Jupiter blasted by 6.5 fireball impacts per year on average

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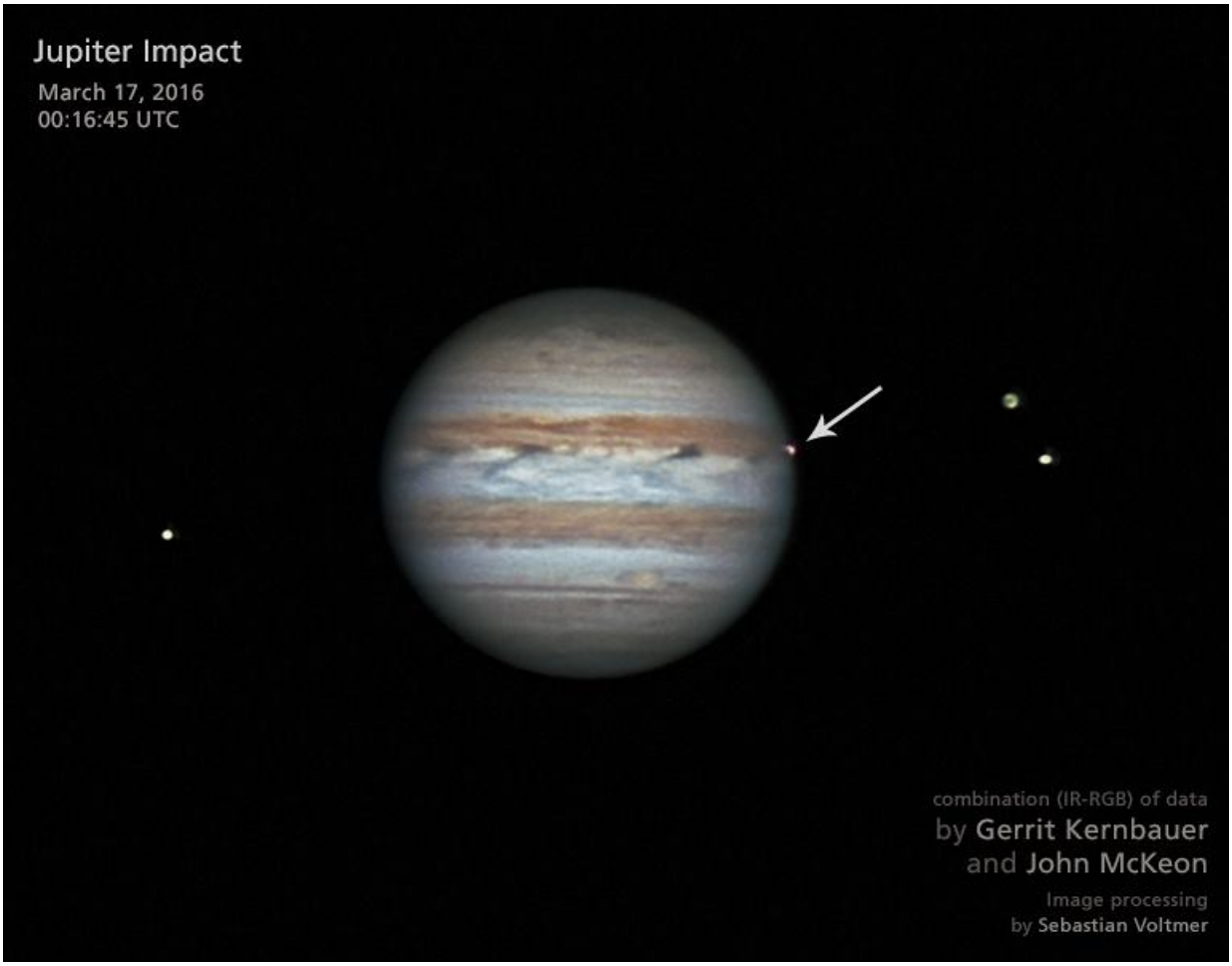

March 17th fireball captured by Gerrit Kernbauer and John McKeon. Image processed by Sebastian Voltmer. Credit: G. Kernbauer, J. McKeon, S. Voltmer

Jupiter is hit by an average of 6.5 objects per year that create impacts large enough to be visible from Earth, according to preliminary results from a worldwide campaign by amateur astronomers to observe the giant planet. The estimate was presented at an international workshop on Jupiter for professional and amateur astronomers organized by Europlanet 2020 Research Infrastructure at the Observatoire de la Côte d'Azur in Nice, France.

