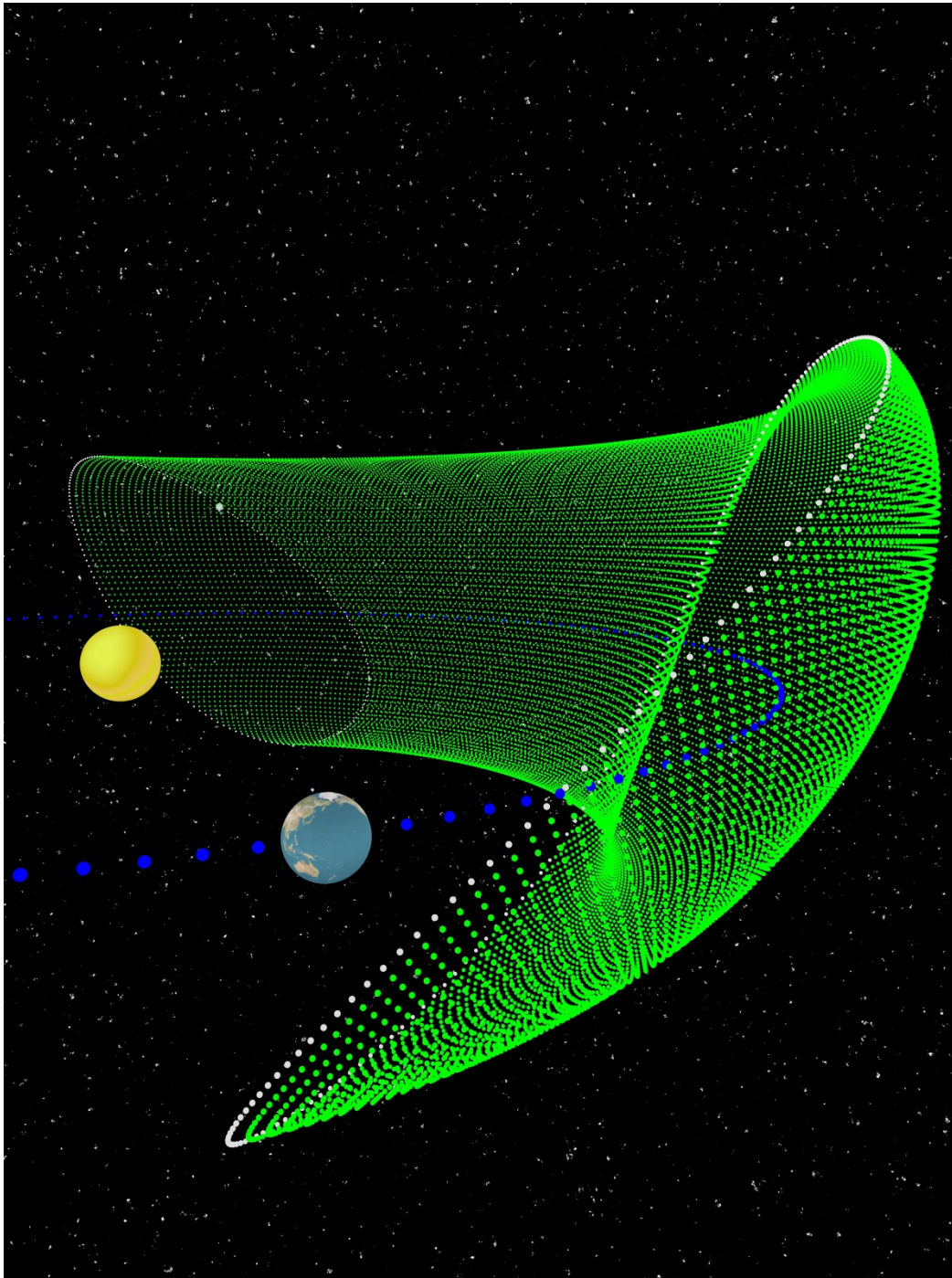
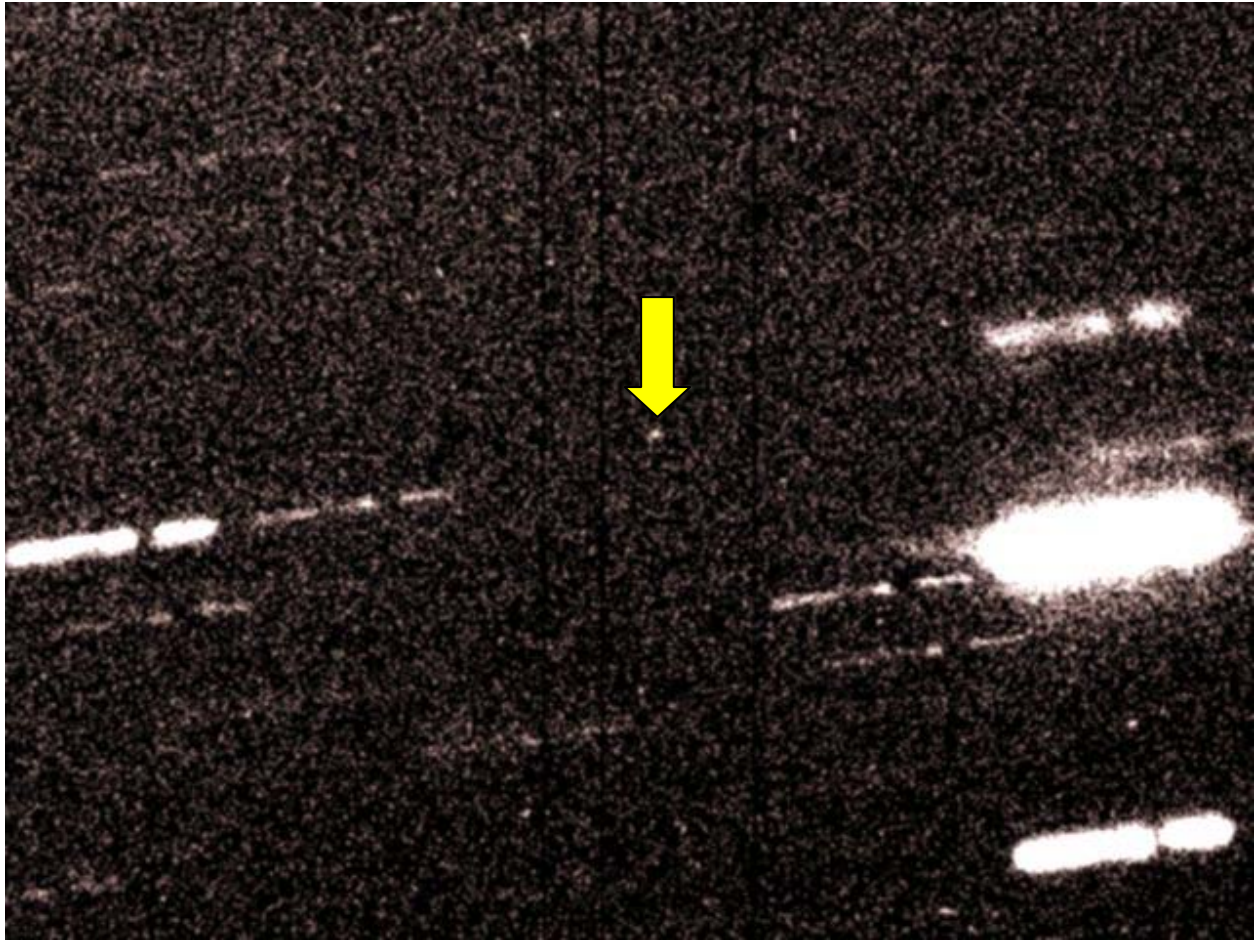




