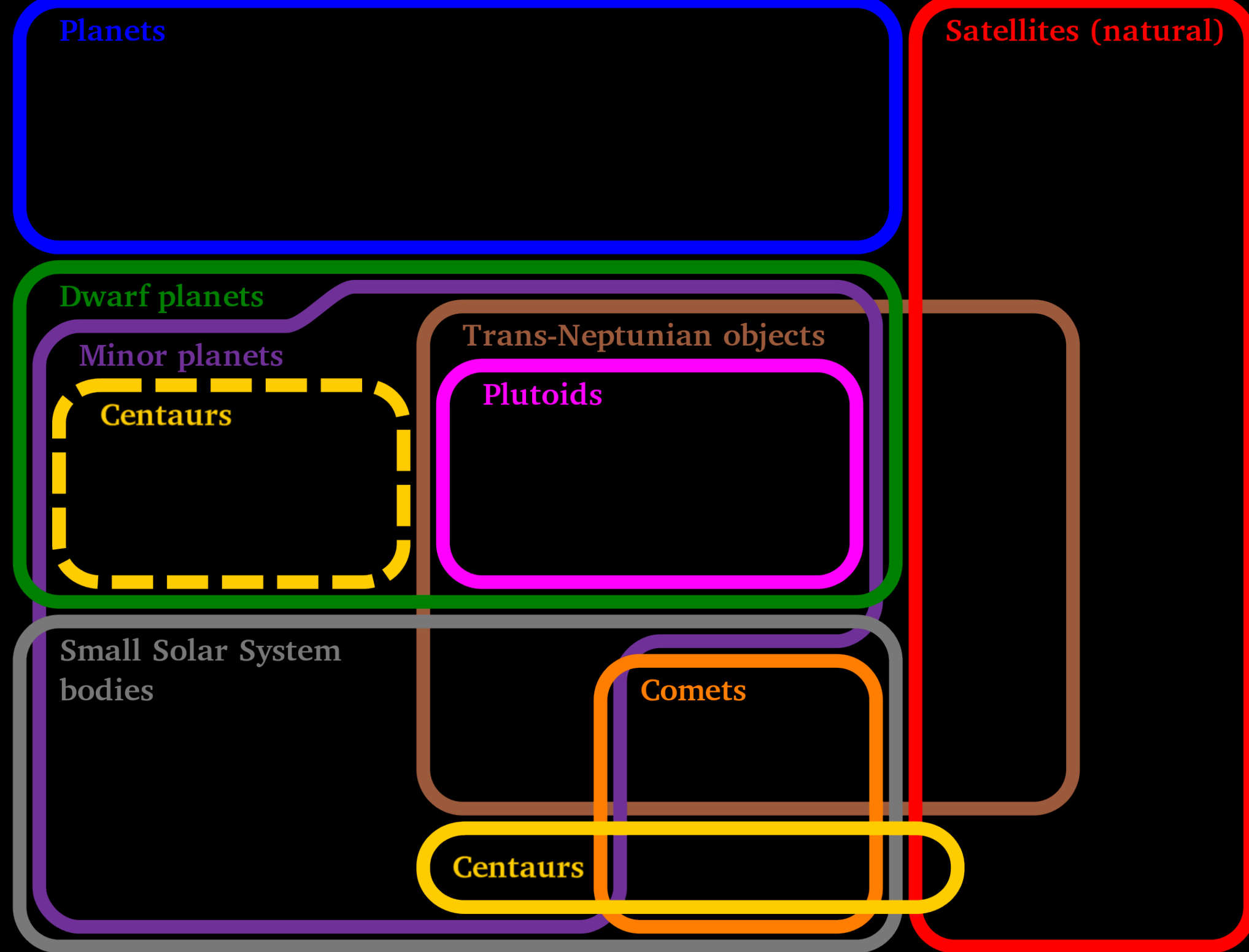
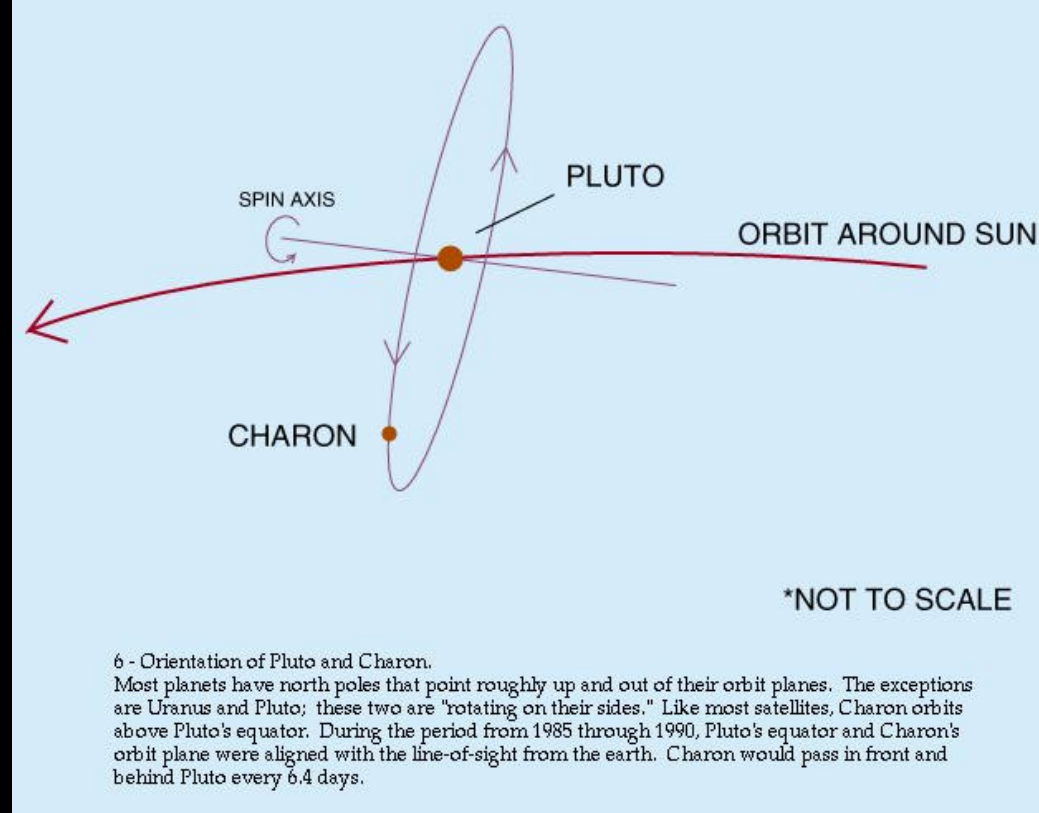




