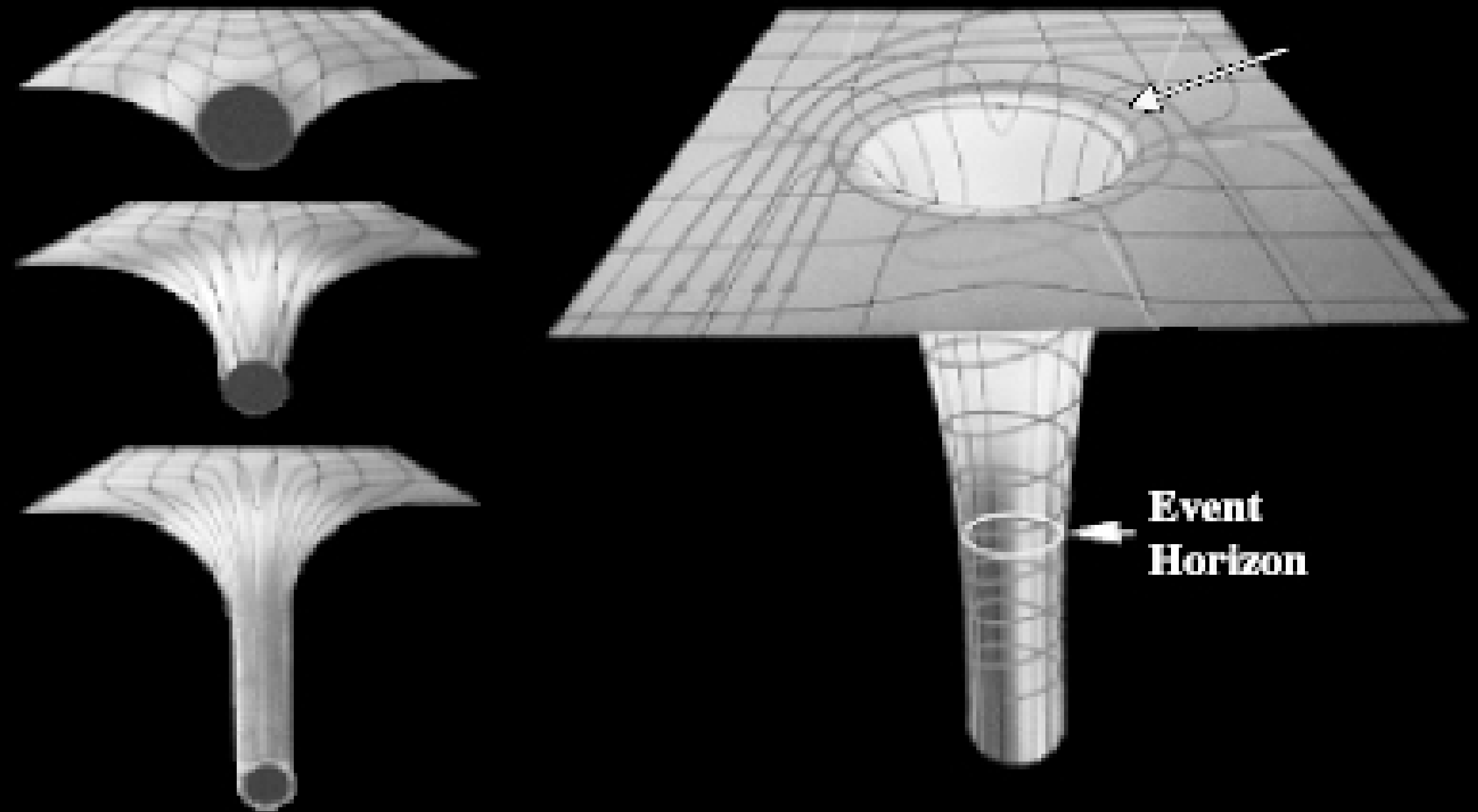


supermassive black holes and where to find them

Emily Liepold, 2024-03-21

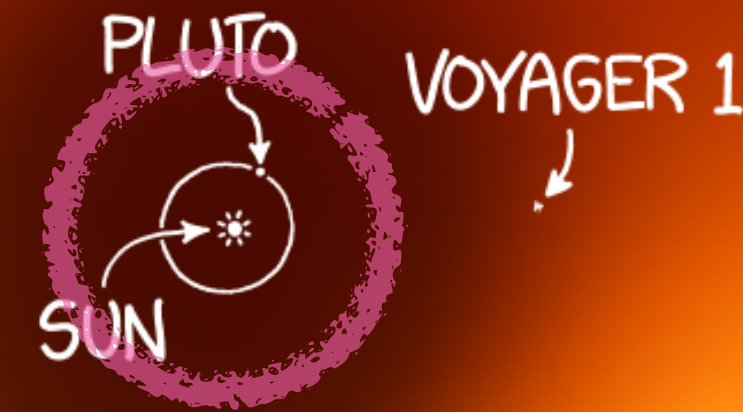
what is a black hole?

1. a good place to hide
2. a lot of stuff in a small space
3. simple
4. the fate of (many) massive stars
5. sometimes supermassive!



