Rapidly Evolving X-ray Oscillations in the Active Galaxy 1ES 1927+654

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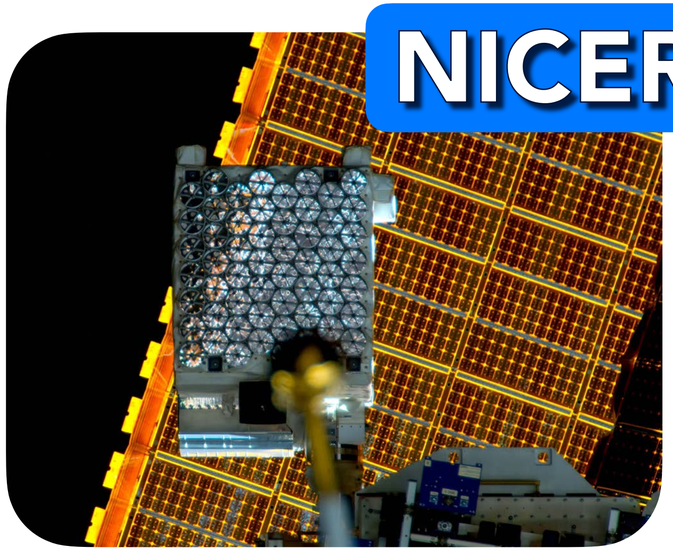
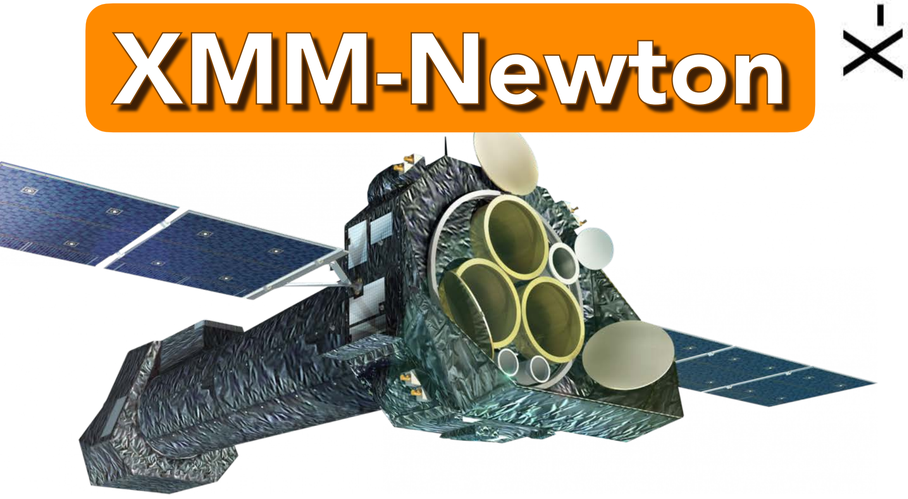
Megan Masterson, MIT
mmasters@mit.edu
919-325-6552

