

GRAVITATIONAL LENSING

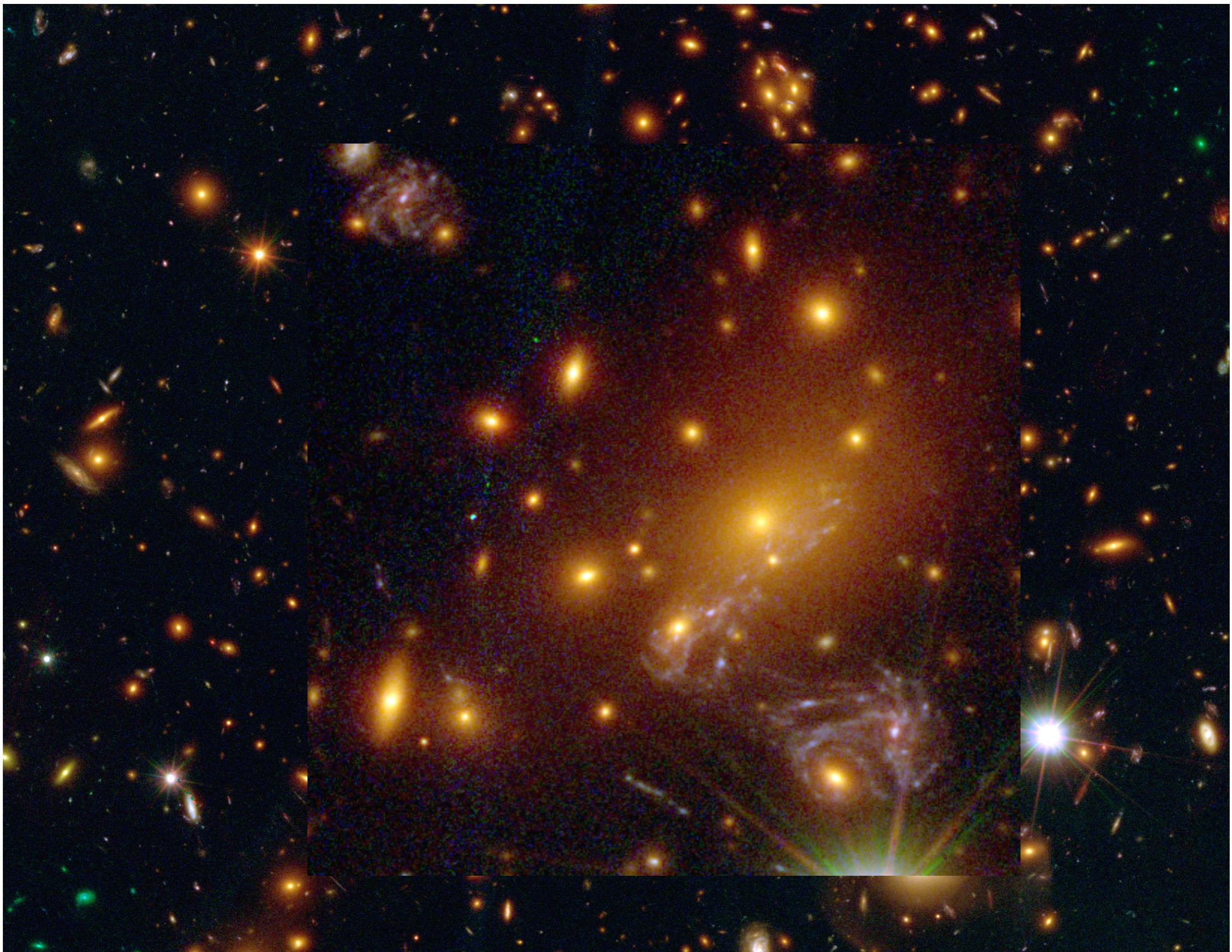
9 - TIME DELAYS, MICROLENSING

Massimo Meneghetti
AA 2018-2019

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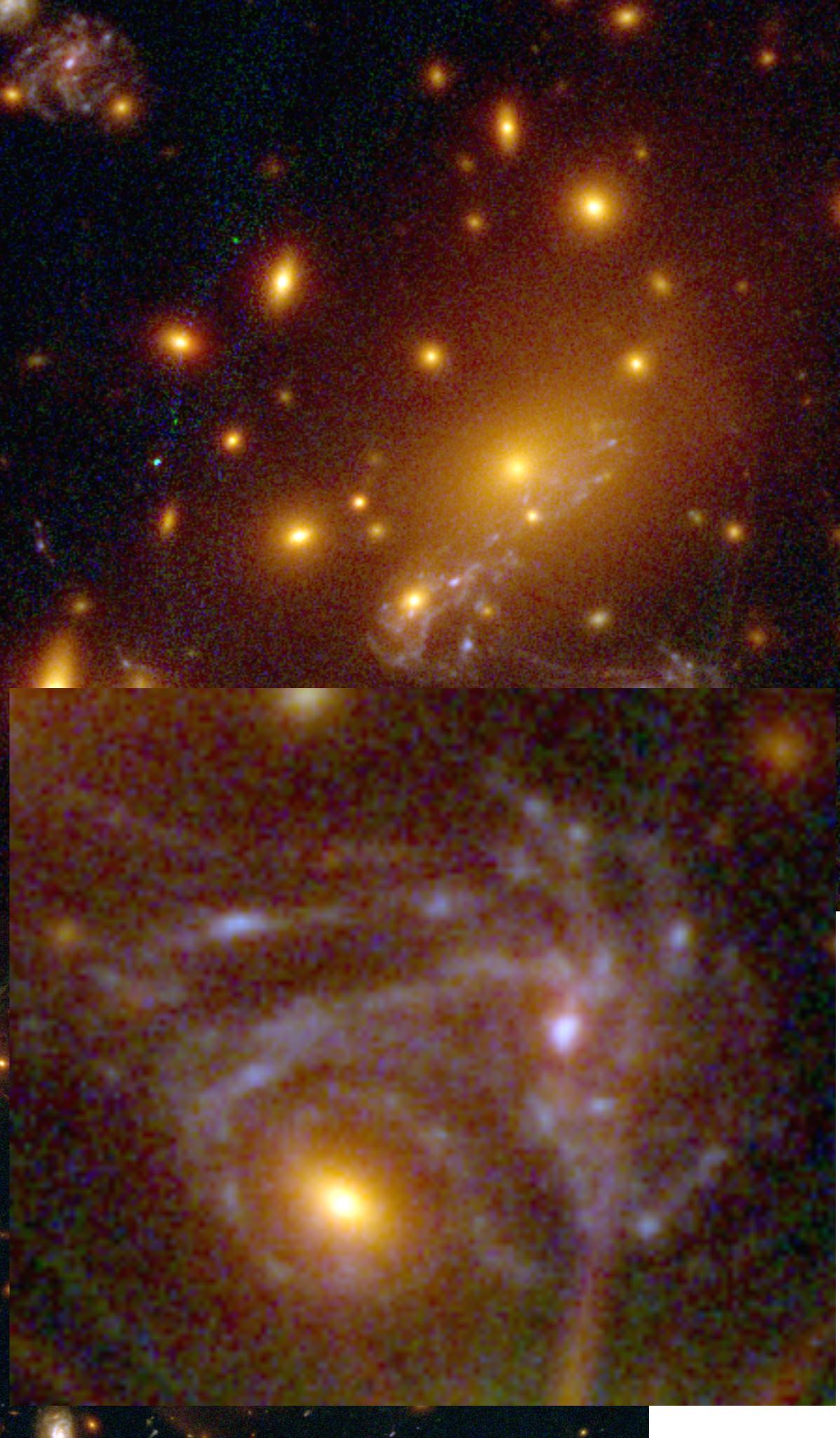
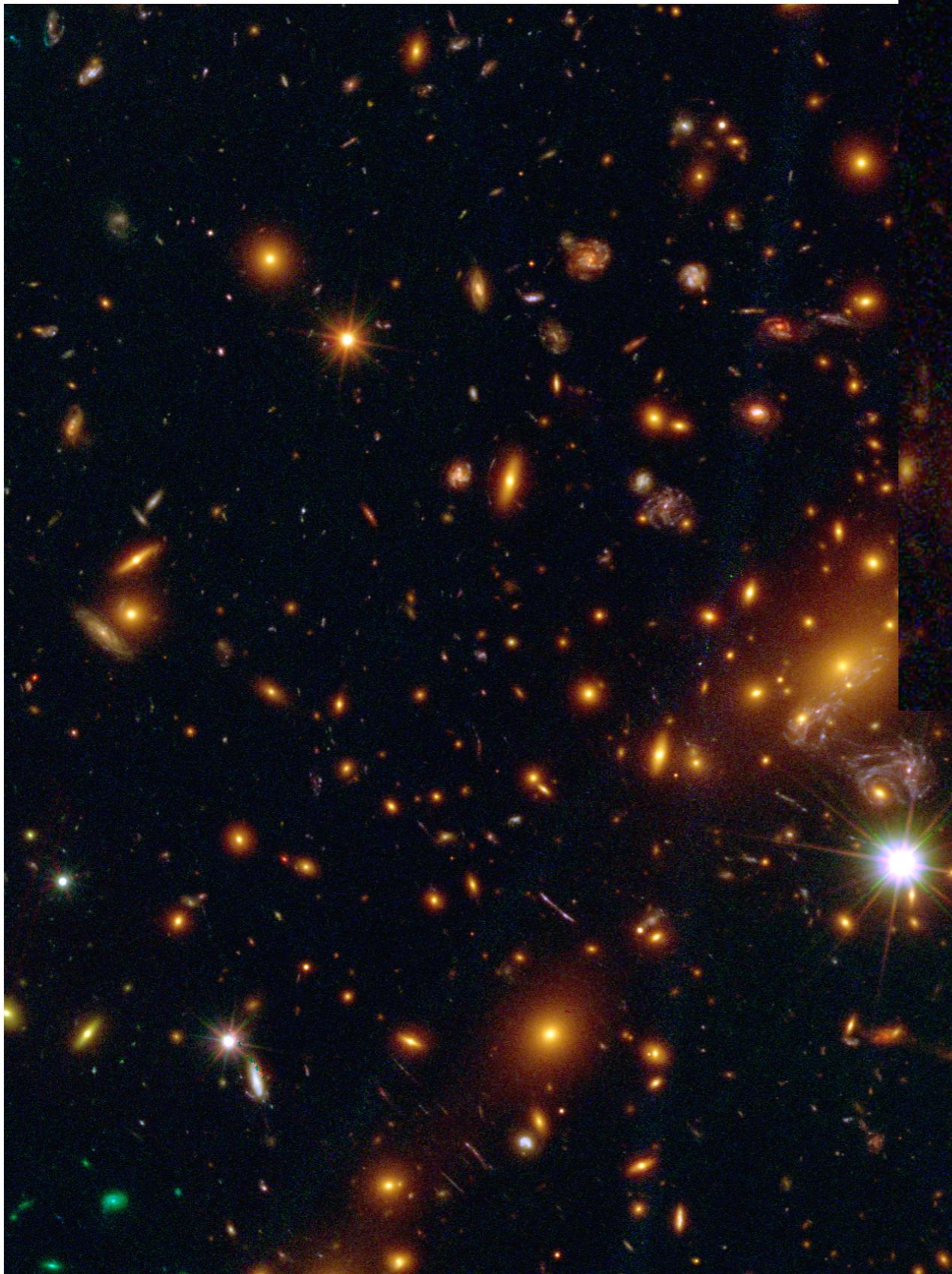
