Planet mercury map

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In December 2009, the first high-resolution global map of Mercury was made publicly available. These images are from MESSENGER, a NASA Discovery mission to conduct the first orbital study of the innermost planet, Mercury. Members of the MESSENGER team and experts from the U. S. Geological Survey (USGS) used images from MESSENGER’s three Mercury flybys and from the Mariner 10 mission in 1974-75 to create a global mosaic that covers 97.7% of Mercury’s surface at a resolution of 500 meters/pixel (0.31 miles/pixel).Image Credit: NASA/Johns Hopkins University Applied Physics Laboratory/Carnegie Institution of Washington/U. S. Geological Survey/Arizona State University

Mercury''s sidereal year (88.0 Earth days) and sidereal day (58.65 Earth days) are in a 3:2 ratio. This relationship is called spin-orbit resonance, and sidereal here means "relative to the stars". Consequently, one solar day (sunrise to sunrise) on Mercury lasts for around 176 Earth days: twice the planet''s sidereal year. This means that one side of Mercury will remain in sunlight for one Mercurian year of 88 Earth days; while during the next orbit, that side will be in darkness all the time until the next sunrise after another 88 Earth days.

Combined with its high orbital eccentricity, the planet''s surface has widely varying sunlight intensity and temperature, with the equatorial regions ranging from -170 ?C (-270 ?F) at night to 420 ?C (790 ?F) during sunlight. Due to the very small axial tilt, the planet''s poles are permanently shadowed. This strongly suggests that water ice could be present in the craters. Above the planet''s surface is an extremely tenuous exosphere and a faint magnetic field that is strong enough to deflect solar winds. Mercury has no natural satellite.

As of the early 2020s, many broad details of Mercury''s geological history are still under investigation or pending data from space probes. Like other planets in the Solar System, Mercury was formed approximately 4.5 billion years ago. Its mantle is highly homogeneous, which suggests that Mercury had a magma ocean early in its history, like the Moon. According to current models, Mercury may have a solid silicate crust and mantle overlying a solid outer core, a deeper liquid core layer, and a solid inner core. There are many competing hypotheses about Mercury''s origins and development, some of which incorporate collision with planetesimals and rock vaporization.

Mercury is one of four terrestrial planets in the Solar System, which means it is a rocky body like Earth. It is the smallest planet in the Solar System, with an equatorial radius of 2,439.7 kilometres (1,516.0 mi).[4] Mercury is also smaller--albeit more massive--than the largest natural satellites in the Solar System, Ganymede and Titan. Mercury consists of approximately 70% metallic and 30% silicate material.[27]

Craters on Mercury range in diameter from small bowl-shaped cavities to multi-ringed impact basins hundreds of kilometers across. They appear in all states of degradation, from relatively fresh rayed craters to highly degraded crater remnants. Mercurian craters differ subtly from lunar craters in that the area blanketed by their ejecta is much smaller, a consequence of Mercury''s stronger surface gravity.[61] According to International Astronomical Union rules, each new crater must be named after an artist who was famous for more than fifty years, and dead for more than three years, before the date the crater is named.[62]

The largest known crater is Caloris Planitia, or Caloris Basin, with a diameter of 1,550 km (960 mi).[63] The impact that created the Caloris Basin was so powerful that it caused lava eruptions and left a concentric mountainous ring ~2 km (1.2 mi) tall surrounding the impact crater. The floor of the Caloris Basin is filled by a geologically distinct flat plain, broken up by ridges and fractures in a roughly polygonal pattern. It is not clear whether they were volcanic lava flows induced by the impact or a large sheet of impact melt.[61]

At the antipode of the Caloris Basin is a large region of unusual, hilly terrain known as the "Weird Terrain". One hypothesis for its origin is that shock waves generated during the Caloris impact traveled around Mercury, converging at the basin''s antipode (180 degrees away). The resulting high stresses fractured the surface.[64] Alternatively, it has been suggested that this terrain formed as a result of the convergence of ejecta at this basin''s antipode.[65]

Overall, 46 impact basins have been identified.[66] A notable basin is the 400 km (250 mi)-wide, multi-ring Tolstoj Basin that has an ejecta blanket extending up to 500 km (310 mi) from its rim and a floor that has been filled by smooth plains materials. Beethoven Basin has a similar-sized ejecta blanket and a 625 km (388 mi)-diameter rim.[61] Like the Moon, the surface of Mercury has likely incurred the effects of space weathering processes, including solar wind and micrometeorite impacts.[67]

There are two geologically distinct plains regions on Mercury.[61][68] Gently rolling, hilly plains in the regions between craters are Mercury''s oldest visible surfaces,[61] predating the heavily cratered terrain. These inter-crater plains appear to have obliterated many earlier craters, and show a general paucity of smaller craters below about 30 km (19 mi) in diameter.[68]

Smooth plains are widespread flat areas that fill depressions of various sizes and bear a strong resemblance to lunar maria. Unlike lunar maria, the smooth plains of Mercury have the same albedo as the older inter-crater plains. Despite a lack of unequivocally volcanic characteristics, the localization and rounded, lobate shape of these plains strongly support volcanic origins.[61] All the smooth plains of Mercury formed significantly later than the Caloris basin, as evidenced by appreciably smaller crater densities than on the Caloris ejecta blanket.[61]

There is evidence for pyroclastic flows on Mercury from low-profile shield volcanoes.[74][75][76] Fifty-one pyroclastic deposits have been identified,[77] where 90% of them are found within impact craters.[77] A study of the degradation state of the impact craters that host pyroclastic deposits suggests that pyroclastic activity occurred on Mercury over a prolonged interval.[77]

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