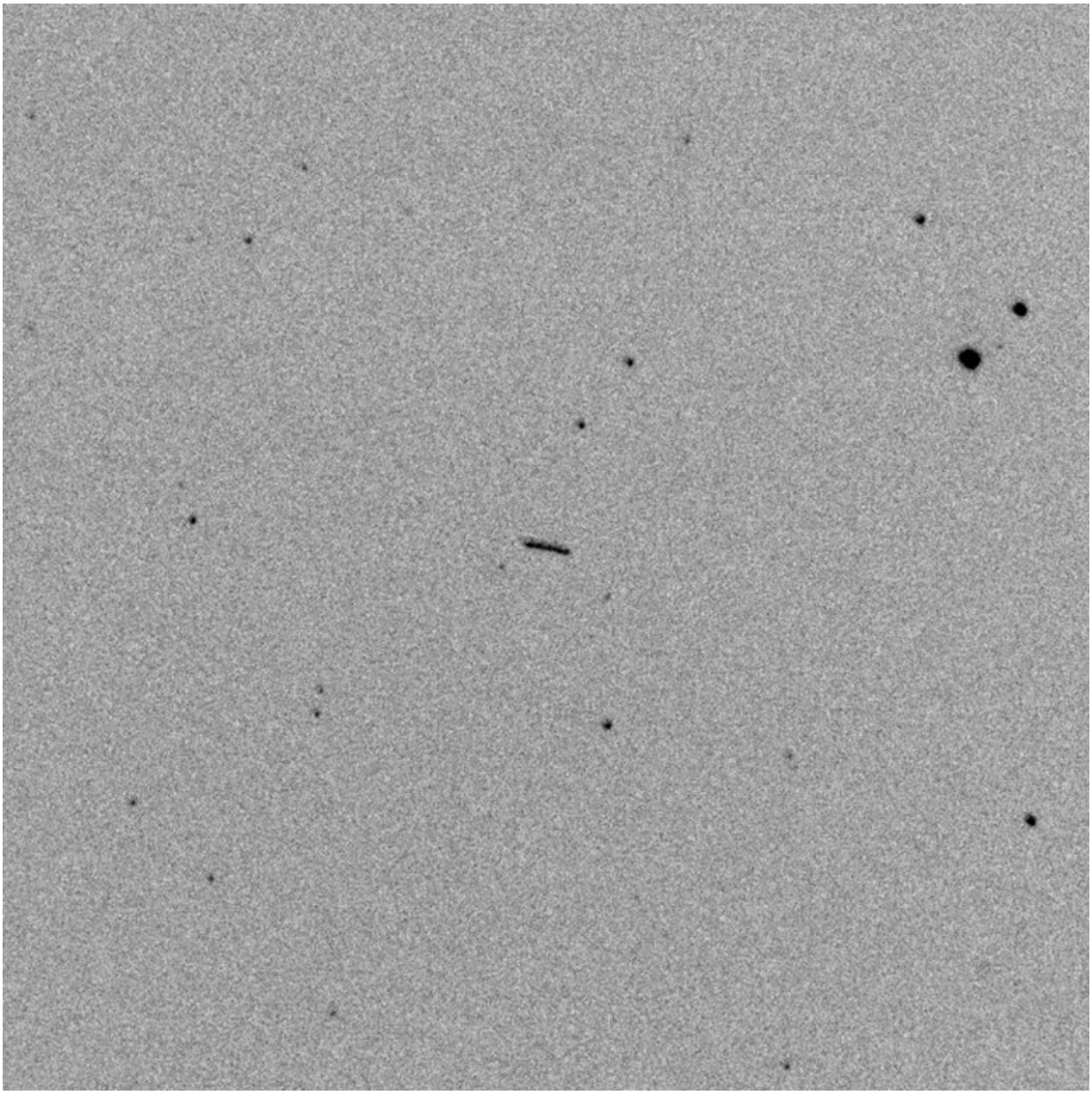
Fifth asteroid ever discovered before impact

March 16 2022



Kleť Observatory sees asteroid 2022 EB5, 13 minutes before impact. Credit:

At 19:24 UTC on 11 March 2022, astronomer Krisztián Sárneczky discovered a bright and fast-moving new object in the sky using the 60cm Schmidt telescope at the Piszkéstető observatory, Hungary. He collected four observations in quick succession, and just 14 minutes later reported his findings to the Minor Planet Center (MPC), initially designating the object "Sar2593."

