

= Metis ( moon ) =

Metis ( / ˈmiːtɪs / ; Greek : ????? ) , also known as Jupiter XVI , is the innermost moon of Jupiter . It was discovered in 1979 in images taken by Voyager 1 , and was named in 1983 after the first wife of Zeus , Metis . Additional observations made between early 1996 and September 2003 by the Galileo spacecraft allowed its surface to be imaged .

Metis is tidally locked to Jupiter , and its shape is strongly asymmetrical , with one of the diameters being almost twice as large as the smallest one . It is also one of the two moons known to orbit Jupiter in less than the length of Jupiter 's day , the other being Adrastea . It orbits within the main ring of Jupiter , and is thought to be a major contributor of material to the rings .

= = Discovery and observations = =

Metis was discovered in 1979 by Stephen P. Synnott in images taken by the Voyager 1 probe and was provisionally designated as S / 1979 J 3 . In 1983 it was officially named after the mythological Metis , a Titaness who was the first wife of Zeus ( the Greek equivalent of Jupiter ) . The photographs taken by Voyager 1 showed Metis only as a dot , and hence knowledge about Metis was very limited until the arrival of the Galileo spacecraft . Galileo imaged almost all of the surface of Metis and put constraints on its composition by 1998 .

= = Physical characteristics = =

Metis has an irregular shape and measures  $60 \times 40 \times 34$  km across , which makes it the second smallest of the four inner satellites of Jupiter . Therefore , a very rough estimate of its surface area could be placed between 5 @, @ 800 and 11 @, @ 600 square kilometers ( approx . 8 @, @ 700 ) . The bulk composition and mass of Metis are not known , but assuming that its mean density is like that of Amalthea (  $\sim 0 @. @ 86$  g / cm<sup>3</sup> ) , its mass can be estimated as  $\sim 3 @. @ 6 \times 10^{16}$  kg . This density would imply that it is composed of water ice with a porosity of 10 ? 15 % .

The surface of Metis is heavily cratered , dark , and appears to be reddish in color . There is a substantial asymmetry between leading and trailing hemispheres : the leading hemisphere is 1 @. @ 3 times brighter than the trailing one . The asymmetry is probably caused by the higher velocity and frequency of impacts on the leading hemisphere , which excavate a bright material ( presumably ice ) from its interior .

= = Orbit and rotation = =

Metis is the innermost of Jupiter 's four small inner moons . It orbits Jupiter at a distance of  $\sim 128 @, @ 000$  km ( 1 @. @ 79 Jupiter radii ) within Jupiter 's main ring . Metis 's orbit has very small eccentricity (  $\sim 0 @. @ 0002$  ) and inclination (  $\sim 0 @. @ 06^\circ$  ) relative to the equator of Jupiter .

Due to tidal locking , Metis rotates synchronously with its orbital period , with its longest axis aligned towards Jupiter .

Metis lies inside Jupiter 's synchronous orbit radius ( as does Adrastea ) , and as a result , tidal forces slowly cause its orbit to decay . If its density is similar to Amalthea 's , Metis 's orbit lies within the fluid Roche limit ; however , because it has not broken up , it must lie outside its rigid Roche limit .

Because Metis orbits very close to Jupiter , Jupiter appears as a gigantic sphere about  $67 @. @ 9^\circ$  in diameter from Metis , the largest angular diameter as viewed from any of Jupiter 's moons . For the same reason only 31 % of Jupiter 's surface is visible from Metis at any one time , the most limited view of Jupiter from any of its moons .

Metis is the fastest @-@ moving of Jupiter 's moons . It orbits Jupiter at  $31 @. @ 5$  km / s .

= = Relationship with Jupiter 's rings = =

Metis 's orbit lies ~ 1000 km within the main ring of Jupiter . It orbits within a ~ 500 km wide " gap " or " notch " in the ring . The gap is clearly somehow related to the moon but the origin of this connection has not been established . Metis supplies a significant part of the main ring 's dust . This material appears to consist primarily of material that is ejected from the surfaces of Jupiter 's four small inner satellites by meteorite impacts . It is easy for the impact ejecta to be lost from the satellites into space because the satellites ' surfaces lie fairly close to the edge of their Roche spheres due to their low density .