

AMPM

Searching for Asteroid-Mass Primordial Black Hole Microlensing

AMP

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→ Why + How + Cool finds

Motivation

Classic DM preamble of 'hidden' mass around galaxies + doesn't interact with light

From ~1980s, try to explain the Dark Halo around galaxies using *known objects*

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MACHOs

Could be Black Holes



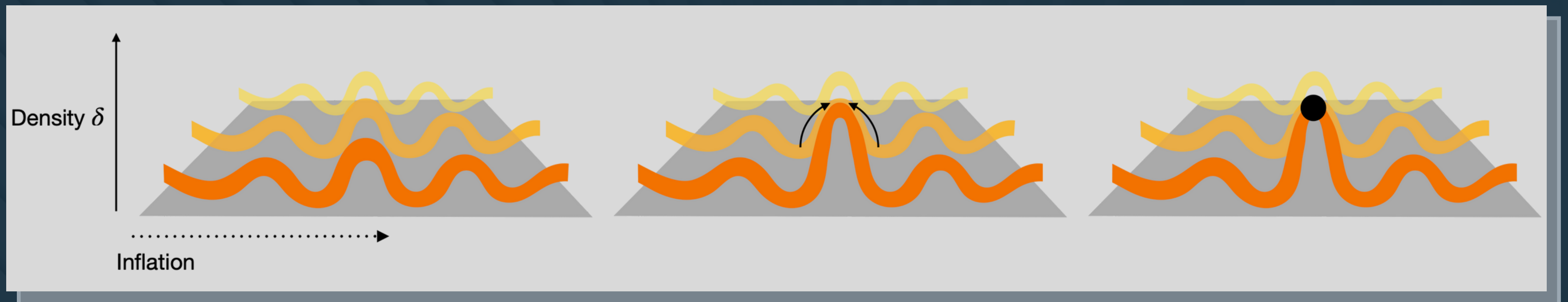
credit: NASA

Not your regular BH

Stellar black holes form too late after BB to be DM

Perturbations in the primordial Universe create Primordial Black Holes

"Volumes where gravity exceeds the rate of expansion...would have collapsed again" -Hawking, 1971



