



Figure 34. MI image 1M145849709, acquired on sol 199 of target Muffins while fully shadowed, merged with enhanced color from Pancam filters R2 (754 nm), R7 (1009 nm), and R1 (436 nm). Concretions are spherical in shape and relatively blue in color, while popcorn grains are yellower and more irregular in shape. Area shown is 31 mm square.

measure grains less than 100 μm in diameter, this coarser subset is also plotted in Figure 30. In combination, focus on individual components and dismissal of fines result in better sorting. For comparison, we also plotted *Ahlbrandt's* [1979] measurements of eolian sands in Figure 29.

[75] Surge and eolian deposits have nonoverlapping distributions in Figure 30; mean grain sizes overlap at the finer end of the surge grain distribution, but eolian deposits are uniformly better sorted. Because surge deposits do not predict a grain size distribution similar to eolian sands, MI-based quantitative grain size measurements provide a compelling test of eolian versus surge hypotheses. The two

boxes in Figure 30 show the two Meridiani sandstone targets. Clearly, the ancient Martian samples plot within the field for eolian sands but well outside of the field for surge deposits. Thus, MI observations provide strong support for the hypothesis that Meridiani outcrop rocks formed largely by the deposition of windborne grains.

4.2.7.2. Lamination Thickness Distribution

[76] Recently, ancient sedimentary environments on Mars have been investigated using images of outcrops at hand specimen scales by both Opportunity and Spirit [Grotzinger *et al.*, 2005; 2006; Lewis *et al.*, 2008]. We now take the study of the Opportunity landing site a step further by