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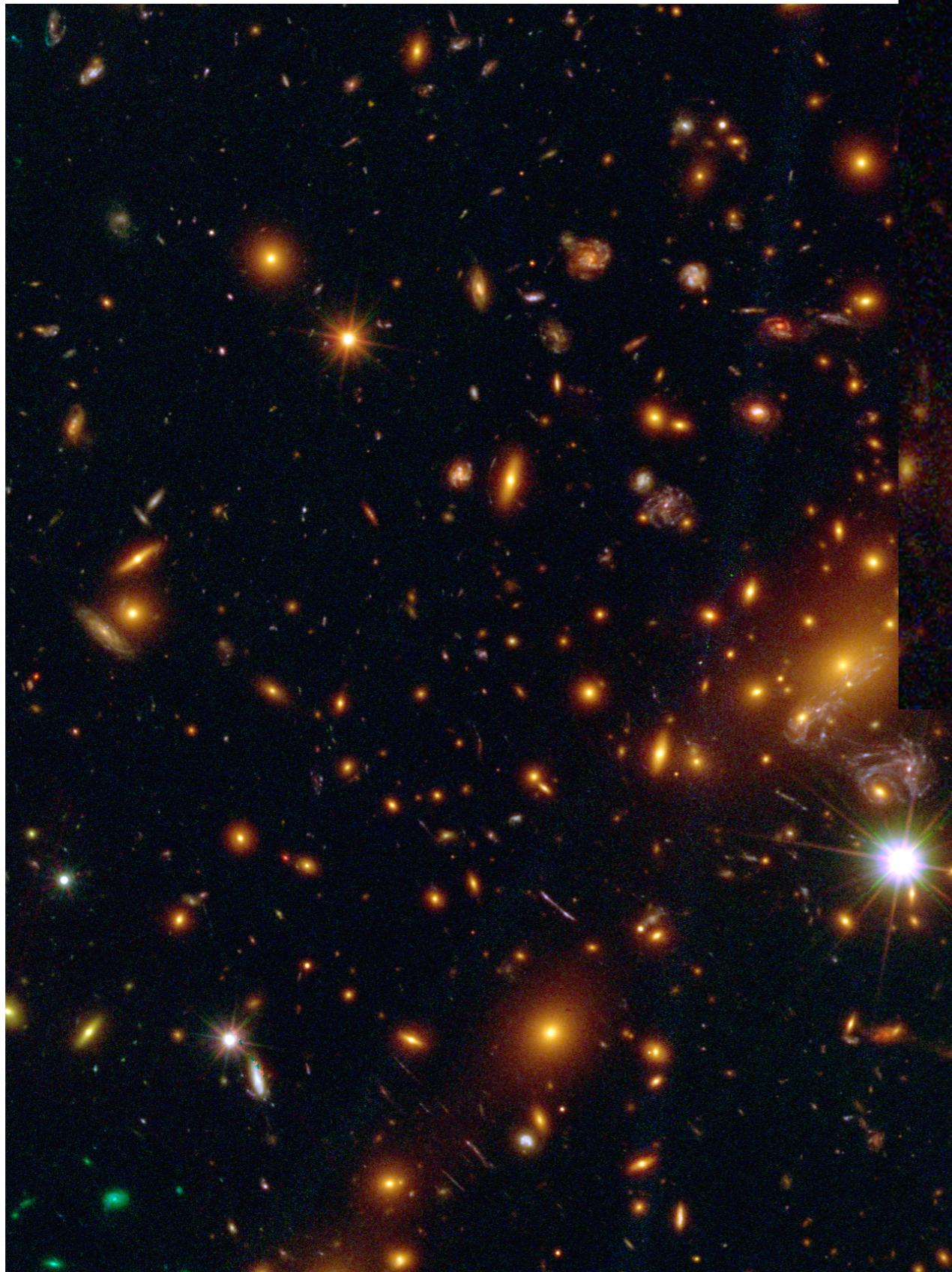
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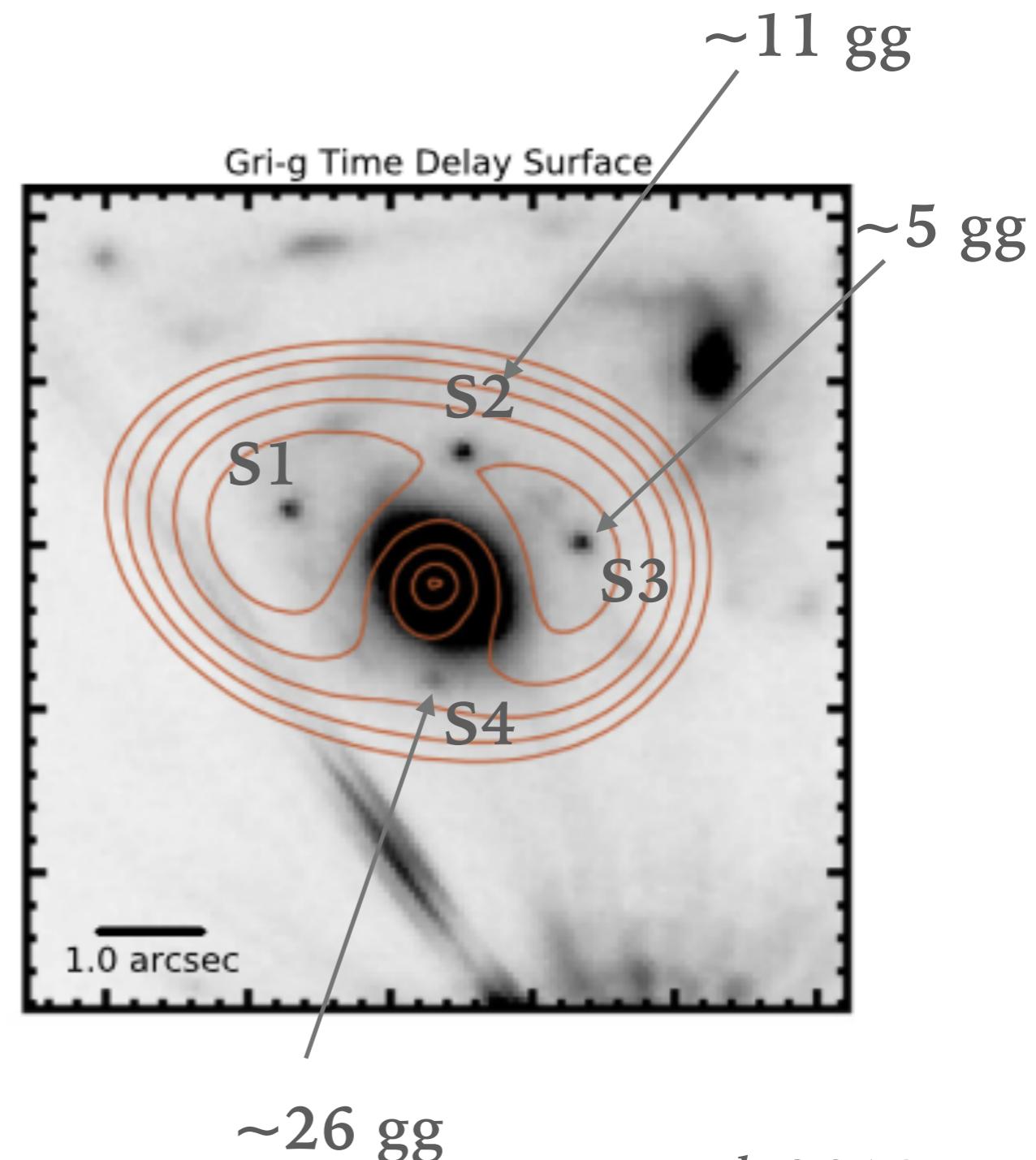
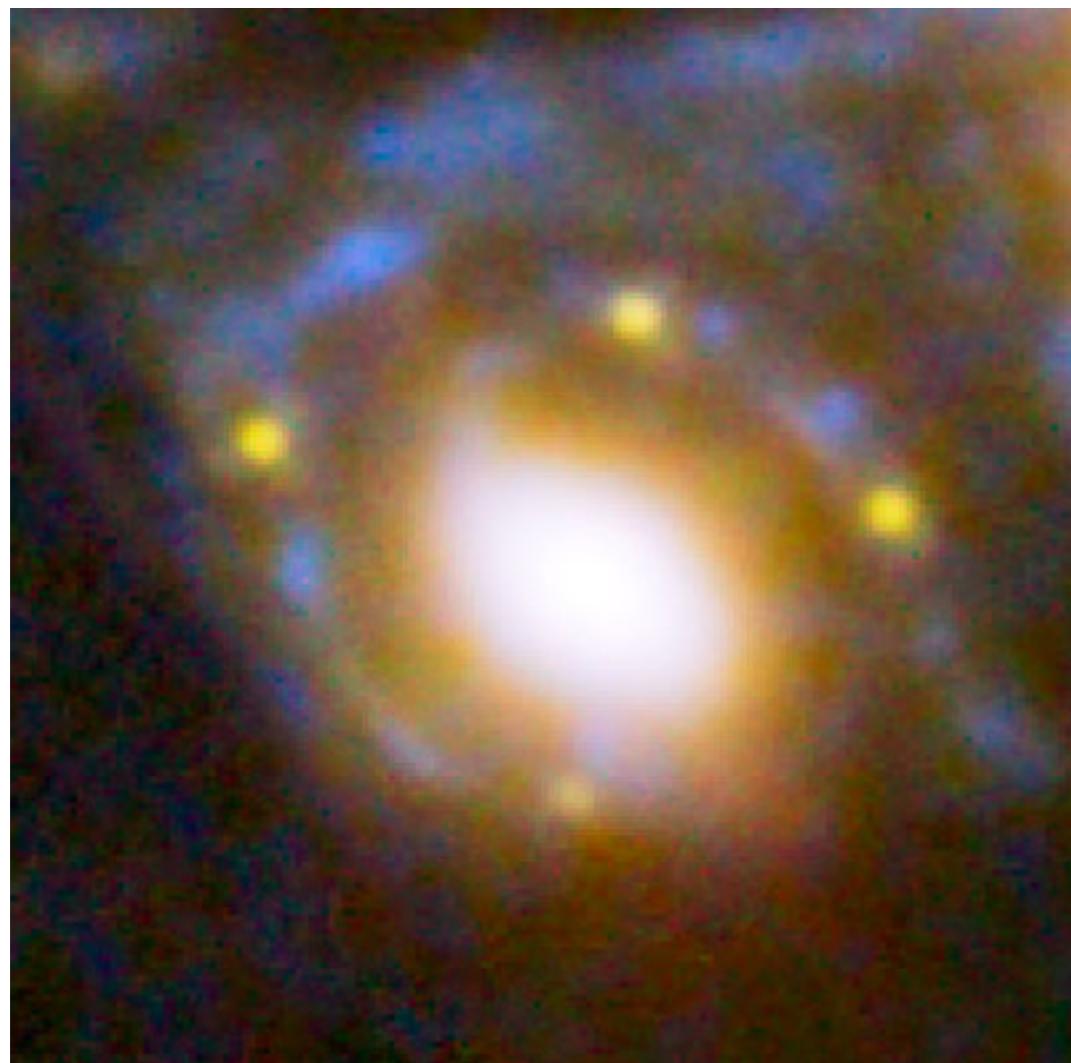