Microlensing

Gravitational lensing of single stars by low-mass objects

Images extend over microarcseconds



Overall stellar amplification

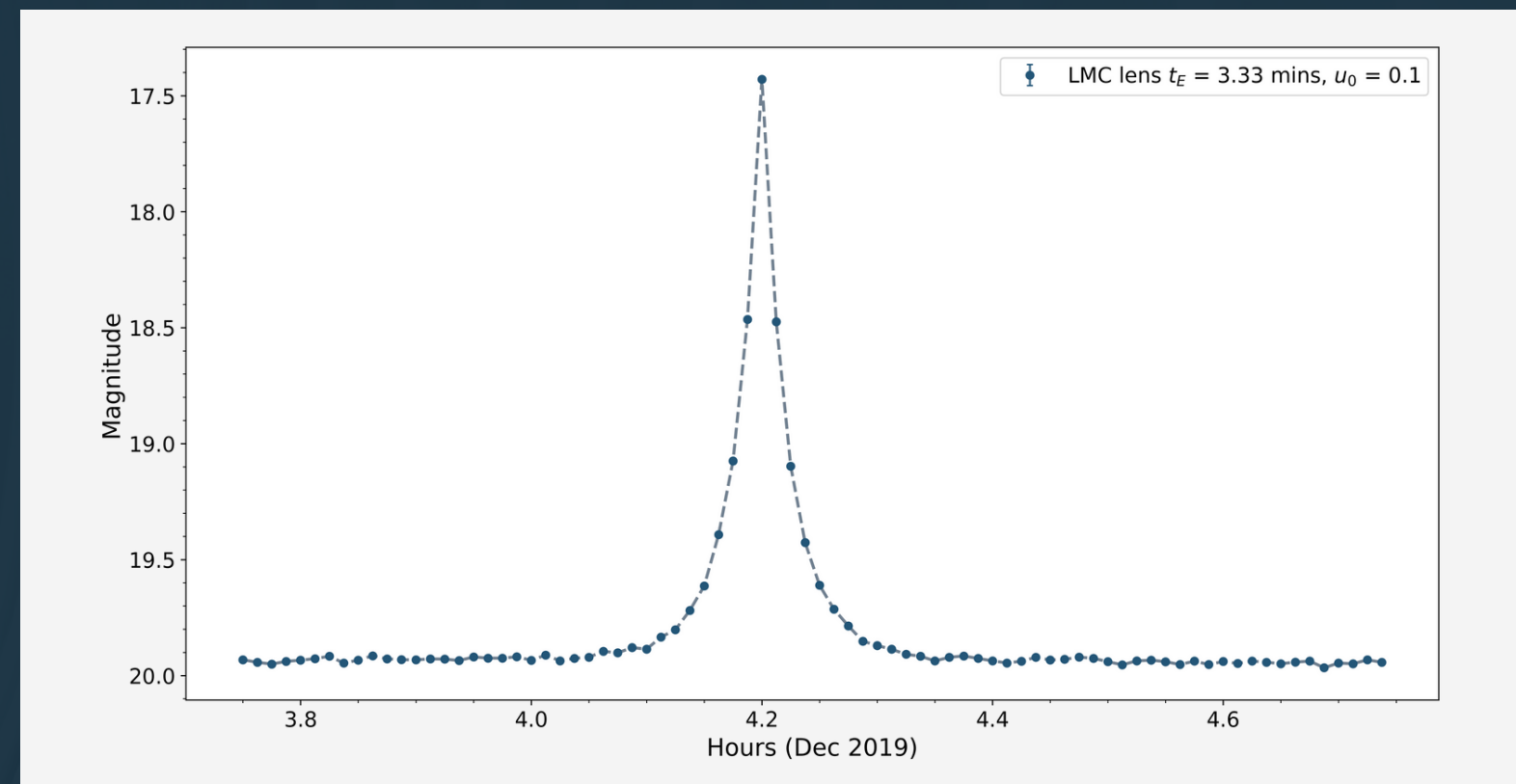
Microlensing

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$$A(u(t)) = \frac{u^2 + 2}{u\sqrt{u^2 + 4}}$$

