FINDING PŌWEHI

Event Horizon Telescope

A WORLD WIDE EFFORT

The Event Horizon Telescope Collaboration,
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Event Horizon Telescope

THE ASTROPHYSICAL JOURNAL LETTERS

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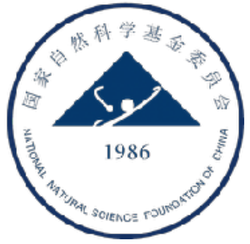
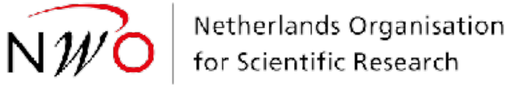
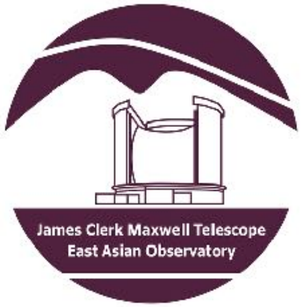




EHT Stakeholder Logos



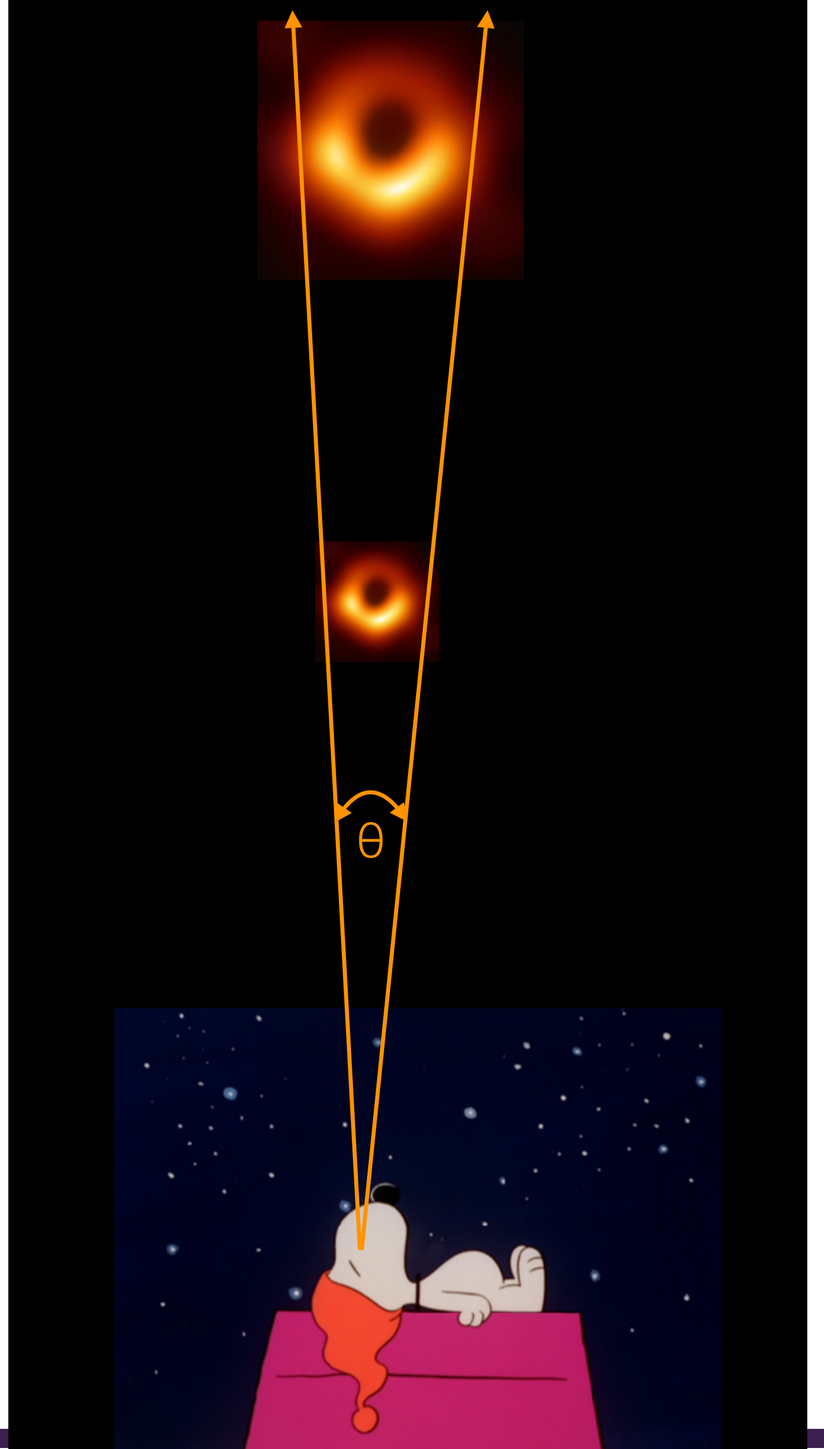
Large Millimeter Telescope *Alfonso Serrano*

EHT Associated Logos

Event Horizon Telescope

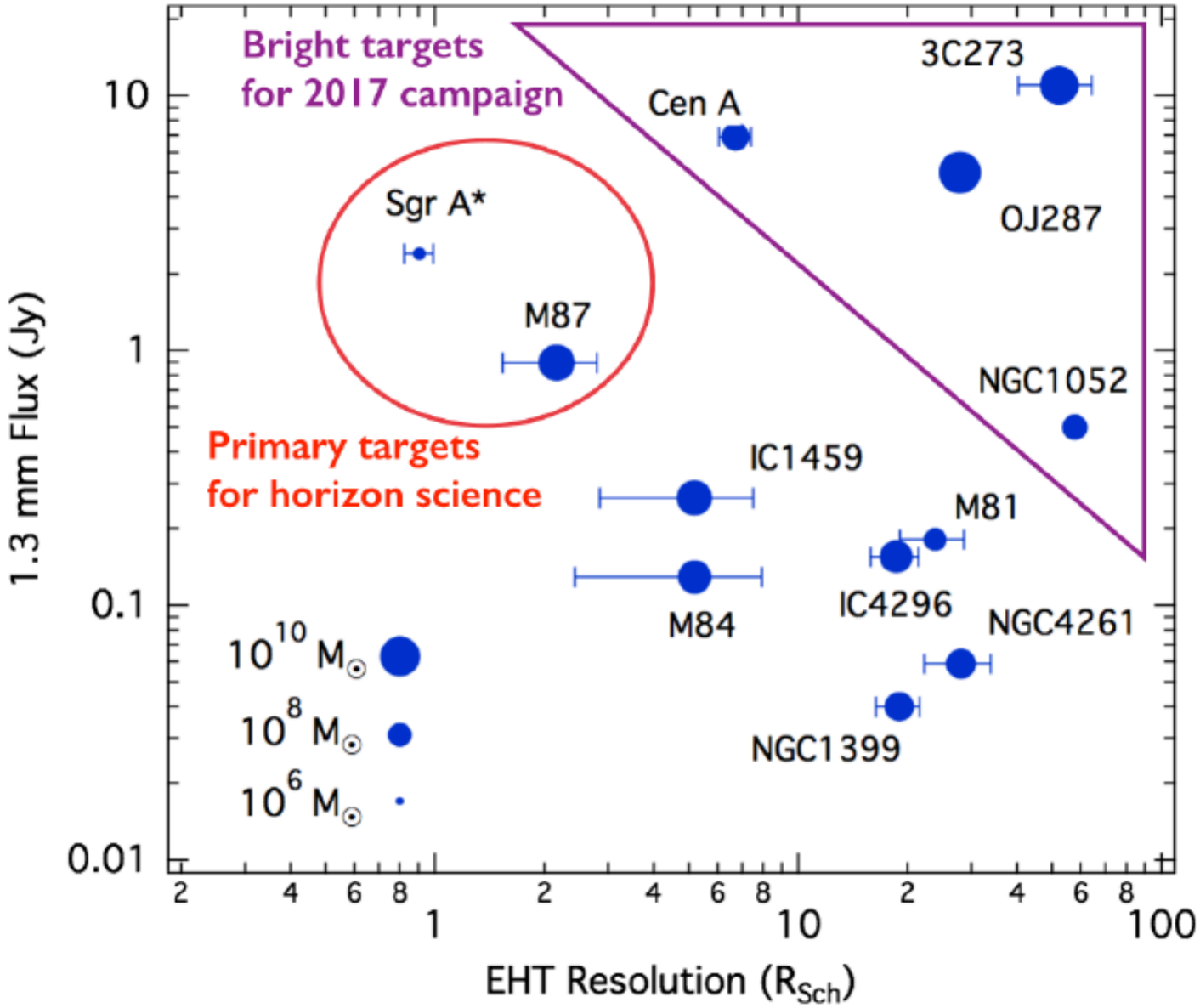
AN IMPOSSIBLE TASK?

