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Mars Science Laboratory Curiosity rover initial Mastcam geomorphologic and multispectral characterization of the Gale crater field site

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The Mars Science Laboratory Curiosity rover landed in Gale crater on August 6, 2012 and has been enabling the exploration of a variety of geologic terrains between the rover's landing site at Bradbury Rise and the nearby topographic low point known as Yellowknife Bay. Curiosity carries a multispectral imaging system known as Mastcam, which consists of two boresighted CCD cameras, one of which acquires relatively wide field images (34-mm focal length, 18.4x15 degree FOV) and the other of which obtains narrower-angle telephoto images (100-mm focal length, 6.3x5.1 degree FOV). Each of these cameras has an 8-position filter wheel to enable imaging through broadband RGB Bayer filtes, nine specific narrowband filters in the 445 to 1012 nm region to enabled limited detectability of certain ferric, ferrous, and hydrated minerals, and neutral density solar filters for monitoring of atmospheric opacity. The Mastcams acquire images designed primarily to address specific scientific goals in geology, mineralogy, and atmospheric science, but also to support operational decisions related to rover driving, arm instrument placement, and rover subsystems status.

Here we provide an overview of the initial scientific imaging results from the Mastcam investigation, from sol 0 (landing sol) through the end of the drilling campaign in Yellowknife Bay and the beginning of the long drive from there to the base of Mt. Sharp. A diversity of terrain elements have been encountered, including angular and sub-angular boulders and rocks, some of which are variably dusty, "clean", and "coated", layered/laminated, polygonally fractured, and/or exhibit light-toned fracture fill materials; angular, sub-angular, and rounded/cemented pebbles and gravel (*e.g.,* breccias and conglomerates); and granule ripples and other fine-grained deposits. The occurrence of these materials corresponds to major geologic map units defined by the MSL Science Team from orbital images and other data sets.

Multispectral imaging and RGB color observations have been calibrated to radiance using pre-flight calibration coefficients, and to radiance factor (I/F) using near-in-time observations of the Mastcam calibration target. These data enable searches for crystalline ferric oxide minerals like hematite and other ferric oxides, oxyhydroxides, or oxyhydroxysulfates, for common rock-forming ferrous silicate minerals like high and low calcium pyroxenes, and for a subset of hydrated minerals that can potentially be detected using Mastcam's longest-wavelength near-IR filters. Initial 12-color Mastcam "spectra" are consistent with variable coatings of nanophase ferric oxide-bearing airfall dust, with some lower albedo material showing features consistent with a weak olivine and/or pyroxene absorption, and evidence for hydration, potentially from gypsum ($CaSO_4 \bullet 2H_2O$), in some of the veins within rocks and in other clasts in Yellowknife Bay [see also M. Rice *et al.,* this meeting].