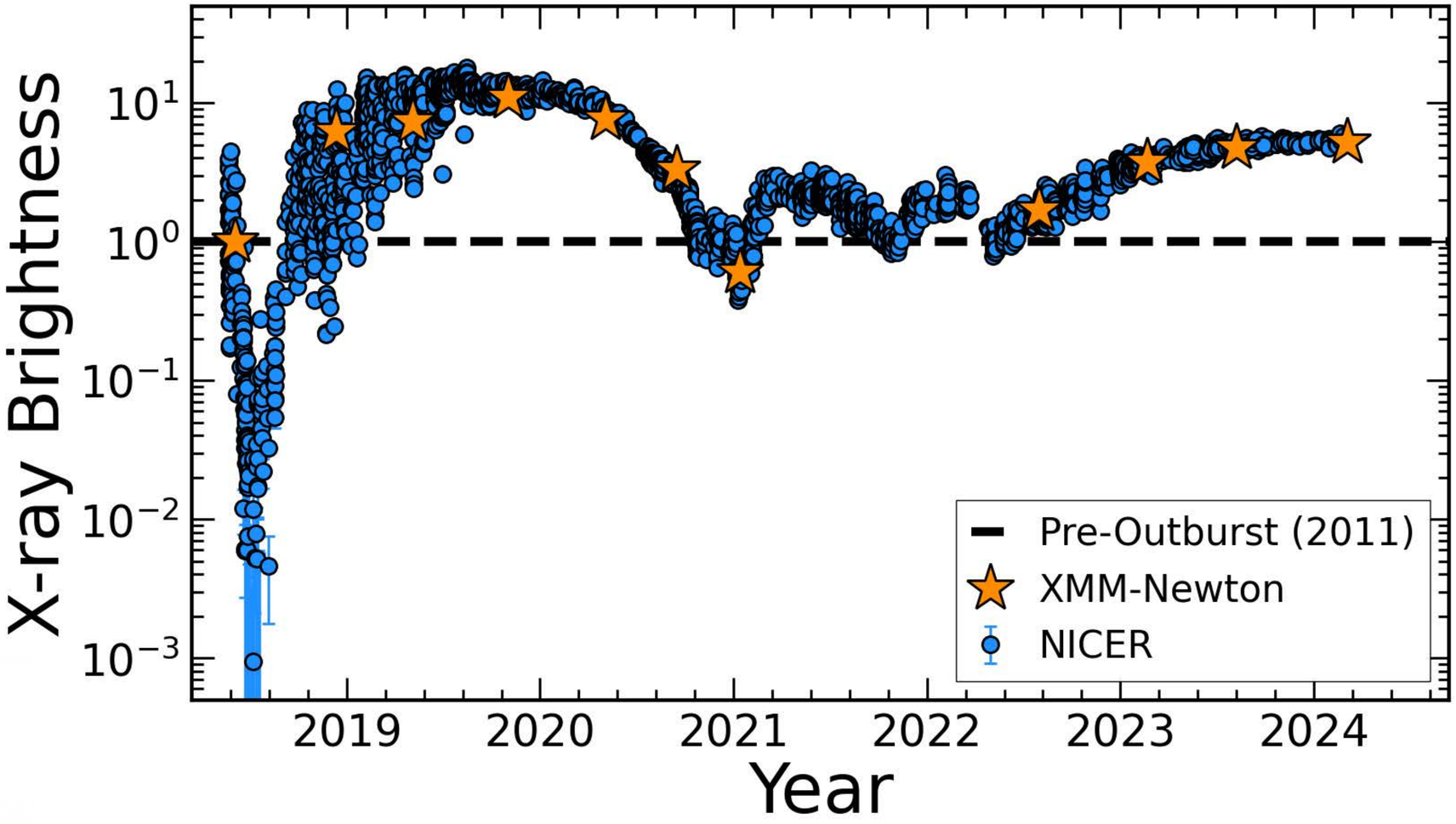
MIT KAVLI INSTITUTE

Image Credit: NASA/Sonoma State University, Aurore Simonnet

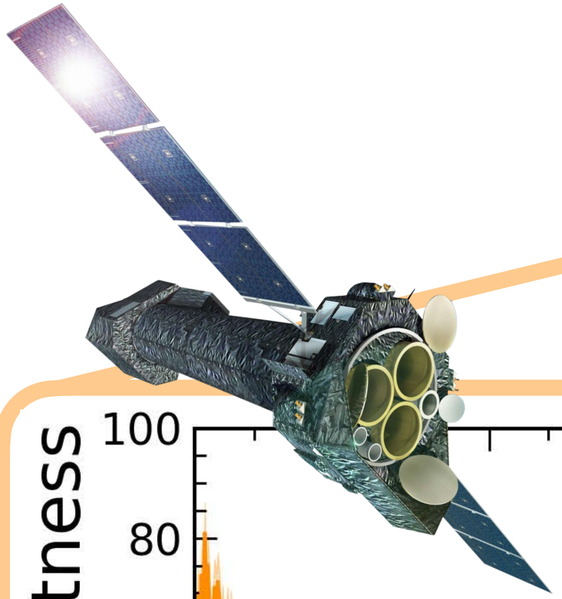
An active galaxy with exquisite X-ray coverage

