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A NEW BELT BEYOND KUIPER'S: A BELT OF FOCAL SPHERES BETWEEN 550 AND 17,000 AU
FOR SETI AND SCIENCE

Abstract

Gravitational lensing is one of the most amazing discoveries produced by Einstein's general theory of relativity. To date, hundreds of gravitational lenses have been observed by astronomers and they led to a number of new results in extrasolar planet search, astrophysics and cosmology. SETI also could benefit from gravitational lensing if we could just get to 550 AU from the Sun and beyond. This is because the gravitational lens of the Sun would highly intensify there any weak radio signal reaching the solar system from distant civilizations in the Galaxy, as shown by this author in his 2009 book "Deep Space Flight and Communications". The gravitational lens of the Sun, however, has a drawback: the solar Corona. Electrons in the Corona make electromagnetic waves "diverge" and this "pushes the focus out" to distances higher than 550 AU. For instance, at the CMB peak frequency of 160 GHz, the true focus lies at 763 AU. It would be safer to let the FOCAL spacecraft reach 1,000 AU. We could get rid of all solar-Corona-related problems, however, if we could reach the six-times higher distance of 6,077 AU. This is where the focal sphere of Jupiter lies. Jupiter is the second larger mass in the solar system after the Sun, but in this focal game not only the mass matters: rather, what really matters is the ratio between the radius of the body squared and the mass of the body. In this regard, Jupiter qualifies as the second best choice for a FOCAL space mission, requiring the FOCAL spacecraft to reach 6,077 AU. What about the other planets as gravitational lenses, then? Neptune qualifies third, with a focal sphere of 13,520 AU and Saturn comes fourth with a focal sphere of 14,420 AU. But the real surprise is the Earth, that qualifies just fifth with a focal sphere of 15,370 AU. And the Earth is indeed the best body we could use as a gravitational lens since we know about its atmosphere better than about any other planetary atmosphere. Just to complete the picture, Uranus comes sixth at 16,980 AU and Venus seventh at 17,020 AU, let alone Mars, Mercury and the Moon, all with focal spheres at 40,000 AU and beyond. We have discovered a new BELT of focal spheres. In this paper, we study it in detail for the first time, for the benefit of SETI and science.