The Solar System is filled with a diverse set of objects ranging from the largest jovian worlds to grain-sized meteorites. Classification is important to develop a model for how all these objects formed. For objects inside the orbit of Neptune, we divide bodies into planets, satellites (moon), dwarf planets, minor planets (asteroids) and meteorites.



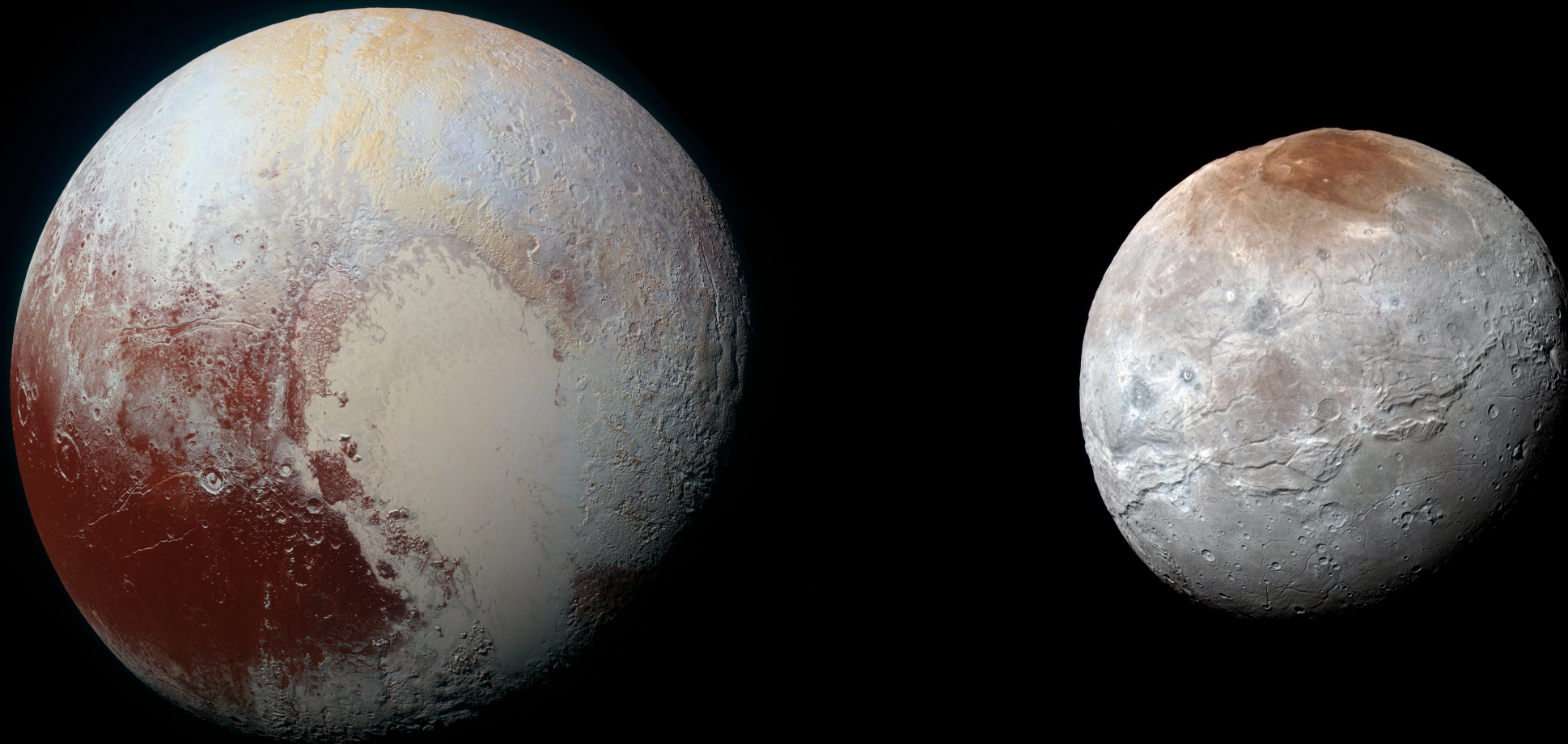
Pluto/Charon was discovered on February 18, 1930, making it the last planet found in our Solar System. Technically, Pluto is not an independent planet, but rather the largest member of an outer asteroid field called the Kuiper Belt. However, for historical reasons, we still call it a planet, although it is now classified as a dwarf planet. The debate between planet and dwarf planet came to a head on August 24, 2006, with an IAU resolution that created an official definition for the term "planet". According to this resolution, there are three conditions for an object in the Solar System to be considered a planet:

The object must be in orbit around the Sun.

The object must be massive enough to be rounded by its own gravity. More specifically, its own gravity should pull it into a shape defined by hydrostatic equilibrium.

It must have cleared the neighborhood around its orbit.

The plains on Pluto's surface are composed of more than 98 percent nitrogen ice, with traces of methane and carbon monoxide. Nitrogen and carbon monoxide are most abundant on the anti-Charon face of Pluto (around 180 longitude, where Tombaugh Regio's western lobe, Sputnik Planitia, is located), whereas methane is most abundant near 300 east. The mountains are made of water ice.



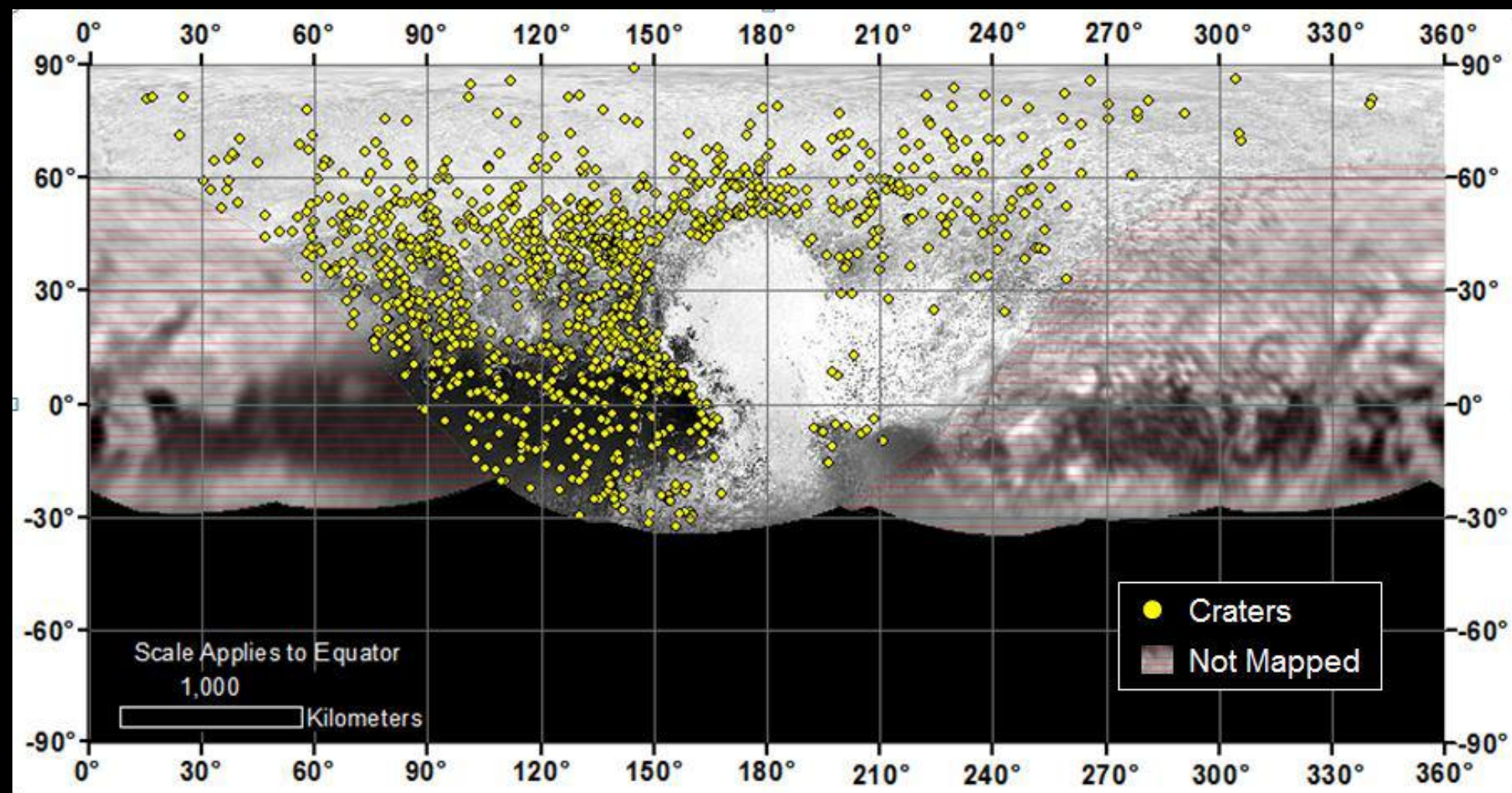
The reddish-brown cap of the north pole of Charon is composed of tholins, organic macromolecules that may be essential ingredients of life. These tholins were produced from methane, nitrogen and related gases which may have been released by cryovolcanic eruptions on the moon, or may have been transferred over 19,000 km (12,000 mi) from the atmosphere of Pluto to the orbiting moon.



