

(GMN) is a collection of more than 450 video meteor cameras hosted by amateur astronomers and professionals alike in 23 countries across the globe.

That's a lot of cameras and more, much more, are on the way. The massive array, working collectively and connectively, is needed to achieve GMN's mission prime: ensuring that no unique space events, such as rare meteor showers or meteorite-dropping fireballs, are missed.

"The main operational goal of the project is to establish a decentralized, science-grade instrument which observes the night sky every night of the year from as many locations around the world as possible," said Vida, a postdoctoral associate in Western's department of physics and astronomy.

A new paper, soon-to-be published by *Monthly Notices of the Royal Astronomical Society* and currently available at [arXiv](#), details the project and also shares some of GMN's impressive preliminary findings.

Meteor astronomers, like Vida and Western's Canada Research Chair in Planetary Small Bodies Peter Brown, have a unique challenge to get their data. Unlike other fields of astronomy, where the objects of interest, like planets or distant galaxies, are usually so far away that they can be observed from virtually any point on the globe, [meteors](#) occur much closer to Earth, and most burn up in the atmosphere at heights of around 100 km.

"Other astronomers can pool their resources to build a big telescope on top of a mountain where the skies are dark and clear year-round, but meteor astronomers need spatial coverage most of all," said Vida.

A bright, meteorite-dropping fireball can occur anywhere in the world, and can only be well observed from within a distance of 300 km. To get

the exact fall location and the orbit, it needs to be observed by at least two cameras in two different locations. That's exactly what GMN provides.

Just a few months ago, the Winchcombe meteorite made international headlines. Several GMN cameras in the UK tracked the fireball together with other meteor networks, leading to important data retrieval and its eventual discovery on Earth. Spurred by the Winchcombe event, more than 150 meteor enthusiasts in the UK now want to install GMN cameras.

"There are already more than 100 existing ones in the UK, so that's really exciting," said Vida. "Its role in the recovery and analysis of the Winchcombe meteorite fall is proof positive that GMN works."

GMN started when Vida was an undergraduate student. The first system was installed at Western in 2017, and GMN has continued to grow since with cameras now in Ontario, Quebec and Alberta, as well as the United States, the UK, Spain, Belgium, Croatia and Brazil.

"A few friends and I realized that we can use low-cost Raspberry Pi single-board computers and reduce the cost of a single meteor observing system by 10 times, allowing us to install many more cameras than was previously possible," said Vida.

Raspberry Pi computers are considered the most popular single-board systems and are often used in DIY projects or as a cost-effective system for learning to code.

Beyond the thrilling visuals, GMN provides the world's meteor community with real-time awareness of the near-Earth meteoroid environment by publishing orbits of all observed meteors from around the globe within 24 hours of observation. The network also observes

meteor showers in an effort to better understand flight patterns, flux capacities, and even predict future events.

The location of all the cameras and the latest data is available for anyone to explore, via the GMN website.

More information: Denis Vidaet al, The Global Meteor Network—Methodology and First Results, arXiv:2107.12335 [astro-ph.EP] arxiv.org/abs/2107.12335

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