"The Asteroid Spin Rate Study Using Large Filed Sky Survey"

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Thanks to modern technology—wide-field detectors, high computing power, massive data storage, and robotic observation—it is possible to obtain many asteroid light curves within a short period of time. Therefore, several important physical properties derived from asteroid light curves can be investigated in a more comprehensive way.

1. The rubble pile asteroid and the spin barrier at ~2.2 hr

   Asteroids of diameter (D) > 150 m are "rubble pile" (i.e., gravitationally bounded aggregations) that cannot rotate faster than the spin barrier (i.e., rotation period < 2.2 hr). However, several large super-fast-rotators (SFR), such as 2001 OE84 (Pravec et al. 2002), 2005 UW163 (Chang et al. 2014), 1950 DA (Rozitis et al. 2014), and 2000 GD 65 (Polishook et al. 2015), have rotation periods of < 2.2 hr and cannot be explained by the rubble pile model. To explain this, Holsapple (2007) use a size-dependent strength model with cohesion for asteroids to allow the presence of these large SFRs. Consequently, the 2.2 hr spin barrier should on long exit at least for kilometer-sized asteroids, and we therefore can expect more large SFRs to be discovered by large sky-coverage and short-cadence survey.

2. The bulk-density-dependent spin barrier

   The rubble pile asteroids of different bulk densities (ρ) should show different spin barriers ($P \sim 3.3\sqrt{(1+\Delta m)/\rho}$; Pravec & Harris 2000). Consequently, the overall spin rate of C-type asteroids (i.e., $r \sim 1.33 \pm 0.58$ g cm^{-3}) should be lower than for S-types (i.e., $r \sim 2.72 \pm 0.54$ g cm^{-3}; DeMeo & Carry 2013). Although this is preliminarily seen by Chang et al. (2015), a more solid evidence should be observed from asteroid rotation period survey cooperating with asteroid colors (i.e., spectral type).

3. The location- and size-dependent spin-rate distribution

   The spin-rate distribution of asteroids of 3 < *D* < 15 km has excesses in both the slow and fast ends. This is because the Yarkovsky–O'Keefe–Radzievskii–Paddack (YORP) effect altering the spin rate of small asteroids on million-year timescales (Rubincam 2000). Since the YORP effect is dependent on solar illumination and asteroid size, we should be able to see different spin-rate distributions for different semimajor axes or different sizes from a comprehensive asteroid rotation period survey. Moreover, some unexpected features, such as the number drop at spin rate of 5 rev/day (Chang et al. 2015), will also be reveal from such large survey.