- The problem with black holes…… they were still so small on the sky…
- The biggest shadows (we know of) are just 50 μas across
- Need a telescope the size of the planet…
  - $\theta_{array} = \lambda/D = 1.3mm/11000\ km \sim 20\ \mu as$



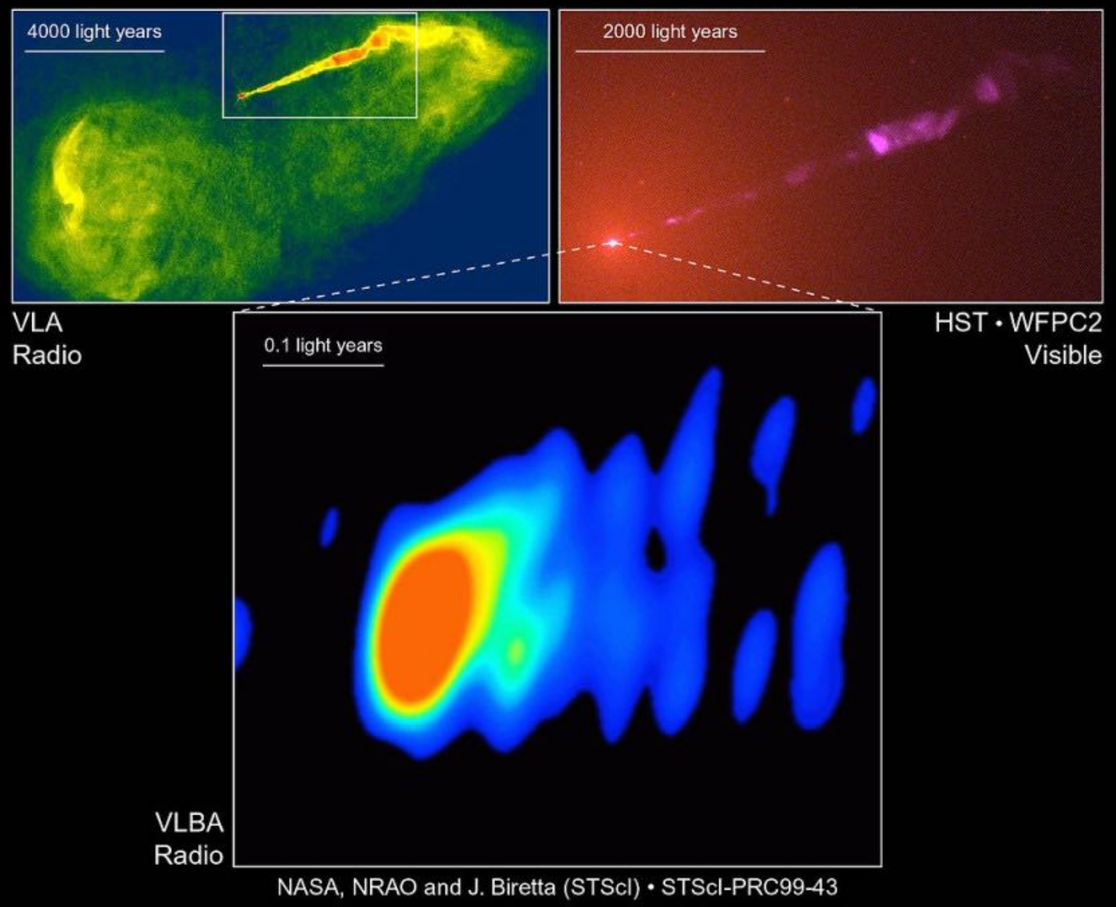
Event Horizon Telescope

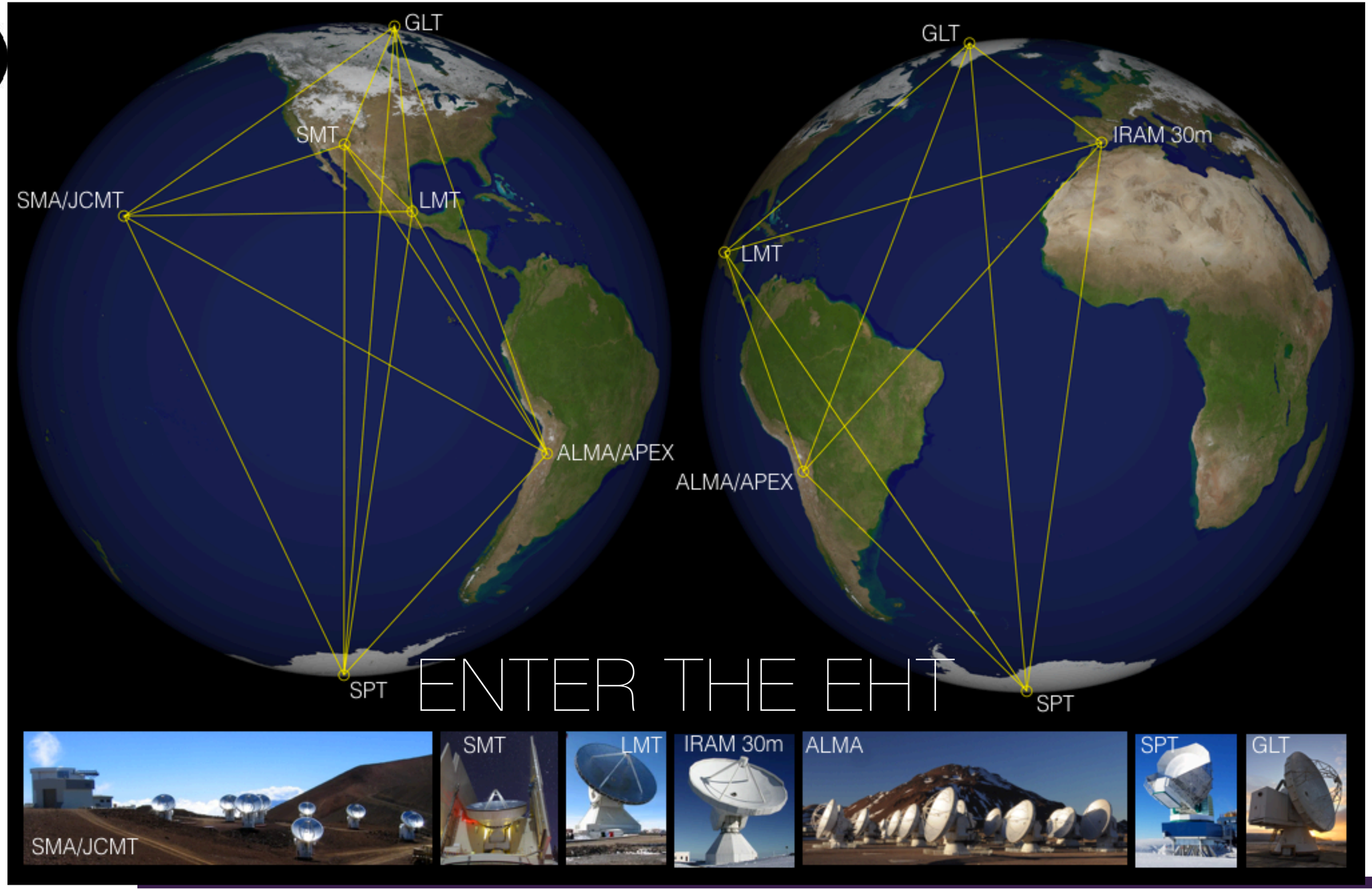
BRIGHT AND BIG



Event Horizon Telescope

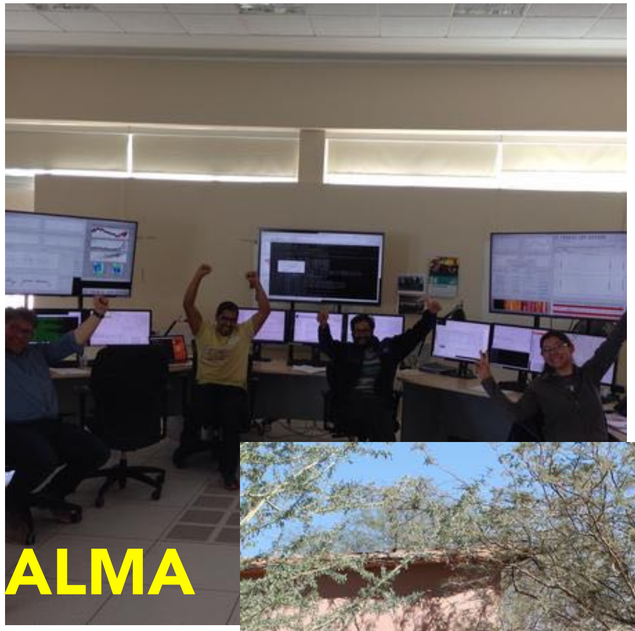
M87



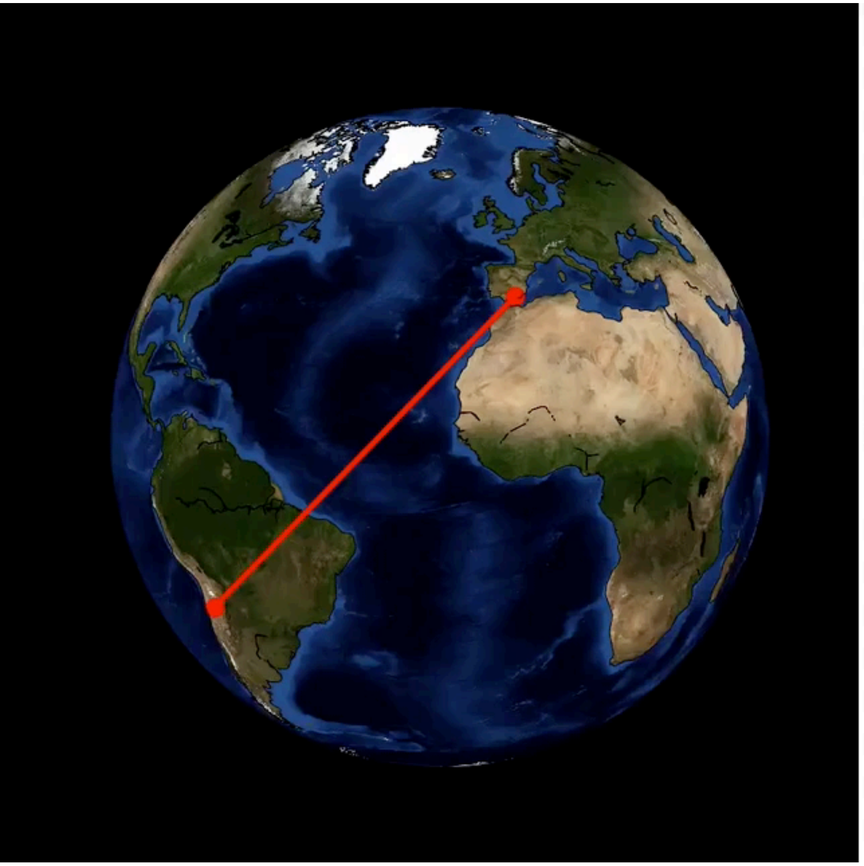

GLT
SMT
SMA/JCMT
LMT
ALMA/APEX
SPT
GLT
IRAM 30m
LMT
ALMA/APEX
SPT
ENTER THE EHT
SMA/JCMT
SMT
LMT
