AN ASTEROID SHOWER OVER THE CRETACEOUS PERIOD

William F. Bottke[1], David Vokrouhlický[1,2], and David Nesvorný[1]

1. Southwest Research Institute, 1050 Walnut St, Suite 400, Boulder, Colorado 80302, USA
2. Institute of Astronomy, Charles University, V Holešovičkách 2, 18000 Prague 8, Czech Republic

The terrestrial and lunar cratering rate is often assumed to have been nearly constant over the last 3 Gy. Different lines of evidence, however, suggest the impact flux increased by at least a factor of 2 over the last 100-200 My. Our work shows that that this apparent surge was triggered by the catastrophic disruption of the Baptistina parent body, a $\sim$ 170 km diameter carbonaceous chondrite-like asteroid that broke up 160^{+30}_{-20} My ago in the inner main belt region. Approximately 15-20% of Baptistina's multi-kilometer fragments were directly injected or drifted by Yarkovsky thermal forces into the 7:2 mean motion resonance with Jupiter (J7:2), where at their peak $\sim$ 100 My ago, they increased the near-Earth object population by a factor of 3. By combining our numerical results together with meteoritic constraints, we find the Baptistina asteroid shower is the most likely source ($> 95\%$ probability) of the Chicxulub impactor that produced the Cretaceous-Tertiary (K/T) mass extinction event 65 My ago.

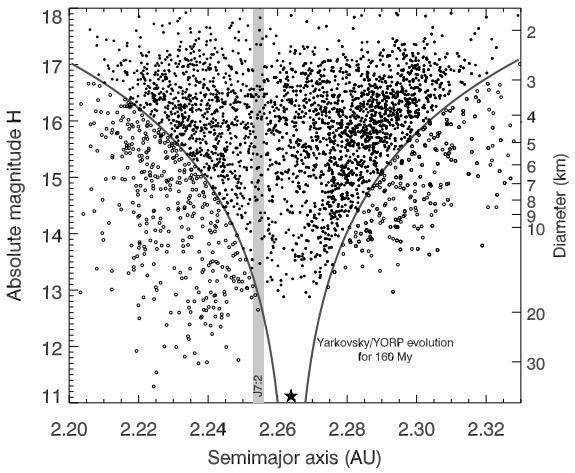

Figure 1: The Baptistina asteroid family (filled circles). The family is noticeably depleted near the J7:2 ($a \approx 2.2545$ AU). The gray lines that bracket the outside of each lobe represent our best estimate of how far the majority of family members spread by Yarkovsky/YORP evolution in $\sim$ 160 My. The open circles are predominantly interlopers from the Flora family.