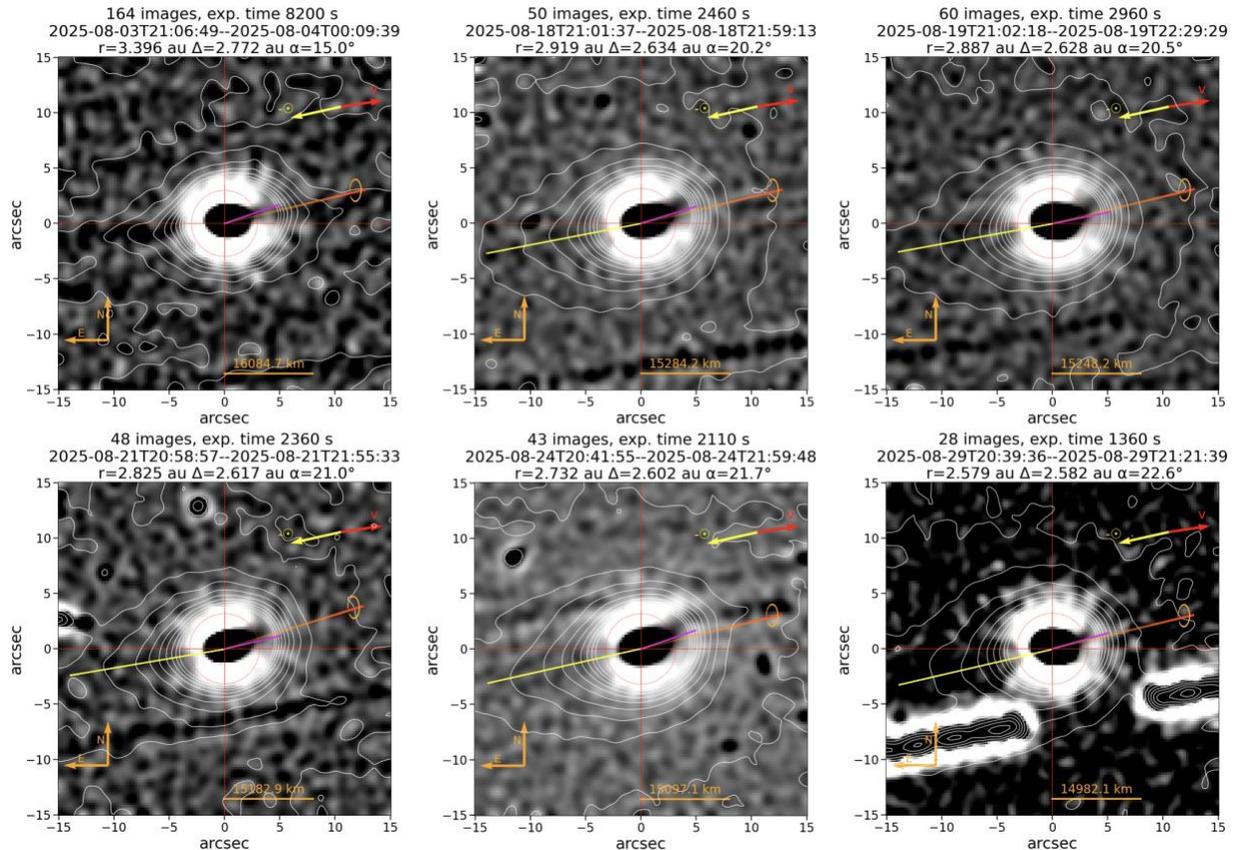


The Anti-Tail of 3I/ATLAS Wobbled Before Perihelion

by Avi Loeb on December 16, 2025



Images of the interstellar object 3I/ATLAS. Thin purple lines indicate the position angle of the detected anti-tail jet at a projected distance of 6,000 kilometers from the brightness peak (dotted red circle). For each frame, the observation date and the start and end times in UTC are shown above the panels, along with the total number of sidereal-tracking exposures and the cumulative integration time. The projected velocity vector (red arrow) and the anti-solar direction (yellow arrow) are marked, as well as the image scale and orientation. Degraded orange lines denote the projected rotation-axis direction, derived from mean value of the anti-tail positions angles, while yellow lines trace the tail direction. Brightness contours are overplotted using ten logarithmically spaced levels between the 20th and 95th percentiles of pixel intensity in each frame. The anti-tail refers to the narrow, linear, black feature extending roughly northwest in the direction of the Sun. (Image credit: [Serra-Ricart, Licandro & Alarcon 2025](#))