IRAM 30m
ALMA
SPT
GLT

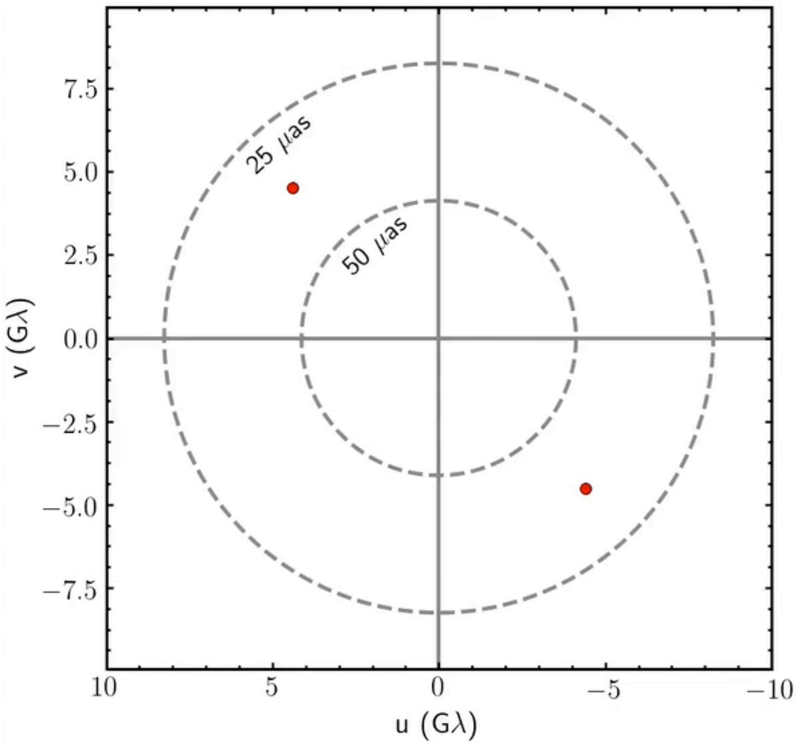
Event Horizon Telescope

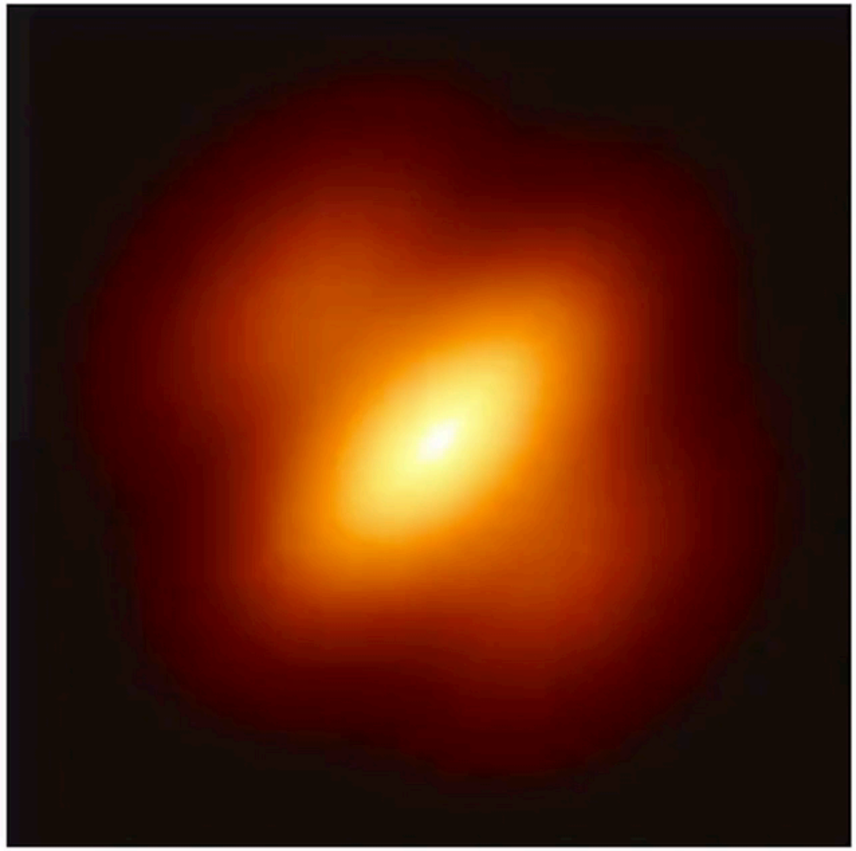
2017 RUN



Event Horizon Telescope







Event Horizon Telescope

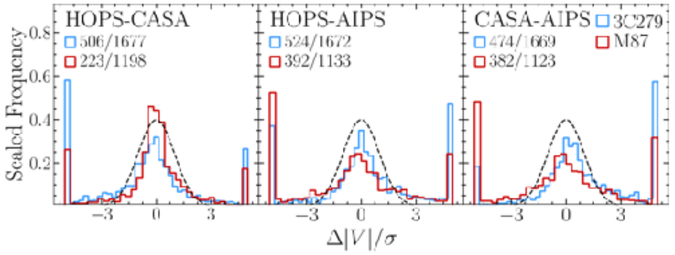
- Hundreds of terabytes of data needed to be flown to a central location
- Just confirming the telescopes were synced took months (and more - the South Pole disks were delayed until the October station open)
- Then…lots of math.
- One of the key goals for the team was to be absolutely sure we knew what we had - this means redundancy…