The results were quickly published and used by automatic impact assessment systems around the world to estimate the possibility of an impact: at the time, it seemed unlikely, at less than 1%.

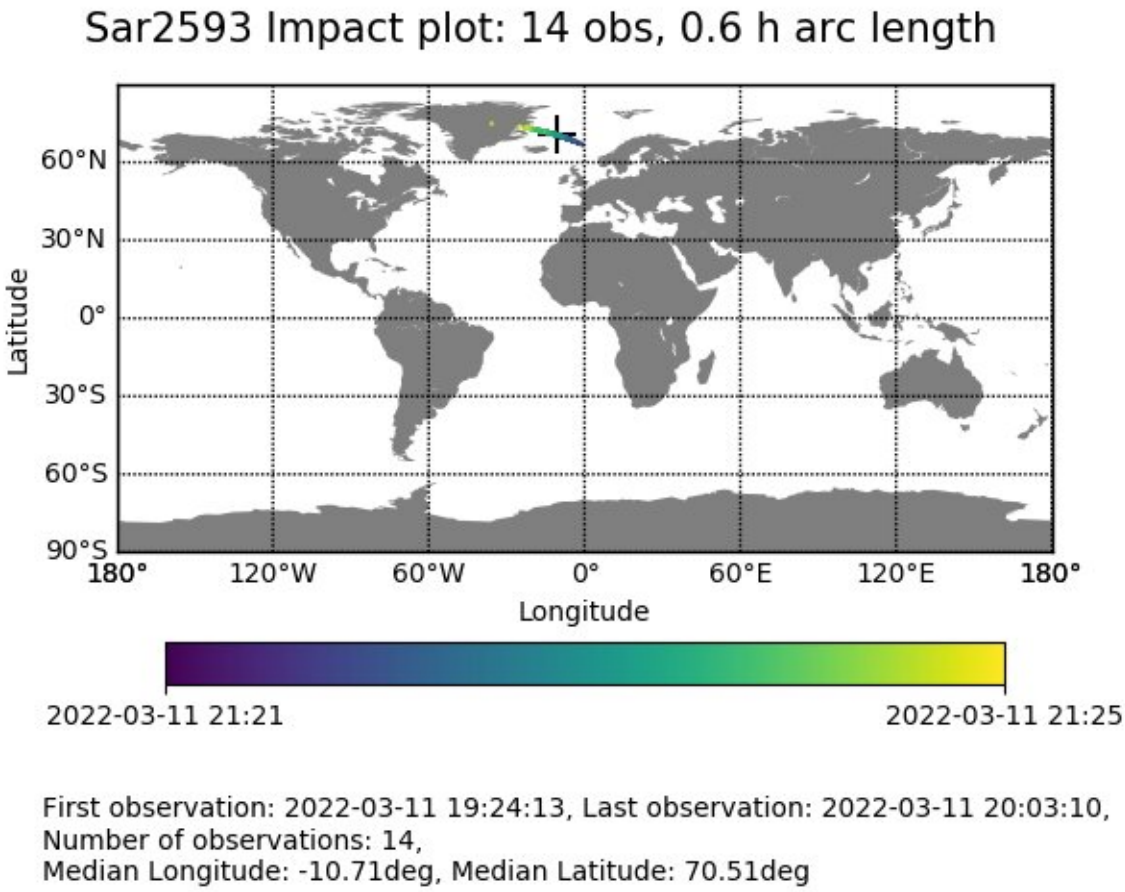
Krisztián continued to observe the object, making a further 10 observations soon after the discovery and again submitting them to the MPC. These, however, resulted in an entirely different scenario. Almost exactly an hour after it was detected at 20:25 UTC, ESA's "Meerkat" monitoring system triggered an alert to the Agency's Near-Earth Object Coordination Centre (NEOCC) based on the accumulated observations.