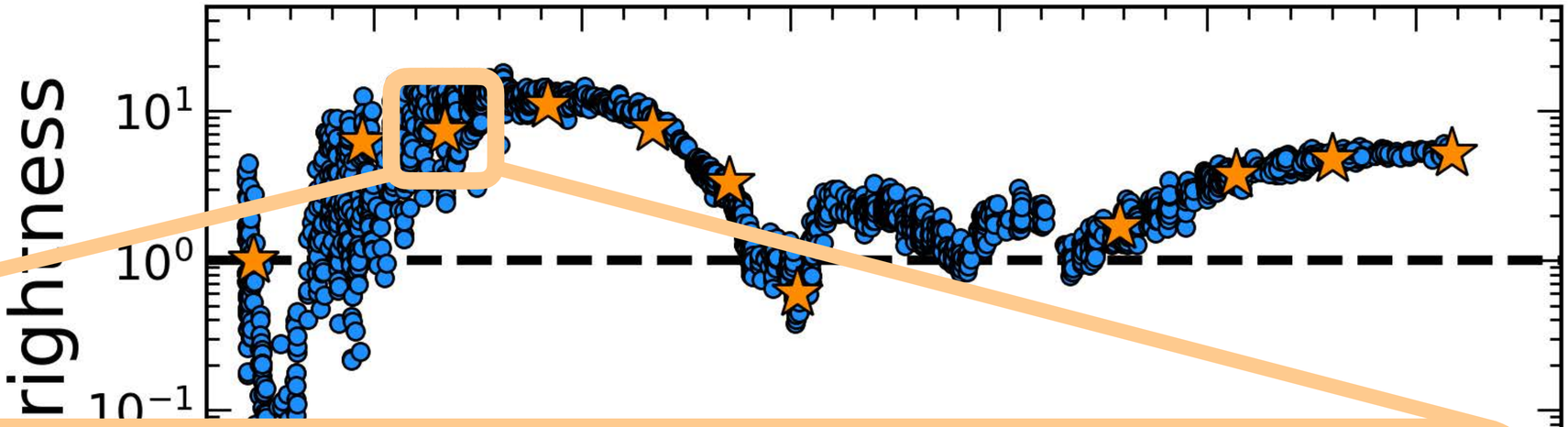


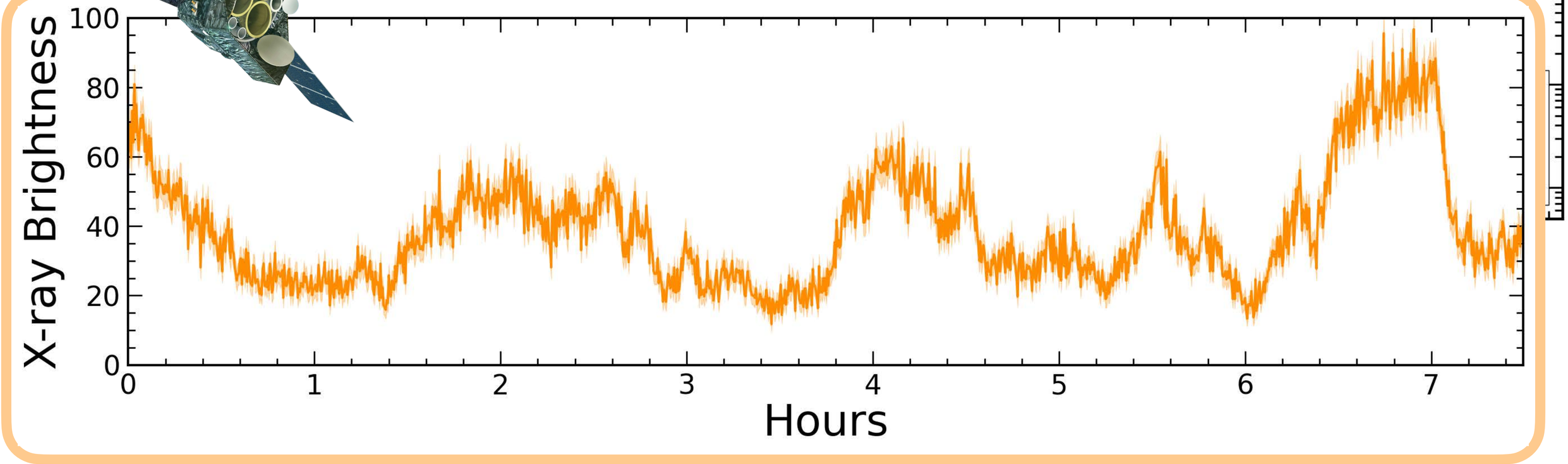




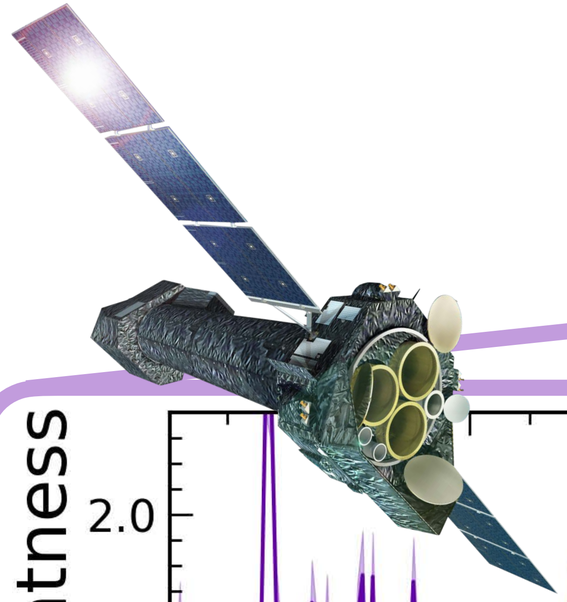
2018-2021: relatively standard variability