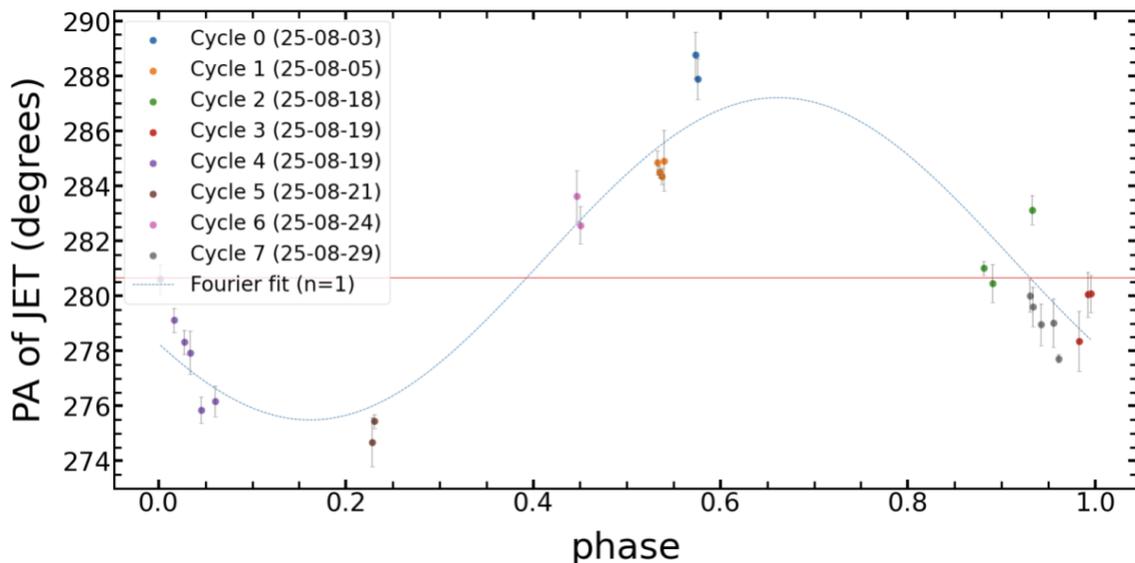
A new paper (accessible [here](#)) reports the detection of a periodic wobble in the anti-tail jet of the interstellar object [3I/ATLAS](#) with a period of $7.74 (\pm 0.35)$ hours during July and August, 2025. The wobble is the result of the anti-tail base (from where the jet is launched out of the nucleus) being offset from the poles associated with the rotation axis of the

nucleus. As a result of this offset, the jet axis exhibits precession along a cone surrounding the rotation axis, just like the rotating light beam of a lighthouse or a pulsar.

The paper analyses images of 3I/ATLAS from 37 nights between July 2 and September 5, 2025, taken by the Two-meter Twin Telescope (TTT) at the Teide Observatory in Tenerife, Canary Islands, Spain.

The images show a faint high-latitude anti-tail of 3I/ATLAS which maintains an almost, though not perfectly, constant position angle. Accurate measurements of the position angle of the jet at a projected distance of 6,000 kilometers from the brightness peak, reveal a periodic modulation consistent with a high-latitude jet undergoing precession around the rotation axis of the nucleus. This is the first periodic jet-angle modulation detected in an interstellar object.

The derived periodicity of $7.74 (\pm 0.35)$ hours may imply a nucleus rotation period of $15.48 (\pm 0.70)$ hours if the anti-tail originates from a single active spot near one of the poles associated with the rotation axis. This value is consistent with the period derived during July 2025 from the periodic brightness variability of 3I/ATLAS: $16.16 (\pm 0.01)$ hours (as reported [here](#)).



Phase angle of the position angle of the anti-tail of 3I/ATLAS, measured at a projected distance of 6,000 kilometers from the brightness peak and phased with the calculated $7.74 (\pm 0.35)$ hour period. The horizontal red line is the mean value of position angles, representing the sky-projected orientation of the rotation axis. (Image credit: [Serra-Ricart, Licandro & Alarcon 2025](#))

At 06:02 UTC (01:02 AM US Eastern Time) of Friday, December 19, 2025, 3I/ATLAS will get to a perigee distance of $268.9097 (\pm 0.0060)$ million kilometers. Coincidentally, this night is also a New Moon, and so mother Nature is kind enough to allow Earthlings to watch

3I/ATLAS without the contamination of moonlight. The data collected around that time by multiple telescopes on Earth and in space will educate us about the qualities of our latest interstellar visitor.

The appeal of 3I/ATLAS to people of all backgrounds was demonstrated in two new messages that I received today before my morning jog at sunrise.

Letter 1:

“Dear Professor Loeb,

My name is Carlos Mendoza. I am writing to you from the Chilean, Patagonia—often called the "End of the World." Here, under some of the darkest and most pristine southern skies on Earth, your recent analysis of the interstellar object 3I/ATLAS resonates deeply

Your relentless pursuit of the truth, regardless of established consensus, is a source of great inspiration here at the southern edge of the continent. Living in such a remote landscape teaches us that reality is often stranger and more vast than we assume. Your courage to challenge scientific dogma encourages us to look up with the same sense of wonder and possibility.

Thank you for reminding the world that science should be an adventure into the unknown, not just a defense of the known.

Sincerely,

Carlos

Patagonia, Chile”

Letter 2:

“Hi Avi,

After we spoke, two historical examples came to mind about paradigms determining perception (or at least interpretation):

Because of Aristotelian cosmology that held that the sun was perfect, early astronomers were positive that sunspots were satellites (it was easier for them to reach that clumsy conclusion rather than offer the most straightforward interpretation of what they observed).

U.S. radar operators detected the Japanese planes on the morning of December 7, 1941, but the aircraft were interpreted as expected B-17 bombers from California, because the American threat model did not include a Japanese attack on Pearl Harbor.

Both illustrate a greater attachment to the received hypothesis than to data. I take it this is your concern with the insistence on seeing 31/Atlas as a natural comet before all data is collected.

Warmly,

Nir

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(Image Credit: Chris Michel, National Academy of Sciences, 2023)

Avi Loeb is the head of the Galileo Project, founding director of Harvard University's - Black Hole Initiative, director of the Institute for Theory and Computation at the Harvard-Smithsonian Center for Astrophysics, and the former chair of the astronomy department at Harvard University (2011-2020). He is a former member of the President's Council of Advisors on Science and Technology and a former chair of the Board on Physics and Astronomy of the National Academies. He is the bestselling author of "[*Extraterrestrial: The First Sign of Intelligent Life Beyond Earth*](#)" and a co-author of the textbook "[*Life in the Cosmos*](#)", both published in 2021. The paperback edition of his new book, titled "[*Interstellar*](#)", was published in August 2024.