Meteors impacting Jupiter's upper atmosphere can create spectacular fireballs, such as the one observed by amateur astronomers Gerrit Kernbauer and John McKeon on 17th March 2016. This was the fourth in a series of fireballs in Jupiter observed serendipitously by amateur astronomers since June 2010. Groups of amateurs worldwide have coordinated efforts to obtain improved estimates of the number of small bodies around Jupiter and how they interact with the planet.

Marc Delcroix, who coordinates a 60-strong group of amateur astronomers worldwide, said, "Dramatic impacts with Jupiter can be captured with standard amateur equipment and analyzed with easy-to-use software. But to get a good estimate of how often these events occur, we need observers around the world who are willing to collaborate to create a program of more-or-less continuous monitoring of Jupiter. It takes time and commitment—observations of no impacts are just as important as detecting a fireball. In 3 years since our program started, amateur contributors from Europe, the US and Australia have analyzed the equivalent of more than 56 days of videos—around 53,000 videos—without discovering an impact. This is a result in itself and, together with the reports of amateur astronomer John McKeon, has helped us come up with our preliminary estimate which slightly reduces previous estimates of the flux of impacting objects in Jupiter. We are now working to further enhance our software to improve its usability, while maintaining its simplicity and efficiency, to reach an even wider participation by amateurs. This should help in refining the impact

estimations for Jupiter, and hopefully discover new impacts."

Isshi Tabe and Dr. Jun-ichi Watanabe, of the Association of Lunar and Planetary Observers (ALPO) in Japan, set up the Find Flash project following the observation of an impact flash by four Japanese amateur astronomers on 20th August 2010.

Tabe explained, "We recognized the importance of impact flashes for estimating the number of small bodies around Jupiter. We have perhaps more than 50 Japanese amateur astronomers in our association who take video images almost every night. We also have around 10 nights per year observation time on bigger telescopes in public and professional observatories, which allows us to employ a narrow band methane filter to detect fireballs in Jupiter's upper atmosphere more efficiently. We've carried out the observational campaign for three years, but unfortunately we have never yet detected any impact flashes. We expect to have an increasing of number of observations over the next few years and to get valuable data both from bigger and smaller telescopes. However, in northern hemisphere of Earth, especially in Japan, we can only get consistently good observational conditions in summer, so it is important that we work together with other amateur groups around the world to get more data."

John McKeon, who observed the St Patrick's Day impact said, "Collaboration is extremely important in the amateur astronomer community. On March 28th I became aware that an amateur astronomer in Austria, Gerrit Kernbauer, had discovered a possible impact on Jupiter on March 17th. I remembered I had been filming Jupiter around the same time, with the intention of illustrating a double moon transit of the planet. I'd filmed a total of 207 short 55 second movies of the planet over a period of about 3 and half hours and had processed them to create a time-lapse animation. When I checked back through my videos, I found the impact in the second last video I had taken. This secondary

observation helped to confirm the impact event. Having a hand in this discovery, and the input and support from other amateurs in the analysis of the event, has changed and improved my imaging process for the future."

"The new estimate of 6.5 impacts a year of comparable size objects lies at the bottom part of our previous estimate of impacts in Jupiter," said Ricardo Hueso of the University of the Basque Country and chair of the workshop's scientific organizing committee. "Constraining this number is important to improve our expectancies of observing large impacts in the planet, such as the Shoemaker-Levy impact in 1996 and the 2009 impact. Unfortunately, we are still dealing with the statistics of a very few number of impacts detected, but plans to improve our detection methods and perform systematic searches will help us to detect more of these objects. That will allow us to know more about the current architecture of the outer solar system and the role of Jupiter in protecting the Earth from comparable impacts."

Provided by Europlanet