Physical properties of asteroids in comet-like orbits in the infrared asteroidal survey catalogs

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Dormant comet and Infrared Asteroidal Survey Catalogs. Comet nucleus is a solid body consisting of dark refractory material and ice. Cometary volatiles sublimate from subsurface layer by solar heating, leaving behind large dust grains on the surface. Eventually, the appearance could turn into asteroidal rather than cometary. It is, therefore, expected that there would be "dormant comets" in the list of known asteroids.

Over past decade, several ground-based studies have been performed to dig out such dormant comets. One common approach is applying a combination of optical and dynamical properties learned from active comet nucleus to the list of known asteroids. Typical comet nucleus has (i) Tisserand parameter with respect to Jupiter, $T_{\rm J}$ <3, (ii) low geometric albedo, $p_{\rm v}$ <0.1 and (iii) reddish or neutral spectra, similar to P, D, C-type asteroids.

Following past ground-based surveys, infrared space missions gave us an opportunity to work on further study of dormant comets. To the present, three infrared asteroidal catalogs taken with *IRAS*[1], *AKARI*[2] and *WISE*[3] are available, providing information of sizes and albedos which are useful to study the physical properties of dormant comets as well as asteroids. Usui et al. (2014) merged three infrared asteroidal catalogs with valid sizes and albedos into single catalog, what they called I-A-W[4]. We applied a huge dataset of asteroids in I-A-W to investigate the physical properties of asteroids in comet-like orbits (ACOs, whose orbits satisfy Q >4.5 au and $T_{\rm J}$ <3).

Here we present a study of ACOs in infrared asteroidal catalogs taken with *AKARI*, *IRAS* and *WISE*. In this presentation, we aim to introduce albedo and size properties of ACOs in infrared asteroidal survey catalogs, in combination with orbital and spectral properties from literature.

Results and Implications.

We summarize our finding and implication as followings:

- There are 123 ACOs (Q >4.5 au and $T_{\rm J}$ <3) in I-A-W catalog after rejection of objects with large orbital uncertainties.
- Majority (∼80 %) of ACOs have low albedo ($p_{\rm v}$ <0.1), showing similar albedo distribution to active comet nuclei.
- Low-albedo ACOs have the cumulative size distribution shallower than that of active comet nuclei.
- High-albedo ($p_{\rm v}$ ≥0.1) ACOs consist of small (D <3 km) bodies are concentrated in near-Earth space.
- We suggest that such high-albedo, small near-Earth asteroids are susceptible to Yarkovsky effect and injected into comet-like orbits.

References: [1] Tedesco E. F. et al. (2002) *AJ*, 123, 1056. [2] Usui F. et al. (2011) *PASJ*, 63, 1117. [3] Mainzer A. et al. (2011) *ApJ*, 731, 53. [4] Usui F. et al. (2014) *PASJ*, in press.