supermassive black holes

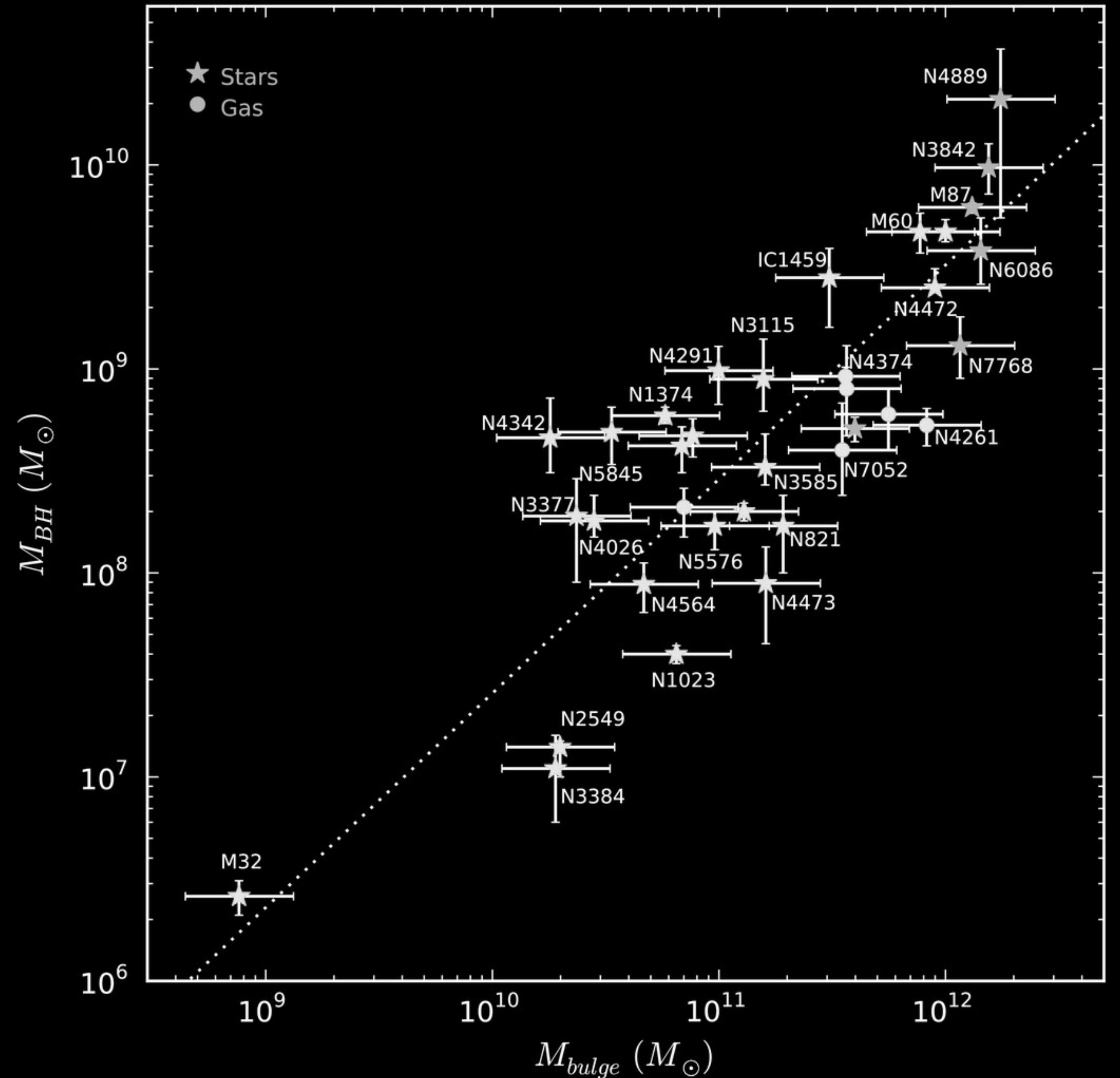
	Mass	Event Horizon Radius
Earth	0.000003 M_{\odot}	1 cm
Sun	1 M_{\odot}	3 km (UC Berkeley)
Milky Way Sgr A*	4.3 Million M_{\odot}	10 million km (3x circumference of sun)
M87*	5.37 Billion M_{\odot}	15 billion km (distance to Voyager 2)



supermassive black holes co-evolve with their galaxies

the SMBH mass is related to

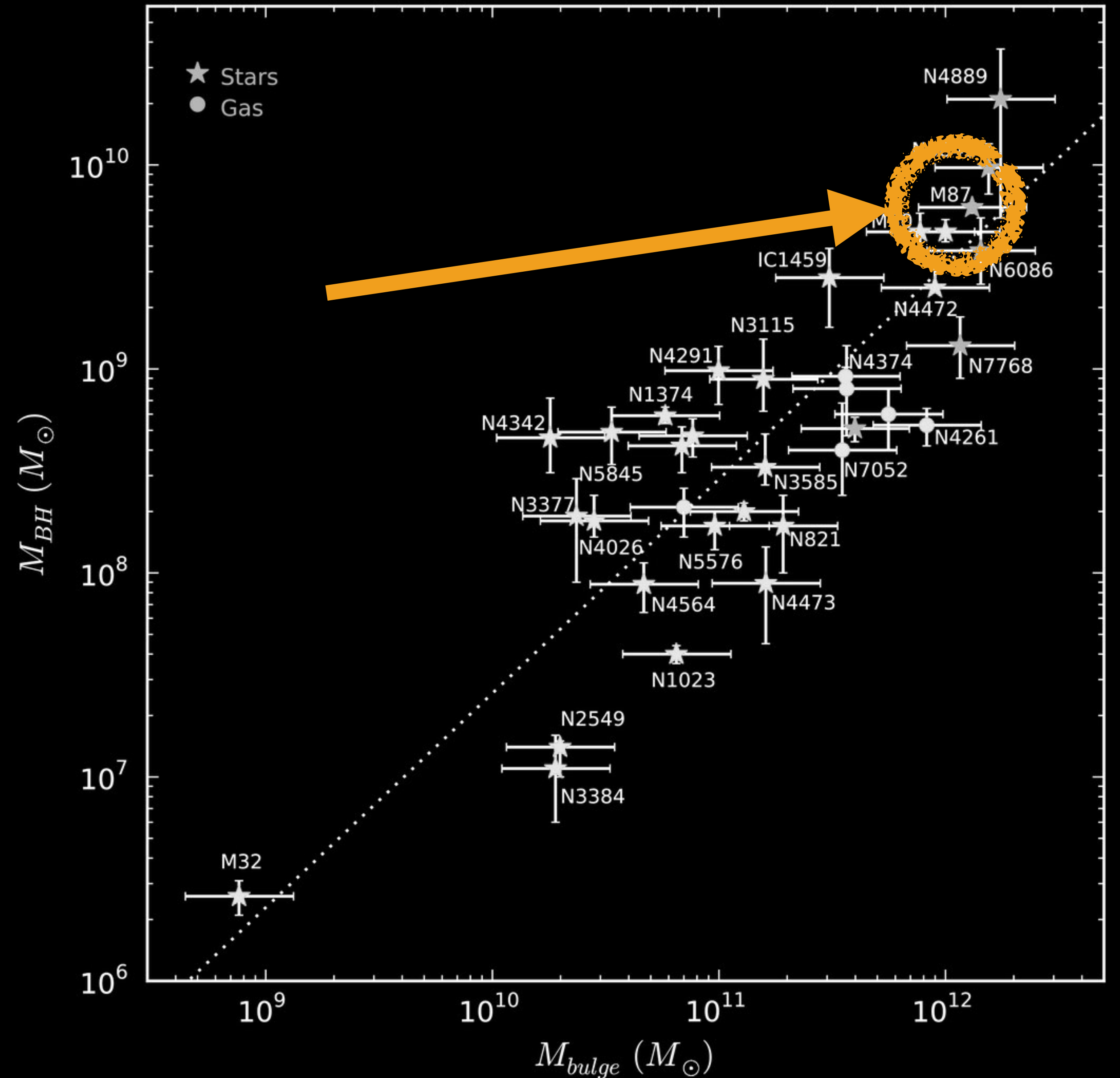
- galaxy stellar mass
- stellar velocity dispersion
- shape of light distribution
- total galaxy luminosity



