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An overview of the large TNOs: a fast-changing ranking among the 100 largest bodies of our Solar System

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Abstract

TransNeptunian Objects (TNOs) have now gained a two-third majority in the list of the 100 largest bodies in the Solar System. For those largest TNOs, we have compiled the available peer-reviewed published data whether on size, shape and color, and complemented the lacking data by interpolation and reasonable default values. This results into a poster putting them in perspective, with an estimate of the top 100 and a representation of those bodies in a comprehensive composite picture up to scale. We zoom on all largest Solar System solid bodies in the bottom rows and provide our table of assumptions in the caption. In particular, we show the evolution of this ranking between 2010 and 2011: the large number of changes in less than one year illustrates the dynamism of this field of knowledge.

1. Introduction

When elaborating this picture and this ranking, one of our goals has been to raise awareness to TNOs for both public and other science communities. TNOs include indeed full-fledged planetary bodies. By daring ranking them by size, despite the large uncertainties remaining on most of them that will constantly modify such a list, we aim at enabling an immediate order of magnitude comparison with the mid-sized icy moons.

2. Why does size matter?

Size matters indeed as it increases significantly the scientific interest for a given object, whether by favoring full or partial differentiation, by enabling past or extant liquid subsurface layers [3] or, via the value of surface gravity, by allowing the potential presence of a thin atmosphere and a more complex chemistry on the surface.

3. Assumptions

This work has taken into account the available data on the TNO sizes, reporting median values from references [2][4][5][6][12].

In particular recent results following observations by ESA's Herschel space telescope [1][2][12] have been incorporated. For Orcus' moon, Vanth, we have taken the middle of the wide range expected by M. E. Brown [8]. For all other TNOs that are without much characterization obtained as of today, we have assumed by default (given the general trend [7]) a progressive increase of albedo versus diameter by allocating estimates as a function of the absolute magnitude H.

Aware of the large associated uncertainties, we have nevertheless inferred an estimated ranking.

The large variability on albedos and "colors" evidenced so far points at a fascinating diversity. We have selected pictures from space missions or generated artist's views so as to represent the objects as much as possible as they should appear to the naked eye with the exception of the Sun, Venus and Titan.

The latest findings on Pluto [11] have been taken into account too in our artist's view. On this poster, the colors of the TNOs vary from bluish grey to reddish brown based on V-R or B-R spectrographic data whenever available [4][5][6][9][10], with beige as a default option. We recap all these data in tabular form in the text part of the poster.

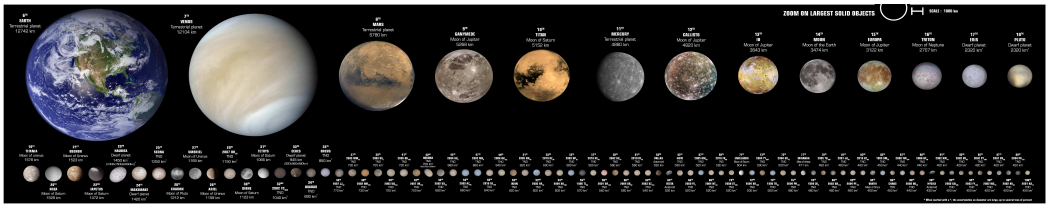

Figure 1: Excerpt: ranking of largest solid objects as of December 2010.

4. Resulting ranking and conclusion

The resulting estimated rankings as of December 2010 and September 2011 are thus presented and compared in this poster. An excerpt is provided here in figure 1 with the ranking as of December 2010 for the solid bodies (from 6th largest – the Earth – to the 100th largest).

The ranking will further evolve in the coming years as space and ground observatories gather new data and as new objects are discovered.

Acknowledgements

Images courtesy of NASA and ESA: missions Messenger for Mercury, Viking Orbiter for Mars, Galileo for the moons of Jupiter, Cassini for the moons of Saturn, Voyager for the moons of Uranus and Neptune.
Image by Mattias Malmer for Venus, processed from pictures by NASA's Mariner 10.
Istockphoto for the Earth and the Moon.
Artist's view and graphics by E. and Th. Briot for Thales Alenia Space.

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