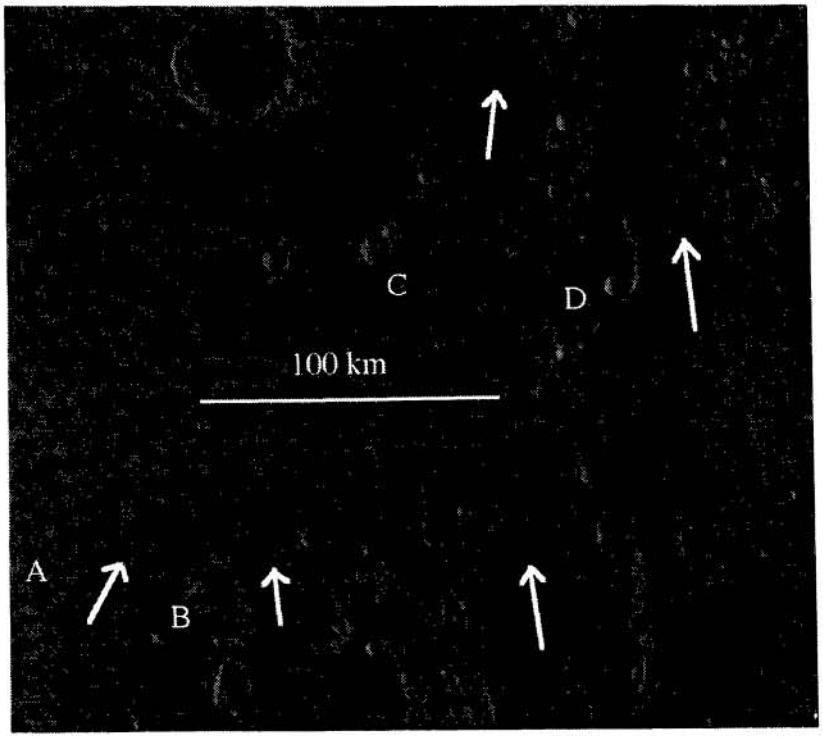

Fig. 1

Fig. 1 Ares Vallis outwash plain. This area almost corresponds to the Pathfinder landing site ellipse. Flow directions are indicated by the arrows. A, B, C, and D correspond to the locations of the flood morphologies shown in Figs. 2-5.

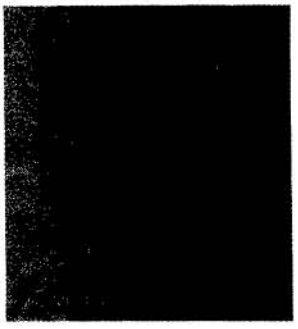

Fig. 2a

Fig. 2a (A) Mottled terrains. The darker upper strata were stripped by the high discharge flow, exposing either lower lighter strata or trapped eolian materials.

Fig. 2b

Fig. 2b Scabland landscape along the Columbia Gorge formed by the outburst of the Pleistocene glacier Lake Missoula.

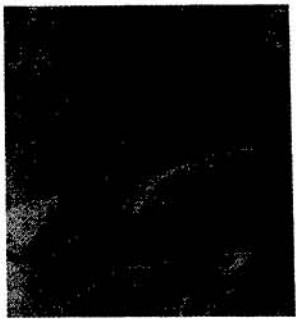

Fig. 3

Fig. 3 (B) Grooves scoured by the flood flows.

Fig. 4

Fig. 4 (C) An impact crater with fluidized ejecta blankets (rampart crater).Secondary craters in the image probably postdate the flood events.

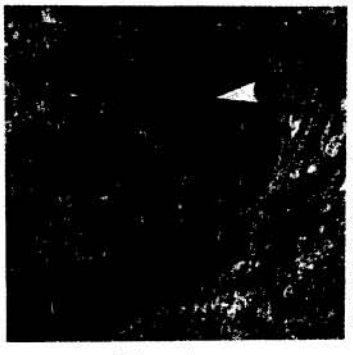

Fig. 5a

Fig. 5a Streamlined hill landscape of the eastern Washington State near Spokane (European Earth Resource Satellite-1 SAR image, courtesy of Alaskan SAR Facility). Image frame is about 50 km wide.

Fig. 5b

Fig. 5b (D) Streamlined hills with possible terraces.