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A tale of clusters – asteroid impacts on Earth happen (almost) at random

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There are currently about 190 known impact structures on Earth, from a few m to ~150 km in diameter [1]. It has long been claimed that large impacts of asteroids (and/or comets) happen not at random, but are concentrated at regular periods, with a length of about 26-30 Ma (e.g., [2-4]). Many of these claims make use of a statistical method called a circular spectral analysis (CSA). We show that when we apply a CSA to a list containing only impact structures with “robust” (SE < 1%) ages, the claimed periodicity is not significant anymore. If we divide the impactor flux into periodic and random components, we can exclude at the 95%-level that the periodic component contributes more than 80% of the total flux. Finally, we show that the presence of a few (non-periodic!) impact “clusters”, e.g., due to impactor showers after asteroid break-ups, can give rise to spurious periodicity peaks in a CSA [5].

[1] Earth Impact Database 2017, www.passc.net/EarthImpactDatabase [2] Alvarez W. & Muller R. A. (1984), Nature 308:718. [3] Melott A. L., Bambach R. K. (2010) Mon. Not. R. Astron. Soc. 407:L99. [4] Rampino M. R. & Caldeira K. (2015) Mon. Not. R. Astron. Soc. 454:3480.

[5] Meier M. M. M. & Holm-Alwmark S. (2017) Mon. Not. R. Astron. Soc. 467:2545.

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