Discovery of The Closest-Separation Multiwavelength Dual Active Galactic Nuclei

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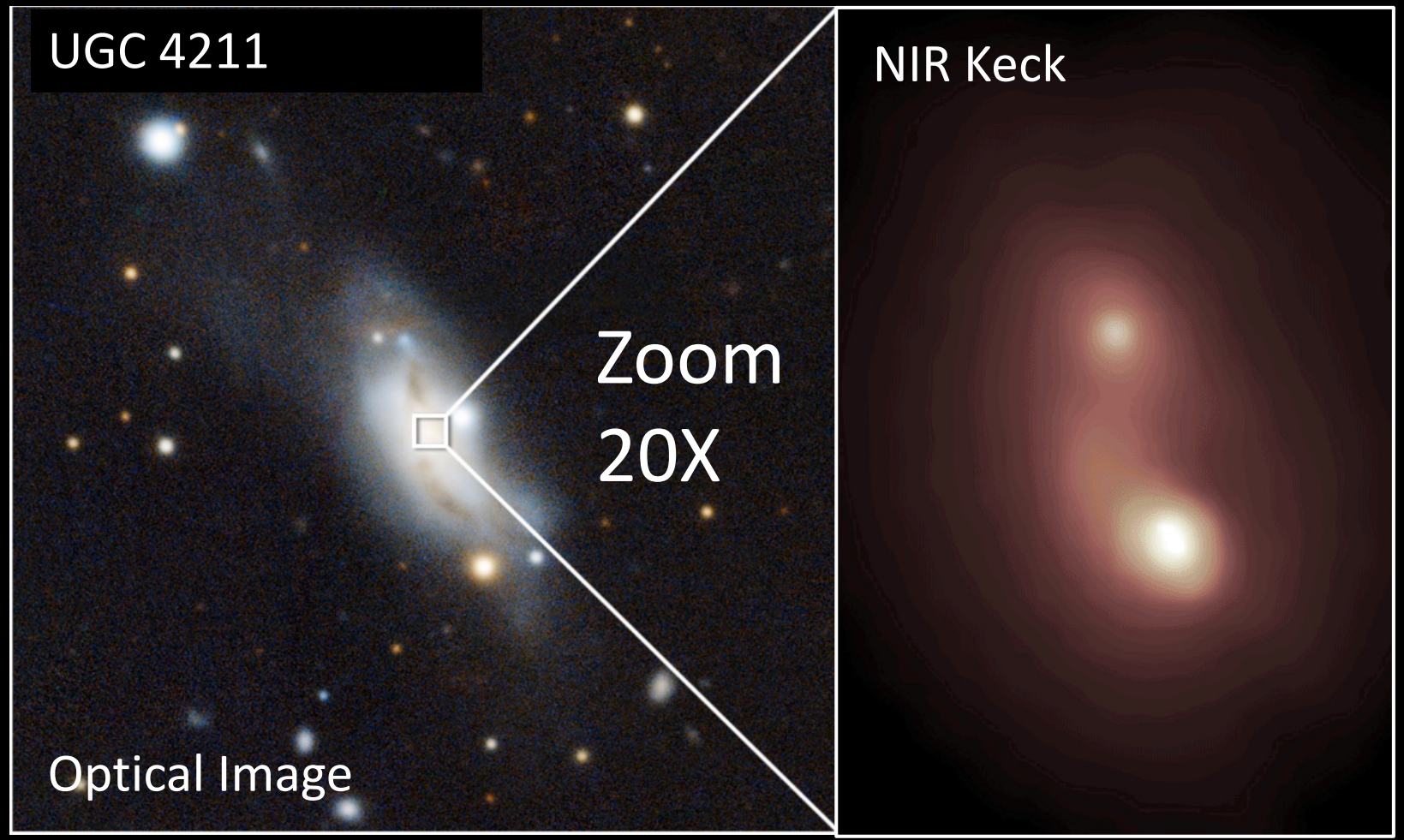
Galaxy Merger Timeline: Black hole growth, merger and gravitational waves

- Our galaxy and others have merged in the past
- Merging galaxies fuel black holes
- Black holes grow and eventually merge, emitting gravitational waves

How many are in final merging stage?

