

COORDINATES FOR EROS
PDS ARCHIVE HOLDINGS FOR THE NEAR MISSION

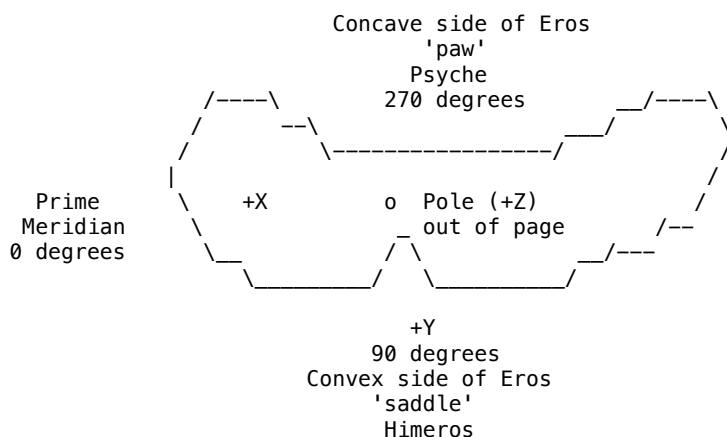
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April 7, 2007

IAU Standard for asteroids and comets:

The positive rotational pole is defined by the right-hand rule (RHR), with values of latitude ranging from [+90 degrees,-90 degrees] from the positive pole down to the negative pole. Longitude should also follow the RHR, with values increasing from [0 degrees,360 degrees] from the Prime Meridian around the body in the right-handed sense (Seidelmann et al. 2005).

NEAR Eros Data:



For a topographic reference for the user, the IAU Standard places the 0 degrees Prime Meridian line at one of the long ends, with longitude increasing to 90 degrees near Himeros and 270 degrees near Psyche. The Prime Meridian was set with the low-resolution data, attempting to fix a crater near one of the long ends. With the later data, the crater's position was slightly off. The North Pole is the positive pole. There is no need to express "East" or "West" longitude in this system and there should not be any negative longitude values (although the typical "East" longitude corresponds to the IAU Standard). These coordinates are planetocentric.

Prior to Seidleman et al. (2005), there were no explicit definitions for small bodies, so the coordinate definitions for planets were used by some groups and other groups used their own definitions (which in the case of NEAR turned out to be the "new" standard). Therefore, much of the NEAR data and documentation is not in compliance with the IAU Standard Longitude Coordinate System.

The PDS is imposing conformity by documenting the inconsistencies and detailing the data affected. Data files will not be changed, so the user must use this document as a guide. Data are listed by instrument.

General Documentation

Many of the archived catalog files use an incorrect longitude system. The catalog files for the mission, named either "nearmission.cat" or "mission.cat", refer to the landing site on Eros as 37.2 degrees South by 278.4 degrees West. To conform to IAU standards, the landing site is -37.2 degrees latitude, 81.6 degrees longitude (i.e. 360 degrees - West longitude).

Multi-Spectral Imager (MSI)

All data for this instrument uses the Western Longitude System. To comply with the IAU Standard, the correct longitude = 360 degrees - West longitude

value.

Starting with the "observation_overview.doc" file, an Eros body schematic is given and both East and West longitude is mentioned. Level 1 and 2 data have ".lbl" files with "CENTER_LONGITUDE" keywords. The given longitude is West longitude. Index tables of data include the latitude and longitude. Level 3 data products include basemaps, shape models, and mosaics all with West longitude. Some files follow a naming convention which includes the latitude and longitude in the filename. Keywords to be aware of are "WESTERNMOST_LONGITUDE", "EASTERNMOST_LONGITUDE", and "SUB_S/C_LON".

NEAR Infrared Spectrometer (NIS)

Level 3 data products are the only ones affected. Keywords "LONGITUDE_RANGE" and "LONGITUDE" are used. The longitudes are reported as Western longitude. To comply with the IAU Standard, the correct longitude = 360 degrees - West longitude value.

NEAR Laser Ranger (NLR)

All documentation, data and derived products use the IAU Standard Longitude System. Nothing needs to be done.

Magnetometer (MAG)

The data use X, Y, and Z coordinates rather than latitude/longitude. The X, Y, and Z system is correctly right-handed.

For Level 3 data products, there are graphs and maps hard labeled with longitude values of -180 degrees...0 degrees...+180 degrees. To conform to the IAU Standard, 360 degrees should be added to the negative longitude values.

X-ray Spectrometer (XRS)

The data are given with West longitude. To comply with the IAU Standard, the correct longitude = 360 degrees - West longitude value.

The Level 1 data are not affected, but a Level 2 data keyword "BORESIGHT_INTERSECT_LON" is given in West longitude.

Gamma-Ray Spectrometer (GRS)

The data are given with West longitude. To comply with the IAU Standard, the correct longitude = 360 degrees - West longitude value.

The Level 1 data are not affected, but a Level 2 data keyword "BORESIGHT_INTERSECT_LON" is given in West longitude.

Radio Science (RSS)

Data are in East longitude which conforms to the IAU standard.

Values range from [-180 degrees, 180 degrees] instead of [0 degrees, 360 degrees] in derived data products. To completely conform to the IAU Standard, 360 degrees should be added to the negative longitude values. Keywords to be aware of in the Level 2 data products are "WESTERNMOST_LONGITUDE", "EASTERNMOST_LONGITUDE", "REFERENCE_LONGITUDE" and "CENTER_LONGITUDE".

SPICE

The data do not specifically reference longitudes.

Published Data

Many references cited in the documentation, including "refs.cat", are published in the Icarus Special Edition for NEAR (Volume 155). Of these, several do not use the IAU Coordinate Standard. The following is a list of the coordinate systems used in the publications and how to convert to the IAU Standard Longitude System.

Miller et al. uses correct right-handed system for longitude, but with a range of [-180 degrees, 180 degrees] instead of [0 degrees, 360 degrees]. To conform to the IAU Standard, 360 degrees needs to be added to all negative values.

Thomas et al. uses West longitude. To conform to the IAU Standard, the given longitude must be subtracted from 360 degrees.

Bussey et al. uses West longitude. To conform to the IAU Standard, the given longitude must be subtracted from 360 degrees.

Cheng et al. uses both East and West longitude. To conform to the IAU Standard, the West longitude values must be subtracted from 360 degrees. The East longitude values are correct.

Prockter et al. uses West longitude. To conform to the IAU Standard, the given longitude must be subtracted from 360 degrees.

Bell et al. uses West longitude. To conform to the IAU Standard, the given longitude must be subtracted from 360 degrees.

Murchie et al. uses West longitude. To conform to the IAU Standard, the given longitude must be subtracted from 360 degrees.

Lucey et al. uses East longitude. These values are correct.

Acuna et al. uses correct right-handed system for longitude, but with a range of [-180 degrees, 180 degrees] instead of [0 degrees, 360 degrees]. To conform to the IAU Standard, 360 degrees needs to be added to all negative values.

Reference

Seidelmann, P. K., Archinal, B. A., A'Hearn, M. F., Cruikshank, D. P., Hilton, J. L., Keller, H. U., Oberst, J., Simon, J. L., Stooke, P., Tholen, D. J., and Thomas, P.C. 2005. Report of the IAU/IAG Working Group on Cartographic Coordinates and Rotational Elements: 2003. *Celestial Mechanics and Dynamical Astronomy* 91, 203-215.