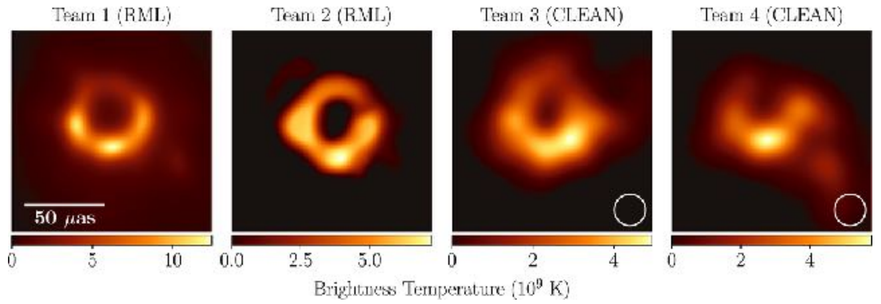
Calibration

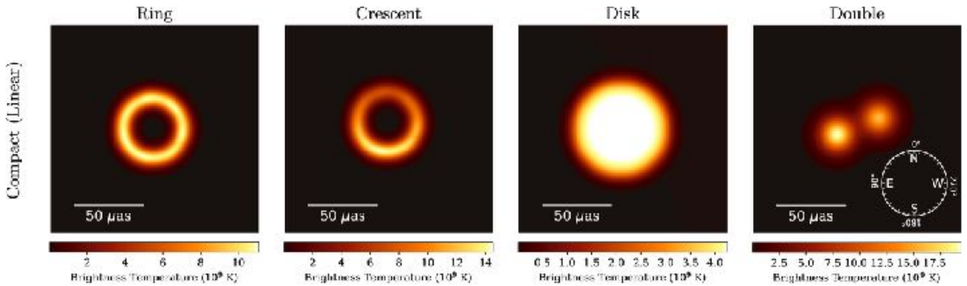
Imaging

Models

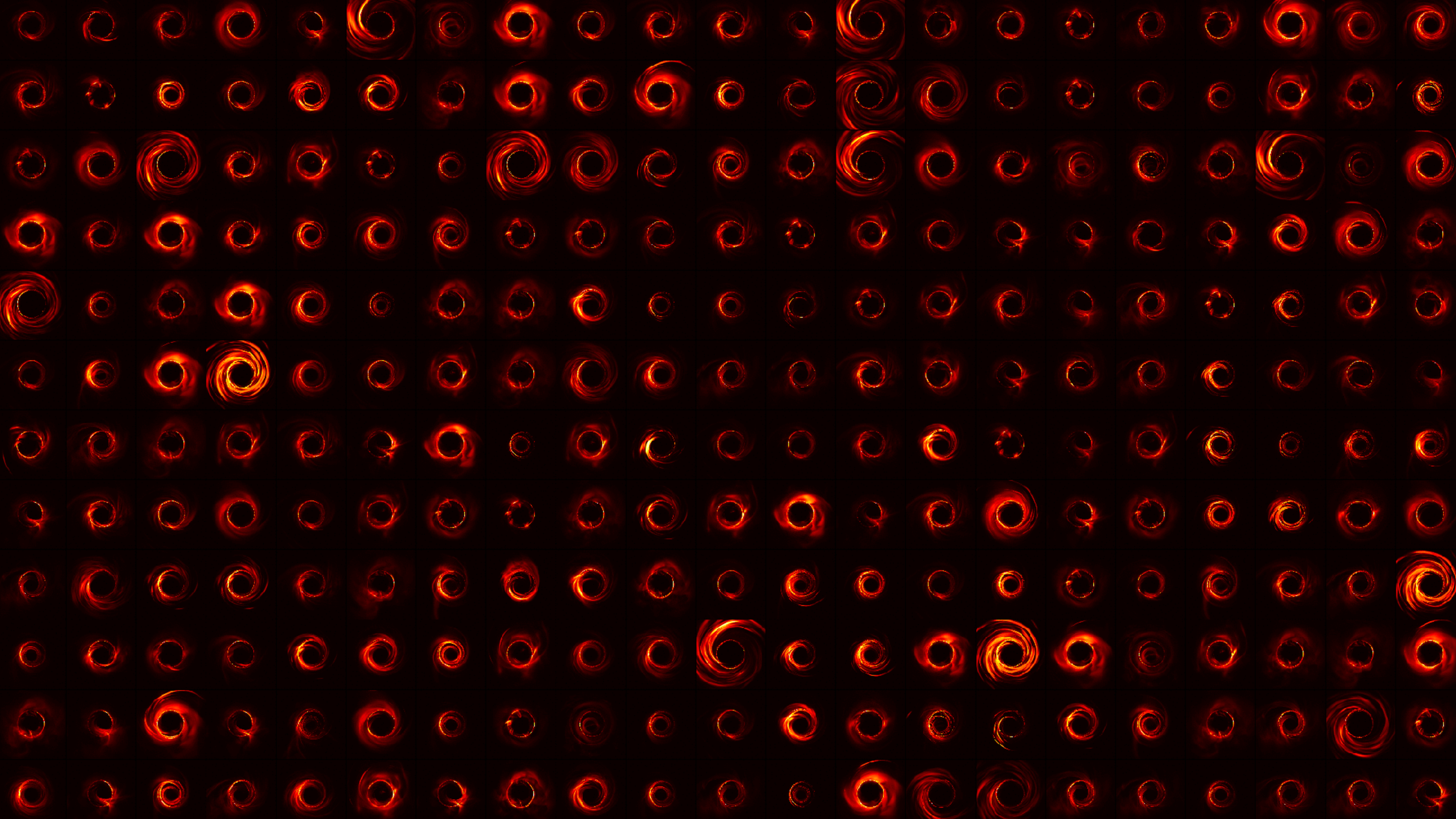
Simulations





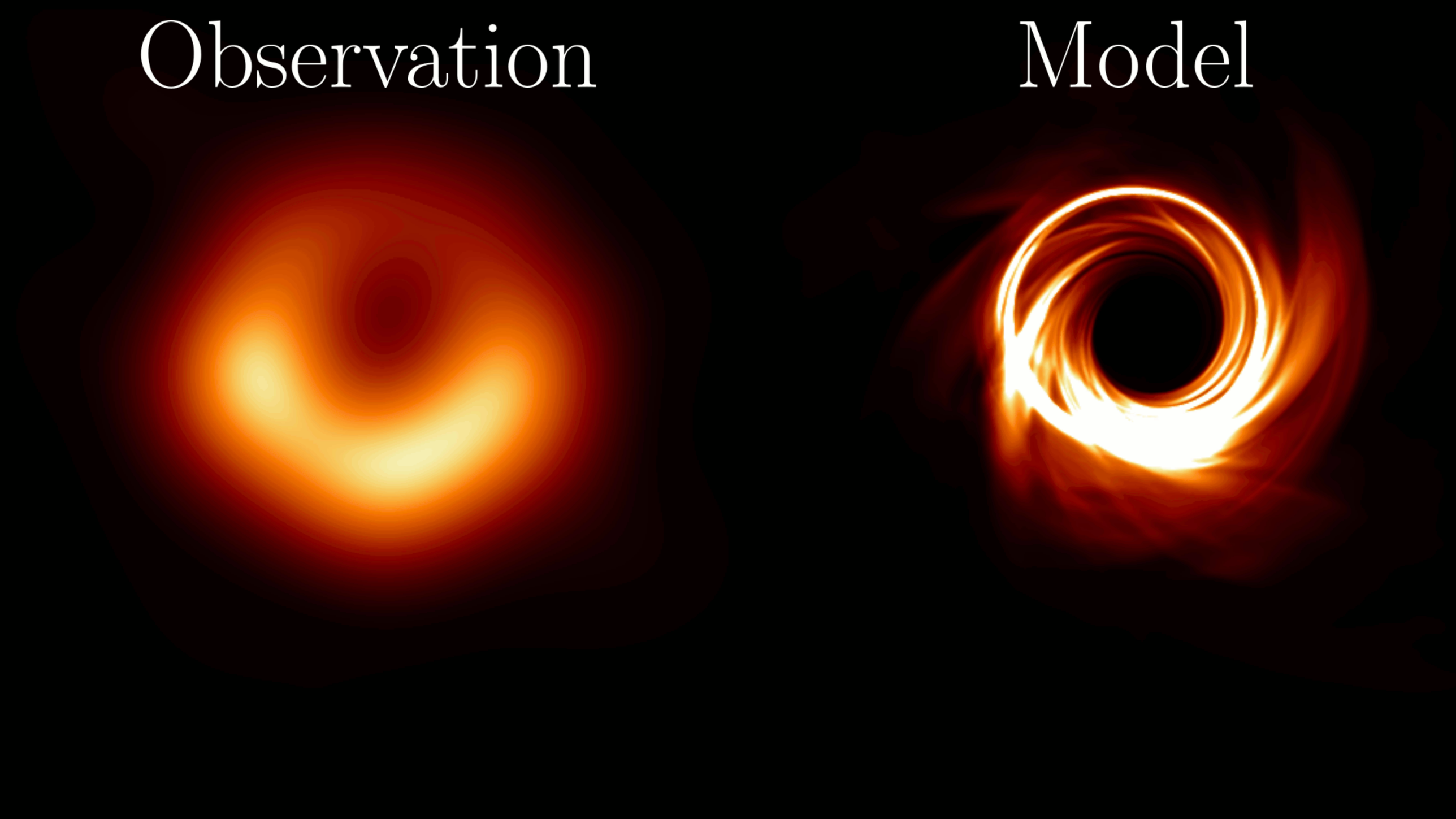


Well…



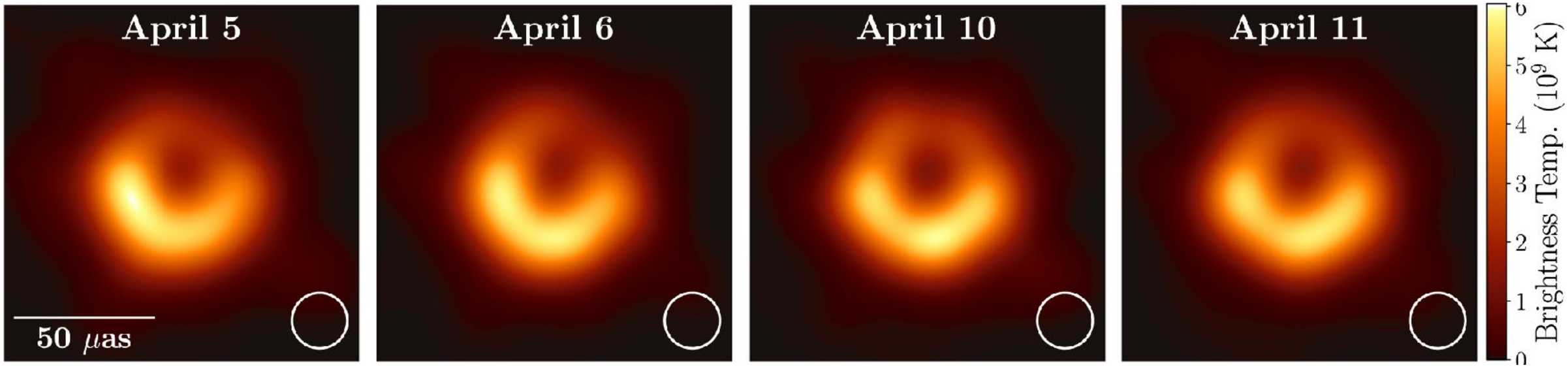
Observation

Model



Event Horizon Telescope

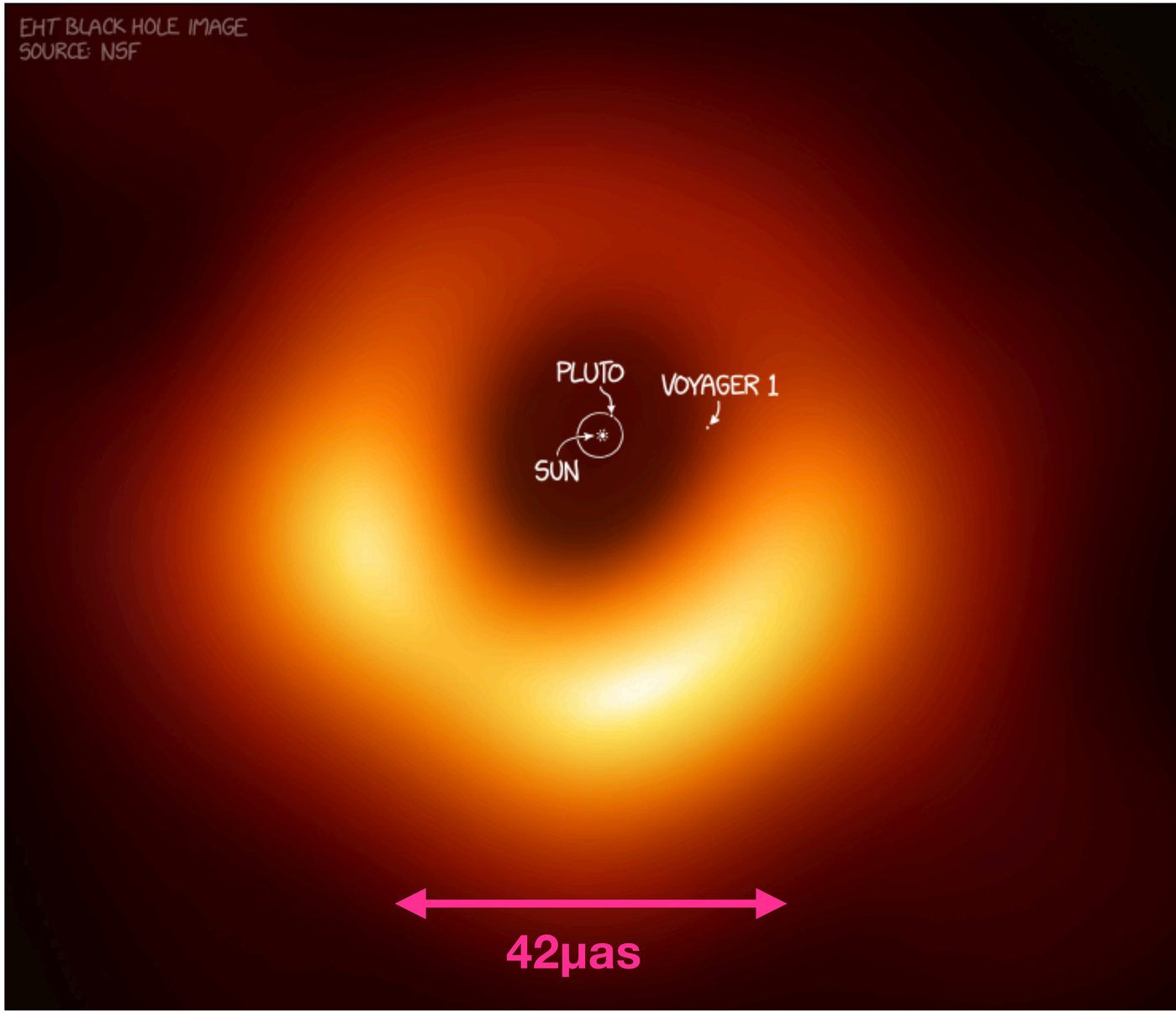
TO SEE THIS…



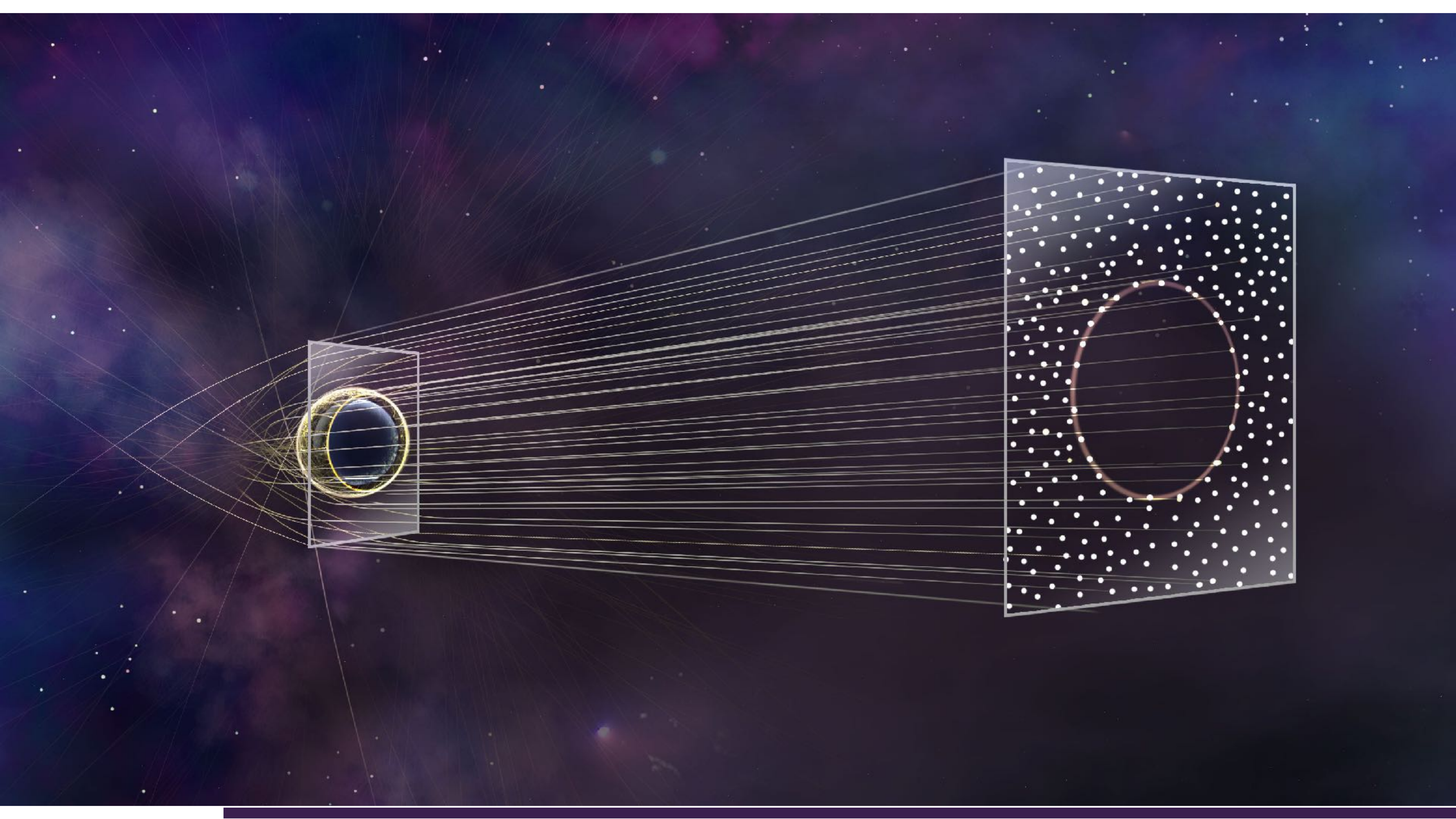
- Four days of images - with similar structure to each other (that's good)