Pluto is one of the most contrastive bodies in the Solar System, with as much contrast as Saturn's moon Iapetus. The color varies between charcoal black, dark orange and white. Pluto's color is more similar to that of Io with slightly more orange, significantly less red than Mars.



The surface temperature of Pluto/Charon is near the freezing point of methane. As Pluto/Charon approaches perihelion a haze forms from evaporating methane. The Pluto/Charon moves away from the Sun, the methane haze ``snows'' onto the surface. The surface of Pluto/Charon should be dark due to radiation darkening where cosmic ray (high energy particle from outside the Solar System) break down molecules which leads to hydrocarbon growth (i.e. soot).

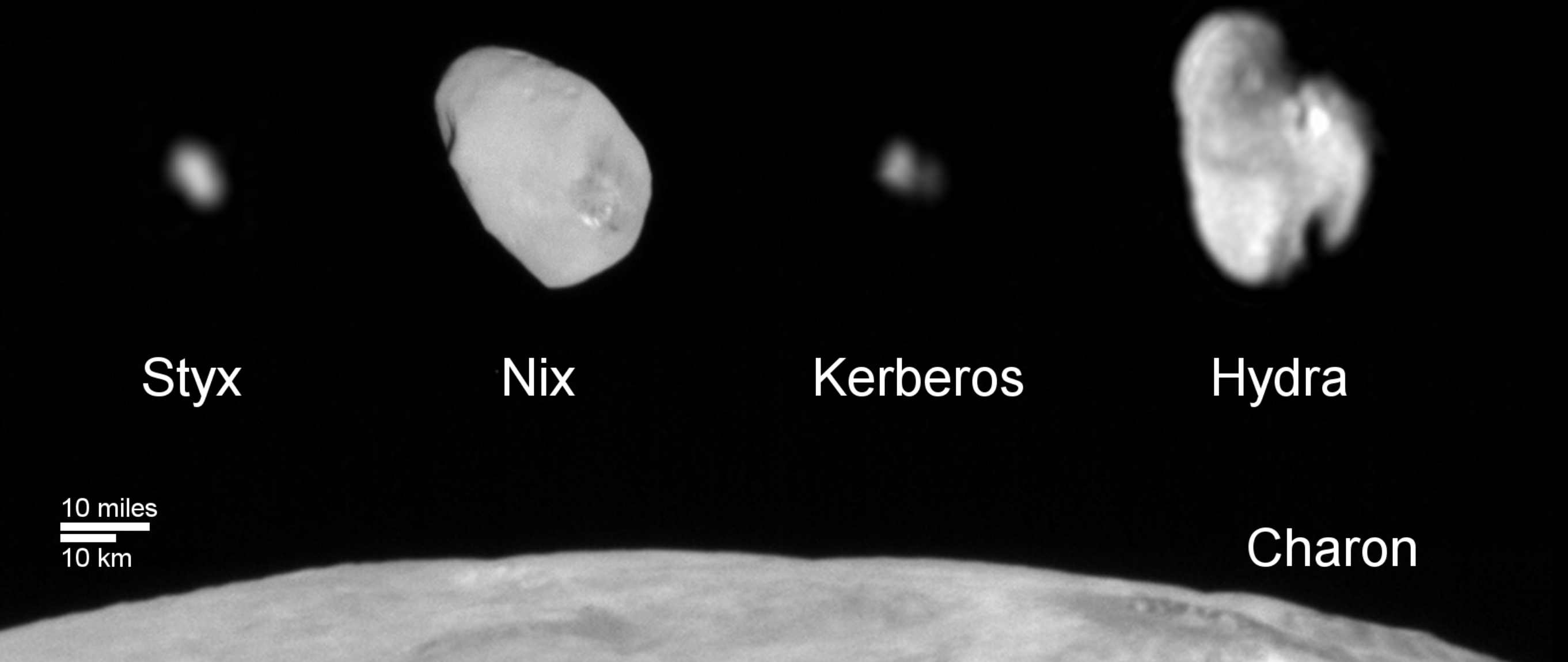


Sputnik Planitia, the western lobe of the "Heart", is a 1,000 km-wide basin of frozen nitrogen and carbon monoxide ices, divided into polygonal cells, which are interpreted as convection cells that carry floating blocks of water ice crust and sublimation pits towards their margins; there are obvious signs of glacial flows both into and out of the basin. It has no craters that were visible to New Horizons, indicating that its surface is less than 10 million years old.