A Hidden Merger in the Heart of a Nearby Galaxy

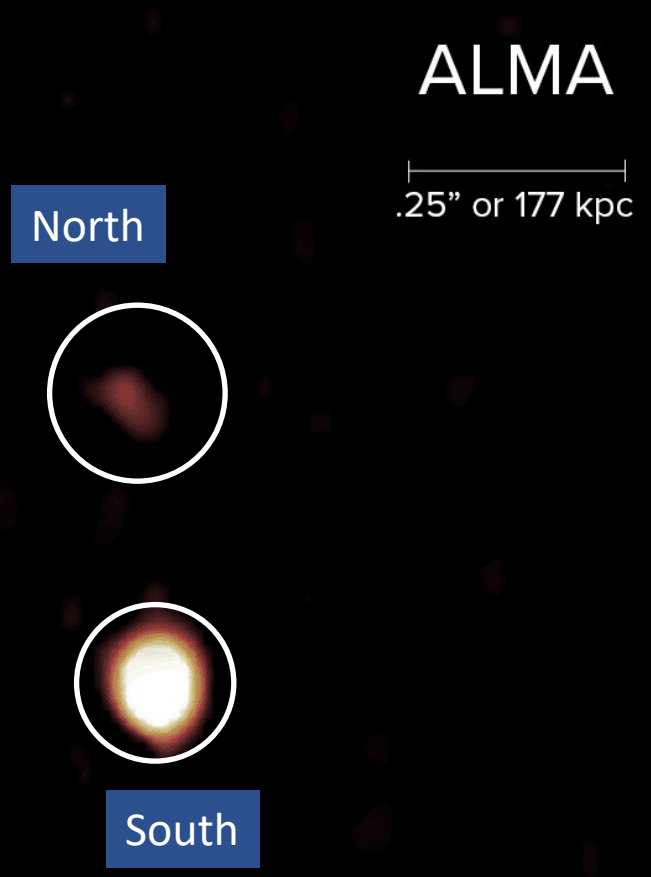


- Only 500 million light years away
- Two galaxy nuclei identified with adaptive optics
- Nuclei separated by 750 light years
- Could resolve a candle on the moon

Is this merger a dual growing black hole?

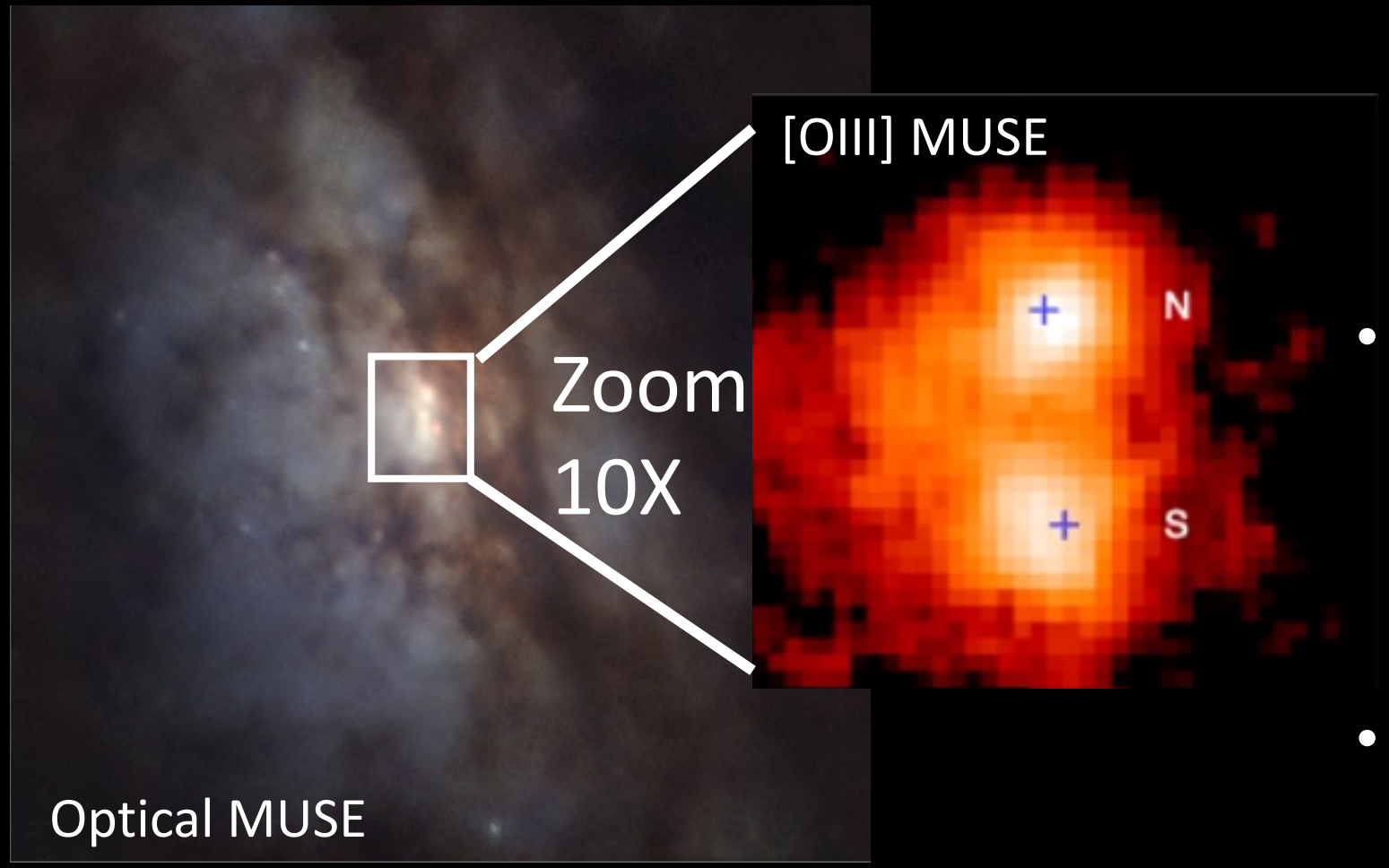
Credit: W. M. Keck Observatory, and M. Koss (Eureka Scientific, Inc.)

