ESA's NEO Coordination Centre

Find an NEO!

95 % of all NEOs larger than 1 km are already known, but only about 18 000 from the estimated 2 million NEOs larger than 30 m have been detected so far. The reason is that they are very faint and become observable only when they come close to Earth. This year in July a so far unknown NEO, now named 2020 OM3, passed the Earth at a distance of 10 million km. The estimated size was 40 m, which is about the diameter of the Tunguska asteroid that exploded in Siberia on 30 June 1908 and flattened 2000 square kilometers of forest.

ESA is using its 1 m telescope located in Tenerife, Spain, typically 4 nights per month to observe NEOs. The focus is on follow-up observations. Once regular follow-up targets have been observed, we run a search programme to look for new objects. Images are taken of a number of fields and this is repeated four times.

2020 OM3 showed up on 24 July in the four images taken between 2:46 UT and 3:36 UT as a faint speckle of light. But during these 50 minutes it had crossed quite a significant part of the 0.7° field-of-view of the telescope, making it quite a challenge to spot.

The animation reported on the next page is a crop of the full field-of-view: nonetheless, 3 moving objects are visible, including 2020 OM3. The four exposures are repeated in an endless loop and tiny dots are hopping on a straight line.

The challenge this month is to discover the moving objects:

- if you find any, send us the approximate beginning and end of the track in the given RA/DEC coordinate system.
- Bonus questions: can you give us the official names of the objects that you found?

Hint: 2020 OM3 is the fastest of all moving objects, and it's also the faintest. Good luck with your asteroid hunting!

Please, send your responses before the proposed deadline to the following e-mail: neocc@ssa.esa.int.
Use as subject of your e-mail: "Riddle #4 – solution".
Moreover, please let us know if you would prefer not to have your name included in the list of correct replies.

European Space Agency

Answer

The riddle of this month was very popular, we received more than 200 answers. We apologize for the poor quality of the axis labels reported on the website, which many of you could not read. We were hoping that you had a look at the higher definition image present in the PDF itself, but the majority of the replies showed that this was not even necessary. 203 found at least one of the three moving asteroids, 72 found all three. And 10 were even able to tell the names of the three asteroids.

We thank especially Felipe García for the nice animation which he sent us and which he generously offers to the public. In this animation you can see 1998 HQ17 on the left side moving slowly from left to right, 2015 GT43 on the right lower part moving also quite slowly towards the right bottom corner and finally 2020 OM3 moving very fast on the right side towards the upper edge of the image.

Animation provided by Felipe García.

In order to find the names of the three asteroids, you can go to Minor Planet Center MPCheck webpage and enter the date (2020 07 24.12) and the approximate centre of our image (R.A.: 20 51.3 and Decl: -14 16.8). If you enter a radius of search of 8 arc-minutes, corresponding roughly to the portion of sky shown, and a limiting magnitude of 20, you will find exactly the three asteroids we were looking for and their names.

Actually, a forth asteroid is present in the image: 1999 WD25. However, it has magnitude of 21.7, hence it is well below the detection limit of this exposure ($\sim$ 20 mag).

Federico Pfaffendorf, an amateur astronomer from Buenos Aires, sent us a nice Python program that you can use to display the tracks of all known asteroids (or position in case of galaxies) by entering the right ascension and declination range and the requested time interval. He generously shares his software here. And also worth mentioning is the reply from Jean-Philippe Chavey who wrote a software that detects moving objects

in such noisy images as we provided them. Usually you have to pay a licence fee for professional software like Astrometrica to find moving objects in star fields, but why not write it yourself? Well done Jean-Philippe!

Correct responses

Found all 3 and identified them all:	10
Found all 3 and identified 2020 OM3:	27
Found all 3:	35
Found 2:	116
Found 1:	15
Found none:	4
Total:	207

- Found all 3 and identified them all correctly: Felipe García, Jingyuan, Joaquim Farias, Yu-Hsiang Wang, Hidenori Nohara, Federico Pfaffendorf, Guillaume Doumeng, Caroline Perrin, François and Christophe Ratinaud.