The chance of impact was now 100%, and would happen in less than an hour, sometime between 21:21 and 21:25 UTC. The new object's impact location was already predictable to the nearest thousand kilometers, expected just a few hundred kilometers north of Iceland.

Rapid response to a speedy space rock

In response to ESA's Meerkat alert and others like it, professional and amateur observers across Europe and Asia quickly started to observe the imminent impactor. Finding it was extremely challenging since the object was already very close (about 1/7th the distance to the Moon) and

moving rapidly in the sky.



Predicted impact point and time computed by ESA's imminent impactor alert system "Meerkat" at 20:25 UTC, with the initial 14 observations. The impact location was subsequently refined with more observations and proved correct. Credit: European Space Agency

Another observatory—Kysuce, Slovakia—soon reported its successful observations, together with many more detections from the original discoverer. With this new data added to the mix, the location of the asteroid impact could be pinpointed even more precisely: the asteroid

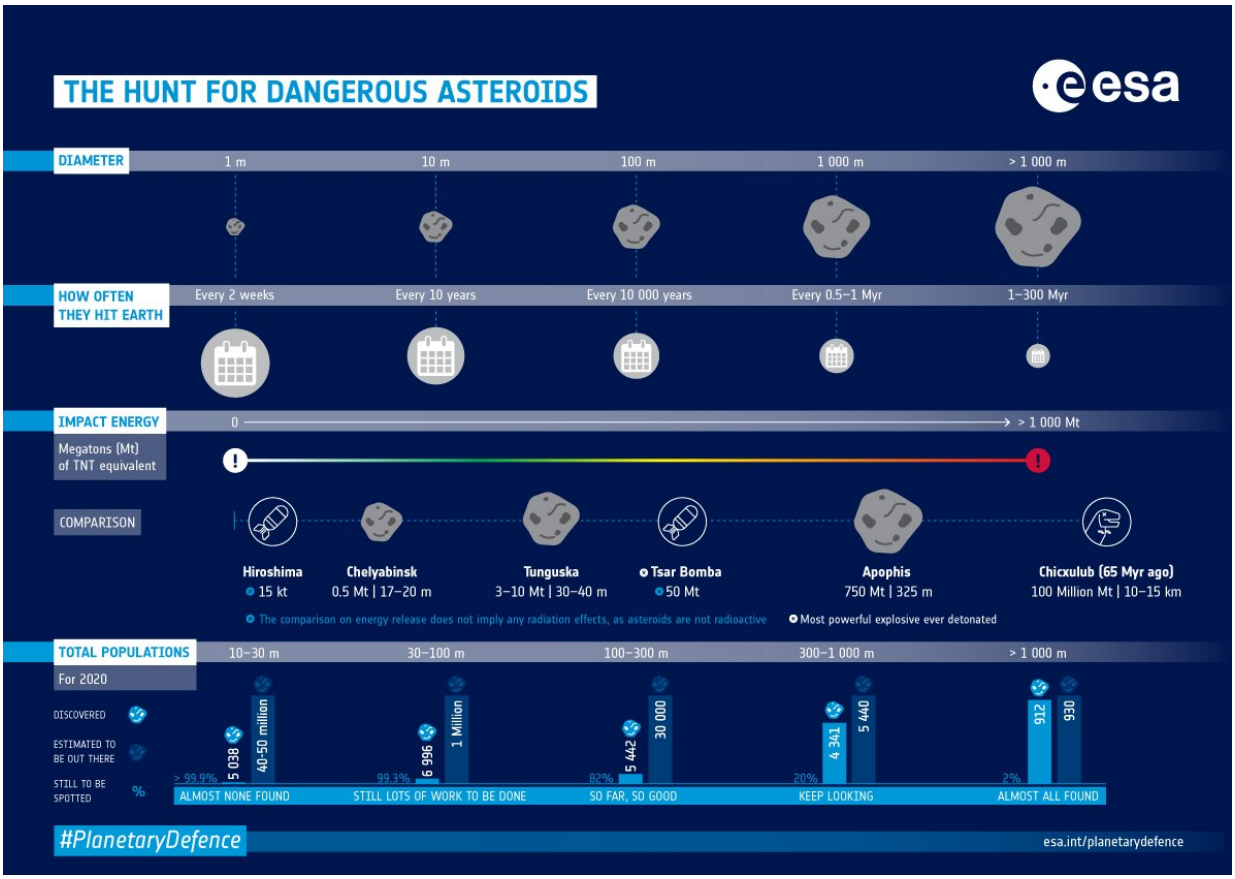
was going to enter the upper layers of our atmosphere roughly 140 km south of the Jan Mayen island at 21:22:42 UTC—less than two hours after being discovered.