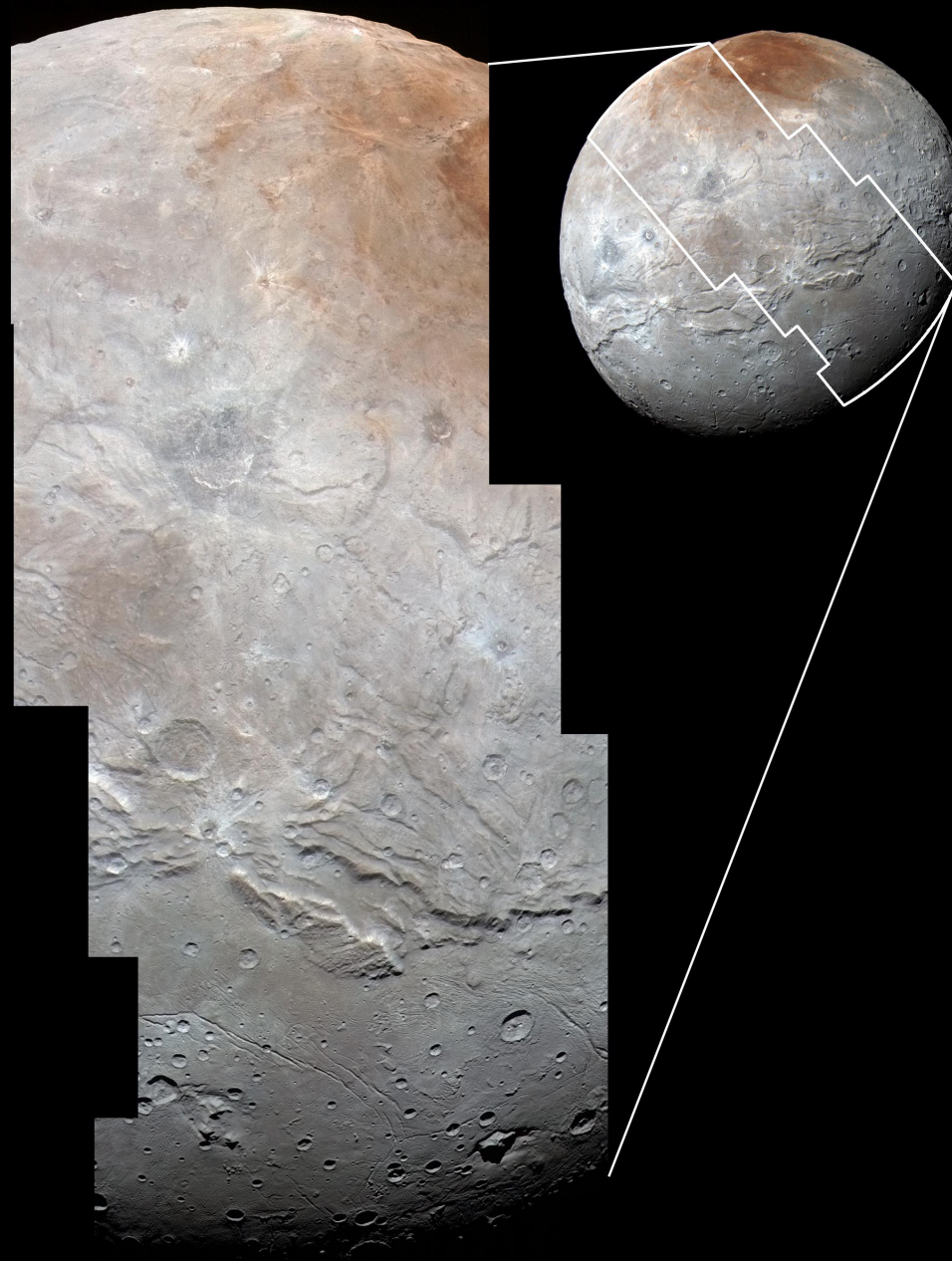


Pluto has a tenuous atmosphere consisting of nitrogen (N_2), methane (CH_4), and carbon monoxide (CO), which are in equilibrium with their ices on Pluto's surface. According to the measurements by New Horizons, the surface pressure is about 1 Pa (10 μbar), roughly one million to 100,000 times less than Earth's atmospheric pressure. It was initially thought that, as Pluto moves away from the Sun, its atmosphere should gradually freeze onto the surface; studies of New Horizons data and ground-based occultations show that Pluto's atmospheric density increases, and that it likely remains gaseous throughout Pluto's orbit

