

Recommended Coordinate System for (4) Vesta

The International Astronomical Union (IAU) Working Group on Cartographic Coordinates and Rotational Elements (WGCCRE) has recommended a coordinate system for the asteroid (4) Vesta. This new system is defined by the equations:

$$\begin{aligned} (4) \text{ Vesta} \quad \alpha_0 &= 309^\circ.031 \pm 0^\circ.01 \\ \delta_0 &= 42^\circ.235 \pm 0^\circ.01 \\ W &= 285.39^\circ + 1617^\circ.3329428 d \end{aligned}$$

Where d is the interval in days from the standard epoch, i.e. J2000.0=JD 2451545.0, i.e. 2000 January 1 12 hours TDB. α_0 , δ_0 , and W are as defined by Archinal et al. [2011].

The prime meridian of Vesta is defined by assigning a positive longitude of 146° to the small crater known as “Claudia.” This definition, following long-standing IAU and WGCCRE recommendations and past practice, keeps the prime meridian passing through the dark albedo feature known informally as “Olbers Regio.” That feature was first identified and defined as the location of the prime meridian by Thomas et al. [1997], and is easily identified in NASA/DLR/ASI Dawn mission images as an area of darker albedo consisting mostly of a degraded topographic depression on Vesta. We recommend this system be known as the “IAU Coordinate System for (4) Vesta,” with the publication year of this announcement (2013) specified as necessary to differentiate it from the earlier or later systems recommended for Vesta. We note however, that in following the IAU recommendations, these systems are essentially indistinguishable from each other as higher accuracy and resolution data become available for Vesta.

The system recommended here is the same as that proposed to the WGCCRE by the Dawn mission in 2012 October. The WGCCRE at that time agreed that such a system did follow existing IAU and WGCCRE recommendations, and recommended that the Dawn mission use it for all of its publications in order to avoid further confusion with other systems that had been proposed which did not follow such recommendations. This system has been used by the Dawn mission to publish their data to the NASA Planetary Data System (PDS). It is described internally as the “Claudia Double-Prime” system in [Li, J., 2012, Table 1]. (Note: Values used here are from Table 1 of that paper. Other values in the text of that paper appear different.)

Compared to the values recommended by the WGCCRE in our most recent full report [Archinal et al., 2011], the system recommended here has an offset of 2.5° in pole position and an increase in rotation rate of $0.0001668^\circ/\text{d}$ and a constant W term (or W_0) decrease of 6.61° . The change in this latter value is mostly due to the change in pole position and the total change in rotation since J2000.0 due to the improved rotation rate.

The WG notes that further improved values for the pole position and spin rate have recently become available from Konopliv et al. [2013], both with and without a model for precession and nutation. The

model without precession and nutation corresponds to that given here, but with updated parameter values that move the pole by $0^{\circ}.009$, and increase the rotation rate by $0.0001807^{\circ}/\text{day}$. However since Konopliv et al. do not give the value of W_0 for that model, it is incomplete for cartographic use. Rather than trying to derive an appropriate W_0 value, we recommend the continued use of the parameter values given here (from Li [2012]), which should be sufficiently accurate for making products from Dawn mission or terrestrial observations of Vesta.

The WG makes this recommendation at the request of Giovanni Valsecchi, (President of IAU Division F on Planetary Systems and Bioastronomy), in support of further use of this system by the IAU and the international community. In particular the system can and should now be used by the IAU Working Group for Planetary System Nomenclature (WGPSN) for identifying the coordinates of named features on Vesta (e.g. at <http://planetarynames.wr.usgs.gov/>). This recommendation is being made in advance of the publication of the next full report of the WGCCRE, now planned for 2014.

Signed,

IAU Working Group on Cartographic Coordinates and Rotational Elements

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Note: This document (file WGCCRE-VestaSystem.pdf) will be posted to the WGCCRE website at <http://astrogeology.usgs.gov/groups/IAU-WGCCRE> and will be submitted for publication to the next *IAU Information Bulletin* (http://www.iau.org/science/publications/iau/information_bulletin/).

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