- The expected shape, size and intensity…
- What parameters can we define from the images?

Event Horizon Telescope

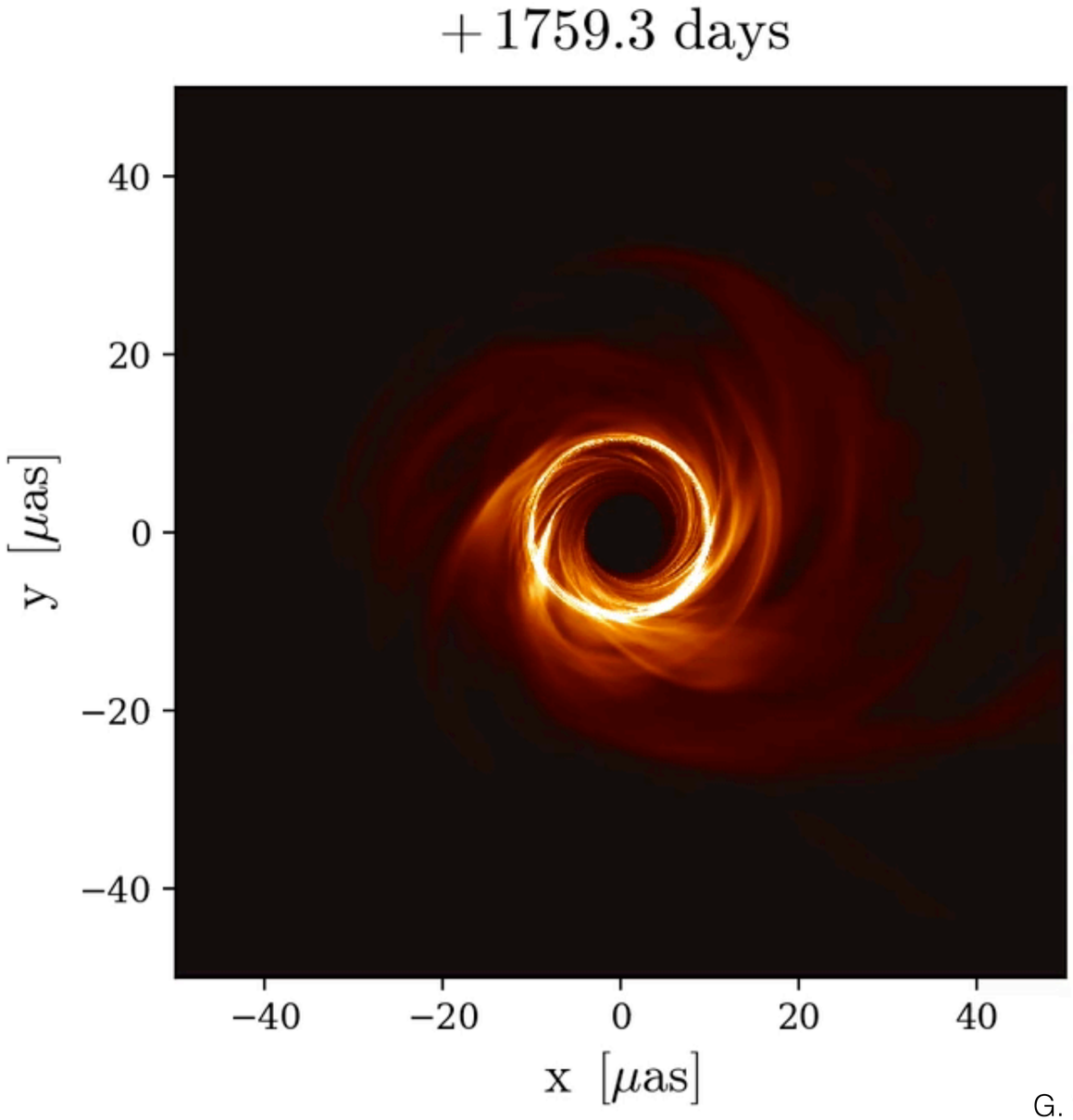
- They are defined by their mass, and their spin (if they are spinning)
- The photon ring size is directly related to the size of the event horizon - if we measure across it… we can measure the mass…
- 6.5 billion times the mass of our sun - bang on the mass predicted from stellar motions