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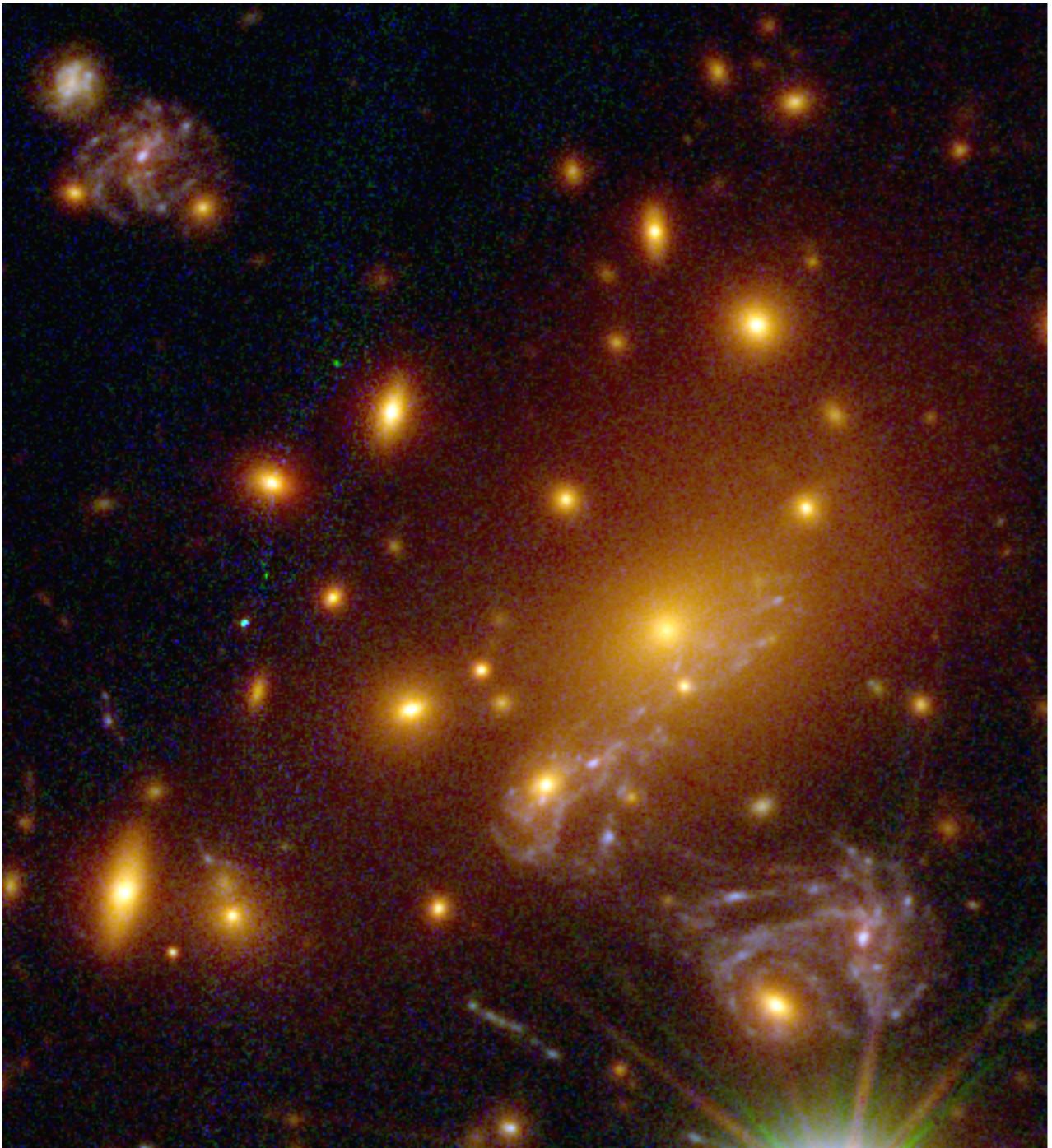