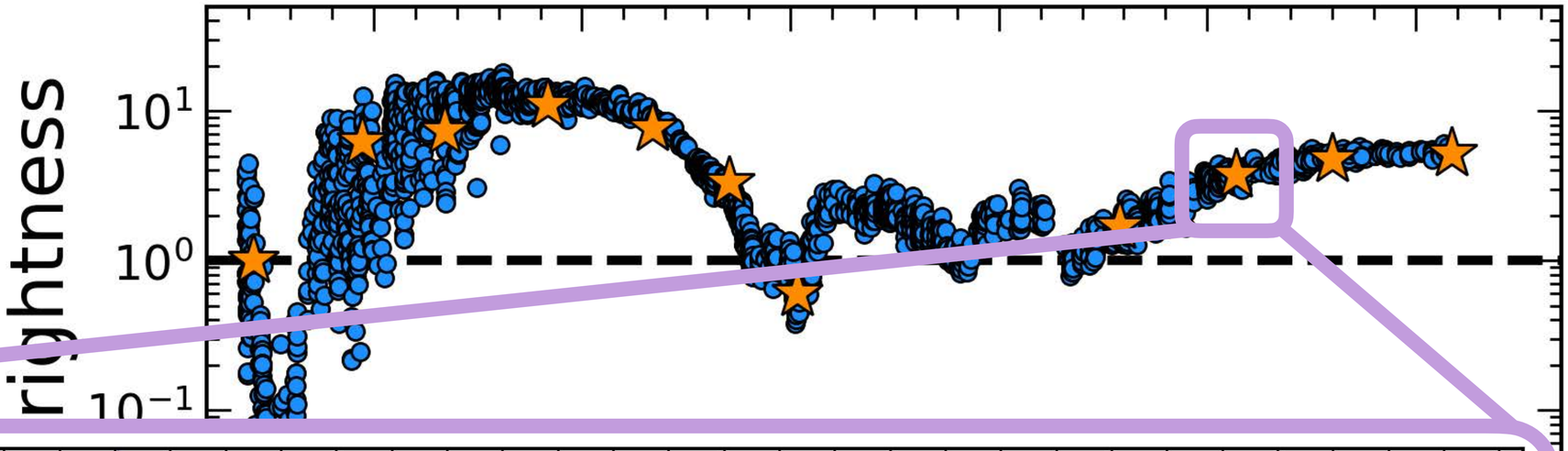


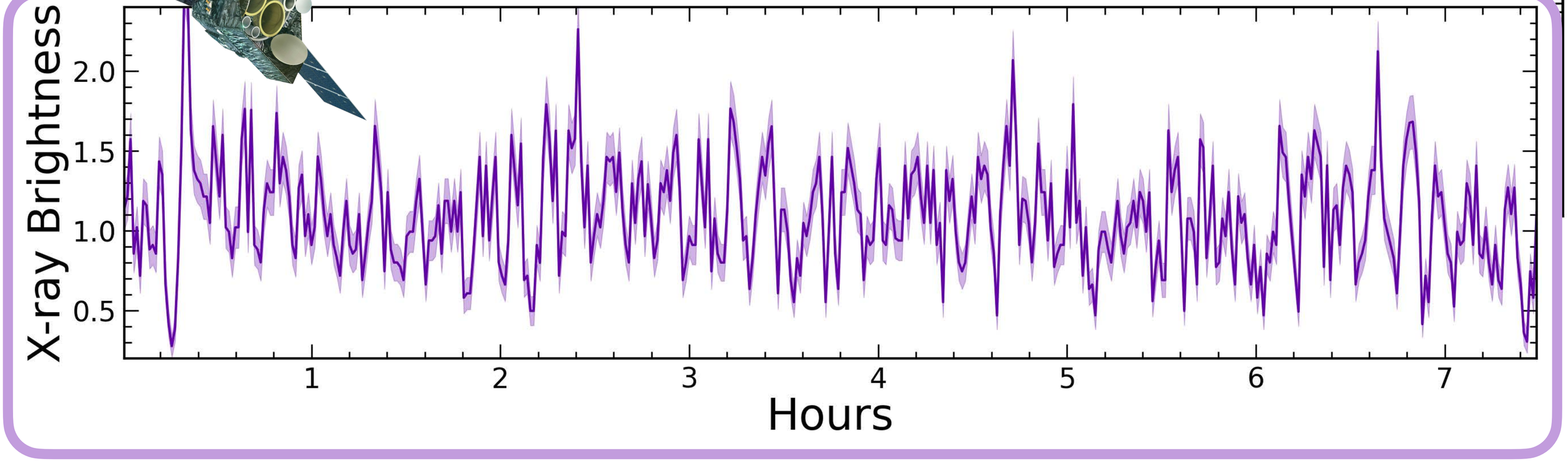




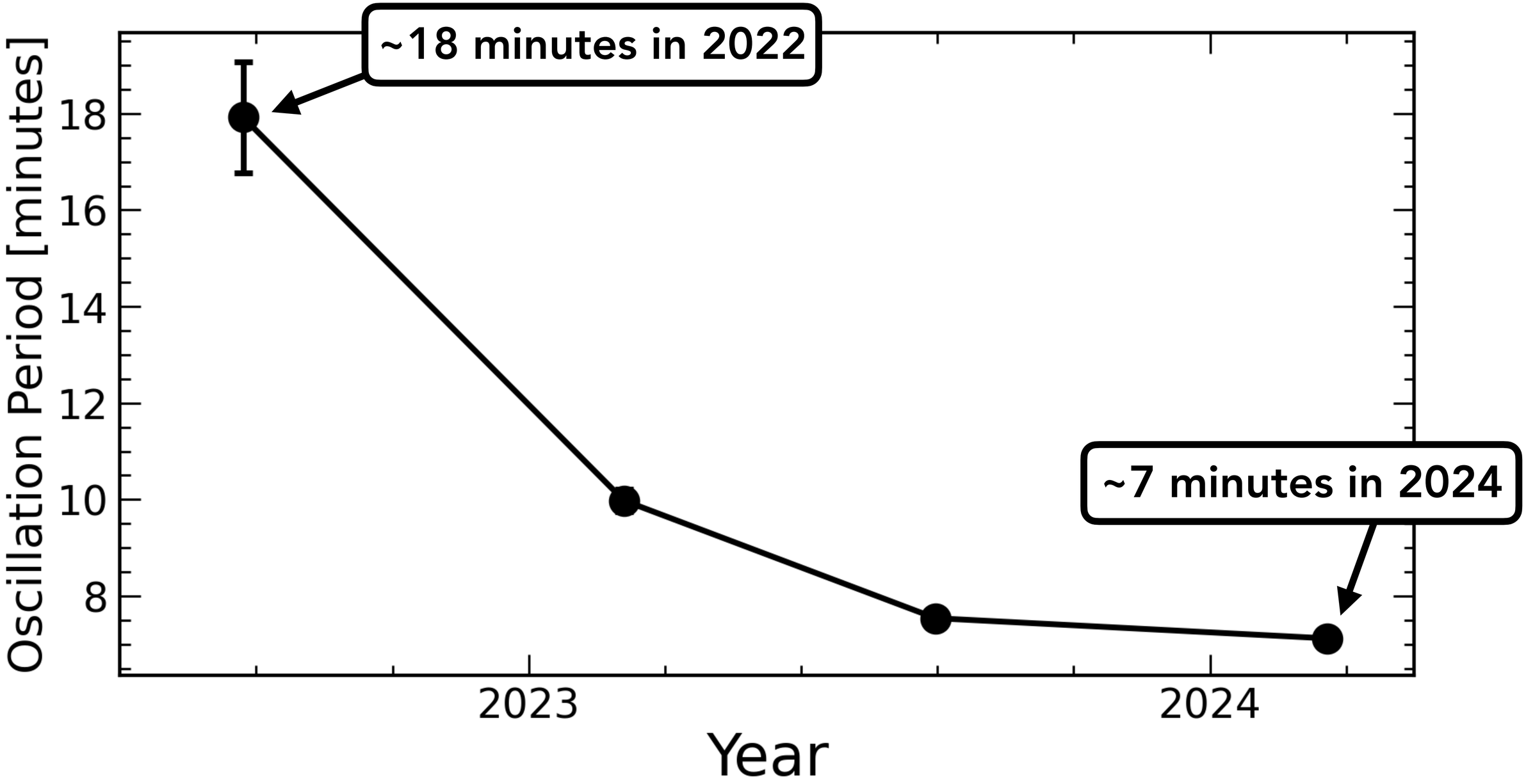