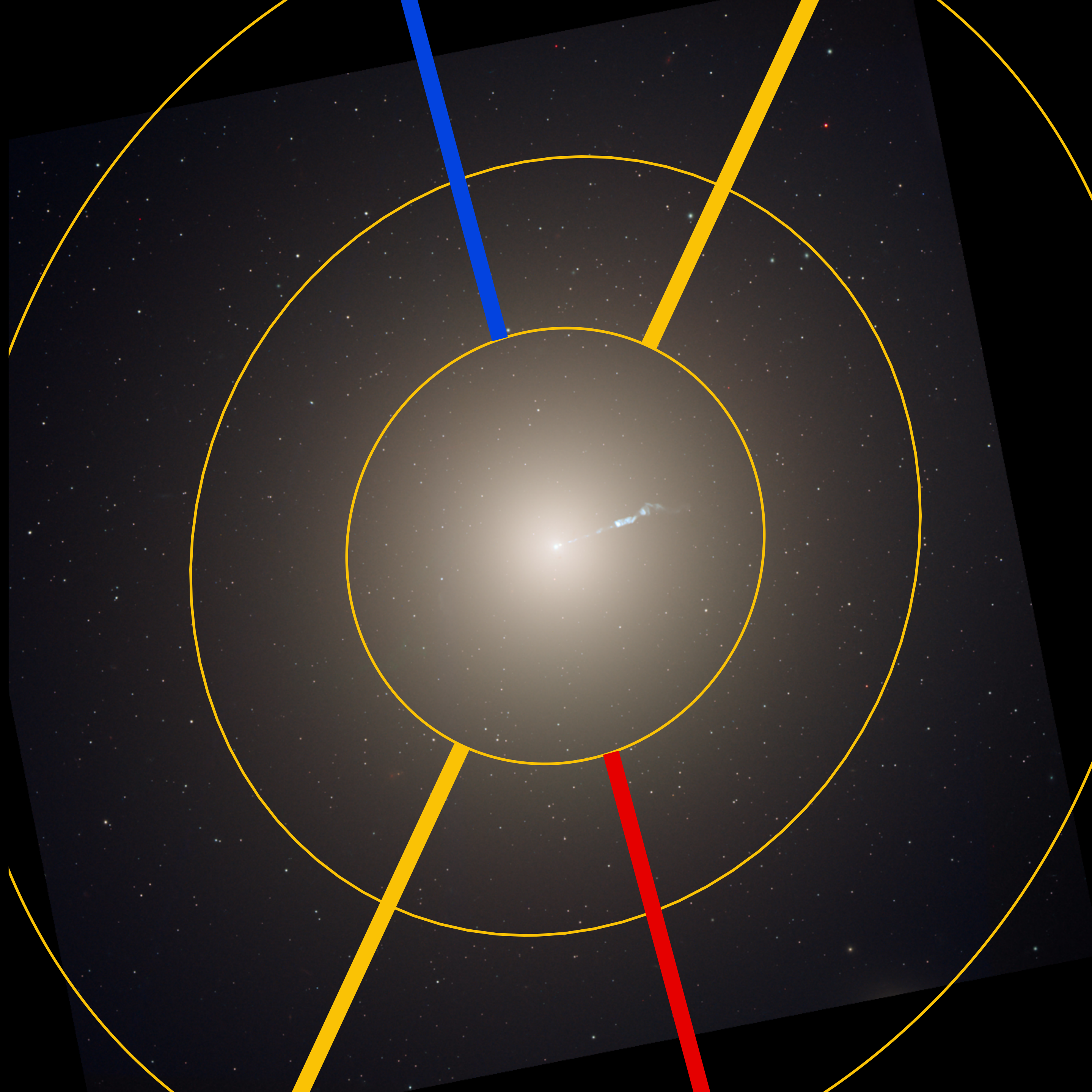
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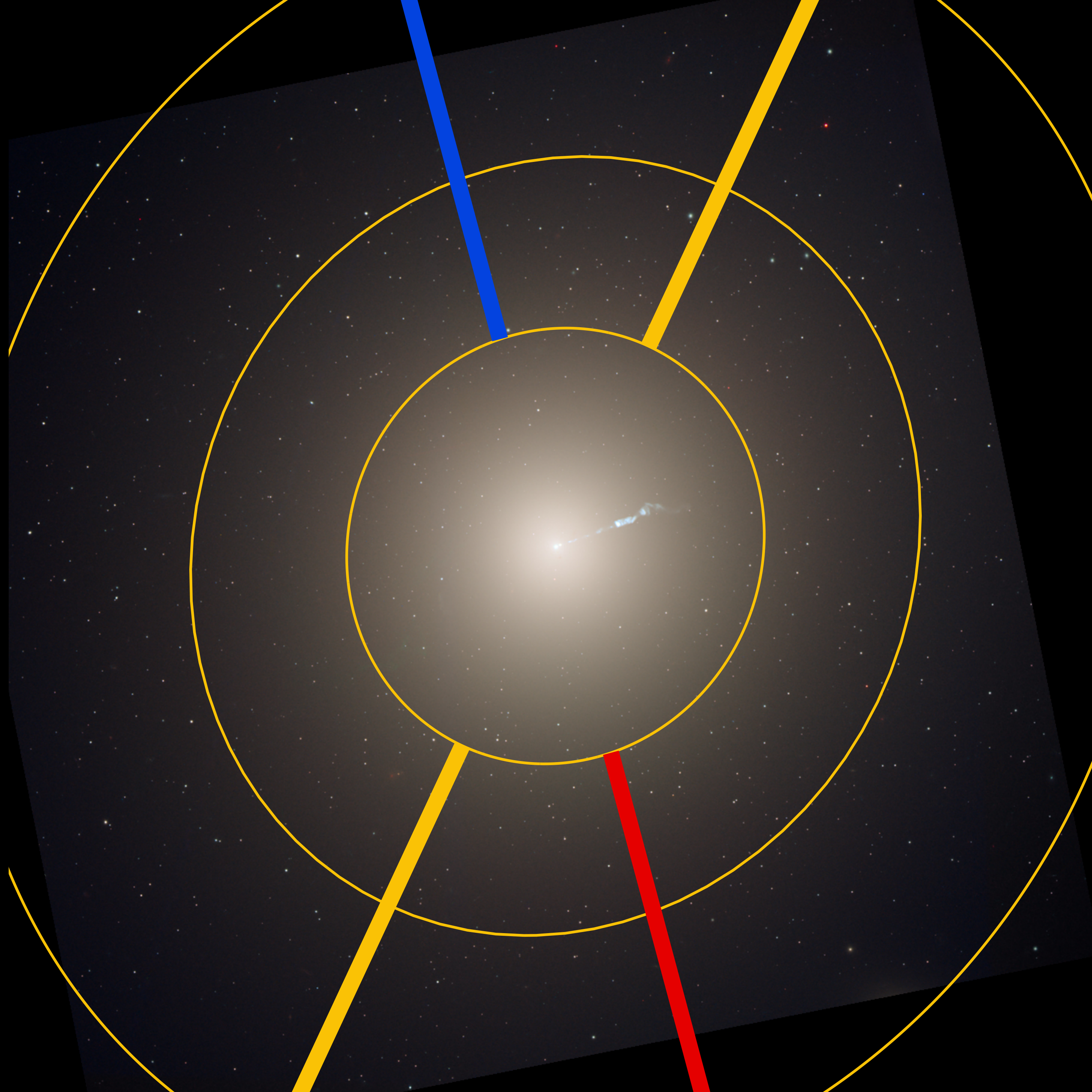