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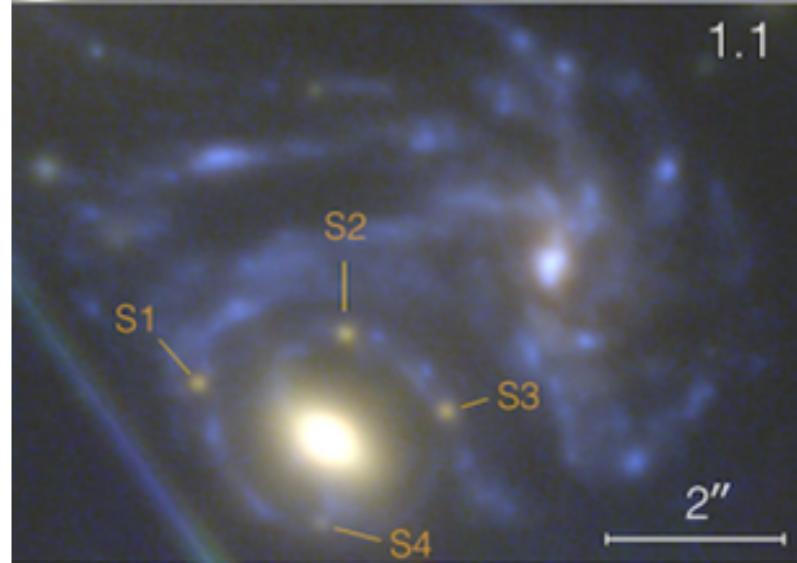
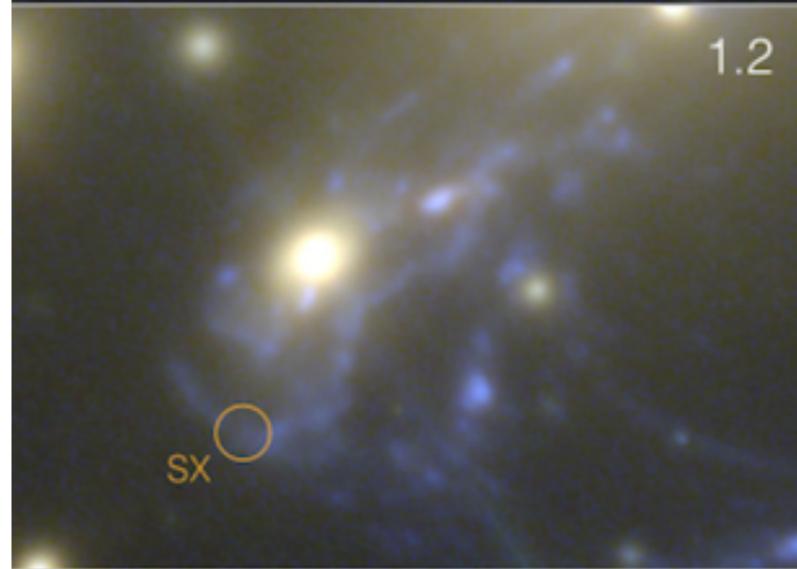
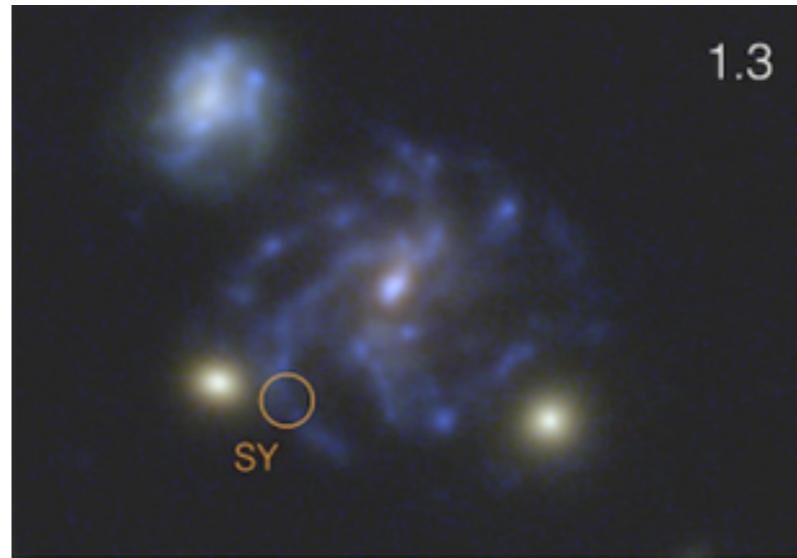
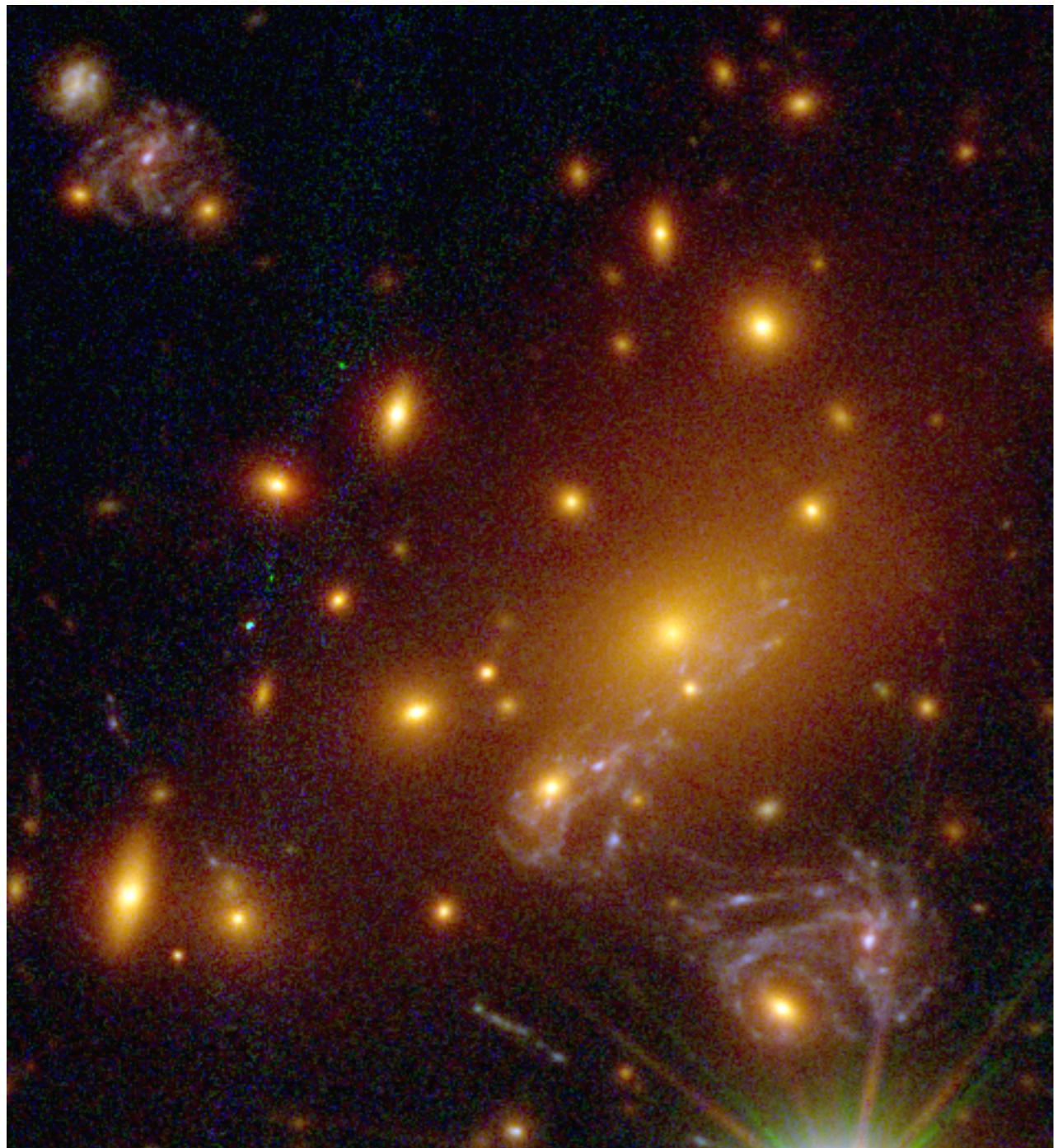
Nov. 2014 (*Kelly et al.*)



