

SAAO ASTRONOMER DISCOVERS COMET

Dr Nic Erasmus, an astronomer from the South African Astronomical Observatory (SAAO), discovered a new comet in September, while monitoring the output of the ATLAS telescopes in Hawaii. ATLAS is the Asteroid Terrestrial-impact Last Alert System, an early warning system for asteroid impacts developed by the University of Hawaii and funded by NASA. It consists of two 0.5-metre telescopes situated 160 kilometres apart at the Haleakala (ATLAS-HKO) and Mauna Loa (ATLAS-MLO) observatories on the islands of Maui and Hawaii, or 'Big Island', respectively. The two telescopes automatically scan the observable sky for asteroids that might pose a threat to Earth, while their CCD cameras capture images that are processed by software optimised to detect fast-moving objects.

Dr Erasmus made the discovery from four 30-second exposures taken by ATLAS-MLO. Working remotely from Cape Town, he does a stint on 'ATLAS duty' every three weeks. This entails vetting the images posted by the software on the nightly discovery page if its algorithms flag any potential near-Earth objects (NEOs). These NEOs include any asteroids or comets whose orbits around the Sun bring them within about 45 million kilometres of Earth's orbit.

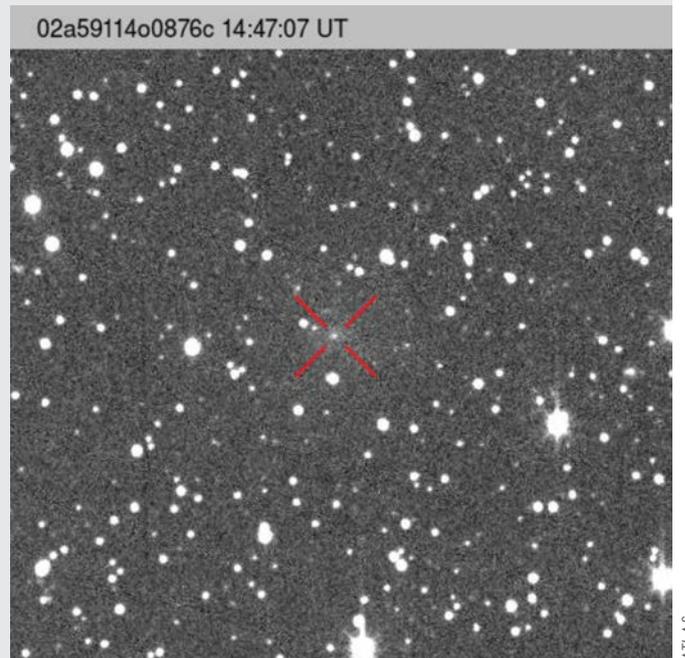
The algorithms generate many false-positives every night, so three astronomers monitor the observations before making the final submissions to the Minor Planet Centre (MPC). The MPC notifies observers worldwide about NEOs so that follow-up observations can be collected for identification and orbit computation.

Dr Erasmus noticed that the object in the discovery images had a faint coma – a fuzzy halo of gas and dust around a comet's icy centre, or nucleus. According to procedure, he double-checked with his two ATLAS colleagues that they could also see a coma before notifying the MPC. A few days later, on 20 September, the MPC confirmed that this was a new comet, named 'C/2020 S3 (Erasmus)' after its discoverer, as is customary.

The comet will reach perihelion – the closest approach to the Sun – around 12 December 2020, and will be at its brightest at that point. How bright it becomes will depend on how much it starts outgassing as it approaches the Sun, but it will most likely not be visible to the naked eye.

Prior to this discovery, more than 50 comets had been discovered by ATLAS since it began operating in 2015, along with over 500 asteroids. But the system has a 'blind spot' in the skies of the southern hemisphere, so in 2018 NASA agreed to fund two additional ATLAS telescopes. One of these will be installed at the SAAO field station in Sutherland in early 2021.

ATLAS is just one of the NEO survey projects funded by NASA through its Near-Earth Object Observation Programme. Other major ones include the University of Arizona's Catalina Sky Survey, the MIT Lincoln Laboratory's



Lincoln Near-Earth Asteroid Research (LINEAR), and the University of Hawaii's Panoramic Survey Telescope and Rapid Response System (Pan-STARRS).

NASA established the programme in 1998. In 2005, the United States Congress set NASA the target of finding 90% of NEOs that are 140 metres or larger in size, because these would pose a significant risk to Earth. They can be detected much further away from Earth than smaller NEOs because they are brighter. Most NEOs are asteroids, and Potentially Hazardous Asteroids (PHAs) are those that come within about 7.5 million kilometres of Earth and have an absolute magnitude (H) of 22.0 or brighter. By the beginning of October 2020, the programme's funded projects had identified 2 122 PHAs, of which 157 were asteroids larger than a kilometre in diameter.

- An animation of comet C/2020 S3 (Erasmus) is available at: <https://www.saa.ac.za/2020/09/23/saa-astronomer-discovers-new-comet-c-2020-s3-erasmus/>

Asteroids are small rocky objects that orbit the Sun. Comets also orbit the Sun, but they are made of ice and dust rather than rock. As a comet's orbit takes it towards the Sun, the ice and dust begin to vaporise, forming the comet's tail.

Sometimes small pieces of asteroids or comets break off, and these are called meteoroids. If a meteoroid comes close enough to Earth, it burns up as it enters Earth's atmosphere, creating a streak of light in the sky known as a meteor, but sometimes called a 'shooting star' or 'fireball'. Sometimes meteoroids don't burn up completely in the atmosphere, and land on the Earth's surface, at which point they are called meteorites.

<https://spaceplace.nasa.gov/>

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