2022-now: rapid X-ray oscillations







A dramatically changing period



Is the newly formed **jet oscillating**?

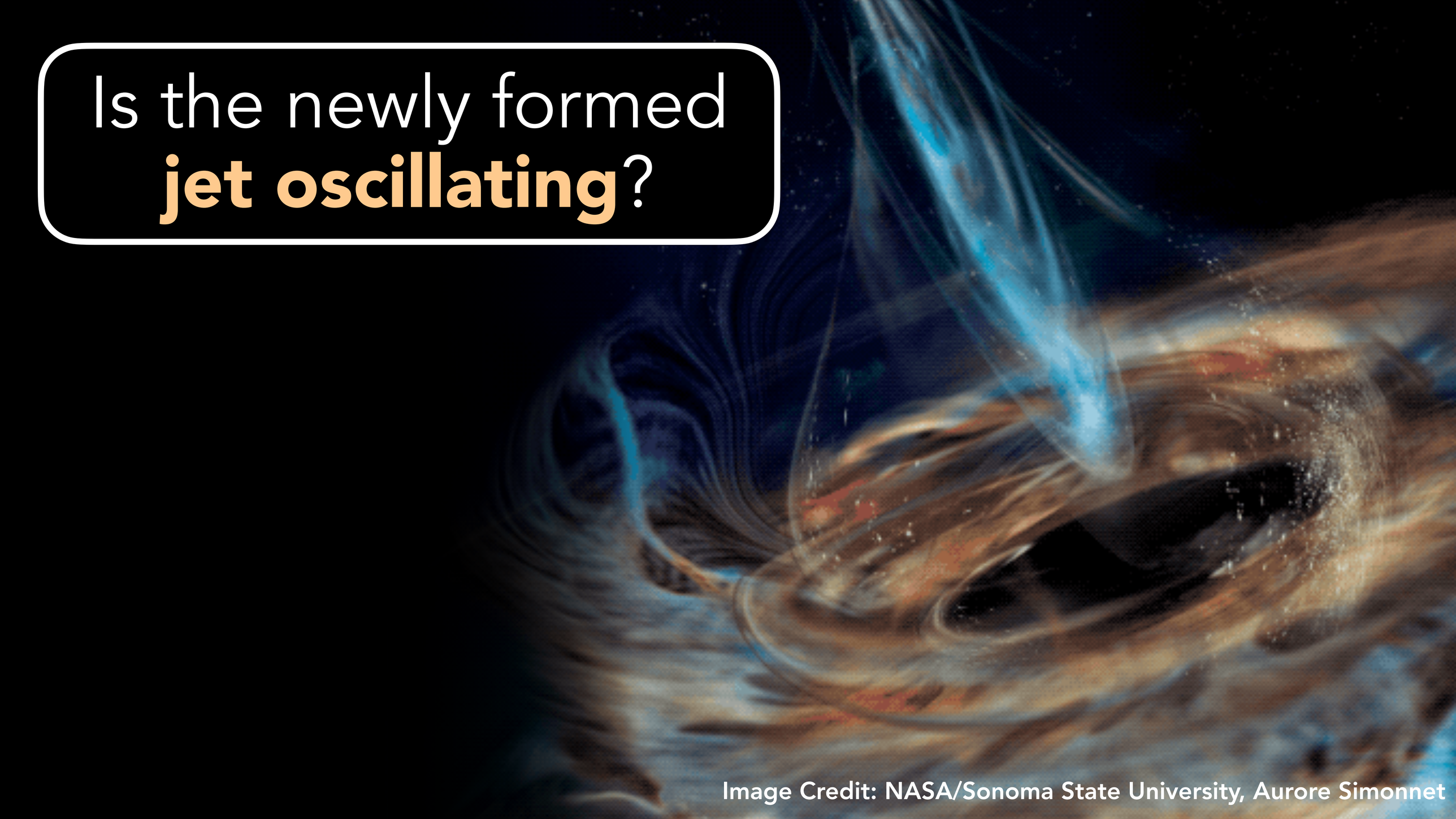
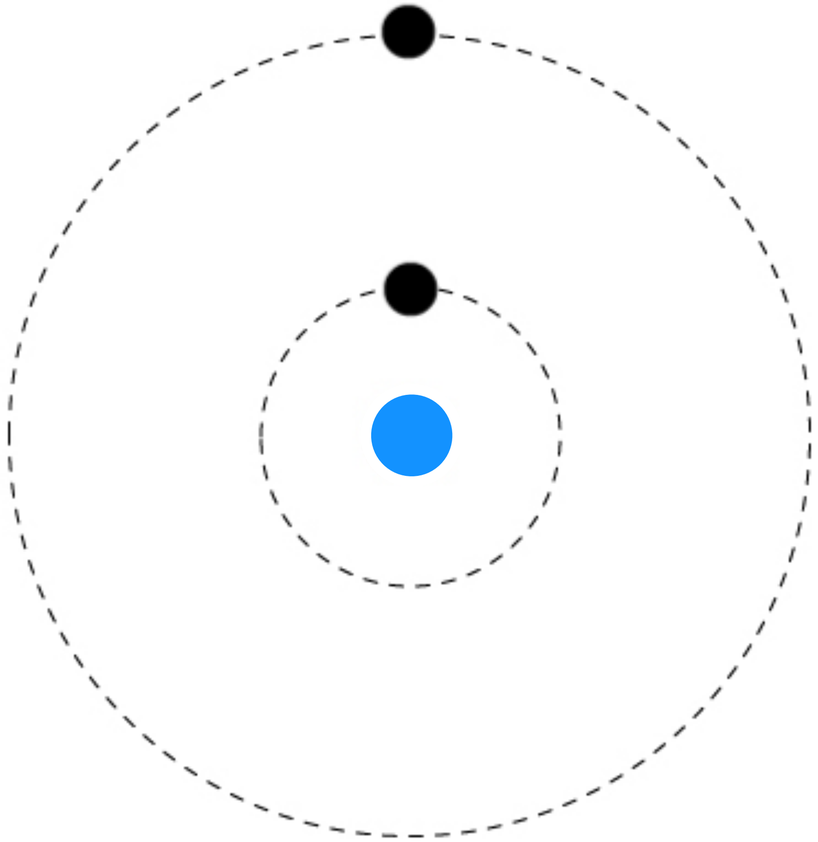