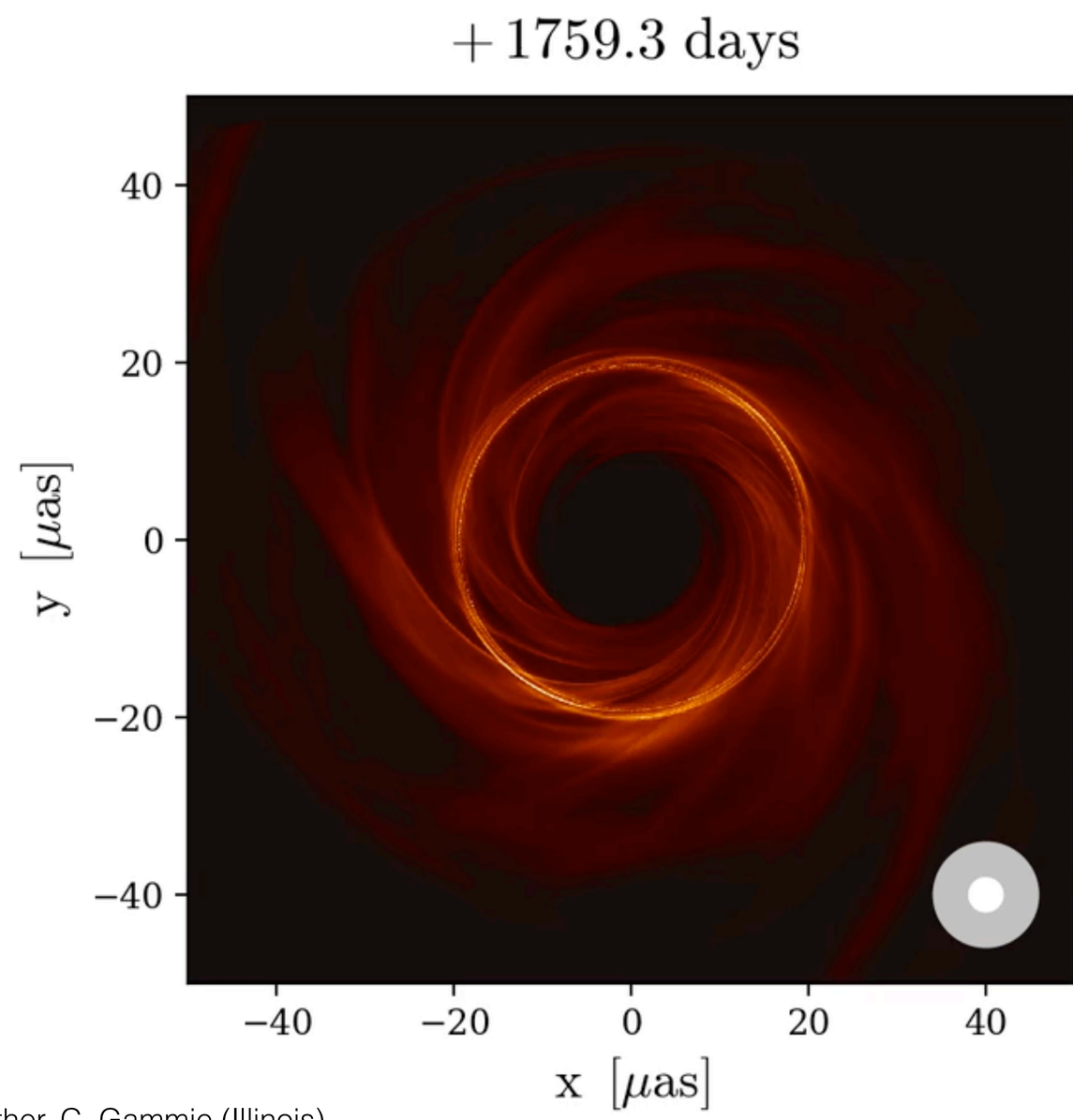


BLACK HOLES ARE SIMPLE CREATURES…



Event Horizon Telescope



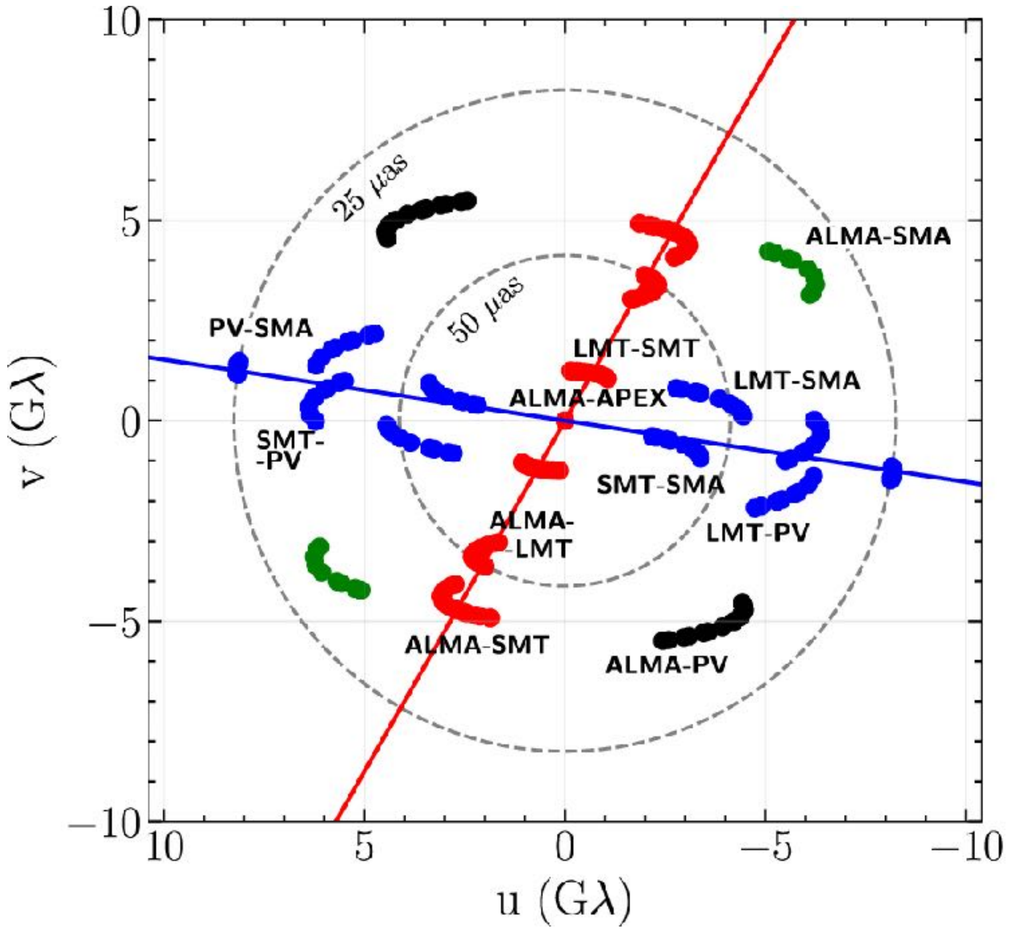


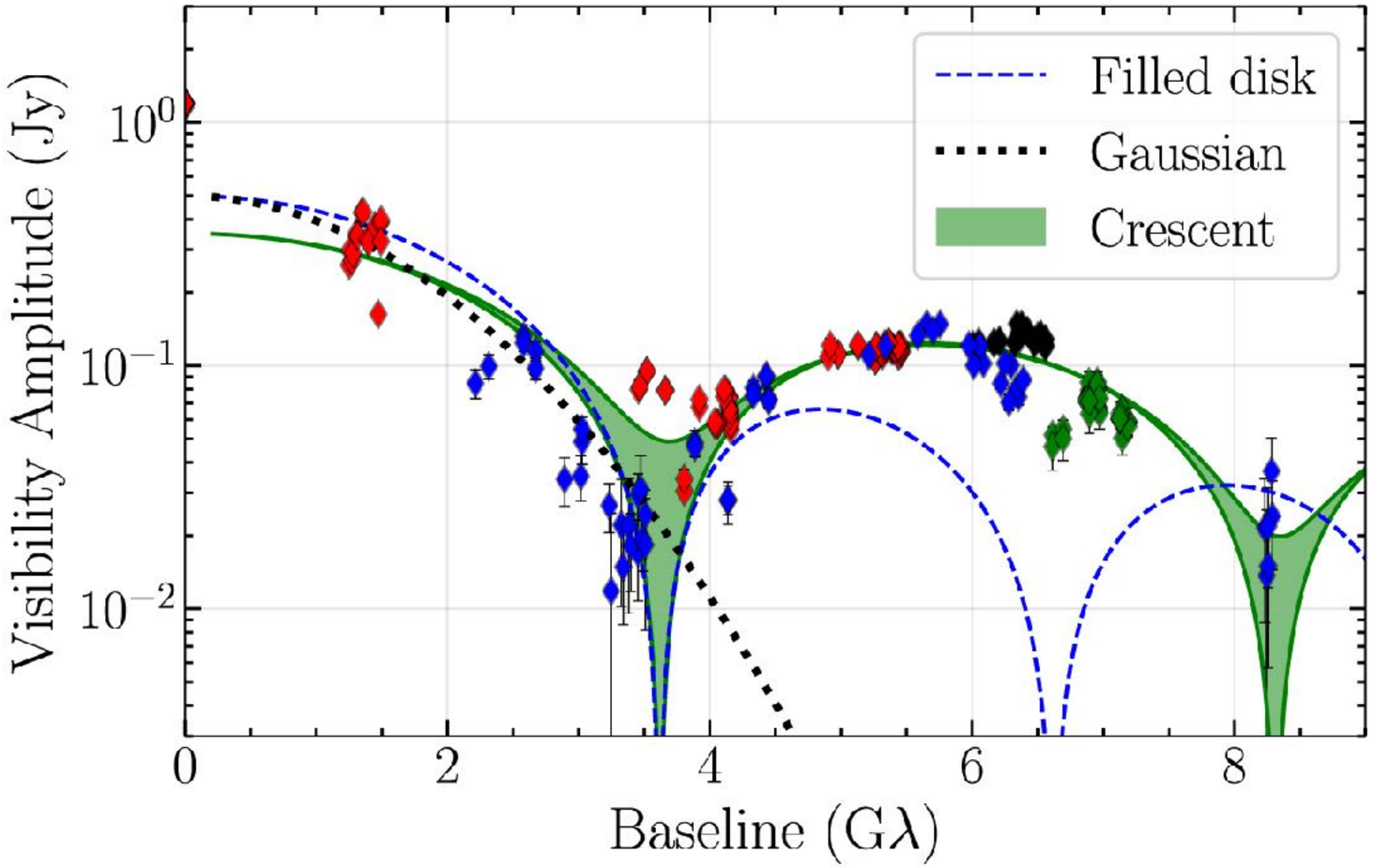
G. Wong, B. Prather, C. Gammie (Illinois)