Millimeter Emission From Two Growing Black Holes



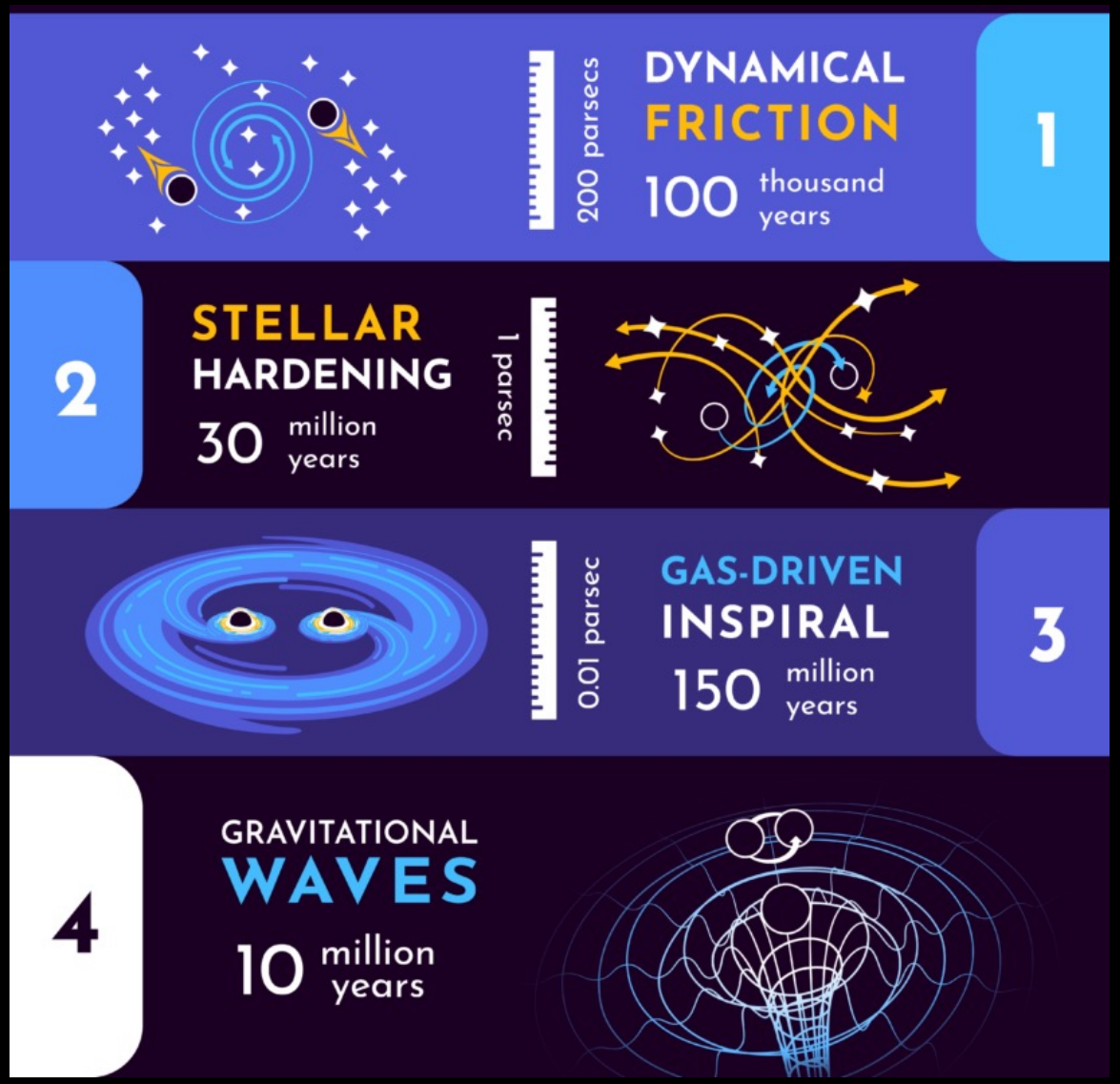
Compact millimeter emission traces growing black holes or active galactic nuclei (AGN)