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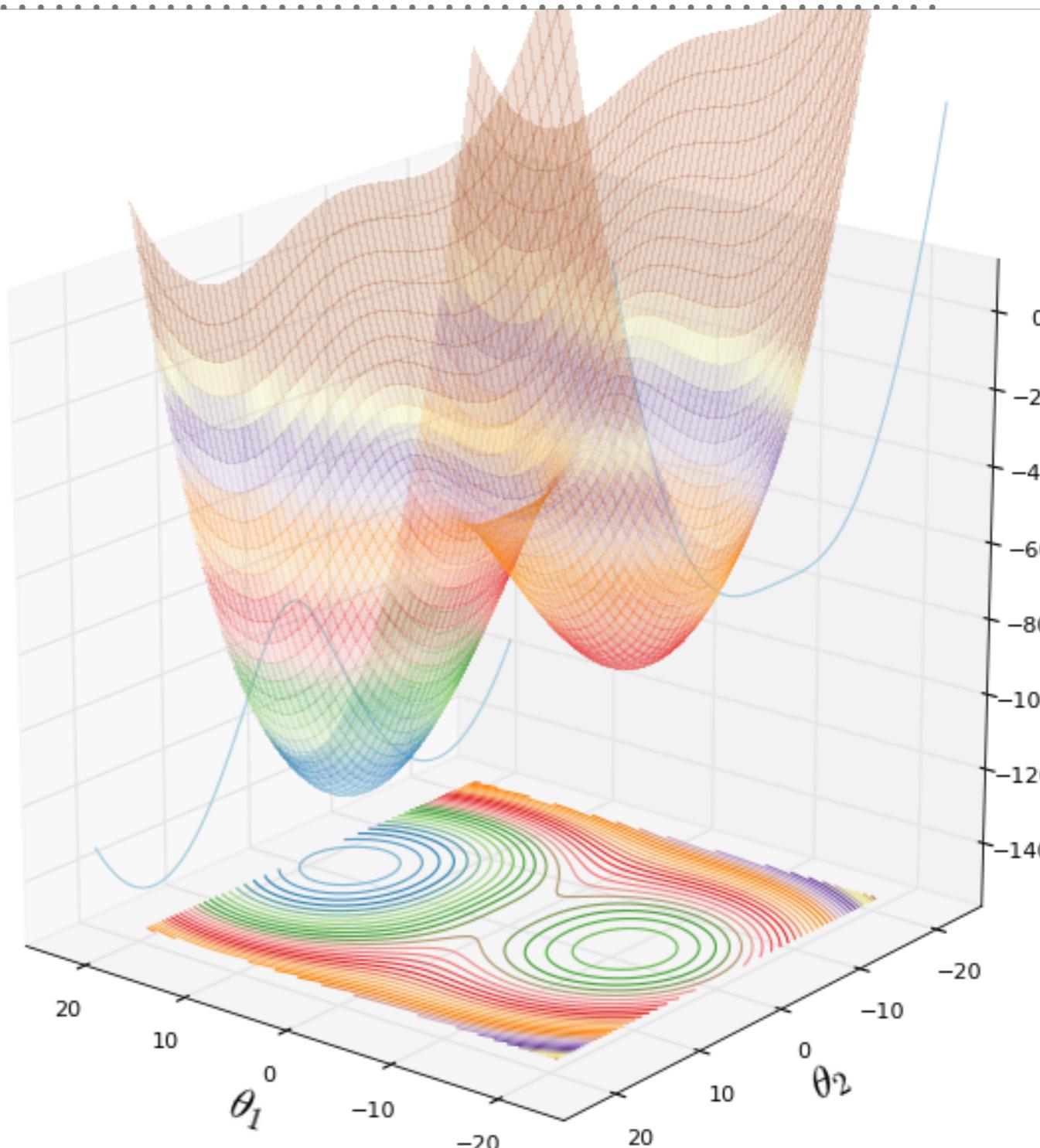
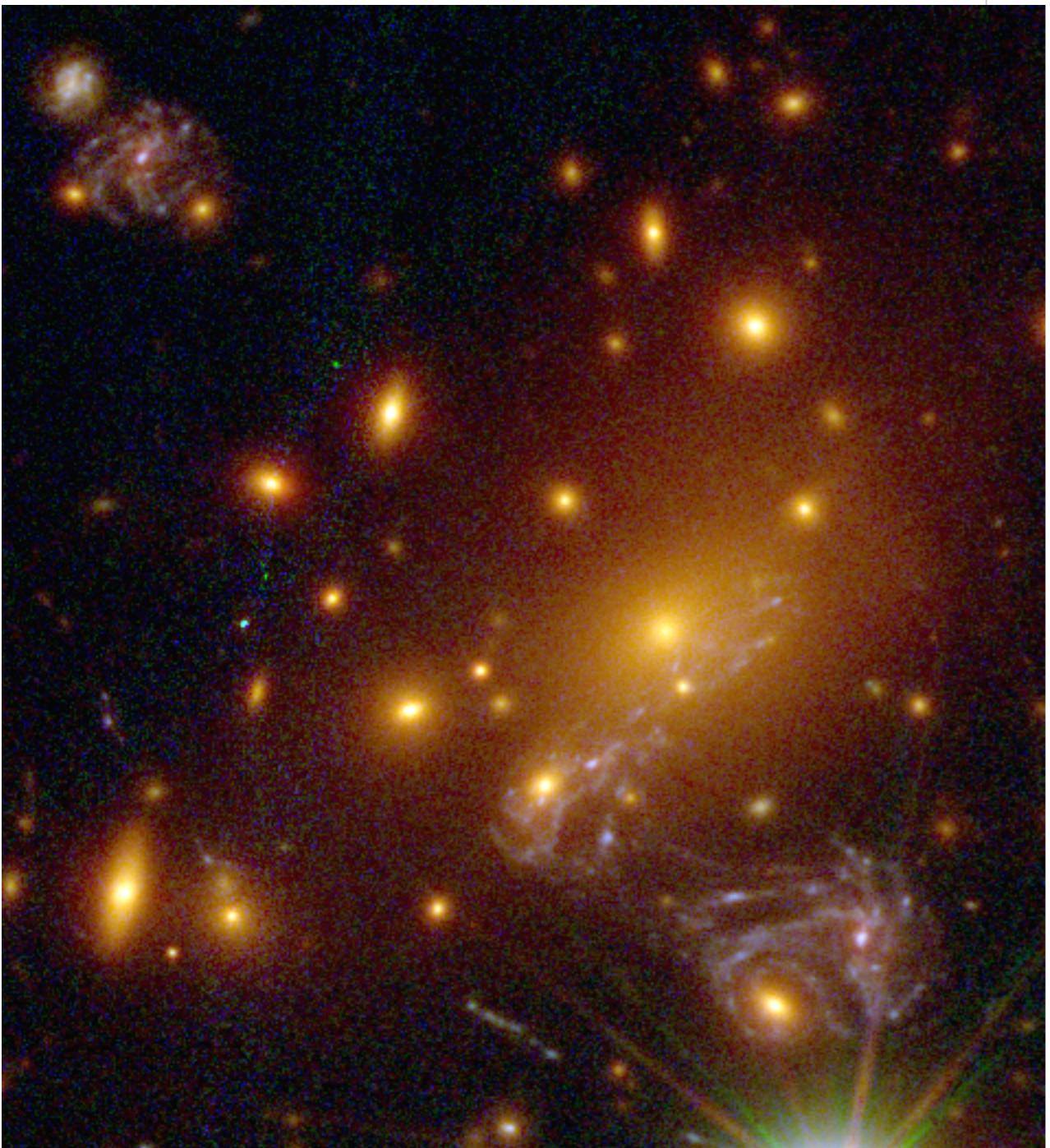


