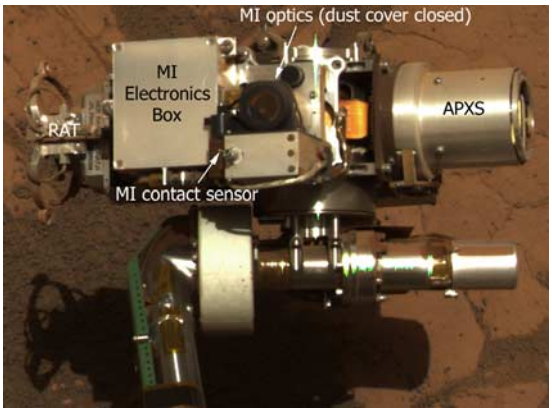

Figure 1. Pancam color (filters L4, L5, and L6) image of Opportunity's Instrument Deployment Device (IDD) turret (about 30 cm across), taken on sol 405 with illumination from top. Bright vertical lines are artifacts caused by blooming of saturated pixels.

(IDD). The MI includes the same charge-coupled device (CCD) detector and electronics as the other MER cameras [*Bell et al.*, 2003; *Maki et al.*, 2003]. MI images are 1024 × 1024 pixels in size, with a scale of 31 microns/pixel at best focus. The MI optics are protected by a retractable Kapton dust cover. The instrument includes a contact sensor that is used to accurately position the MI relative to rock targets (Figure 1). The camera design and experiment objectives were summarized by *Herkenhoff et al.* [2003].

[3] This paper provides an overview of Opportunity MI calibration, processing and analyses of data acquired through sol 900 (a sol is a Martian day, approximately 24 h and 40 min long). During the first 900 sols of the surface mission, the Opportunity rover acquired and returned hundreds of full-frame MI images (see http://pds-imaging.jpl.nasa.gov/Missions/Opportunity_MERB_mission.html or http://an.rsl.wustl.edu/mer/merb/merb.htm to search for and download Opportunity image data). Scientific results of the primary mission (through sol 90) were described previously [*Squyres et al.*, 2004a; *Arvidson et al.*, 2004; *Herkenhoff et al.*, 2004b], so this paper emphasizes the reduction and analysis of MI data acquired from sol 91 to 900 (during the first three extended missions). In addition, we provide further data analysis of observed textures related to grain size and lamina thickness for layered strata of the Burns formation [*Grotzinger et al.*, 2005]. These results support previous interpretations of the emplacement mechanisms for these strata.

[4] MI tactical operations, data processing, archiving, and high-level data products were discussed by *Herkenhoff et al.* [2006]. The MI on Opportunity is operated essentially identically to the MI on Spirit, and data are generally processed in the same way [*Herkenhoff et al.*, 2003], so that discussion is not repeated here.

2. In-Flight Calibration

[5] The results of MI calibration activities before the MER launches were summarized by *Herkenhoff et al.* [2003]; detailed information is available in the MI calibration report [*Herkenhoff et al.*, 2004a]. The collection and application of Opportunity MI calibration data after launch (during cruise to Mars and the first 900 sols of landed operations) are described in this section.

2.1. Dark Current

[6] Because the MI has no shutter and its dust cover is not opaque, it is not possible to acquire useful MI dark current data on the surface of Mars. The MI is sensitive enough that starlight would affect nighttime images, and the dark current is difficult to measure at low temperatures, so we have not

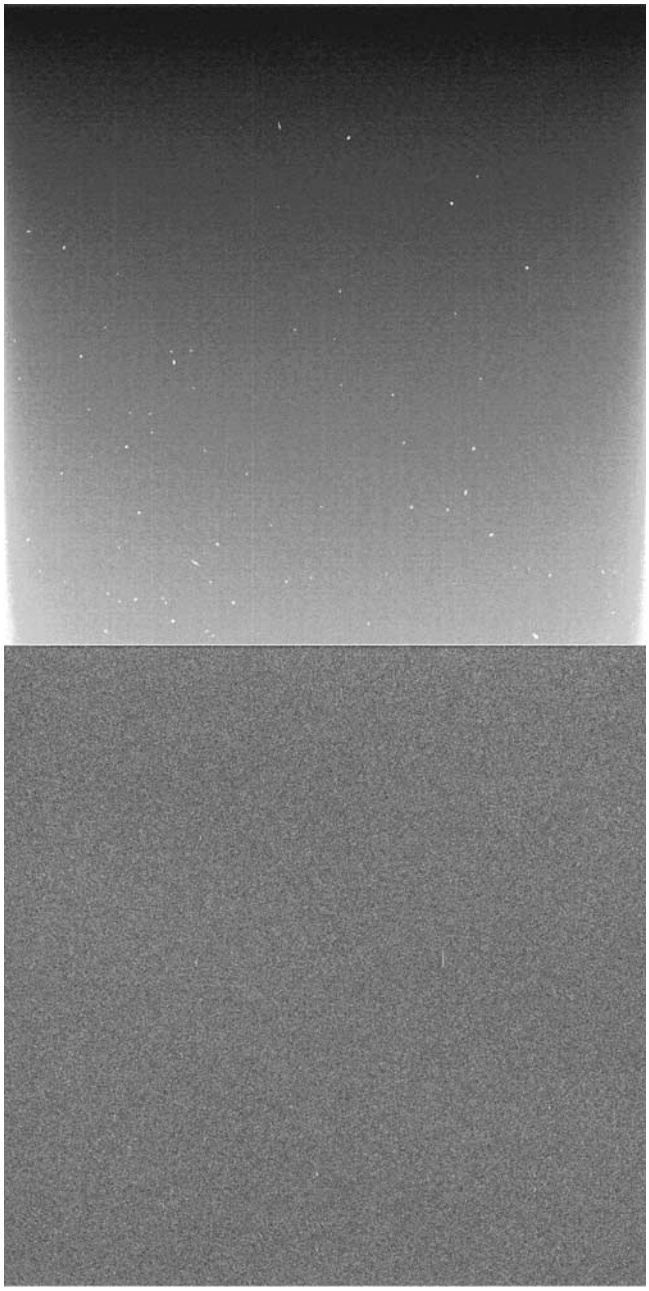

Figure 2. Microscopic Imager (MI) dark current images taken during first cruise instrument checkout on 30 July 2003. Contrast is enhanced to emphasize subtle features. (top) Zero-second exposure image 1M112776938 showing temporary radiation effects. (bottom) One hundred–second exposure image 1M112777598.