LOCATION AND GEOLOGIC SETTING FOR THE THREE U.S. MARS LANDERS. T. J. Parker[1] and R. L. Kirk[2], [1]Jet Propulsion Laboratory, Mail Stop 183-501, Oak Grove Dr., Pasadena, CA 91109, timothy.j.parker@jpl.nasa.gov, [2]U.S. Geological Survey, Flagstaff, AZ 86001.

Introduction: Super resolution of the horizon at both Viking landing sites has revealed "new" features we use for triangulation, similar to the approach used during the Mars Pathfinder Mission. We propose alternative landing site locations for both landers for which we believe the confidence is very high. Super resolution of VL-1 images also reveals some of the drift material at the site to consist of gravel-size deposits. Since our proposed location for VL-2 is NOT on the Mie ejecta blanket, the blocky surface around the lander may represent the meter-scale texture of "smooth palins" in the region.

The Viking Lander panchromatic images typically offer more repeat coverage than does the IMP on Mars Pathfinder, due to the longer duration of these landed missions. Sub-pixel offsets, necessary for super resolution to work [1,2], appear to be attributable to thermal effects on the lander and settling of the lander over time. Due to the greater repeat coverage (particularly in the near and mid-fields) and all-panchromatic images, the gain in resolution by super resolution processing is better for Viking than it is with most IMP image sequences. This enhances the study of textural details near the lander and enables the identification rock and surface textures at greater distances from the lander. Discernment of stereo in super resolution images is possible to great distances from the lander, but is limited by the non-rotating baseline between the two cameras and the shorter height of the cameras above the ground compared to IMP.

With super resolution, details of horizon features, such as blockiness and crater rim shapes, may be better correlated with Orbiter images. A number of horizon features - craters and ridges - were identified at VL-1 during the misison, and a few hils and subtle ridges were identified at VL-2. We have added a few "new" horizon features for triangulation at the VL-2 landing site in Utopia Planitia. These features were used for independent triangulation with features visible in Viking Orbiter and MGS MOC images, though the actual location of VL-1 lies in a data dropout in the MOC image of the area.

Location of Mars Pathfinder: The Mars Pathfinder landing site was pinpointed using "Dead Reckoning" triangulation of horizon features. Viking Orbiter 1 imaged the site in stereo in orbit 004A. The proximity of so many prominent topographic features on the local horizon made pinpointing the lander fairly straightforward.

VO Image	Line	Sample	Uncertainty (pixels)/meters
004A44	708	378	couple/100

Location of VL-1: At VL-1, we have identified more than 8 crater profile shapes (including those identified by the Viking Team) on the horizon that enable us to propose an alternative landing site to that of Morris and Jones [3]. Because of the excellent correlation between these craters and the very high-resolution Viking Orbiter image 452B10, we attribute a very high degree of confidence to this proposed location. At least two of the craters had been identified by the Viking Lander Science Team. In addition, at least three of the ridges identifed by the Science Team correlate with small craters near our proposed lander location (these were interpreted as possible craters by the Viking Team).

VO Image	Line	Sample	Uncertainty (pixels)/meters
452B10	421	630	5/40

This places the lander approximately 5.9 km NE of the position noted by Morris and Jones and less than 600 m NW from a newly-derived position proposed by Zeitler and Oberst [4]. Efforts to convert this location into geodetic coordinates and additional super resolution processing of the VL-1 and VL-2 horizons are currenly under way [5].

Location of VL-2: At VL-2, we have identified a few "new" features, mostly subtle hills (including those identified by the Viking Team) on the horizon that enable us to propose an alternative landing site to those of the Viking lander team and of Stooke [6].Stooke's proposed site is near location accepted by Viking Lander team in 1984, though it is closer to the pedestal crater "Goldstone". Stooke's site assumes much of Goldstone is below the local horizon.

VO Image	Line	Sample	Uncertainty (pixels)/meters
009B15	620	1132	10/800

Flood deposits at the VL-1 landing site: One of the initial subjects for focusing our super resolution effort on is the drift material imaged at the VL-1 site to the north and east of the lander. In some of the Viking images, these drifts appear "speckled," as if the images were noisy or the drifts were grainy. The individual specks are unresolved in nominal VL camera images. However, by applying super resolution to multiple frames, these specks resolve into coarse granular material within the drifts. This granular material is too coarse to have been either emplaced or deflated by eolian processes, and so *must have been transported by water*. The drifts, therefore, are probably eroded fluvial deposits partially mantled by eolian fines that were emplaced and also partially winnowed by floods from Maja and Kasei Valles.

Bedrock near the Mars Pathfinder Lander: The

MPF landing site is most often described as volcanic plain ("Hesperian Ridged Plains"). However, because the Chryse Basin recieved so much channel influx, both from valley networks prior to the major outflow channels and from the outflow channels themselves, it is equally likely that the "bedrock" surface beneath the lander is fluvial, perhaps even marine, sediment. MOC stereo coverage of the region a few kilometers south of the lander reveals a series of subtle low mesas of what appears to be bedrock partially plucked away by the floods, that is higher in albedo than the surrounding flood surface.

Blocky terrain at VL-2: There were some sugggestions, after the landing, that VL-2 may have touched down on Mie ejecta blanket, thus explaining the boulder field as ejecta blocks. However, our "new" location for the lander, based on the MOC image acquired during SPO "proves" that the lander is instead on the "typical" dark, smooth northern plains surface. Is this blockiness representative of the general texture of the northern plains in the region? This question probably cannot be settled for certain until the lander itself has been identified within a 1.5m/pixel nadir-pointing MOC image, and/or until a number of images have been acquired by MOC that sample the various surface textures in region.

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