Infrared Echoes of Cassiopeia A Reveal the Dynamic Interstellar Medium

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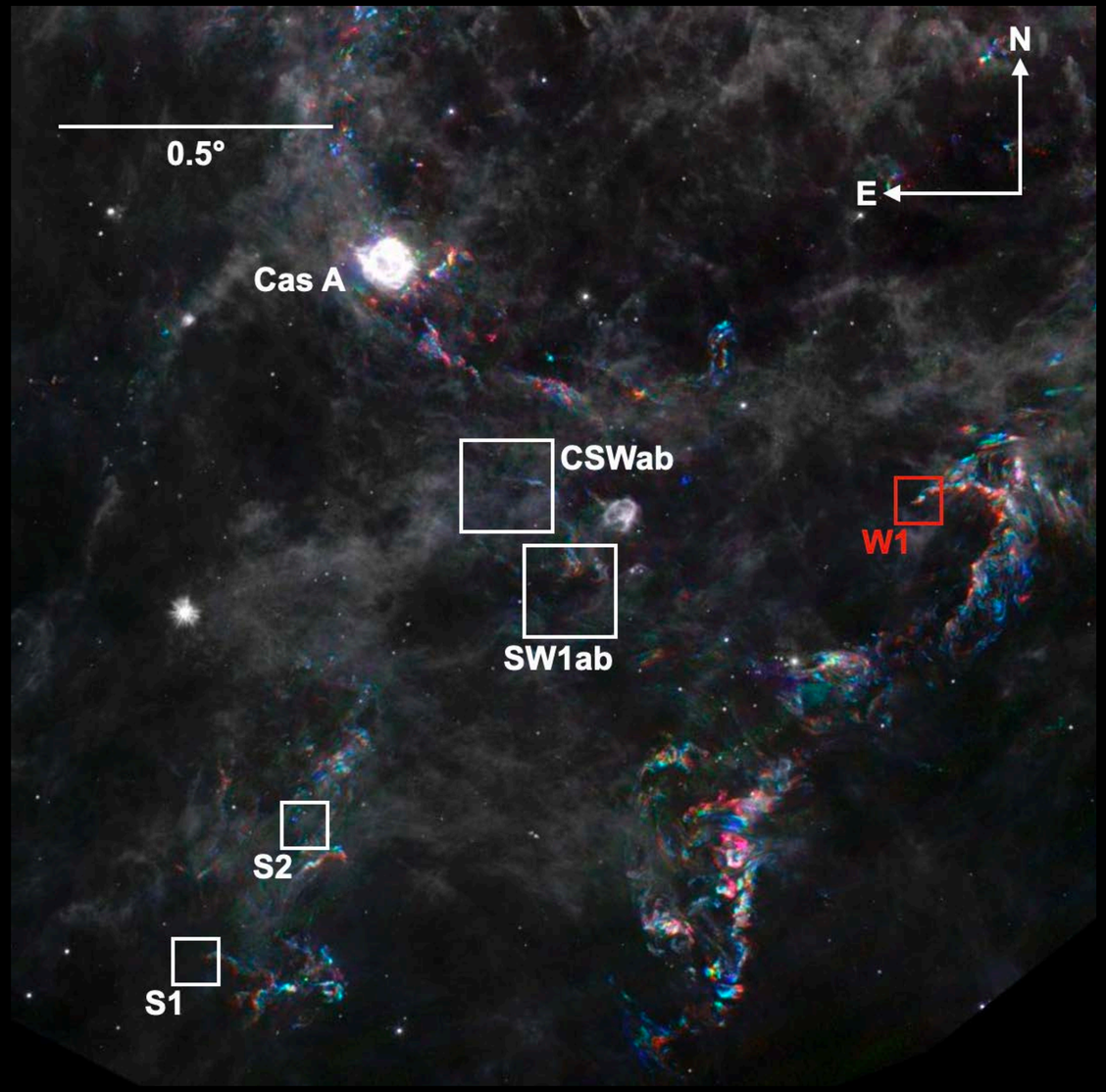
JWST reveals intricate, never-before-seen structures within interstellar clouds around Cas A

Echoes of a Historic Explosion: A Supernova Flash Illuminates Interstellar Material



