

Geometric Calibration of the Lunar Reconnaissance Orbiter Camera

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ABSTRACT:

The Lunar Reconnaissance Orbiter Camera (LROC) consists of two imaging systems that provide multispectral and high resolution imaging of the lunar surface. The Wide Angle Camera (WAC) has a 90° field of view in monochrome mode and collects near global mosaics each month at a pixel scale 75 (Visible) and 384 (UV) m from an altitude of 50 km. The Narrow Angle Camera (NAC) consists of two identical cameras capable of acquiring images with a ground sampling distance of 0.5 from the same altitude. Using measurements collected pre-flight at Malin Space Science Systems and on-orbit observations, the LROC team generated detailed camera models for all three cameras. The improved optical distortion models, focal length/boresight derivations, and temperature based camera pointing offsets increased the accuracy and precision of LROC derived map products. To disseminate the results, we updated and released a new Instrument Kernel (IK), Frames Kernel (FK), and a series of new C-matrix Kernels (CKs) that describe the relative angular offsets of each camera throughout the mission. Using these new kernels along with updates to Integrated Software for Imagers and Spectrometers (ISIS), improved ephemeris from the LOLA/GRAIL team, and high resolution Digital Terrain Models (DTMs), users can now project WAC images with sub-pixel accuracy and NAC images within 20 m of the true location without applying any ground control points.