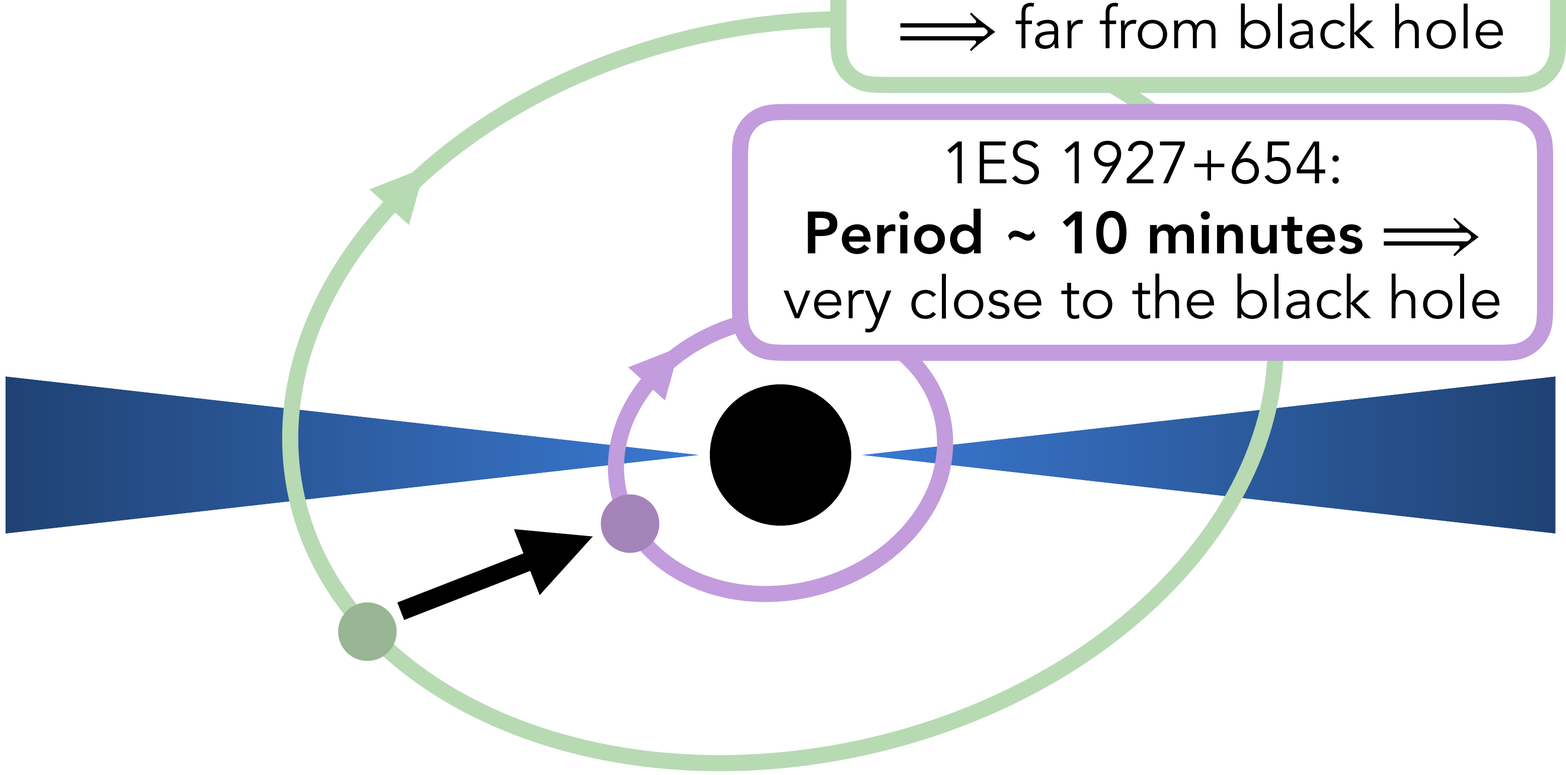
Image Credit: NASA/Sonoma State University, Aurore Simonnet