Event Horizon Telescope

THE SHAPE

Ring-like structure, some asymmetry, large-scale structure resolved

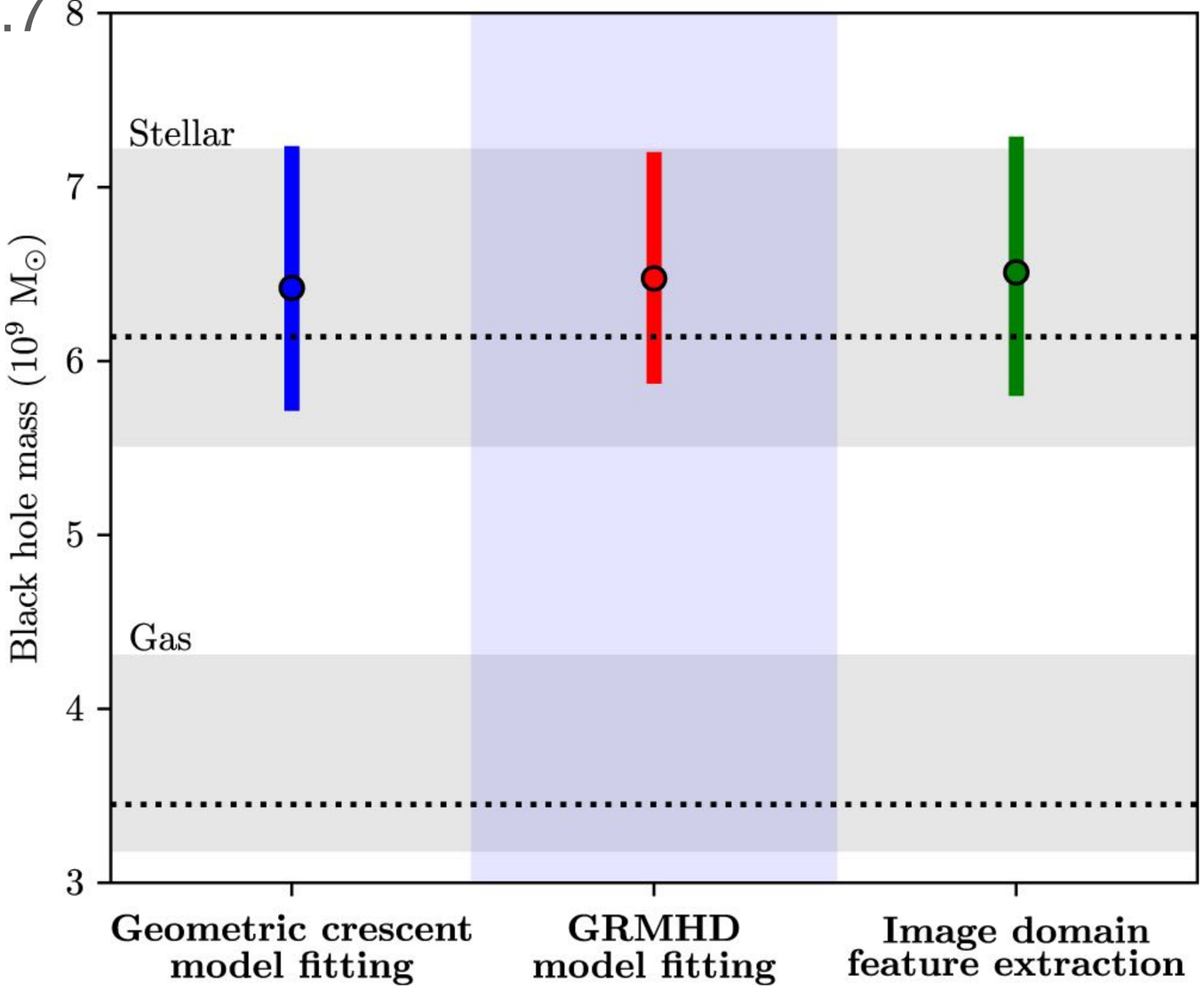




Event Horizon Telescope

THE MASS

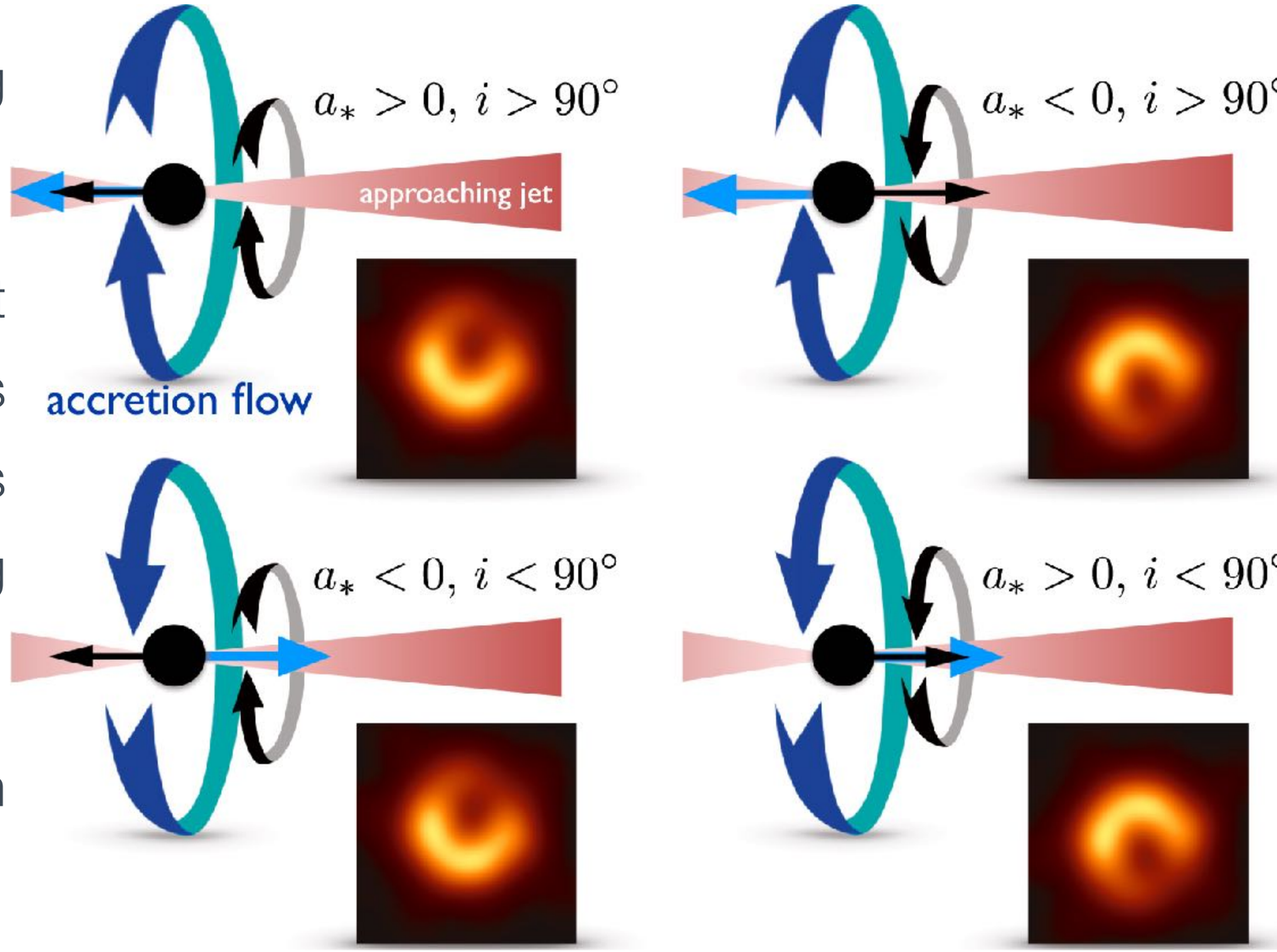
- Convert θ_g to M using D = 16.8 +/- 0.7 Mpc
- M = 6.5 +/- 0.7 x 10^9 Msun
- Three methods in excellent agreement
- Systematic error in calibration of α dominates in all cases
- Excellent agreement with recent stellar dynamics mass estimate (Gebhardt+2011)



Event Horizon Telescope

THE SPIN

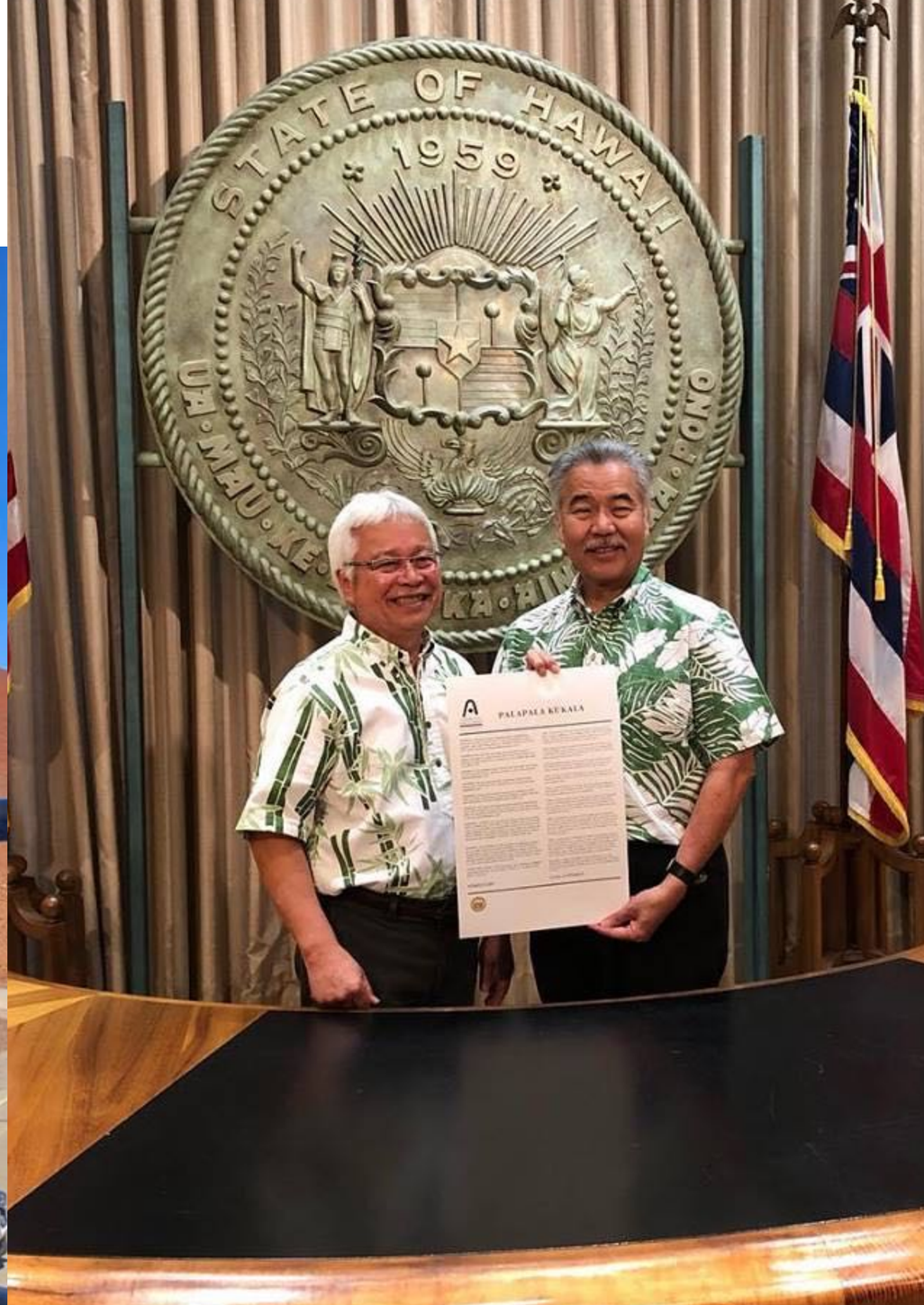
- We know this black hole is spinning and has a jet
- The bright crescent (because that light is being doppler brightened as it is traveling towards us), then tells us the way the black hole is rotating and the jet orientation
- Again, these were as predicted from other measurements




Pōwehi
Embellished, fathomless dark creation

Event Horizon Telescope

UNCLE LARRY



Pōwehi

Pō, profound dark source of unending creation, is a concept emphasized and repeated over and over in the Kumulipo, the primordial creation chant of the Hawaiian universe. It links the Hawaiian genealogy back into a pō of ceaseless creation. The words kumu and lipo, literally mean, source of deep darkness, accentuating the fathomless power of pō.