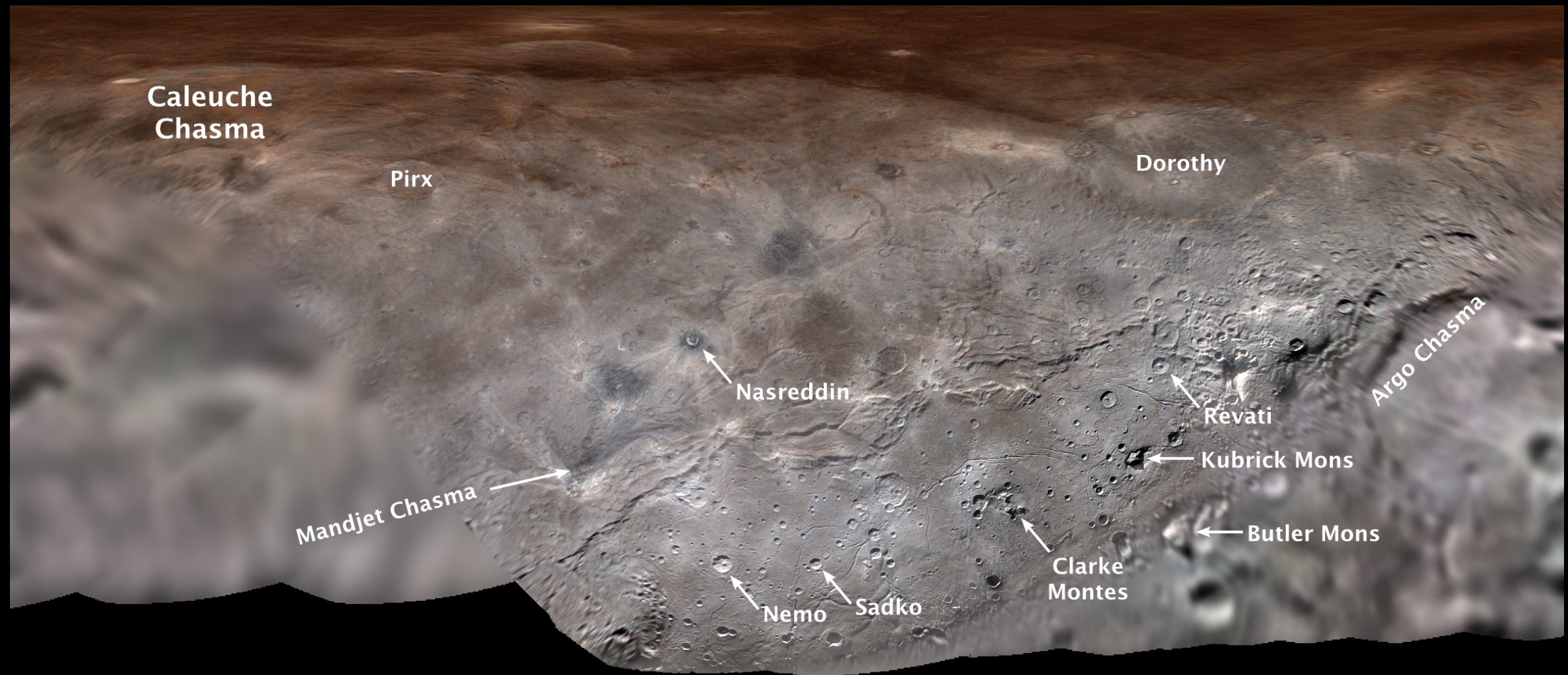
Charon and the Small Moons of Pluto



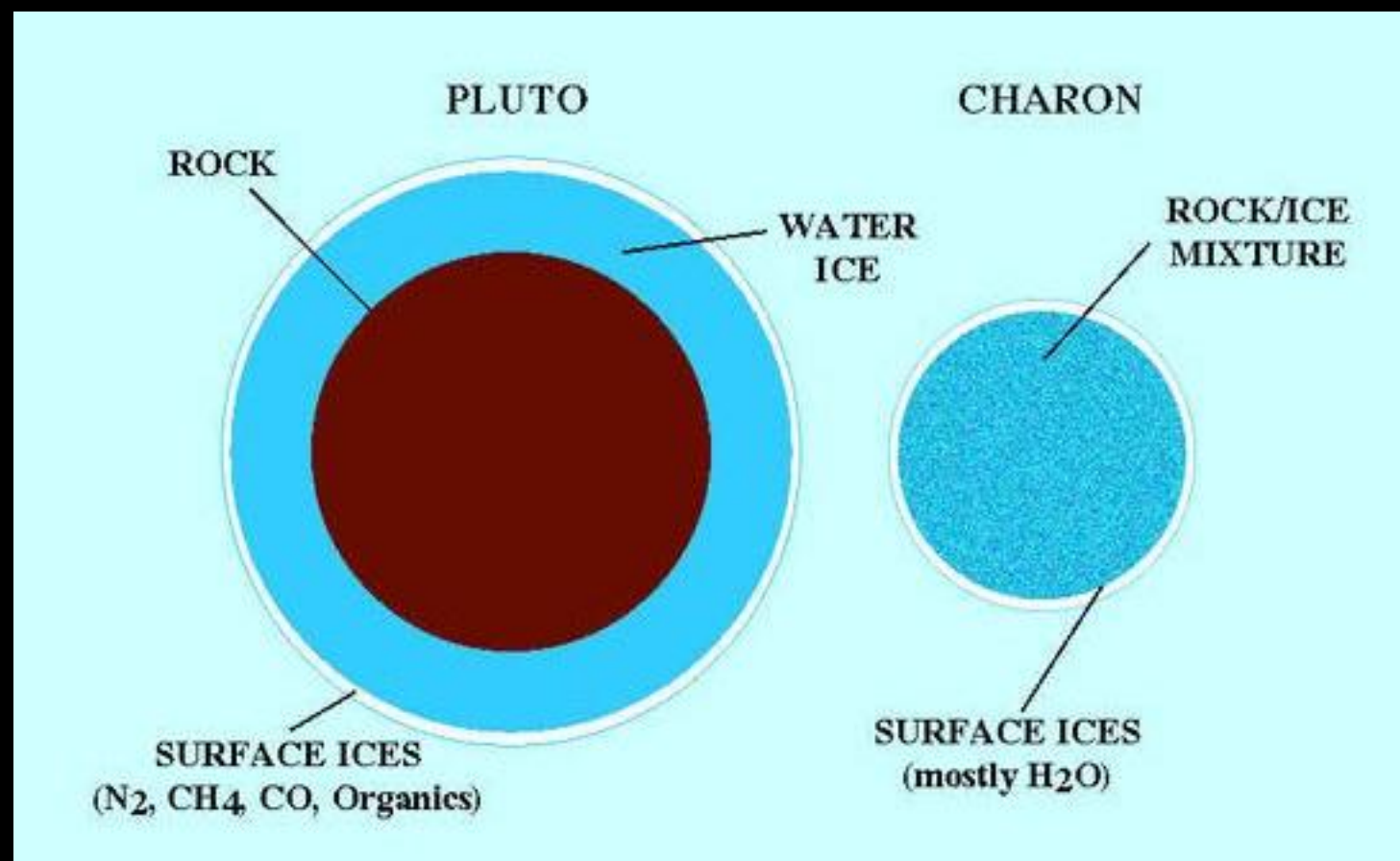
Beyond Charon there are four much smaller circumbinary moons. In order of distance from Pluto they are Styx, Nix, Kerberos, and Hydra. Pluto's moons are hypothesized to have been formed by a collision between Pluto and a similar-sized body, early in the history of the Solar System. The collision released material that consolidated into the moons around Pluto.



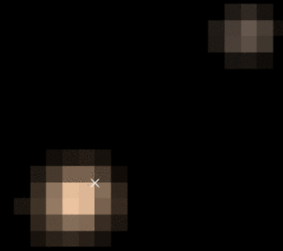
Unlike Pluto's surface, which is composed of nitrogen and methane ices, Charon's surface appears to be dominated by the less volatile water ice. Photometric mapping of Charon's surface shows a latitudinal trend in albedo, with a bright equatorial band and darker poles. The north polar region is dominated by a very large dark area informally dubbed "Mordor"



Charon's volume and mass allow calculation of its density, 1.7 g/cm^3 , from which it can be determined that Charon is slightly less dense than Pluto and suggesting a composition of 55% rock to 45% ice ($\pm 5\%$), whereas Pluto is about 70% rock.

