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ABSTRACT SUBMISSION FORM

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Title of the Paper Geometric Camera Calibration in Planetary Missions
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ABSTRACT(more than 300 words) ^[5]

We present results of recent in-flight camera geometric calibration efforts conducted at the German Aerospace Center (DLR) and their impact on photogrammetric data products. We have developed semi-automatic calibration schemes using images of star fields, with which we are able to derive focal lengths and extensive geometric distortion models from single star field images in a least-squares-fit. These images must contain a sufficient numbers of stars (> 150), well-distributed over the camera's field of view. Flexible software tools have been developed using the Tycho-2 star catalog and making heavy use of SPICE routines. We were able to dramatically improve the quality of Mercury limb profiles and digital terrain models (DTM) derived from MESSENGER stereo images. Also, we have investigated star field images obtained by the Imaging Science Subsystem (ISS) onboard the Cassini spacecraft in support of the photogrammetric and cartographic work undertaken for the Saturnian moons at the DLR. We have also analyzed images taken by the frame cameras on the DAWN (FC1 and FC2) and Rosetta (OSIRIS) spacecrafts, currently en route to their target objects. We also provide examples for the calibration of the Smart Panoramic Optical Sensor Head (SPOSH) camera, used for ground-based observations of meteors.

The precise knowledge of the inner and outer orientation is an important factor in the photogrammetric processing of planetary images. The construction of DTMs and mosaics from stereo imagery would be practically impossible without proper information on focal length, geometric distortion and bore-sight direction. Though every camera sent on a space flight has undergone extensive analyses of its geometric and radiometric properties beforehand, mechanical stresses acting upon the spacecraft during take-off and changing thermal conditions during cruise or mission phases might change the instrument's parameters.

Please refer to overleaf for details.

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