From its observed brightness, the object appeared to be very small. At roughly a meter in diameter it posed no threat to Earth, as at this size it would entirely burn up in Earth's atmosphere.

Shortly after the expected time of impact the Minor Planet Center designated the asteroid the title "2022 EB5," becoming just the fifth known impactor observed in space before hitting our planet, and the first discovered from Europe.

Unfortunately, no conclusive visual or video detections of the corresponding fireball have been located at present, likely due to the remoteness of the impact location.

Nevertheless, there is independent evidence that the impact did in fact occur thanks to the international network of infrasound detectors. Signals from the impact were detected from Iceland and Greenland, suggesting an energy release equivalent to roughly a magnitude 4.0 earthquake.



Asteroid danger explained. Credit: European Space Agency

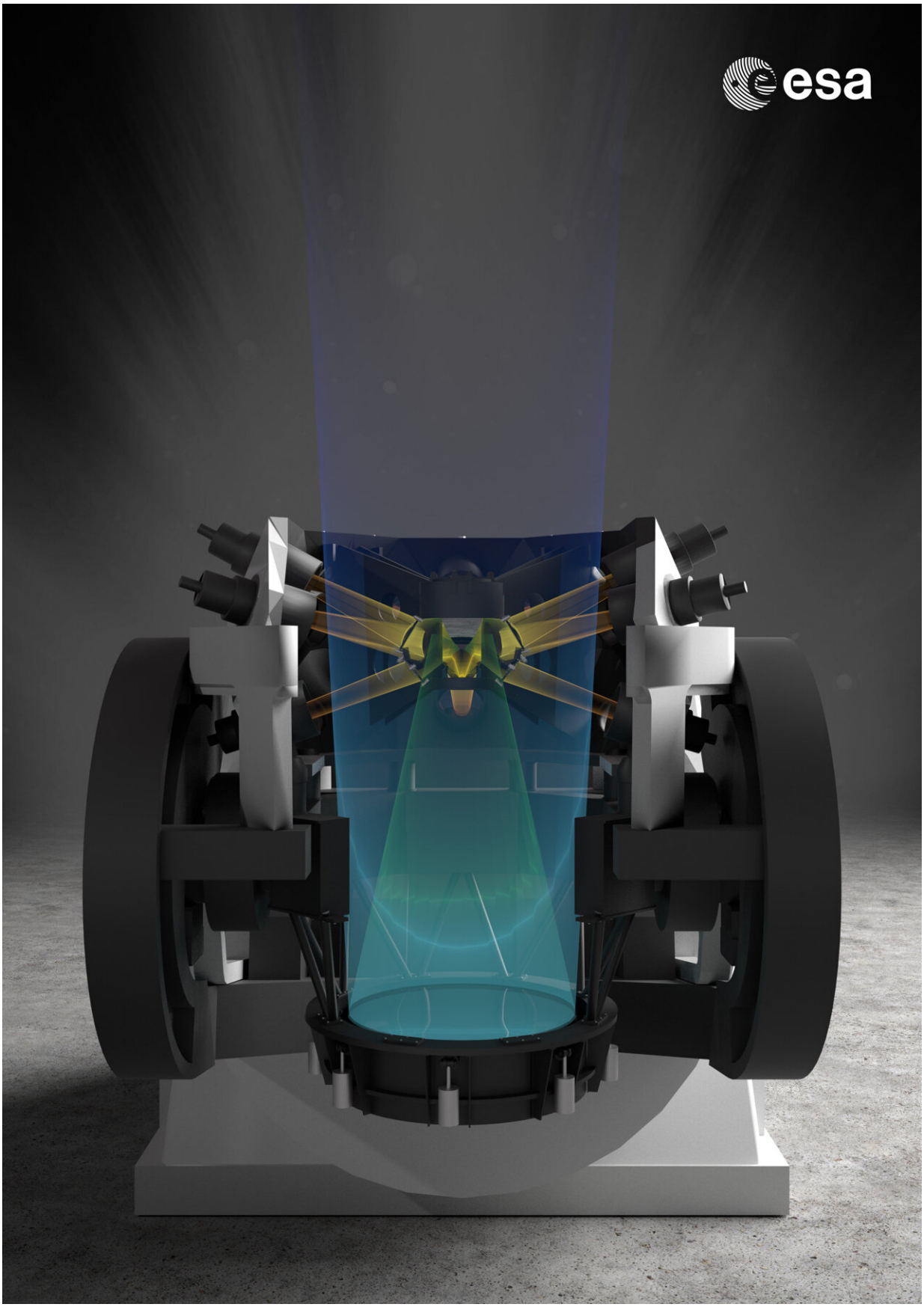
Why only the fifth?

It is estimated that between 40 and 100 tons of space material strike Earth every day, most in the form of very small particles. Larger objects, similar in size to 2022 EB5 are expected to strike roughly ten times per year. So why have only five asteroids been detected before impact?

The news here is rather positive. Large asteroids, kilometers in diameter, are easier to spot. Although they could do immense damage, they are thankfully relatively rare. We now know where the vast majority of

these are and can say for certain that they are safe, at least for the next hundred years. The international community continues to seek out every last one.