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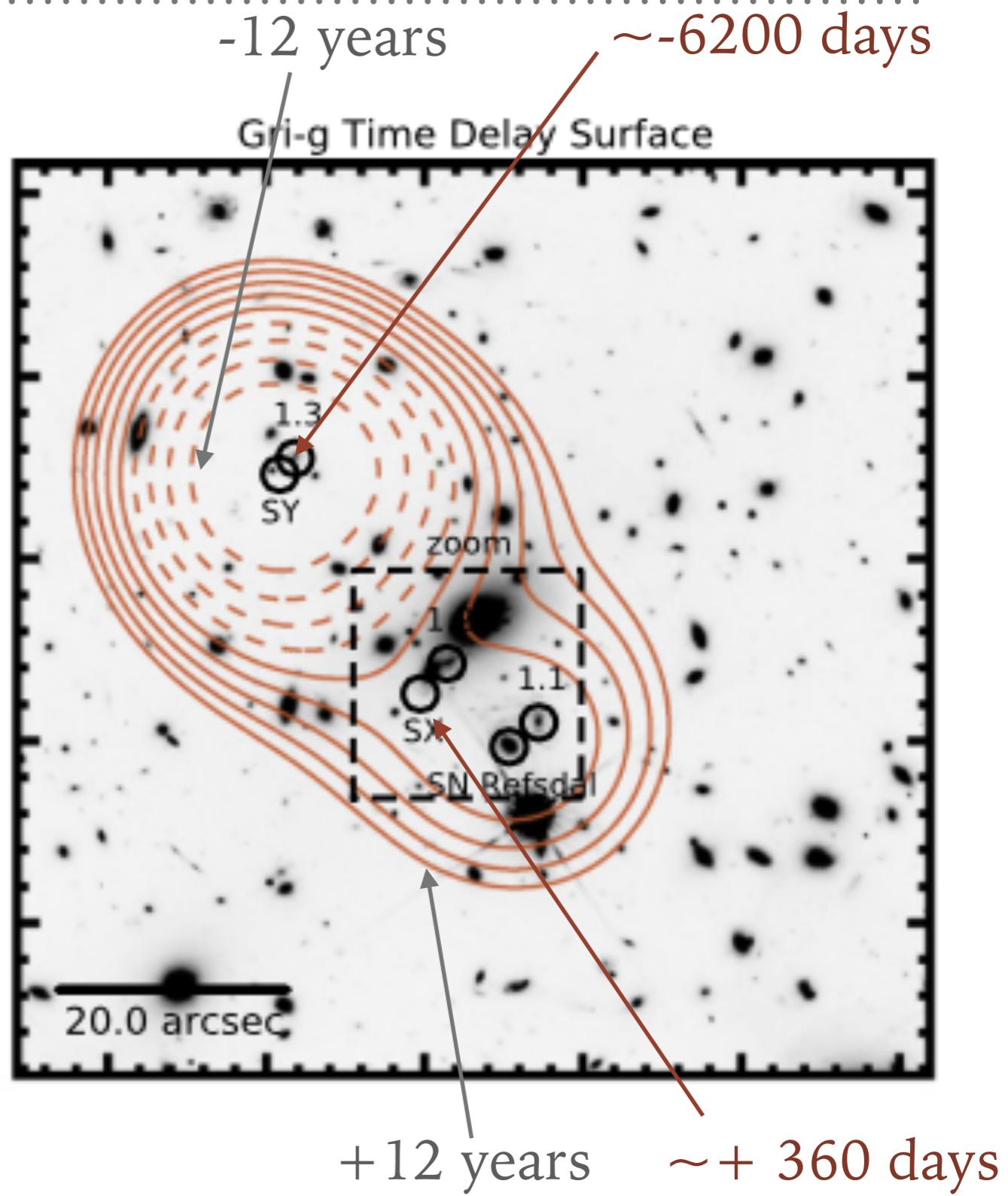