Wehi, or wehiwehi, honored with embellishments, is one of the many descriptions of pō found in the Kumulipo and so the name Pōwehi.

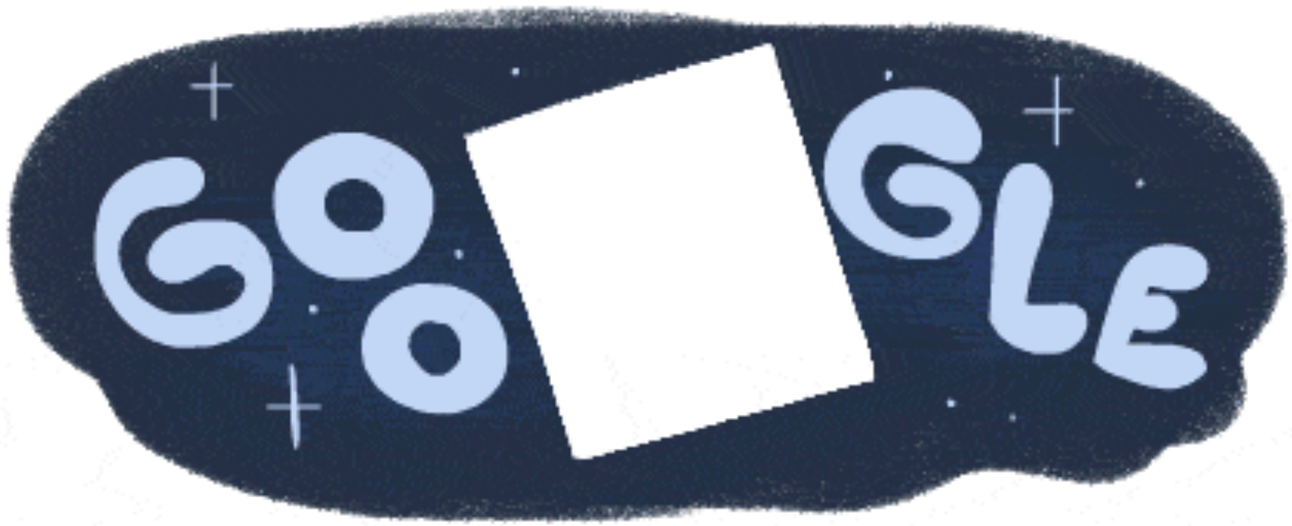
- Dr. Larry Kimura

Event Horizon Telescope

The Black Hole Shadow in M 87

Cover Pages, 2019 April 1`

EHT announcement reaches the entire world



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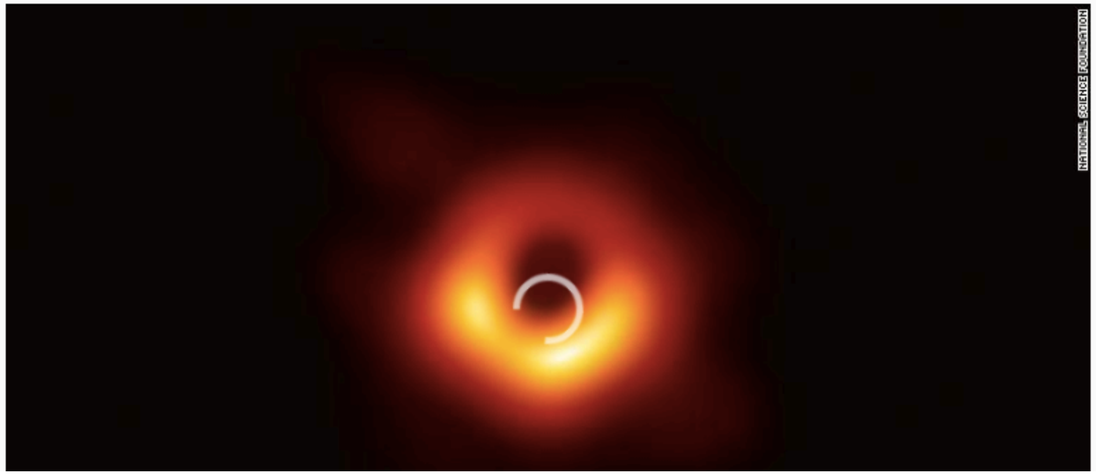
The first black hole to be photographed now has a name

By Rob Picheta, CNN

Updated 1057 GMT (1857 HKT) April 12, 2019



The New York Times

That First Black Hole Seen in an Image Is Now Called Pōwehi, at Least in Hawaii

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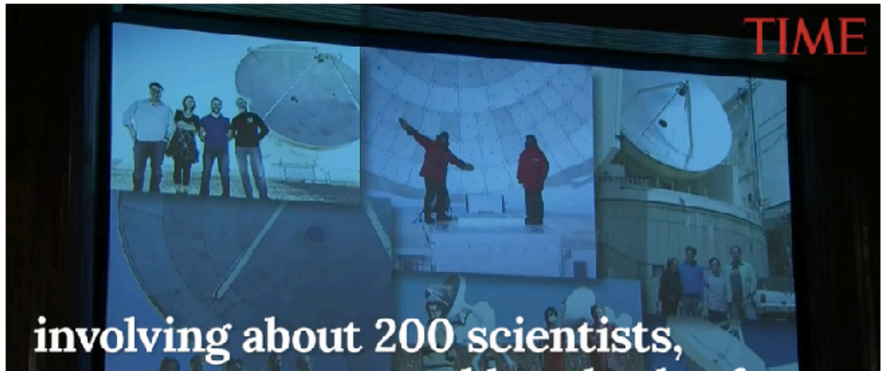
Black Hole Given the Hawaiian Name 'Powehi.' Here's What That Means



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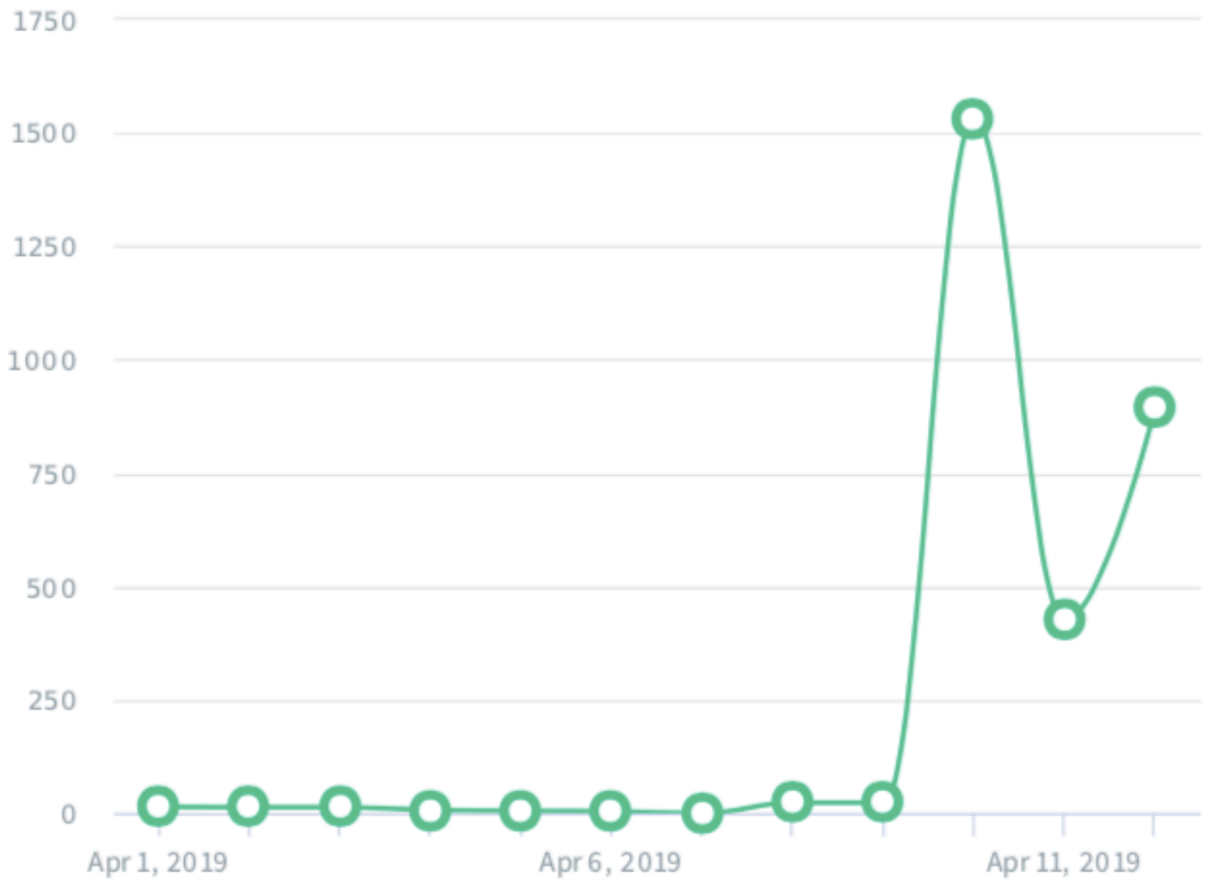

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HAWAII PRESS IMPACT

- Representative Case gives speech on House floor

- “I rise today to recognize the groundbreaking contributions of the James Clerk Maxwell Telescope and Submillimeter Array, located on the 13,803 feet summit of Mauna Kea in Hawai‘i, and celebrate their contributions to a truly international effort producing the first-ever image of a black hole.

- These Hawai‘i observatories pioneered the study of black holes and, thanks to powerful new capabilities, perfect conditions atop Mauna Kea, and dedicated personnel, we can all look forward to more of JCMT and SMA’s cutting edge discoveries in the future, in addition to the continued growth and reputation of Hawai‘i as a world leader in exploring our heavens

FEDERAL SUPPORT

Congressman Case Praise Astronomers Who Captured Image of Black Hole

By Big Island Now

April 10, 2019, 12:18 PM HST (Updated April 10, 2019, 12:19 PM)

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