LOCATION AND GEOLOGIC SETTING FOR THE VIKING 1 LANDER. T. J. Parker[1], R. L. Kirk[2], and M. E. Davies[3], [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, [3]RAND, Santa Monica, CA 90406.

Introduction: Super res. of the horizon at VL-1 has revealed "new" features we use for triangulation. We propose an alternative landing site location for which we believe the confidence is very high. Super res. of VL-1 images also reveals much of the drift material at the site to consist of gravel-size deposits.

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 irregularities in the rim of "crater A" - identified by the Viking Team during the mission - may be better correlated with Orbiter images. A number of horizon features - craters and ridges - were identified at VL-1 during the misison. We have also begun identification of "new" horizon features at the VL-2 landing site in Utopia Planitia. These features will be used for independent triangulation with features visible in Viking Orbiter and MGS MOC images, as they become available. Due to the lower resolution Viking Orbiter coverage of the VL-2 landing site, we may need to rely on imaging of the lander itself by the MOC in order to determine whether it rests on Mie ejecta or whether the blocky surface is typical of the northern plains.

Location, Location, Location: As of this writing, we have identified more than 8 crater profile shapes (including those identified by the Viking Team) on the VL-1 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). Our proposed location is within a few pixels (less than a few tens of meters) of line 421, sample 630 of the rectilinear version of VO image 4525B10 [Figs 1,2]. 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].

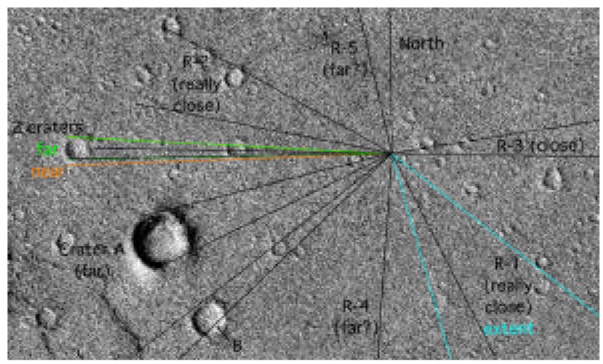

Fig 1: Portion of VO image 452B10, showing proposed location of the VL-1 with vectors to prominent horizon features.

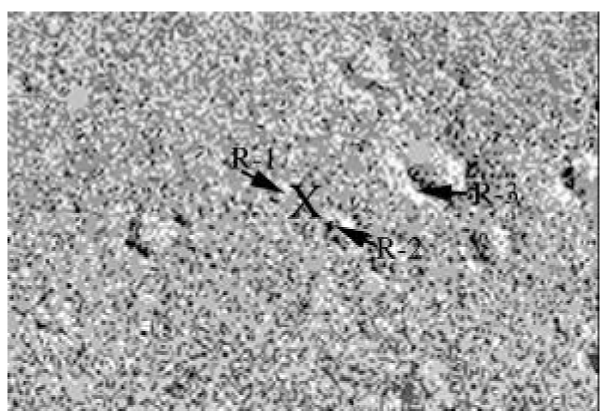

Fig2: Enlargement of immediate vicinity of proposed VL-1 location, with nearby ridges (portions of small crater rims) identified.

Flood deposits at the 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 [Figs 3,4]. 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.

References: [1] Parker T. J. (1998) LPS XXIX, 2p. [2] Kanefsky R. et al. (1998) LPS XXIX, 2p. [3] Morris E. C. and Jones K. L. (1980) Icarus, 44, 217-222. [4] Zeitler W. and Oberst J. (1999) J. Geophys. Res. in press. [5] Kirk R. L. et al., (1999) *LPS XXX*, this volume.