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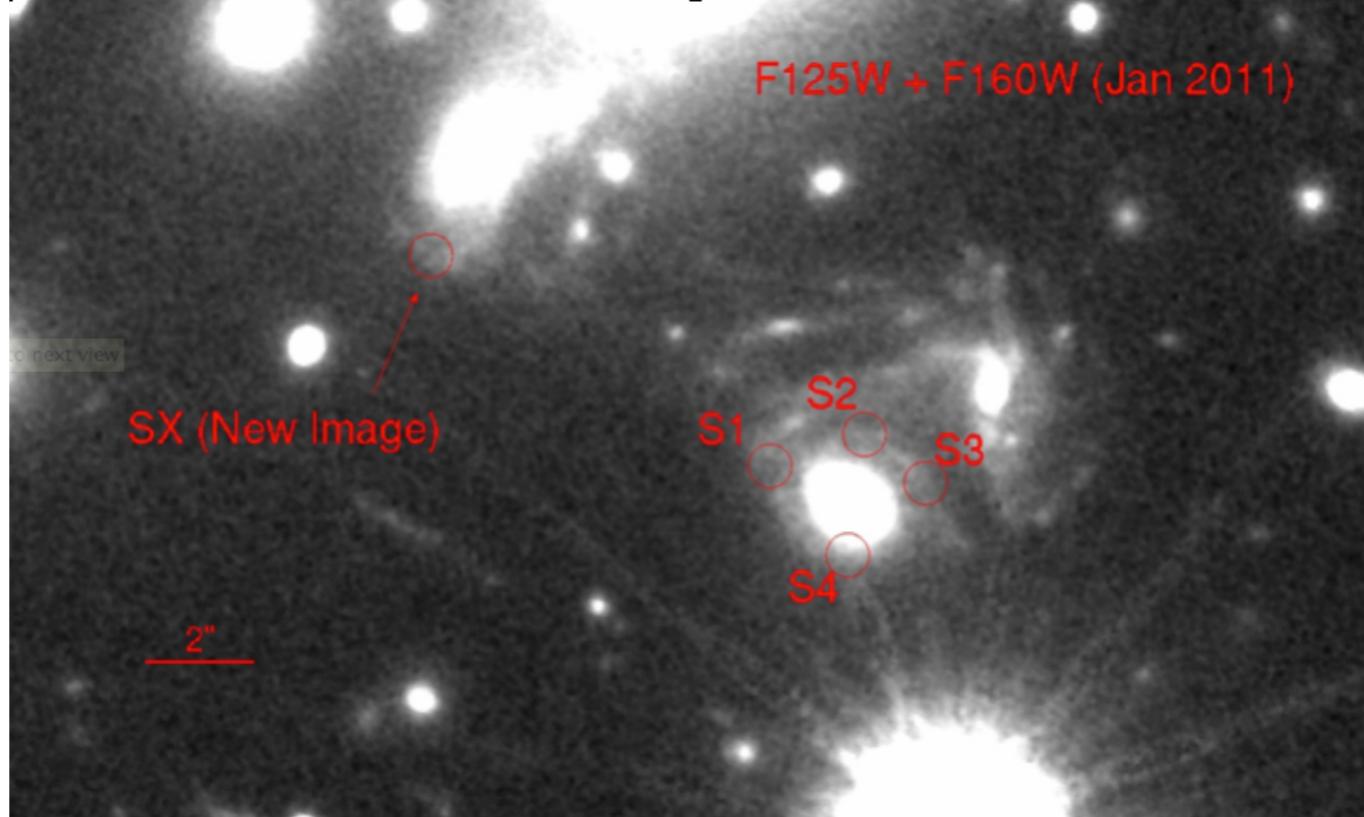
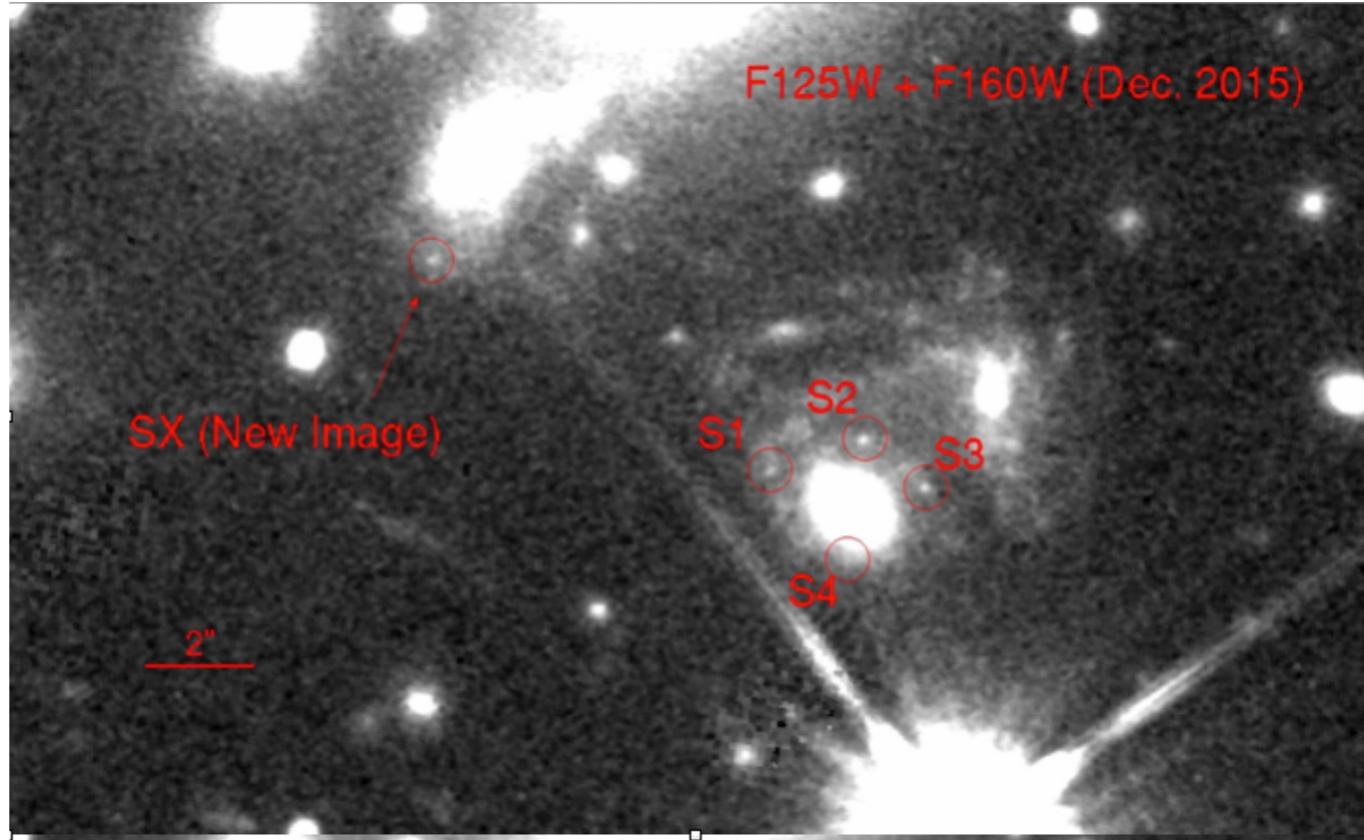
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16/12/2016...