how to find an SMBH: M87



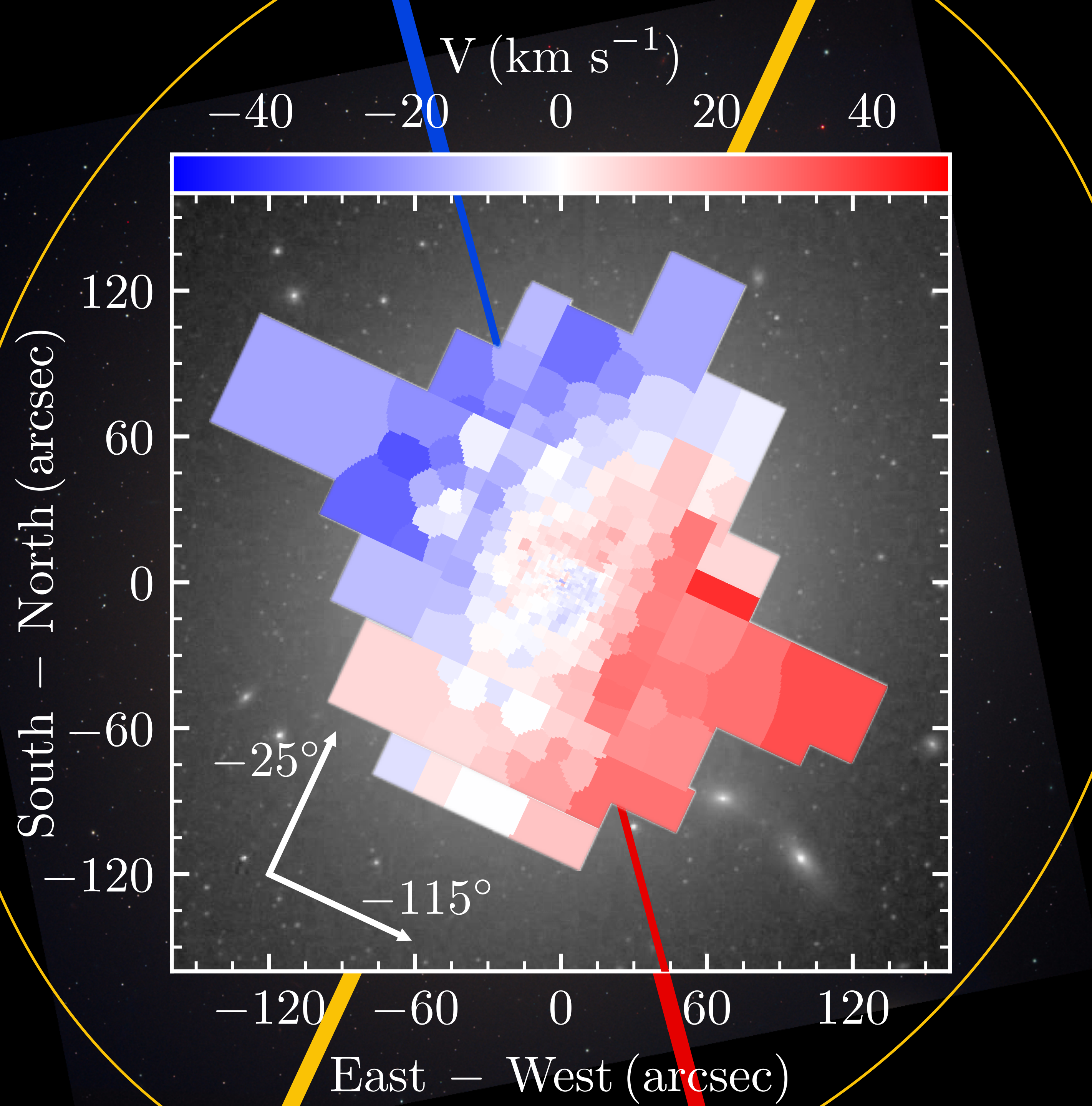
how to find an SMBH: M87

1. measure the light distribution