Supplementary Figure 1: An imaginary view shows 165 years of motion of the Earth Trojan asteroid 2010 TK₇ as it would appear from a vantage point somewhat outside of and above Earth's orbit, in the "corotating frame" going around with the Earth. In this frame the asteroid appears to move alternately away from and toward the Earth. The asteroid's actual orbit around the Sun is more elliptical than Earth's, and tilted. In any one year it follows a tilted oval (for example the path apparently nearest the Sun) with respect to the Earth



Supplementary Figure 2: In this image, taken on Apr 29, 2011 with the Canada-France-Hawaii Telescope, 2010 TK₇ appears as a speck of light (below arrow) in the center, surrounded by trailed stars. The telescope tracked the apparent motion of the asteroid for 8 minutes, making it appear stationary while the stars appeared to move. In this way a faint object can be detected most readily, provided its expected motion is approximately known. On that night, 2010 TK₇ was 120 million km from Earth. The width of the image equates to 1/30th of a degree, or 70,000 km at the distance of the object.

Supplementary Movie Legend 1

This movie shows an artist's conception of the Sun, Earth and asteroid 2010 TK7 (right) as seen by an observer revolving around the Sun near the Earth. The path of the asteroid as seen in this frame is traced out in green. Each green loop takes one year to complete and constitutes one epicycle. While the figures in the paper show the longitudinal and averaged annual motion of the asteroid, this movie shows its full epicyclic motion which displays considerable excursions in all directions from its average position. Despite the asteroid's complex motion, the center of the epicycle is constrained to move in the leading (L_4) sector of the Earth's orbit (MPEG; 6.1 MB)