$$u(t) = \sqrt{\frac{(t - t_0)^2}{t_E^2} + u_0^2}$$

Overall stellar amplification



Microlensing

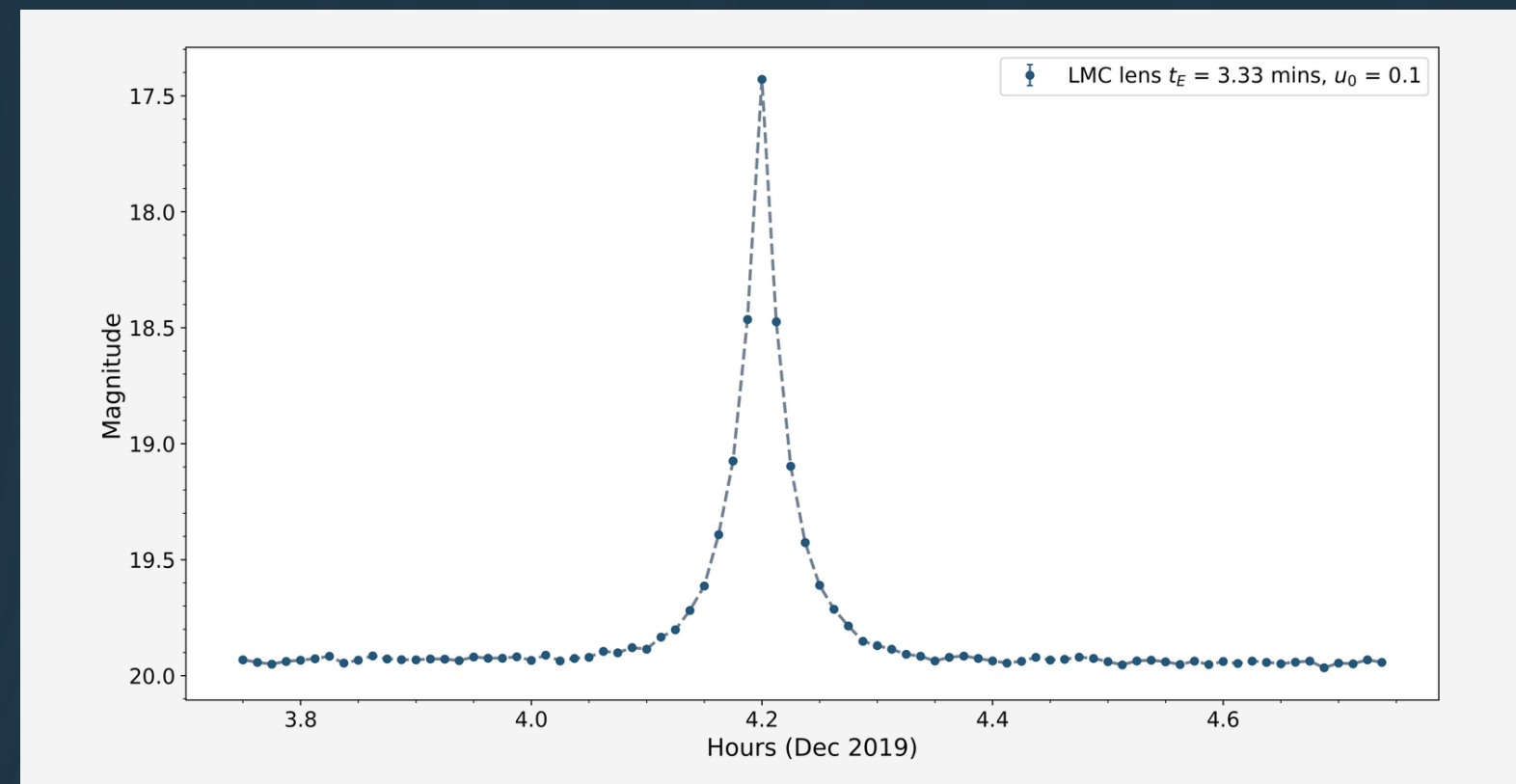
