Some (Apparently) Very Wide Binary Asteroids

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We present lightcurves for 10 asteroids that appear to be the result of very widely-separated binaries. Jacobsen et al. (2014, ApJ 780) attribute the formation of such systems to a somewhat complex series of events that involves BYORP. The lightcurves consist of two components: Period 1 (P1) is very long, P1 = 50-624 h, with moderate to large amplitudes, A1 = 0.23-1.0 mag. The second periods and amplitudes (P2 and A1) are mostly similar to the primaries of close binary systems, i.e., P2 = 2.2-3.6 h, A $<$ 0.1 mag. Two of the objects have secondary periods in the range of 5-7 hours. The most exceptional example is (19204) Joshuatree, which has values of P1 = 480 h, A1 = 0.25 mag and P2 = 21.25 h and 0.08 mag. Given the lack of mutual events, these can be considered to be only possible binaries. Since the orbital period is probably very long, it seems extremely unlikely that mutual events will ever be seen. Based on works by Jacobson et al. (2014, ApJ 780) and Pravec et al. (2016, Icarus 267), we suggest that P1 represents the primary (larger) body of the system and P2 represents the spin rate of the satellite. Another reason to accept this supposition is that the large amplitude (A1) has to be from the larger body, otherwise the dilution of amplitude would require the smaller body to be unreasonably elongate. The limiting size ratio for binaries is around 0.6 (see Pravec et al. 2010, Nature 466, Fig. 1), or a magnitude difference of about 1.0. For a secondary 1.0 mag fainter than the primary to produce a combined lightcurve amplitude of 0.4 mag would require that the secondary undiluted amplitude to be several magnitudes (near-infinite elongation) and also a near equatorial aspect. This is not likely.