SiMDA - Size, Mass and Density of Asteroids

This catalog (data set) contains 'best' values for the bulk density, the size (volume-equivalent diameter) and the mass of 426 small bodies (mainly asteroids) of our Solar System.

4088 individual diameter estimates and 1754 individual mass estimates from the literature were used to find per object average values for these properties and from that for the bulk density. The data are complemented by dynamical (orbital) class and, if available, by taxonomic classes. The averages were computed using the 'Expected Value Method (EVM)' (Birch & Singh 2014).

SiMDA online

SiMDA catalog is not only the data set presented here, but also an online system which provides the complete individual data, including their references and offers also some limited visualization and data processing capabilities. SiMDA can be accessed here: https://astro.kretlow.de/simda

Cite

You can either cite this specific data set (using the Zenodo DOI) and / or acknowledge the SiMDA project in general:

Kretlow, M., 2020: Size, Mass and Density of Asteroids (SiMDA) - A Web Based Archive and Data Service. EPSC Abstracts Vol. 14, EPSC2020-690. URL

References

M. Birch, B. Singh. Method of Best Representation for Averages in Data Evaluation. Nucl. Data Sheets 120, 106 (2014). DOI
Carry, B., 2012 : Density of asteroids. Planetary and Space Science, Volume 73, Issue 1, p. 98-118. ADS

Changelog

v1.0: Initial release

The data

The data set is provided as CSV and as JSON file. The data fields are:

Column / Field	Description
NUM	Number of the asteroid
DESIGNATION	Name or provisional designation of the object
DYN	Orbital class: COM = Comet, MBA = Main-Belt Asteroid (IMB, OMB, MCA), NEA = Near Earth Asteroid, CEN = Centaur, TNO = Trans-Neptunian Object. See here
BD	Bulk density in g / cm^3, calculated from DIAM and MASS
BD.E	Absolute error of BD
BD.R	Relative error of BD in %
RNK	Bulk density accuracy rank (A to E, plus X = unrealisitc)
DIAM	Volume-equivalent diameter D in km
DIAM.E	Absolute error of D in km
DIAM.R	Relative error of D in %
MASS	Mass M in kg
MASS.E	Absolute error of M in kg
MASS.R	Relative error of M in %
T.T	Tholen Tax Class
T.B	Bus & Binzel Tax Class
L.T	S3OS2 Lazarro (Tholen) Tax Class
L.B	S3OS2 Lazarro (Bus & Binzel) Tax Class
T.D	DeMeo Tax Class
C_TAX	Tax Class as given in Carry (2012)
C_BD	Bulk density in g / cm^3 as given Carry (2012)
C_BD.E	Absolute error of C_BD
C_BD.R	Relative error of C_BD in %
C_RNK	Bulk density accuracy rank (A to E, plus X = unrealisitc) as given in Carry (2012)

Bulk density accuracy ranking: (A) to (E), corresponding to the relative error: (B) less than 20%, (C) between 20 and 50%, (D) between 50 and 100%, and (E) more than 100%. (A) stands for (presumably) reliable estimates (accuracy better than 20%), based on more than 5 mass estimates and 5 diameter estimates, or a spacecraft encounter. Apparently unrealistic densities (BD < 0.1 or BD > 8) are tagged with (X).

Notes & Issues

81P/Wild 2 : The density value 0.7 ± 0.10 g / cm^3 from indirect measurement (from non-gravitational forces) should be preferred. See SiMDA website.