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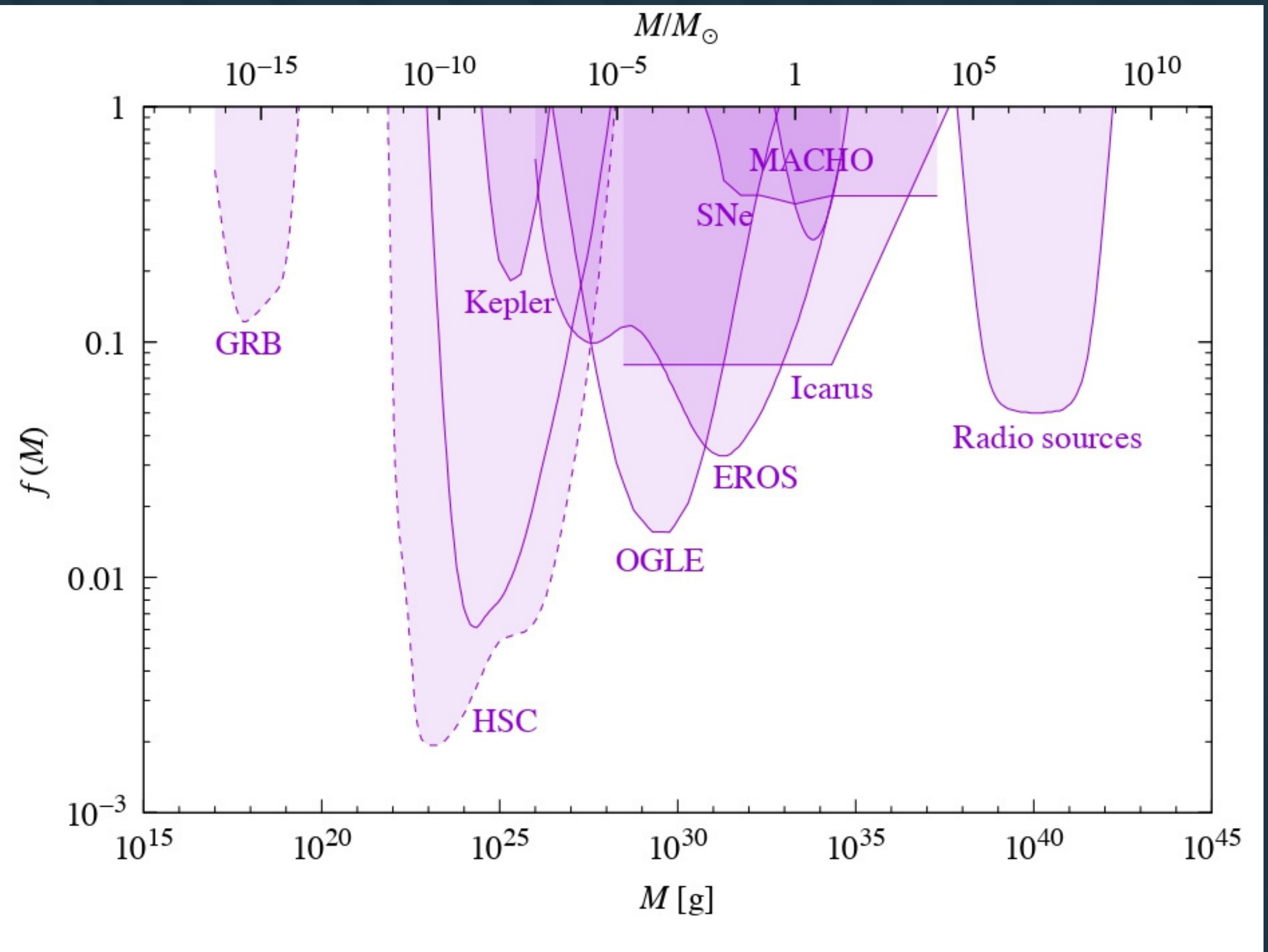