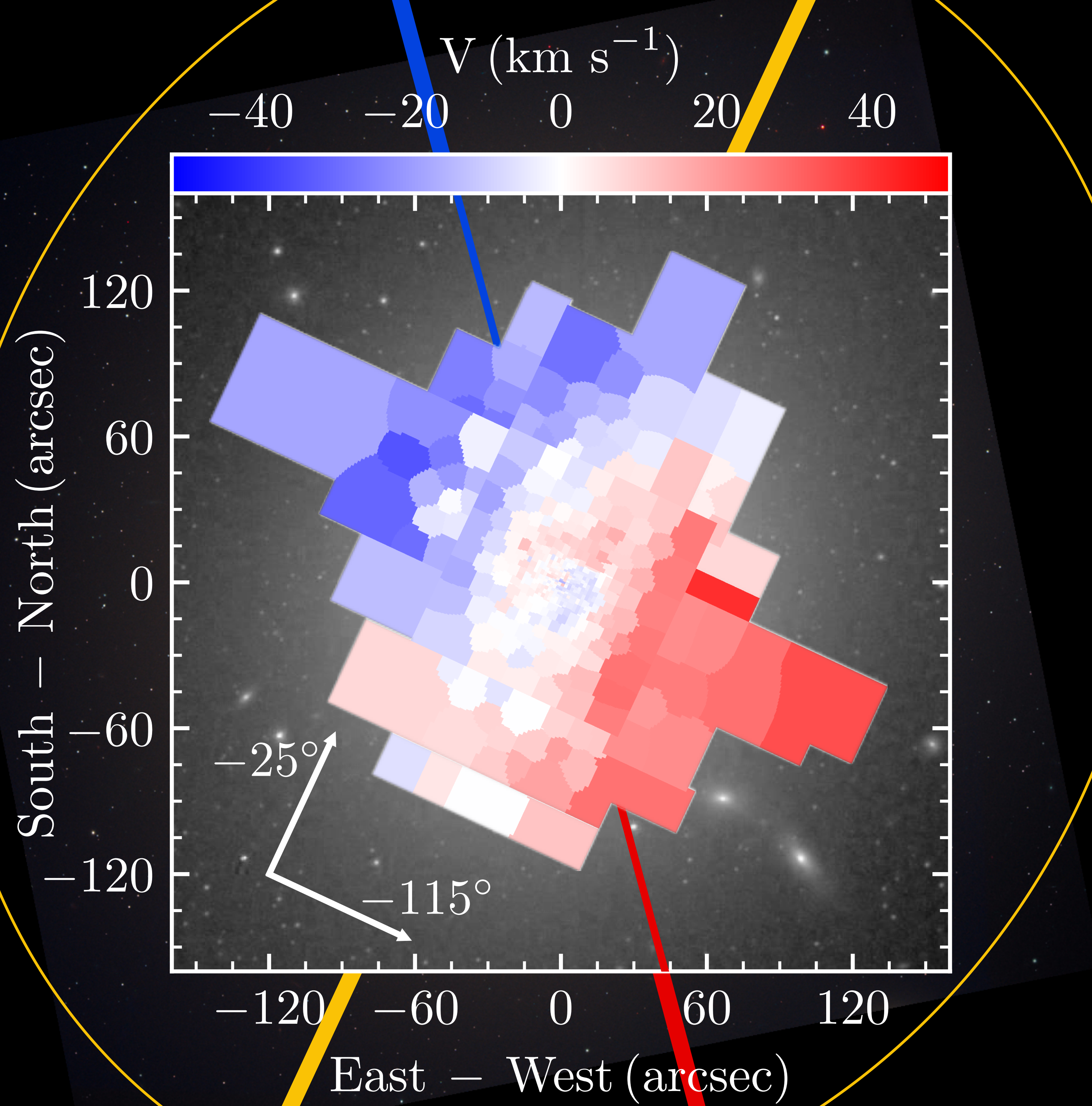
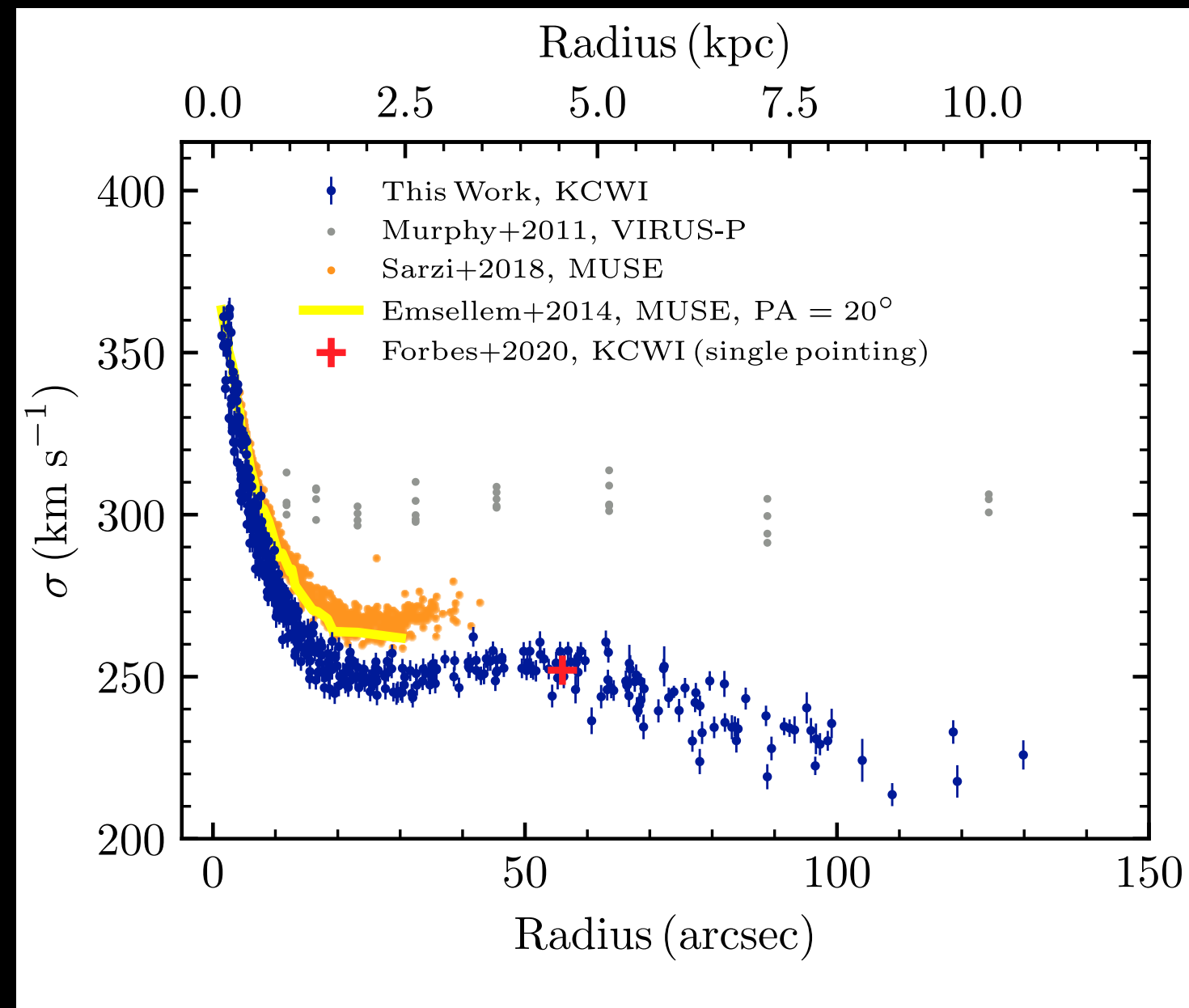
how to find an SMBH: M87