Time delay

(SX- S1)

345 ± 10 gg



MICROLENSING

- Microlensing is a lensing regime which include effects produced by a broad range of masses: from planets to ensembles of stars
- given the small sizes of the lens, these are (to first-order) assimilated to point masses.
- microlensing effects are mostly detectable and searched within our own galaxy, in particular by monitoring huge amounts of stars in the bulge of the MW or in the Magellanic Clouds
- nevertheless, microlensing effects are important also in extragalactic lenses. Small masses in distant galaxies, for example, introduce perturbations to the lensing signal of their hosts

THE POINT MASS LENS MODEL

- The deflection angle of the point mass lens was derived in the first lecture
- the lensing potential can be readily derived

$$\hat{\vec{\alpha}} = \frac{4GM}{c^2} \frac{\vec{\xi}}{|\vec{\xi}|^2} = \frac{4GM}{c^2 D_L} \frac{\vec{\theta}}{|\vec{\theta}|^2}$$

$$\vec{\alpha} = \frac{D_{LS}}{D_S} \hat{\vec{\alpha}} = \vec{\nabla} \hat{\Psi}$$

$$\nabla \ln |\vec{x}| = \frac{\vec{x}}{|\vec{x}|^2}$$



$$\hat{\Psi}(\vec{\theta}) = \frac{4GM}{c^2} \frac{D_{LS}}{D_L D_S} \ln |\vec{\theta}|$$