



15 years of Jupiter impacts monitoring and observations

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After 1994 Shoemaker/Levy 9 comet fragmentation and impacts on Jupiter was predicted and observed by professional astronomers, it was estimated that impacts on Jupiter should be very rarely observed events, maybe once per century. But an Australian amateur observed dark traces of an impact on Jupiter with his backyard telescope in 2009 and observed a flash provoked by another smaller impactor on Jupiter atmosphere in 2010 [1]. This started a series of 13 observations of such events [2],[3], and a long monitoring program supported by a software (DeTeCt) aiming at estimating such impacts frequency, through both semi-automatic detection of flashes on amateur videos of Jupiter and logging of all observations period without any events.

With those 13 observations, we have now enough data to analyze the apparent distribution of those impacts' location on Jupiter. 75% occurred in the equatorial area (between -30° and 30° latitude), which could be an indication that the impactor bodies are originating from the same orbiting plane as Jupiter.

Over the years, we could collect a year worth of videos analysis with our software, from 262 different observers (almost 360 000 videos). To refine the rate of Jupiter impacts' frequency estimation, we analyzed the data in a more detailed way than before, per Jupiter apparition, and considering for each apparition the number of impacts discovered, the total duration and period of all negative observations collected through DeTeCt. Focusing on most relevant apparitions with around or more than a month worth of data collected, we find an impact frequency varying from none per year (no impacts detected in 2018 and 2022), and $\sim 80/\text{year}$ (4 observed in 2023). Averaging the result for these apparitions (between 2018 and 2023), we estimate the impact frequency to $\sim 29/\text{y}$ (twice as much as the previous way of estimating it).

References:

[1] Impact flux on Jupiter: From superbolides to large-scale collisions ", Hueso R., Delcroix M. et al., *Astronomy & Astrophysics*, September 2013

[2] Small impacts on the Giant planet Jupiter, Hueso R., M. Delcroix et al. *Astronomy & Astrophysics* 617, A68 pp1-13 2018

[3] Fragmentation modelling of the 2019 August impact on Jupiter, Sankar R. et al. (incl. Delcroix M.), *Monthly Notices of the Royal Astronomical Society* 2020