Smaller asteroids are far more common and strike Earth much more frequently, but their impact is small and they're much harder to spot. All five asteroids, spotted before impact, were found since 2008, illustrating how much asteroid observation technologies have improved in the last years.


esa

In the Flyeye telescope, a single mirror of 1 m equivalent aperture collects the light from the entire 6.7° x 6.7° field of view and feeds a pyramid-shaped beam splitter with 16 facets. The complete field of view is then imaged by 16 separate cameras that contain 16 detectors. The tubes contain a set of secondary lenses. Credit: ESA/A. Baker

Many more to come

More dedicated sky scanning telescopes are in the pipeline, including ESA's first state-of-the-art Flyeye telescope soon to be constructed in Monte Mufara, Italy. The new, European telescope will split each image into 16 smaller subimages, expanding its overall field of view—similar to the technique exploited by a fly's compound eye.

"The extremely wide field of the new telescopes will allow us to cover a large area of the sky in just one night," says Detlef Koschny, ESA's acting Head of Planetary Defense.

"This will reduce the chance that we miss any interesting object."

As our ability to predict asteroid impacts improves, so will our preparation. For medium-sized impacts that can create airbursts in the sky, this means the chance to warn people to stay away from windows that could break in the explosion. For larger objects, this means having the chance to prepare asteroid deflection missions to prevent impact altogether.

Provided by European Space Agency