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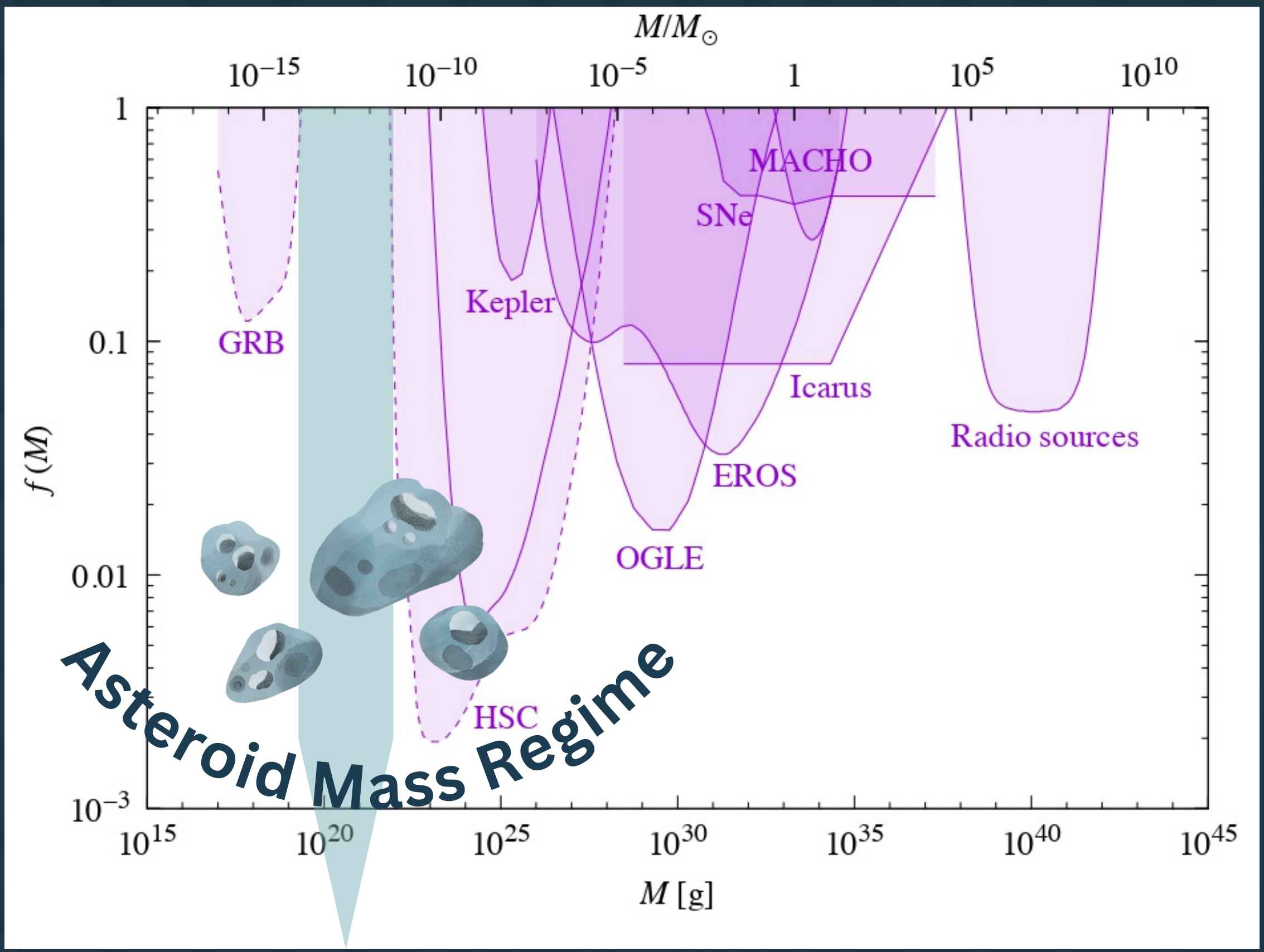
t_E sets the duration, relies on PBH mass