1. measure the light distribution
2. measure the motion of stars



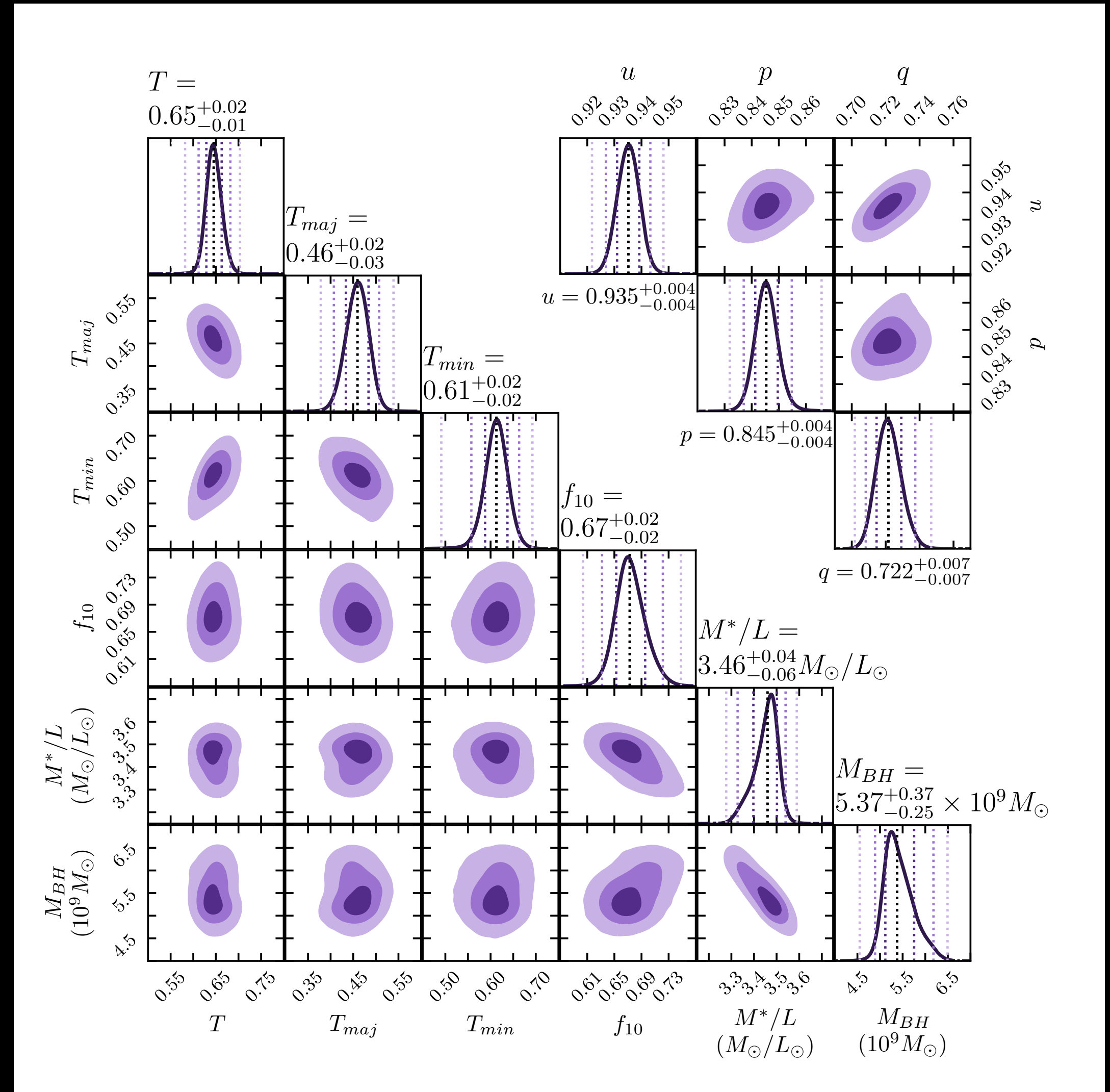
how to find an SMBH: M87

1. measure the light distribution
2. measure the motion of stars



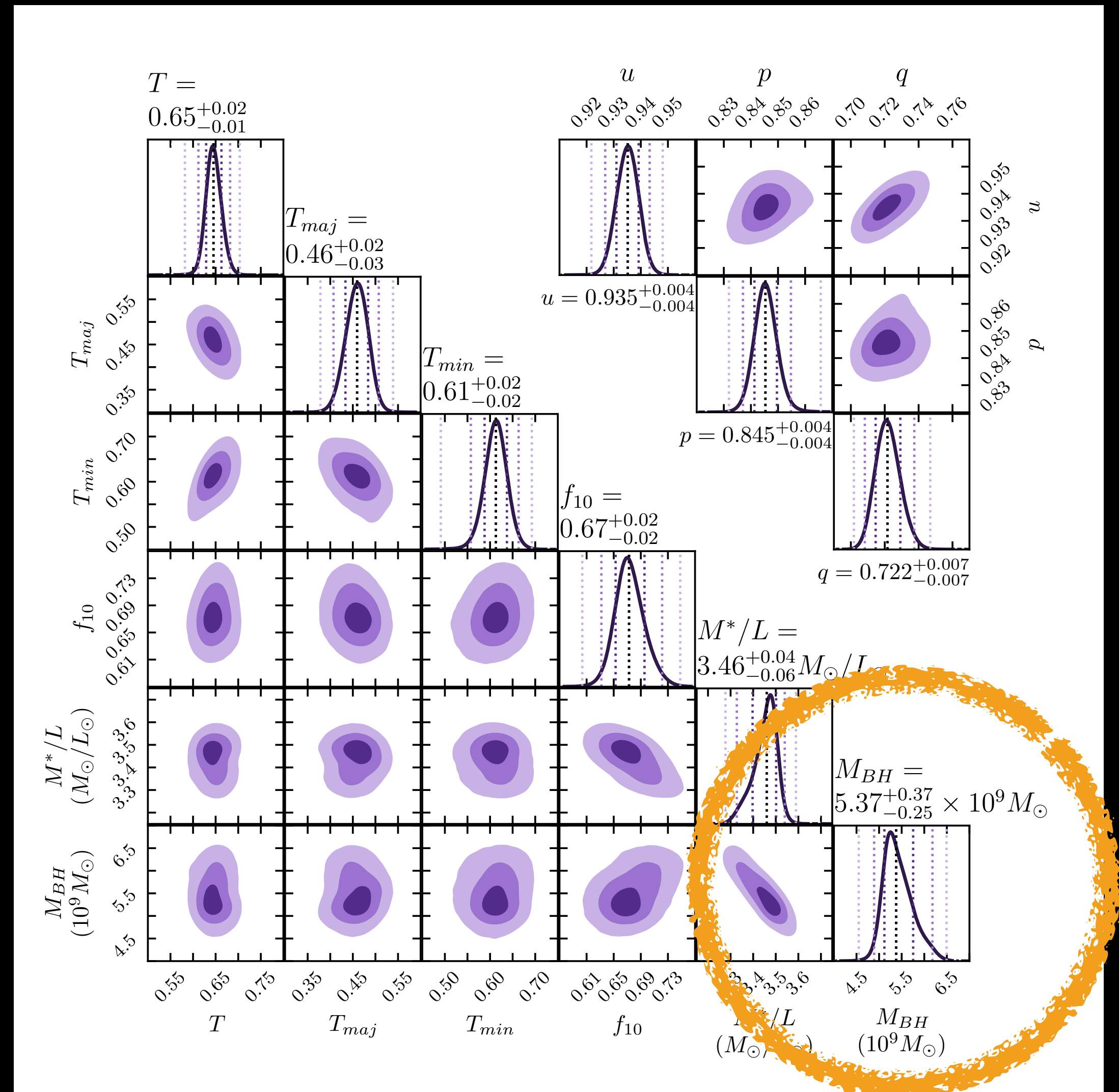
how to find an SMBH: M87

1. measure the light distribution
2. measure the motion of stars
3. model those motions