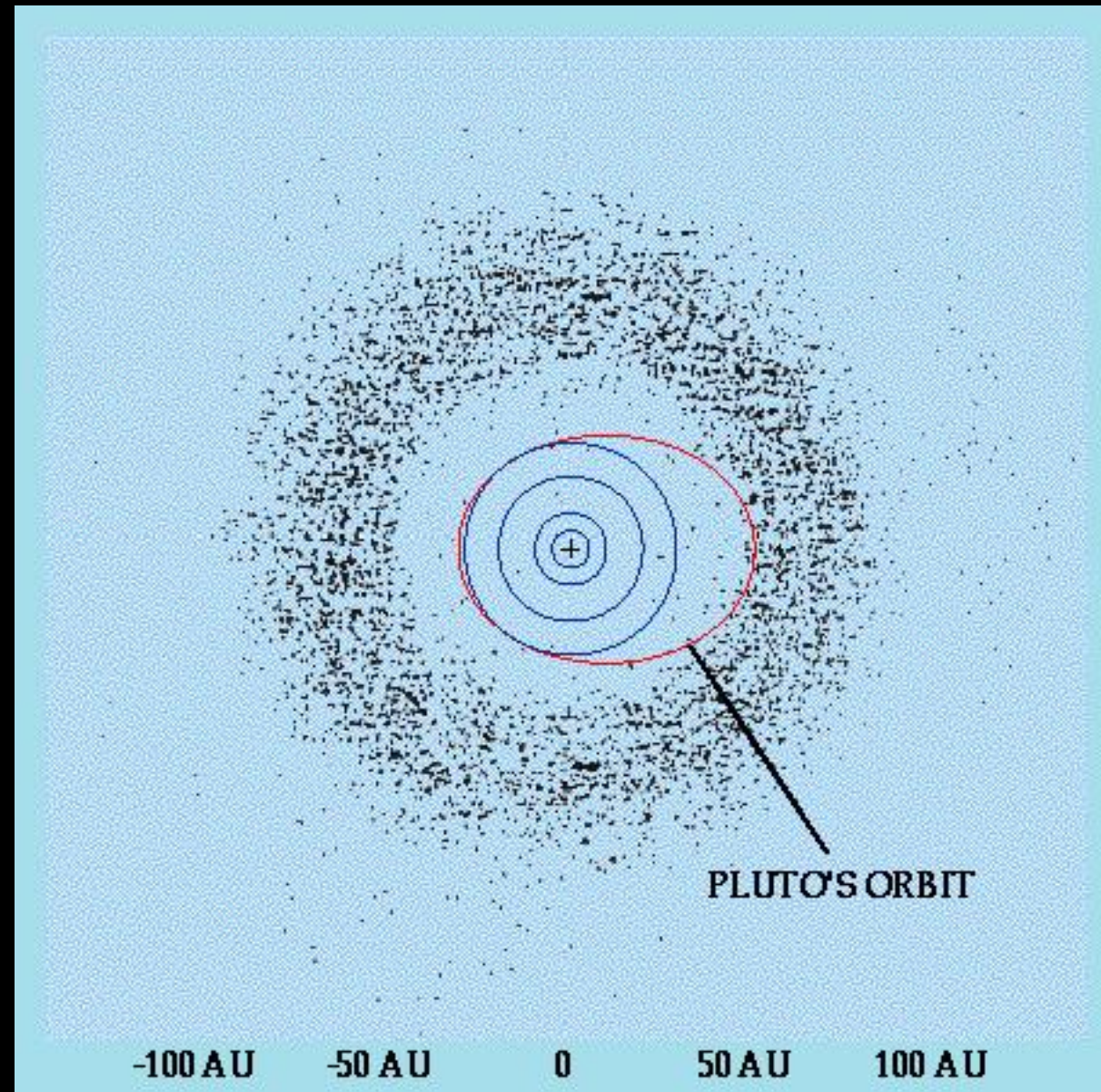


New Horizons MVIC Color Imager
Distance from Pluto: 54.8 million km
Date: 2015-05-29 11:38 UTC
Barycentric view



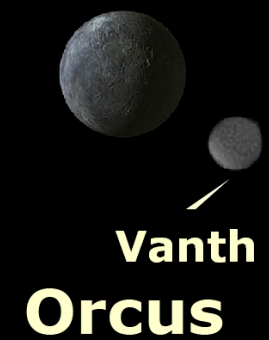
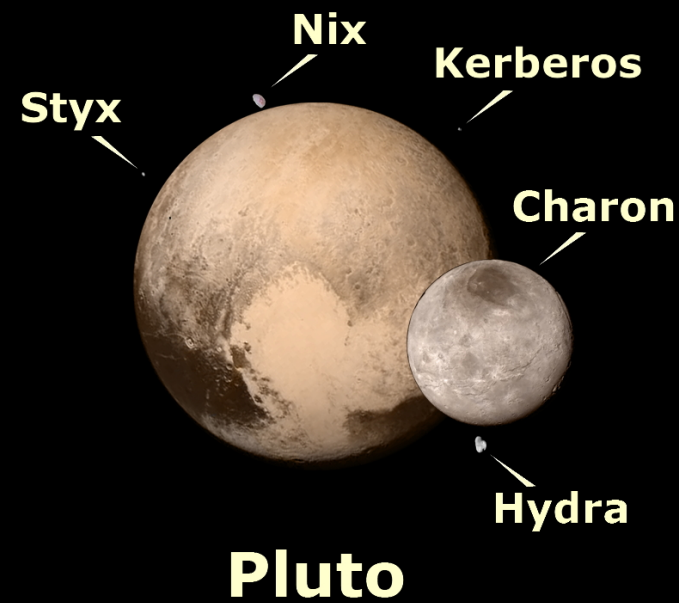
The center of mass (barycenter) of the Pluto-Charon system lies outside either body. Because neither object truly orbits the other, and Charon has 12.2% the mass of Pluto, it has been argued that Charon should be considered to be part of a binary planet with Pluto. The International Astronomical Union (IAU) states that Charon is considered to be just a satellite of Pluto.

In a draft proposal for the 2006 redefinition of the term, the IAU proposed that a planet be defined as a body that orbits the Sun that is large enough for gravitational forces to render the object (nearly) spherical. Under this proposal, Charon would have been classified as a planet, because the draft explicitly defined a planetary satellite as one in which the barycenter lies within the major body. In the final definition, Pluto was reclassified as a dwarf planet, but the formal definition of a planetary satellite was not decided upon.



The Kuiper belt is a circumstellar disc in the Solar System beyond the planets, extending from the orbit of Neptune (at 30 AU) to approximately 50 AU from the Sun. It is similar to the asteroid belt, but it is far larger 20 times as wide and 20 to 200 times as massive. Like the asteroid belt, it consists mainly of small bodies, or remnants from the Solar System's formation. Although many asteroids are composed primarily of rock and metal, most Kuiper belt objects are composed largely of frozen volatiles (termed "ices"), such as methane, ammonia and water.

Largest known trans-Neptunian objects (TNOs)



2000 km