Policy on Acceptable Body-Fixed Coordinate Systems

(Adopted by MC on unanimous vote 2014-08-27)

This policy applies only to body-fixed coordinates systems.

This policy applies solely to coordinate systems based on reference frames that are fixed relative to a body (body-fixed reference frames). For the purposes of this policy a body is any celestial object (planet, moon, asteroid, comet, etc.). This policy uses the SPICE definition of a reference frame "as an ordered set of three mutually orthogonal unit-length direction vectors." [4]. While the SPICE definition of a coordinate system is "A coordinate system specifies the method used to locate a point within a particular reference frame." (e.g., rectangular (x,y,z), spherical (lat,lon)/(RA,dec), and so on) [4], this policy adopts the IAU definition of a coordinate system, which has been used in IAU documents going back to at least 1980 and which defines a coordinate system as the combination of the way positions are measured in the reference frame (the SPICE definition), a defined origin and the reference frame itself.

Archival data that are appropriate for inclusion in NASA's planetary data archive must be in an internationally accepted coordinate system. The prevailing international authority for the body-fixed reference frames for the bodies of the solar system is the Working Group on Cartographic Coordinates and Rotational Elements (WGCCRE) [1] of the International Astronomical Union (IAU).

Acceptable coordinate systems for PDS-archived data are those that are defined and accepted by the IAU (i.e., including the reference frame) or a coordinate system which conforms to the WGCCRE guidelines [2] for defining or improving the accuracy of a coordinate system. One requirement for an acceptable IAU coordinate system is that a description has appeared in a refereed publication. The WGCCRE has indicated (memo to A'Hearn on 2014-Feb-25) [3] that it "considers datasets and documents that are peer reviewed and archived (thus publicly available) by PDS to be (an) appropriate reference".

It is therefore the role of peer review panels, organized to review data prior to acceptance by PDS, to determine if the coordinate system used in the data conforms to an IAU standard coordinate system, if one exists. If data are in a new coordinate system, whether it is an improvement for an existing coordinate system or the first defined for a body, the review panel is to determine if the coordinate system conforms to IAU/ WGCCRE guidelines and that a full description of the coordinate system is available in a refereed publication, whether that is a journal article or as an archival part of a PDS dataset. If the description of the coordinate system only appears as a document in the PDS dataset, then the peer review panel must take special care to verify that the proposed reference frame is both scientifically justified and conforms to the IAU/WGCCRE guidelines.

References:

[1] WGCCRE website [http://astrogeology.usgs.gov/groups/IAU-WGCCRE]

[2] Archinal, B. A., M. F. A'Hearn, E. Bowell, A. Conrad, G. J. Consolmagno, R. Courtin, T. Fukushima, et al. 2011. “Report of the IAU Working Group on Cartographic Coordinates and Rotational Elements: 2009.” Celestial Mechanics and Dynamical Astronomy 109 (2): 101–35. doi:10.1007/s10569-010-9320-4. [http://www.springerlink.com/content/g272325h45517581/]
[3] Archinal, B.A, "IAU WGCCRE comments on use of PDS documentation and SBN coordinates document", memo to PDS, 2014 February 25
[4] SPICE Definitions: Frames & Coordinate Systems, Presentation [internal document]