A search for active main-belt asteroids

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Active Main Belt asteroids are bodies within the Main Belt of asteroids which have shown comet-like activity during parts of their orbits. So far, just a handful of active Main Belt asteroids has been found. A representative example is the first known Main Belt comet 133P/(7968) Elst-Pizarro. Jewitt [1] proposed possible mechanisms for producing mass loss from asteroids, but the cause of the activity of all known active Main Belt asteroids remains still unknown. Statistically, there are indications that there exist many more currently active Main Belt asteroids, but hunting for them by searching for typical cometary features, like tail or coma, requires a lot of telescope time in the middle- and large-class telescopes, and does not guarantee success in detecting them all. If the mass-loss mechanisms causing the activities are too weak to develop visually evident comae or tails, the objects stay unnoticed. We are presenting a novel way to search [2] for active asteroids, based on looking for objects with deviations from their expected brightness in the MPCAT-OBS Observation Archive. From 75 million observations in total, covering 300'000 numbered objects, we have extracted five new candidate objects that possibly show a type of comet-like activity, and the already known Main Belt comet 133P/(7968) Elst-Pizarro. We discuss our search method, show deviation curves of the five new candidates compared to non-active Main Belt asteroids and give possible explanations for causes of their possible activities. The method could be implemented in the future sky survey programs like the Large Synoptic Sky Telescope (LSST) and the Panoramic Survey Telescope and Rapid Response System (Pan-STARRS) to detect outbursts on Main Belt objects almost simultaneously with their occurrence, which is potentially interesting when searching for impact events in the Main Belt.

References: [1] D. Jewitt. The Active Asteroids, The Astronomical Journal 143, 66, 2012. [2] S. Cikota, J. L. Ortiz, A. Cikota, N. Morales, G. Tancredi. A photometric search for active Main Belt asteroids, Astronomy & Astrophysics 562, A94, 2014.