Each Wavelength Tells a Part of the Story



- Closest dual AGN confirmed with multiwavelength observations
- Highly ionized emission from AGN shows two sources confirming ALMA
- Stellar velocities predict masses of two black holes

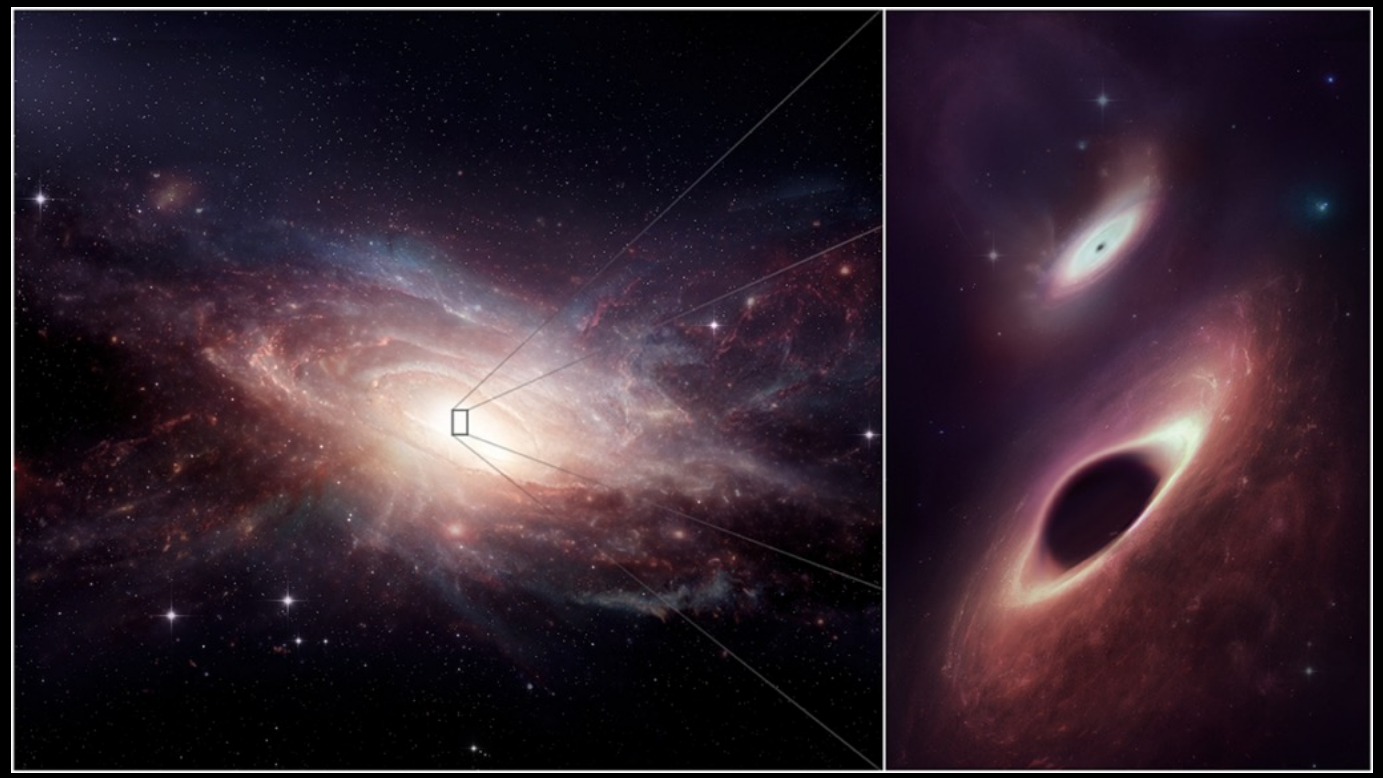
Timeline to Gravitational Waves



- Expect the merger to go through interactions with stars and gas to reach final separation
- Could be a prototype that is common for galaxy mergers which are much more in common distant AGN

Credit: J. Utreras/E. Treister, Center for Astrophysics and Associated Technologies (CATA); M. Koss (Eureka Scientific) et al.