Or is something **orbiting** the black hole?



Other nuclear transients:
Periods ~ hours-days
$\Longrightarrow$ far from black hole

1ES 1927+654:
Period ~ 10 minutes $\Longrightarrow$
very close to the black hole

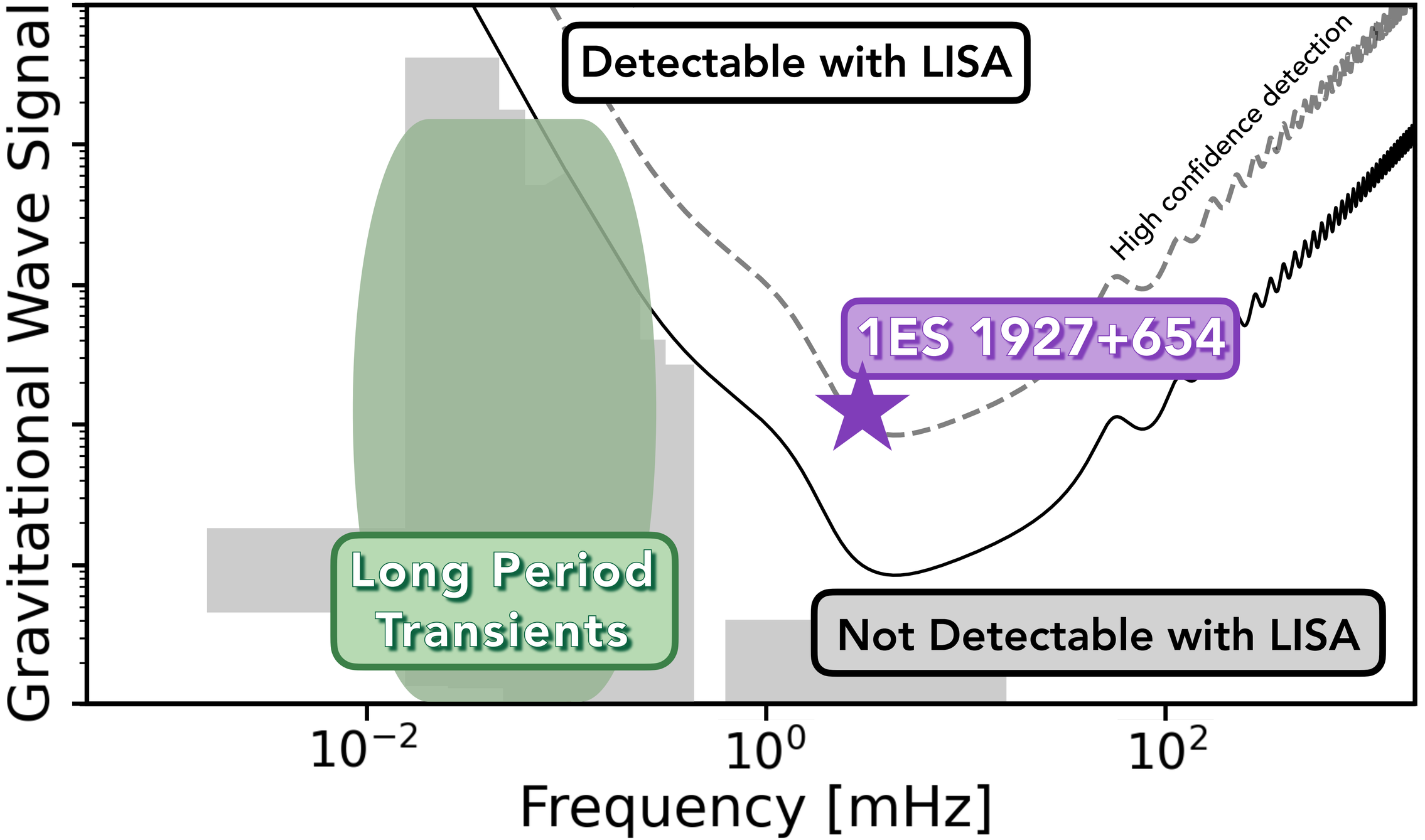


Movie Credit: NASA/JPL-Caltech

The companion must be a **white dwarf** — the remnant of star like our Sun

Image Credit: NASA/Sonoma State University, Aurore Simonnet

Figure credit: Joheen Chakraborty



We discovered **rapidly evolving millihertz oscillations** in an extreme supermassive black hole

These oscillations could arise from either **jet oscillations** or a **white dwarf in orbit** around the black hole

If driven by a white dwarf, this system will be **detectable with next generation gravitational wave detectors**

Megan Masterson, MIT
mmasters@mit.edu
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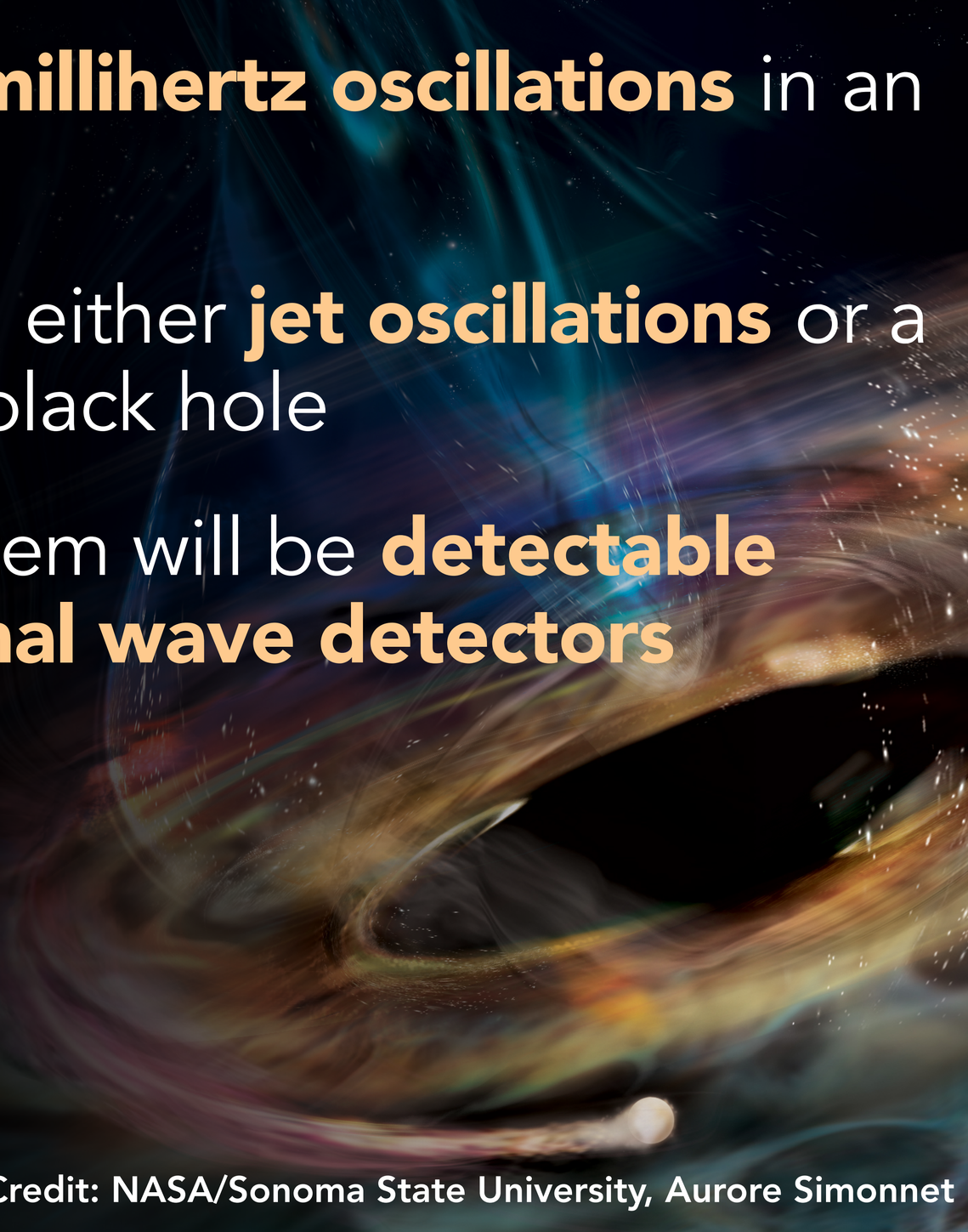

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