

WISE/NEOWISE investigation of the dormant comet population

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Comet nuclei are solid bodies consisting of dark (of visible geometric albedo $p_v < 0.1$) refractory material and volatile ice. Comets lose their volatiles near their surfaces after many returning orbits. Eventually, their surfaces are covered with an inert dust mantle that prevents sublimation of subsurface ice, turning them into asteroidal appearance rather than cometary (i.e., do not show activity). It has long been speculated that there could be dormant or dead comets in the list of known asteroids. Considering that the physical lifetime of short-period comets could be predominantly shorter than the dynamical lifetime, the number of dormant comets is expected to be much larger than that of known active comets. However, due to a considerable observational bias against low albedo objects in visible light surveys, it has been difficult to make an impartial measurement of the dormant comet population.

In recent years, infrared space missions have investigated asteroid sizes and albedos, giving us a unique opportunity to work on the further study of dormant comets (as infrared surveys are less biased against low albedo objects). Here we present a study of potential dormant comets observed by WISE/NEOWISE during its cryogenic mission phase in 2010 and the first three years of the reactivation survey since late 2013. We define the term "potential dormant comet" as one having a comet-like albedo ($p_v < 0.1$) and comet-like orbits (the Tisserand parameter $T_J < 3$ and the aphelion distance $Q > 4.5$ au).

This presentation will address the following key points based on new observational data: (1) the size distribution of potential dormant comets, (2) the ratio of dormant to active short-period comets, and (3) the physical lifetime of cometary volatiles in the inner solar system.

Keywords: comets, asteroids