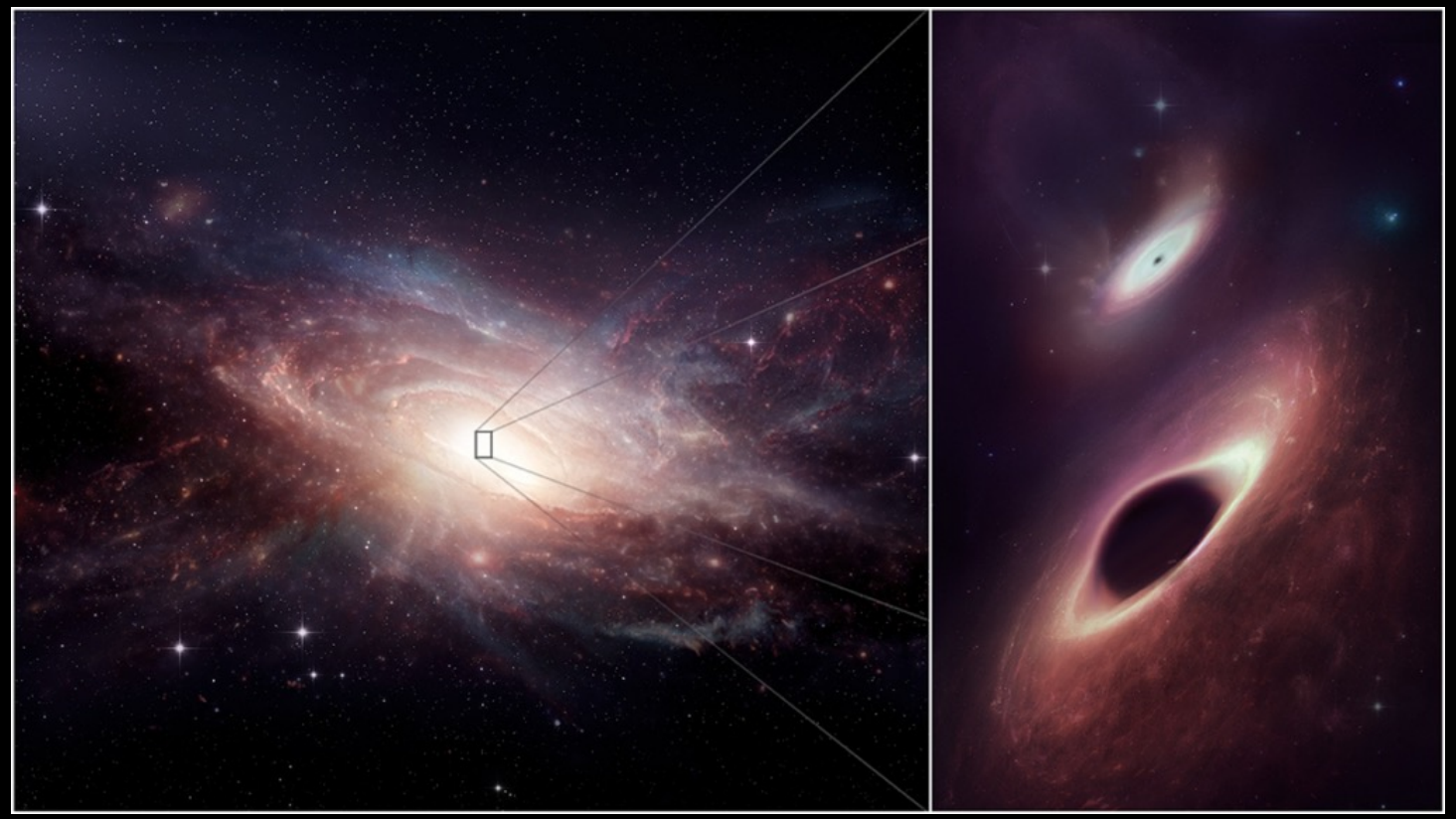
UGC 4211 in Context



- Closest dual AGN detected in multiwavelength observations
- After ~200 million years, galaxy will create massive elliptical galaxy and gravitational waves
- Milky way and Andromeda will merge in 5 billion years, and follow similar timeline

Credit: ALMA (ESO/NAOJ/NRAO); M. Weiss (NRAO/AUI/NSF)

More Information



- Article: Koss et al. (2023) published in Astrophysical Journal Letters (today)
- All graphics, animations, and article available at: bit.ly/UGC4211

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Credit: ALMA (ESO/NAOJ/NRAO); M. Weiss (NRAO/AUI/NSF)