Digital topographic mapping of Mercury

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We describe a cartographic project to re-process and semi-automatically stereo match Mariner 10 vidicon stereo pair images. Three different patch-based digital stereo matching algorithms have been tested: a JPL VICAR Tracker3 program, an ISIS stereo matcher, and the Gotcha matcher from University College London/Laserscan. Comparisons will be made with Viking Orbiter stereo pairs. One problem found, when using Mariner 10 images, has been with the noise present and its effects on the automatic detection of reseau calibration marks. Manual inspection of the results must be used to detect such errors. The stereo matched products for Mercury will be combined to produce a Digital Elevation Model (DEM) of approximately 60% of the imaged hemisphere of the planet, sampled at 1km grid spacing, for eventual distribution to the planetary science community. Additional sources of topographic information, such photoclinometry, limb profile images, and Earth-based radar profiles, will be discussed. Some example DEMs will be shown for the Discovery, Michelangelo, and Tolstoj areas. Mapping opportunities from proposed future missions to Mercury will also be described.