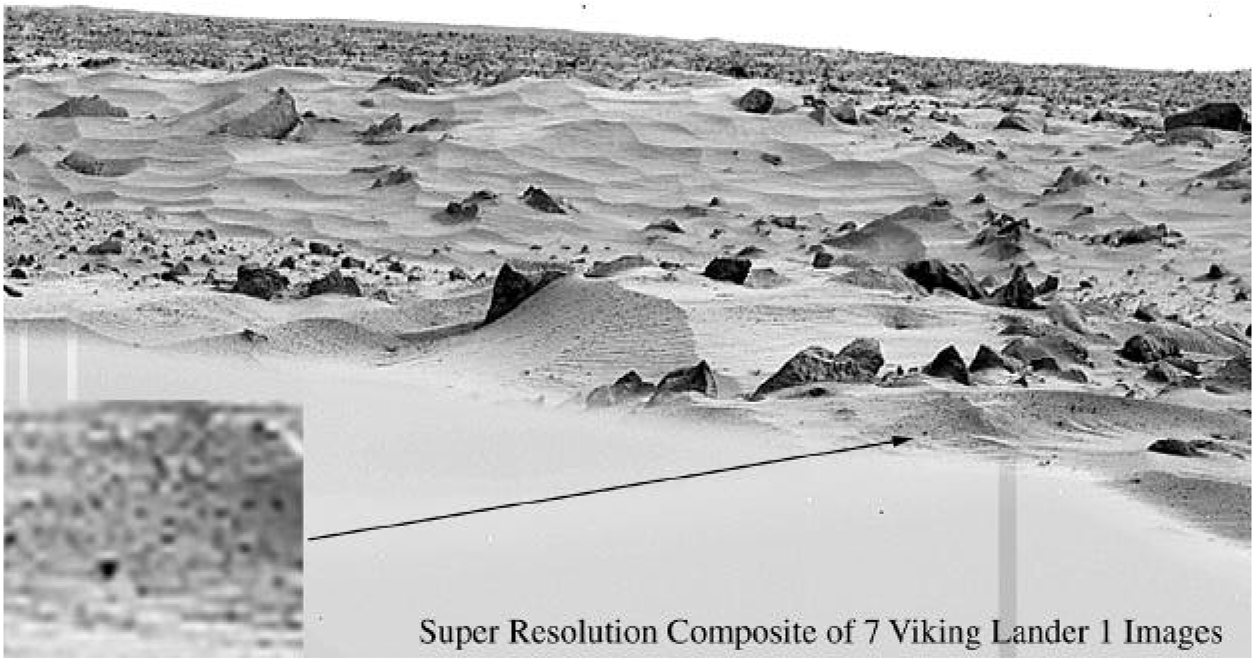

Fig 3: Super resolution composite image of midfield north of the lander. Note resolution of “speckled” texture in drift material into granules within the drifts.

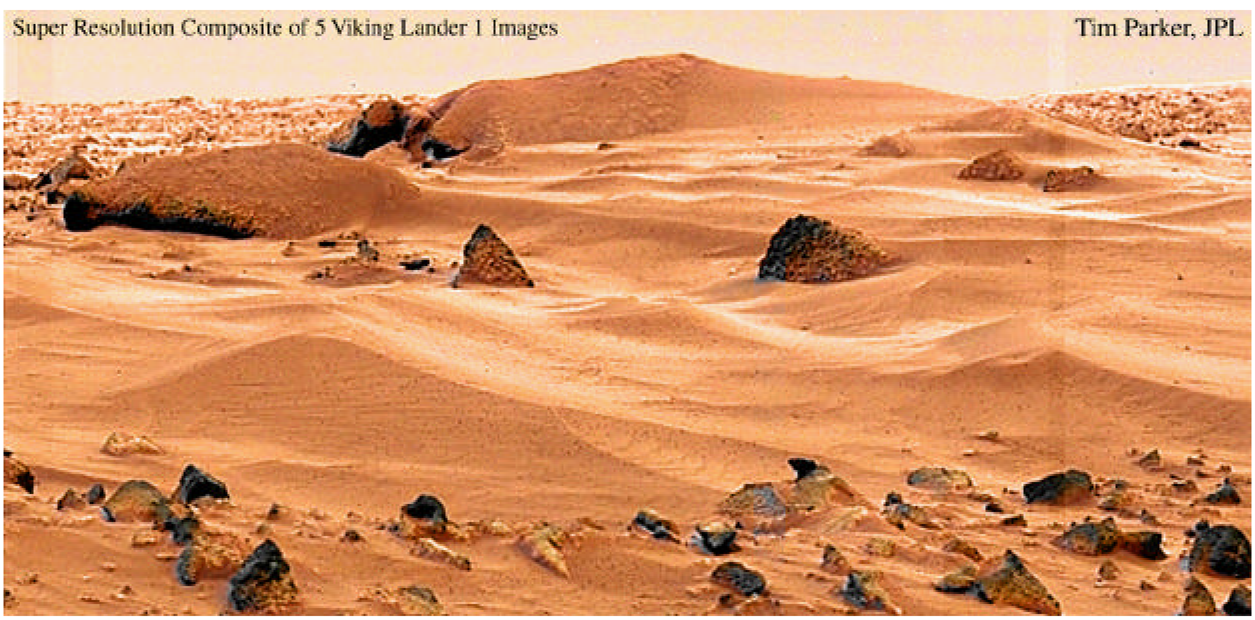

Fig 4: Super resolution composite image of midfield northeast of the lander (east in azimuth from Big Joe). Here, the granular appearance of the drifts fades gradually with distance from the lander. Note also the layering exposed in the sides of the nearest drifts. These were noted by the Viking Lander Team in the late 70’s.