MSL LANDING SITES IN ANCIENT LAYERED TERRAIN: BECQUEREL CRATER. J. C. Bridges[1] and M. R. Balme[2,3], [1]Planetary and Space Sciences Research Institute, Open University, Milton Keynes, MK7 6AA, UK, j.bridges@open.ac.uk [2]Dept. of Earth Sciences, Open University, Milton Keynes, MK7 6AA, UK, m.r.balme@open.ac.uk [3]Planetary Science Institute, 1650 East Fort Lowell Dr. Suite 201, Tucson AZ 85719, mbalme@psi.edu

Introduction: Landing on or close to a layered terrain offers a chance for the Mars Science Laboratory to log a thick sequence of sediments including potentially lacustrine deposits. Becquerel Crater in Arabia Terra offers one such environment. This would enable an accurate description of past environmental conditions and habitability over millions of years in the Noachian in an analagous way to which palaeoenvironments are determined on Earth. The current consensus is that the sediments exposed over the MER Opportunity landing site were deposited from shallow water currents [1] although alternative explanations based on impact surges have been suggested [2]. The nature of martian sediments, whether deposited from water or the results of impacts can be determined using the scientific tools on the MSL.

Some of the most extensive exposures of layered terrain occur in the large impact craters of Arabia Terra such as Trouvelot and Becquerel [3]. Much of the well exposed layered terrain within the Valles Marineris system may be difficult to access because of prohibitive wind conditions [4]. Trouvelot contains rough terrain and the layered deposits are surrounded by dark dunes, which by analogy with the MER operations, are prohibitive for mobility. Becquerel, however, offers suitable terrain in addition to a strong science case.

Becquerel Crater: This 167 km diameter crater is located at 22^{o}N, 352^{o}E and contains an approximately 900 km^2 exposure of Interior Layered Deposits (ILD) in the south of the crater. In the east (e.g. MOC M0702802) the ground surface also contains a faint polygonal terrain which may indicate past near-surface ice. Becquerel elevation ranges from -2.6 to -3.8 km and has rock abundances varying from 4-12 % [5]. The thermal inertia values of >300 units suggest that dust conditions will not prohibit this site. Gamma Ray Spectrometer measurements suggest that no substantial ground-ice is present so there should not be significant planetary protection issues.

It is envisaged that the 20 km landing ellipse would be placed off the ILD (Fig 1) allowing a traverse of the rover onto the main area of interest but providing a safer landing site. Slopes on a 500m scale in the ellipse are 1-3^{o} (MOLA ap10672h, ap01682h). Topography in the MOC images implies that the areas to the NW of the ILD are safer and have easier trafficability (M0701459). MOC images for this area indicate tens of m scale surface roughness comparable to the Gusev MER site. Slopes onto the ILD from NW will need to be considered in detail, limited MOLA data suggests they may be up to ~10^{o}. This should allow the rover to explore the base, the cliff sequence and potentially the top surface of the ILD.

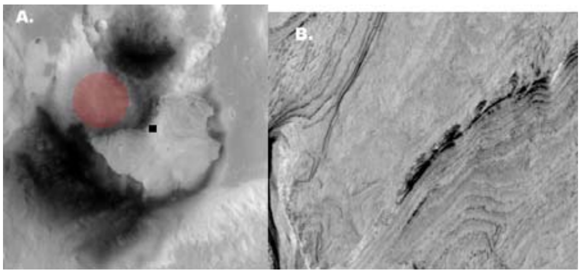

Figure 1a. Becquerel Crater with Interior Layered Deposits (ILD). MOC wide angle image of area with 20 km diameter landing ellipse (21.8^{o}N, 351^{o}E) located to the NW of the Interior Layered Deposits which are the suggested area for scientific study by MSL. The black square marks area of Fig. 2 on ILD. *1b. Layers within ILD.* MOC narrow angle image e0200375 (21.6^{o}N, 351.6^{o}E). Width 1.5 km, 3 m/pixel. Much of the layered terrain (layers of a few tens of m thickness are seen in this image) is suitable for rover traverses. This part of the ILD is located near the projected landing ellipse (Fig. 1a).

Conclusions: Traversing along Noachian layered terrain such as in Becquerel gives an excellent chance for MSL to achieve its science objective of assessing past habitability on Mars by producing a sedimentary log covering millions of years of environmental history.

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