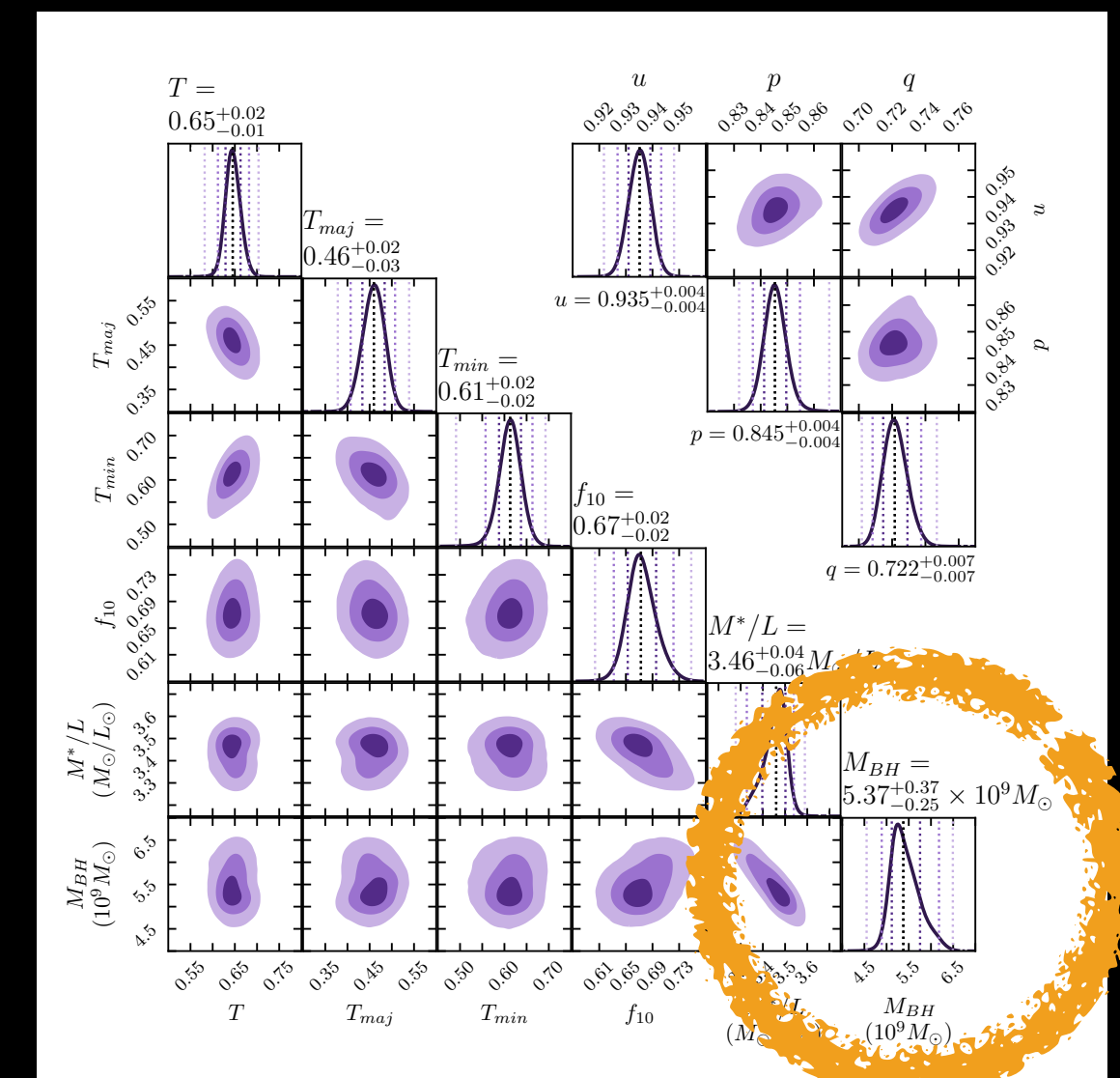
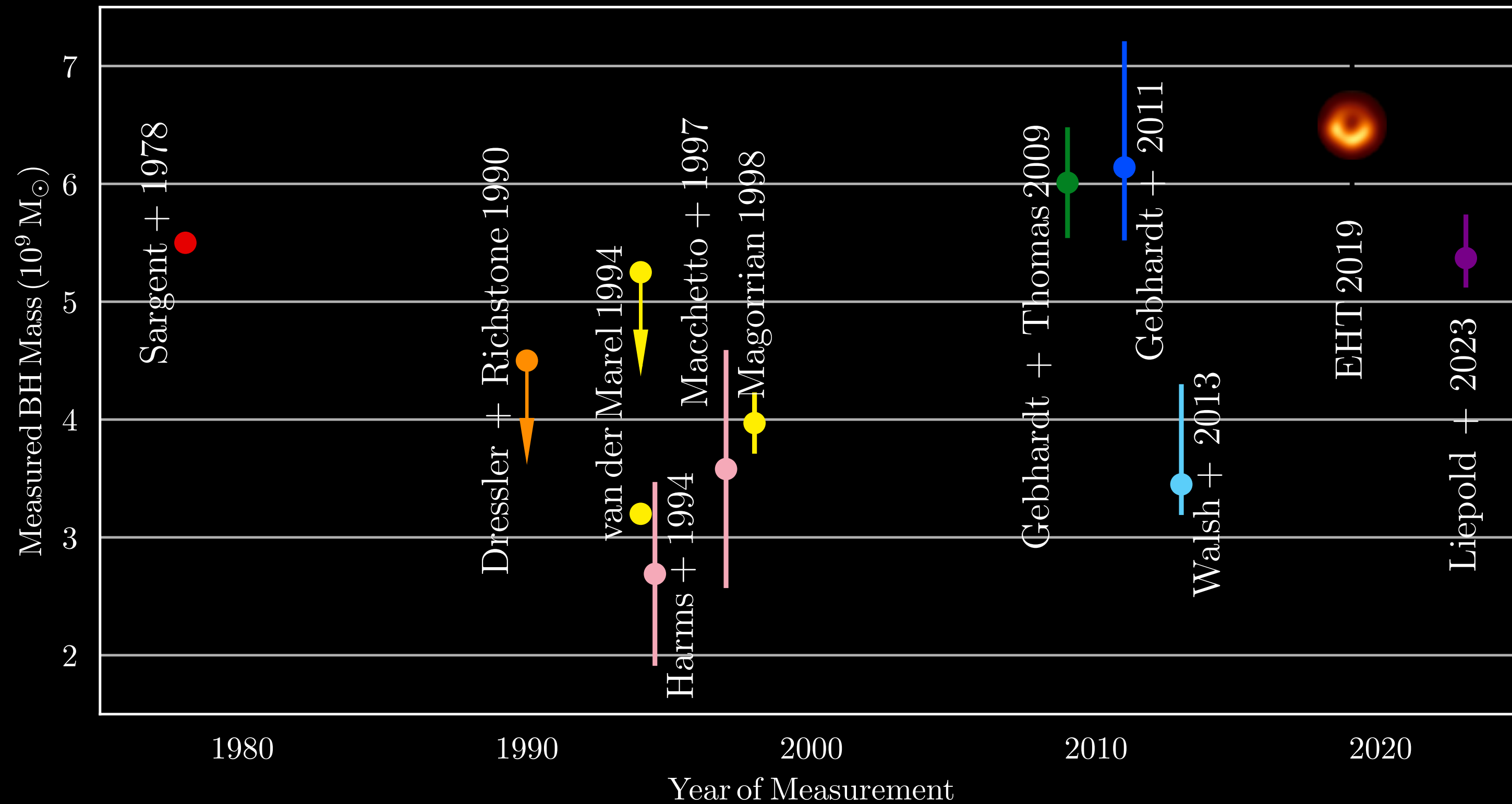
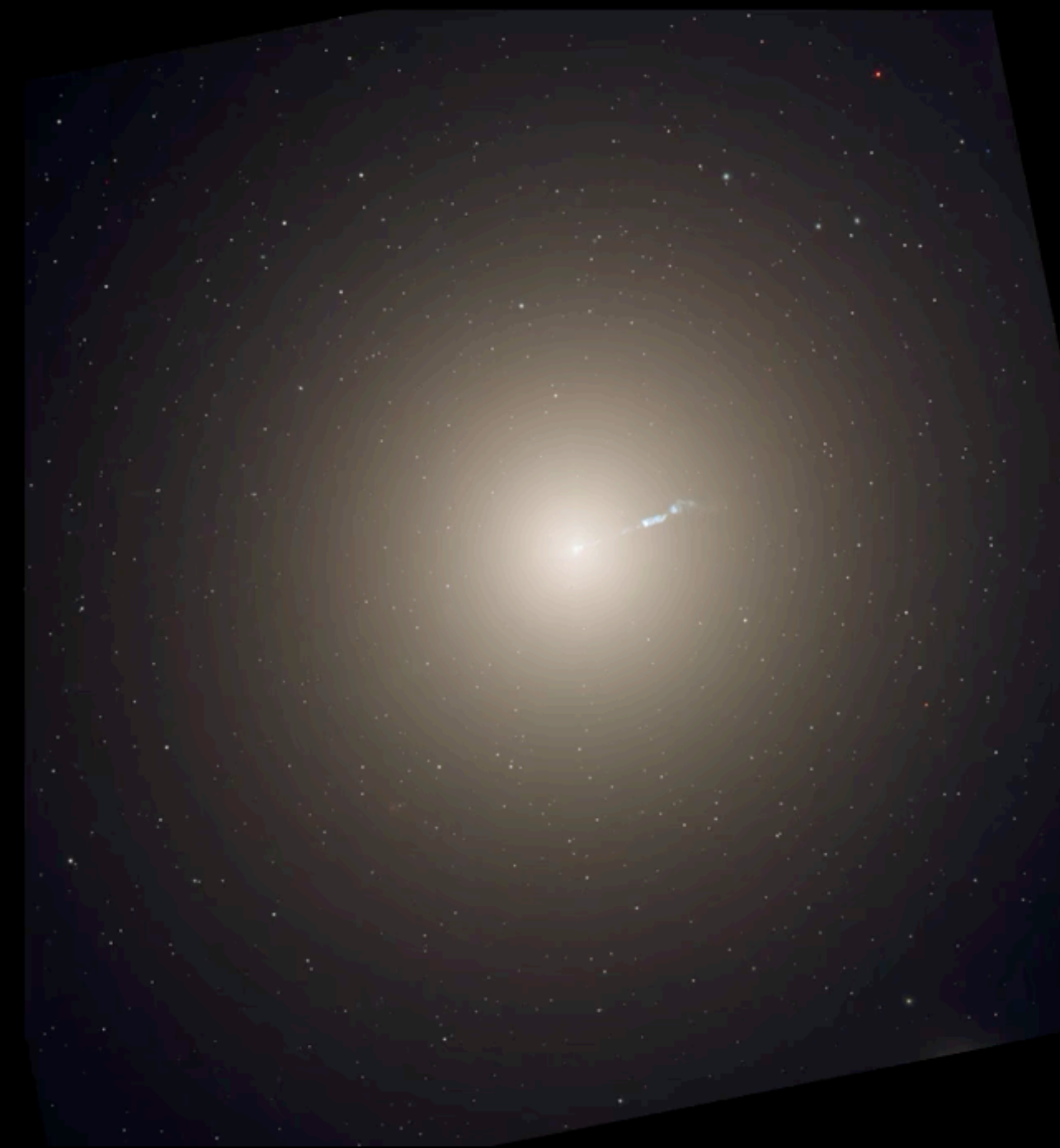


how to find an SMBH: M87

1. measure the light distribution
2. measure the motion of stars
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how to find an SMBH: M87



how to find an SMBH: M87

