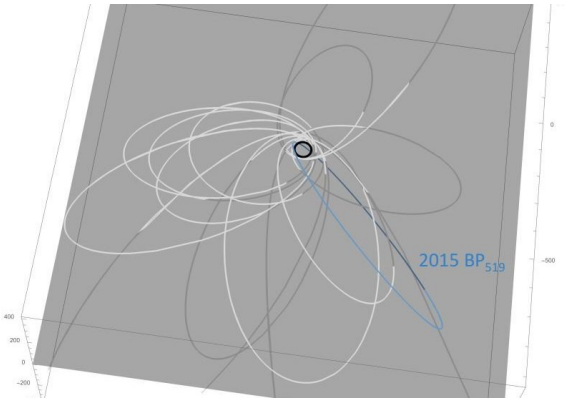
New evidence for existence of Planet Nine

21 May 2018, by Bob Yirka



A visual representation of the orbit of 2015 BP519, plotted with the other ETNOs as comparisons. For each orbit, the darker regions on the curve denote where an object falls below the plane of the solar system. 2015 BP519 has the highest inclination of any extreme TNO discovered to date. The full, interactive 3D orbit visualization can be found at smillholland.github.io/BP519/ . Credit: arXiv:1805.05355 [astro-ph.EP]

A large international team of researchers has found what they are describing as more evidence of the existence of Planet Nine. In their paper posted on the *arXiv* preprint server, the group describes the behavior of a newly discovered distant object as suggestive of an influence of a large planet.

It was just two years ago that astronomers at Caltech proposed the possible existence of a large planet circling the sun—which would make it the ninth known planet in our solar system. The researchers made their prediction based on observations of icy objects that exist at the edge of the solar system—their orbits were clearly being warped by a gravitational mass. They suggested a very distant planet roughly four times the size of Earth, but with 10 times its mass, could account for the odd behavior. If such a planet does exist, it would be quite distant, taking from 10,000 to 20,000 years to make one trip around the sun.

Since announcing their initial findings, the team at Caltech has published papers offering more evidence of the planet—the possibility that it could have played a role in tilting the other planets in our solar system, for example. They have also suggested it as an explanation for why objects in the Kuiper Belt orbit in an opposite direction to everything else.

In this new effort, the researchers suggest the behavior of a certain Trans-Neptunian object could very well be due to gravity from Planet Nine. The object, called 2015 BP519 (Caju for short), was first noted approximately three years ago, but it was only recently that the shape of its orbit was found to be very unusual—it lies nearly perpendicular to the plane established by the known planets. What makes the find so compelling is that the team of researchers who first proposed the existence of Planet Nine created a simulation that predicted the orbital angle of just such an object. And it just happened to match with what has been found.

The researchers report that after Caju was first discovered, attempts were made to calculate its orbit, but they all failed. Then they added a large planet to the simulations, which resolved the discrepancies. All that is needed now, they suggest, is for someone to actually find the planet.

More information: Discovery and Dynamical Analysis of an Extreme Trans-Neptunian Object with a High Orbital Inclination, arXiv:1805.05355 [astro-ph.EP] arxiv.org/abs/1805.05355

Abstract

We report the discovery and dynamical analysis of 2015 BP519, an extreme Trans-Neptunian Object detected detected by the Dark Energy Survey at a heliocentric distance of 55 AU and absolute magnitude Hr= 4.3. The current orbit, determined from a 1110-day observational arc, has semi-major axis a? 450 AU, eccentricity e? 0.92 and inclination i? 54 degrees. With these orbital elements, 2015 BP519 is the most extreme TNO discovered to date, as quantified by the reduced Kozai action,

which is is a conserved quantity at fixed semi-major axis a for axisymmetric perturbations. We discuss the orbital stability and evolution of this object in the context of the known Solar System, and find that 2015 BP519 displays rich dynamical behavior, including rapid diffusion in semi-major axis and more constrained variations in eccentricity and inclination. We also consider the long term orbital stability and evolutionary behavior within the context of the Planet Nine Hypothesis, and find that BP519 adds to the circumstantial evidence for the existence of this proposed new member of the Solar System, as it would represent the first member of the population of high-i, ?-shepherded TNOs.

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