- Found all 3: David Mugridge, Charles Eubanks, Jeffrey Obney, Richard Clow, Emmanuel Pelatre, Tudor Caldare Tudor, Paul Measures, Skitzo Chik, Andrew Alexandre, Homar Torres, Ryan Roberts, Gino Padilla, Thomas Cutonilli, Richard Grabon, Erol Özlav, Nicolas Muñoz, Jorge Fonseca, Chris Pirvu, Nathan Bradford Thigpen, Gabriel Dobersch, Maxime Mateos, Lucie Gracieux, Pierre Thomas, Benoît Schneider, Rachid Amazzane, K M Tsang, Emilio Gaffiot, Andreï Katkalov, Salvatore Geraci, Yohann Bredon, Hélène Magne, Takashi Ogura, Raphaël Peltier, Hannecart Michael, Sadek Jamel, Yann Coulomb, Christelle Llouch, Robert Bigaud, William Miniau, Grégory Giroud, Pierre François, Pierre Veurrier, Ophélie Gravouil, Thierry Bruna, Tanguy Madou, Jeremy Prin, Martin Buob, Laurent Dussimon, Hubert Langlois, Henry Denis, Chris Urban, Baptiste Leuci, Sylvain Tameu, Aurélien Moureaux, Jean-Philippe Chavey, Jaspar Sindermann, Kabaiakh, Therre Yoann, Nicolas Soulier, Mattias Sjöstrand and Juan Miguel Navas.

- Found 1 or 2: Eric Petr, Suguru Minamikawa, Florent, Julius, Andrés Rossi, Rob Jones, Devanshu Jha, Stefanie Jung, Quentin Virriat, Remi Michallet, Roberto Battaglia, Pascal Fleury, Rémi Ivens, Alicja Szendzielorz, Andrea Alessandrelli, François Jarzabek, Natalie Gray, Dominic Bazinet, Steve Dixon, Bob Belcher, Vroni Felber, Sujeet Kumar, Felix Körner, Thibault Enfiedjian, Tim Cheesebrow, Michal Misiaszek, Gerardo Diez, Mauricio Carreto, José Ma Moreno Ibáñez, Jai Nayak, David Beardsley, Christian Hertel, Michael McVey, Cyril Cocq, Nikos Kontostaylakis-Xaramis, Samantha Olsen, Alexander Trukhanov, Charles Wolf, Joe Landman, Manos Makrakis, Pierre Alfaro, Bryan Ribeiro, Alain Martel, Julien Varnier, Sébastien Le Dantec, Kaiss Air, Mael Mougenel, Pitit Pierrot, Alexandre Coniglio, Marc Devallee, Kiki Veyrunes, Cédric Bulard, Ken Lapre, Enzo Falzone, Valentin Gitta, Paul Becquart, Joseph Wigon, Anthony Piner-Mata, Mourad Aggad, Steven Delpierre, Aurélie Courtot, Teddy Saman-Latchimy, Elsa Maizeret, Anthony Micaroni, Luaan Gutierrez, Nicolas Devondel, Matthieu Debray-Kingbo, Cédric Tomas, Maysae Ikniouen, Romain Ledoux, Christo Watre, Astrid Viry Cyril Giroud, Laure BRIAND, Kefane, Cyril Bachy, Thierry Michelet, Luca Solo, Benoit Ractbrancaz, Matthias Pavlic, Jean-Michel Rodriguez, Paulo Aguiar, Gilles Cailachon, Frederic Delatte, Lou Chevry, Likai Lemasson, Damien Gouron, Cédric Barontini, Guillaume Mercier, Celine Huss, Ingrid Willy, Guillaume Goudal, Mathilde Huet, Bruno Bourdas, Bruno Burtin, Lucie Mehdi, Thomazeau Gildas, Vincent Bonnot, Michel Baudoin, Henrinirina De Bertin D'avesnes, Jonathan Magret, Youssef Bakir, Orestis Kazasidis, François Leblanc, Xavier Beuchat, Andries Volckaert, Stephane Cottret, Victor Chakraborty, Ankan Bose, Alexis Tkach, Jay Kepler, Marco Garcia, Karatzoulis Sotirios, Kunal Sharma, Andrew Douville, Edward Hume, Sergio Cabrera, Philippe Garbit, Nicolas Ben Mustapha, Eric Martien, Catherine Deroussent, Stéphane Noguera, Yirui Wang, Michelle Heather, Cédric Aubert, Thomas Deborne and Geoffray de Felice.

Congratulations to all for the great work done and thank you so much for participating in this riddle. And stay tuned for riddle #5.