Overall stellar amplification





credit: Carr, 2022

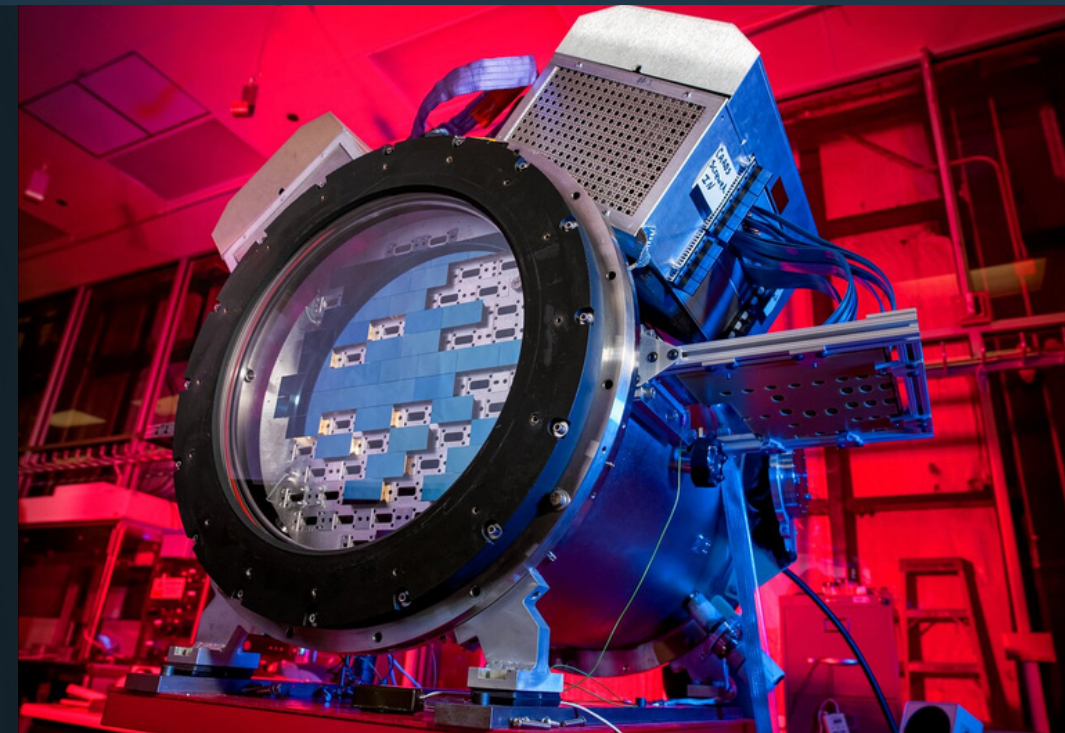


credit: Carr, 2022

AMPM

Use DECam to get 20 second exposures of 2 Million stars in the LMC

Find (or not find) the
smallest PBHs



credit: NOIRlab, NOAO

Quality control
by Detrending

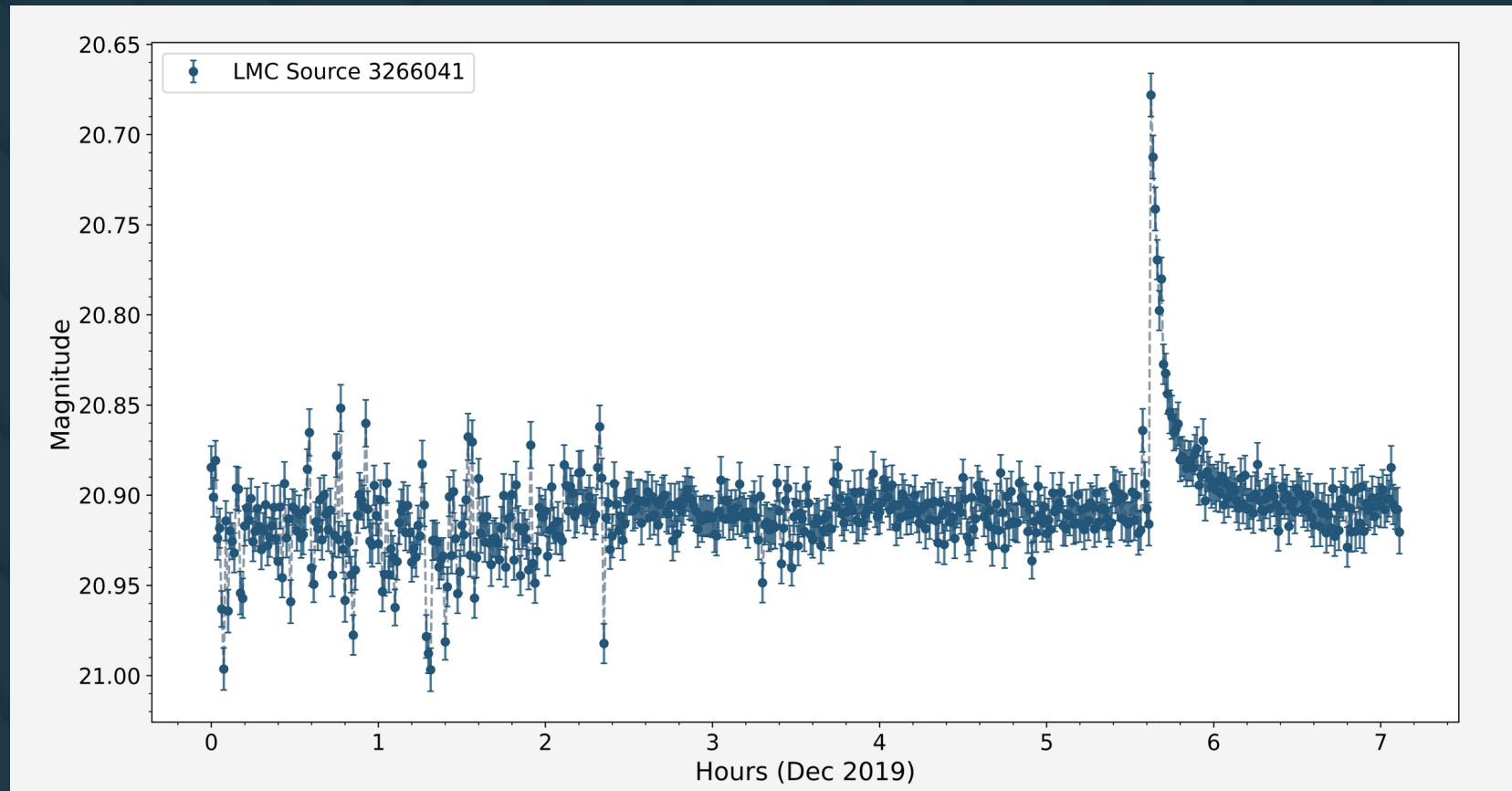
