

Impact of Updates to MESSENGER's Mercury Coordinate System on the Location of Hun Kal Crater in Sample Image Projections

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At the request of the Planetary Data System (PDS), and in support of the Mercury Surface, Space ENvironment, GEochemistry, and Ranging (MESSENGER) Mercury coordinate system PDS peer review, the MESSENGER team has created sample projected images of Hun Kal crater with both the current Navigation and Ancillary Information Facility (NAIF) Planetary Constants Kernel (PCK) and the new MESSENGER PCK (which incorporates MESSENGER's proposed Mercury coordinate system updates). These sample images support an evaluation of the impact on the longitude of Hun Kal of using the MESSENGER Mercury coordinate system values over the current NAIF and International Astronomical Union (IAU)-approved values.

Mercury's longitude system is tied to Hun Kal, an impact crater ~ 1.5 km in diameter for which the center is defined to be 20° west of the prime meridian. Figure 1 shows the measured latitude and longitude coordinates of the center of Hun Kal for each of six sample image pairs. Blue circles indicate Hun Kal center locations for projections that use the NAIF PCK. Red diamonds indicate Hun Kal center locations for projections of the same set of six images that use the new MESSENGER PCK. The position of Hun Kal is now on average within 0.02° of its defined value, compared with a difference of 0.10° when the NAIF PCK is used. For three of the six images, -20° E longitude passes through Hun Kal (as required by the IAU), and the crater's center is measured to be within 0.4 km of the defined location of Hun Kal. The three images in which Hun Kal falls farther from its defined longitude all were acquired at high emission angles (50° , 52° , and 45°) that likely led to the higher errors observed, as the images were projected onto a sphere rather than a digital elevation model, as will be used for the final MESSENGER products. The new MESSENGER PCK does not affect the latitude of Hun Kal in these samples.

In summary, the Mercury coordinate system updates proposed by MESSENGER, incorporated in the new MESSENGER PCK, and used in the projection of MESSENGER images of Hun Kal crater, provide improvements over the current IAU-approved Mercury coordinate system.

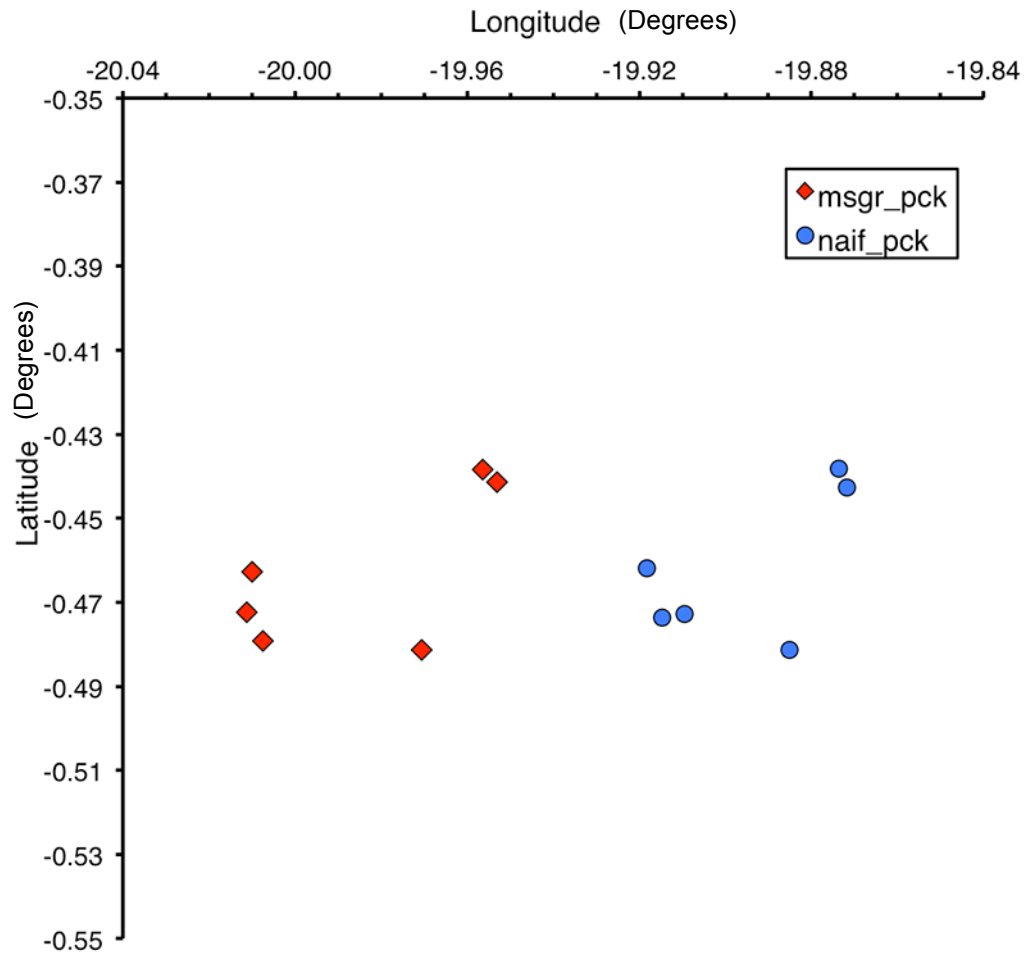


Figure 1. Central coordinates of Hun Kal crater for image projections with NAIF and MESSENGER PCKs.