THE "MAIN-BELT COMETS" ARE NOT COMETS, BUT SHAKEN ASTEROIDS. G. Tancredi[1], [1]Depto. Astronomia, Fac. Ciencias, Montevideo, Uruguay, gonzalo@fisica.edu.uy

Introduction: Several objects in typical asteroidal orbits have presented comaes and tails similar to the ones presented by comets for short period of times. They have been classified as comet and/or asteroids. The first known case is 4015 - 107P/Wilson-Harrington, which it was discovered in 1949 with a cometary tail; but since its recovery in 1979 till present it has not shown any signs of recurrent activity. The object 7968 - 133P/ Elst-Pizarro was discovered in 1979 with an asteroidal appearance; but in 1996 and 2002, it showed the recurrent presence of a coma and a thin dusty tail. The following list of objects in asteroidal orbits had presented a cometary-like activity: 4015 107P/Wilson-Harrington, 7968 - 133P/Elst-Pizarro, 118401 - 176P/Linear, 233P/La Sagra, 238P/Read, 596 Scheila, P/2008 R1 (Garrad), P/2010 A2 (Linear), P/2010 R2 (La Sagra), 300163- 2006VW139. Several hypotheses have been proposed to explain the activity of this object [1]. Among them, the most accepted scenario is the ice sublimation and the ejection of dust, in a similar way as the cometary activity. Therefore several authors have coined these objects "Main Belt Comets" [2]. Nevertheless, in some cases, some authors have concluded that the ejection of dust must be due to an impact, like the case of 596 y P/2010 A2.

An alternative idea: Based on laboratory experiments, numerical simulations of granular media [3], simulations of the dust evolution and analysis of the images of some of these objects, we propose a new model for the formation of the dusty comaes and tails.

The impact of a small body against a larger one initially produces a crater and the ejection of dust at high velocity (> 100 m/s). The dust is rapidly dispersed and it should be only observable just after the impact. But in addition the impact generates a shock wave which propagates to the body interior. The asteroid is globally shaken. When the shock wave reaches the surface at distance far from the impact point, it produces a shake of the material on the surface, ejecting material at low velocities (Fig. 1). We name this process the "Cocoa effect", because it is similar to the effect produced when a can of cocoa is dropped and knocks the floor. Due to the low escape velocities at the surface, even the dust particles ejected at low velocities could slowly escape the asteroid. The particles move away from the asteroid due to the solar radiation pressure, forming the thin tails aligned with the orbital plane. These tails could persist for various months, as they have been seen in these objects.

Another problem to take into account is the recurrence of the activity for some objects. It could be explained due to the collision with a dense meteor shower present in the main-belt.

Conclusion: The so-called "Main Belt Comets" could be explained with a hypothesis that does not require the presence of ice on the surface of these objects. The objects are plain asteroids that suffered a recent collision, and the entire body is shaken, ejecting dust from the surface at low velocities.

References:

[1] Jewitt, D. (2012) *AJ*, 143, 66. [2] Hsieh, H. and Jewitt, D. (2006) *Science*, 312, 561. [3] Tancredi, G. et al. (2012), *MNRAS*, 420.