Find Peaks in
light curves

Determine
lenses and model fit

Compare detected
to expected

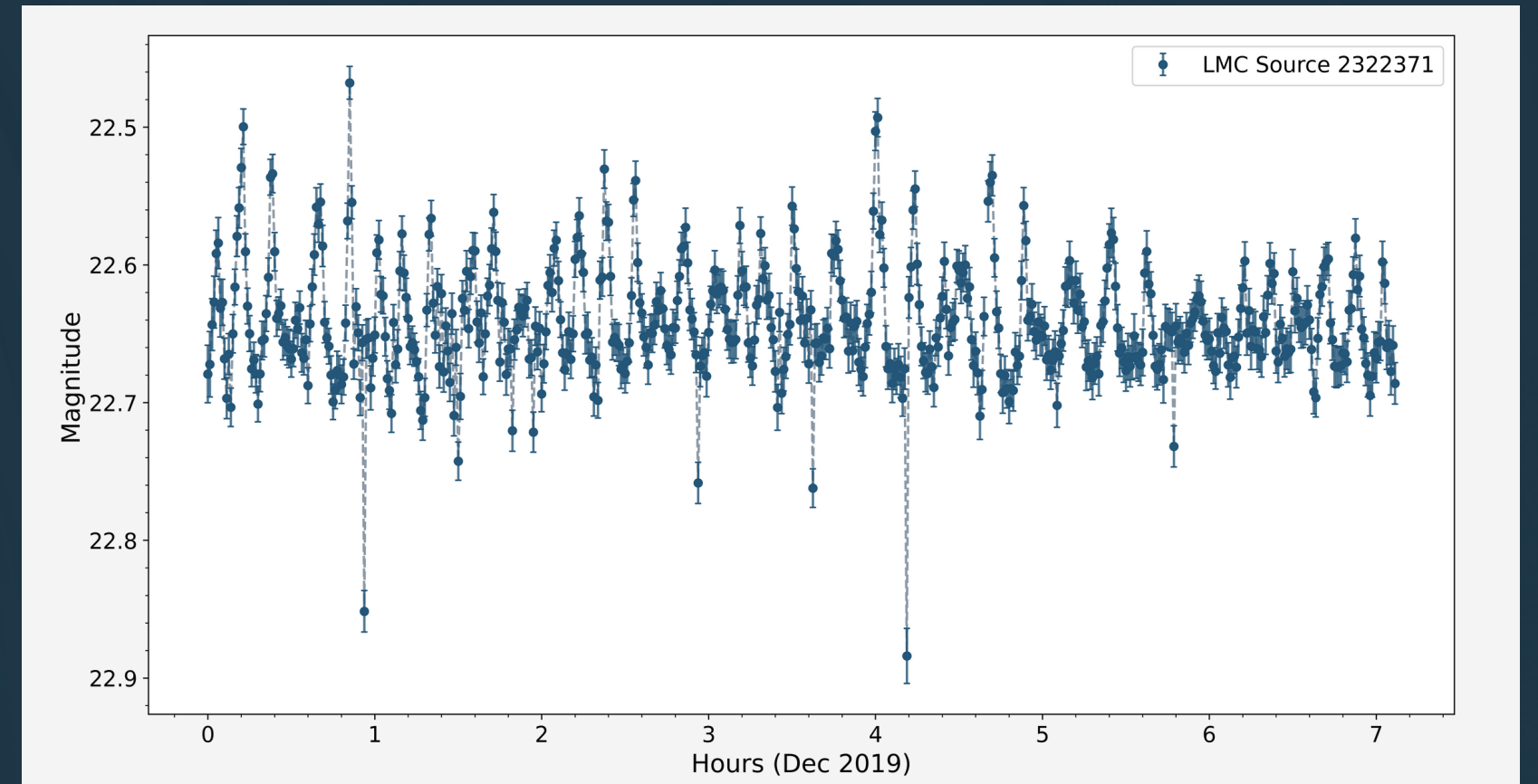
Fun Things

Fast Flares



A Solar Flare that explodes for less than 30 minutes!

ZZ Ceti



A rare pulsating White Dwarf in front of the LMC with period of 12 minutes