- Cas A is the youngest core-collapse supernova remnant in the Galaxy
- Light first reached earth ~350 years ago
- System of infrared echoes discovered by Spitzer, with continued monitoring by NEOWISE

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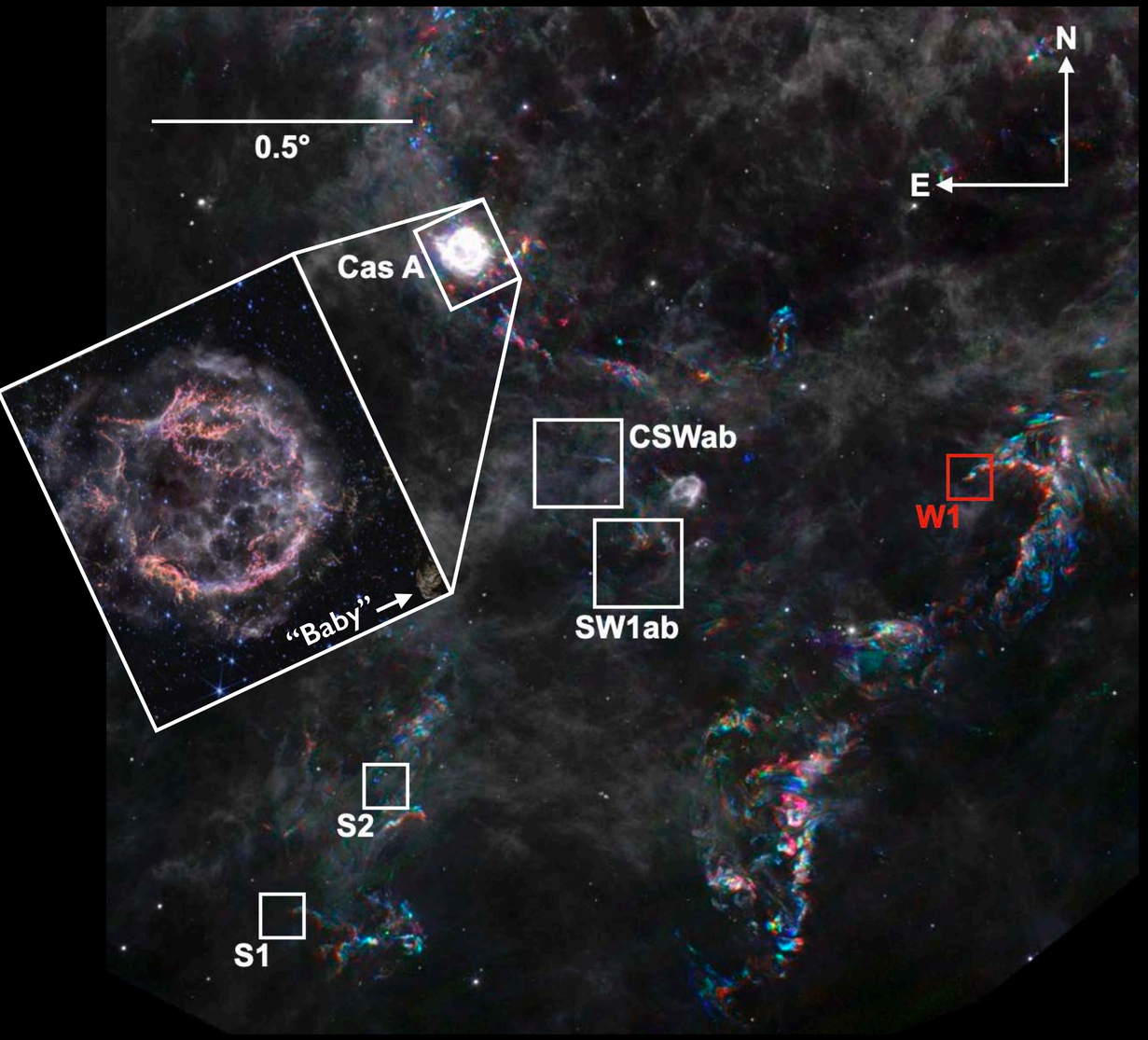

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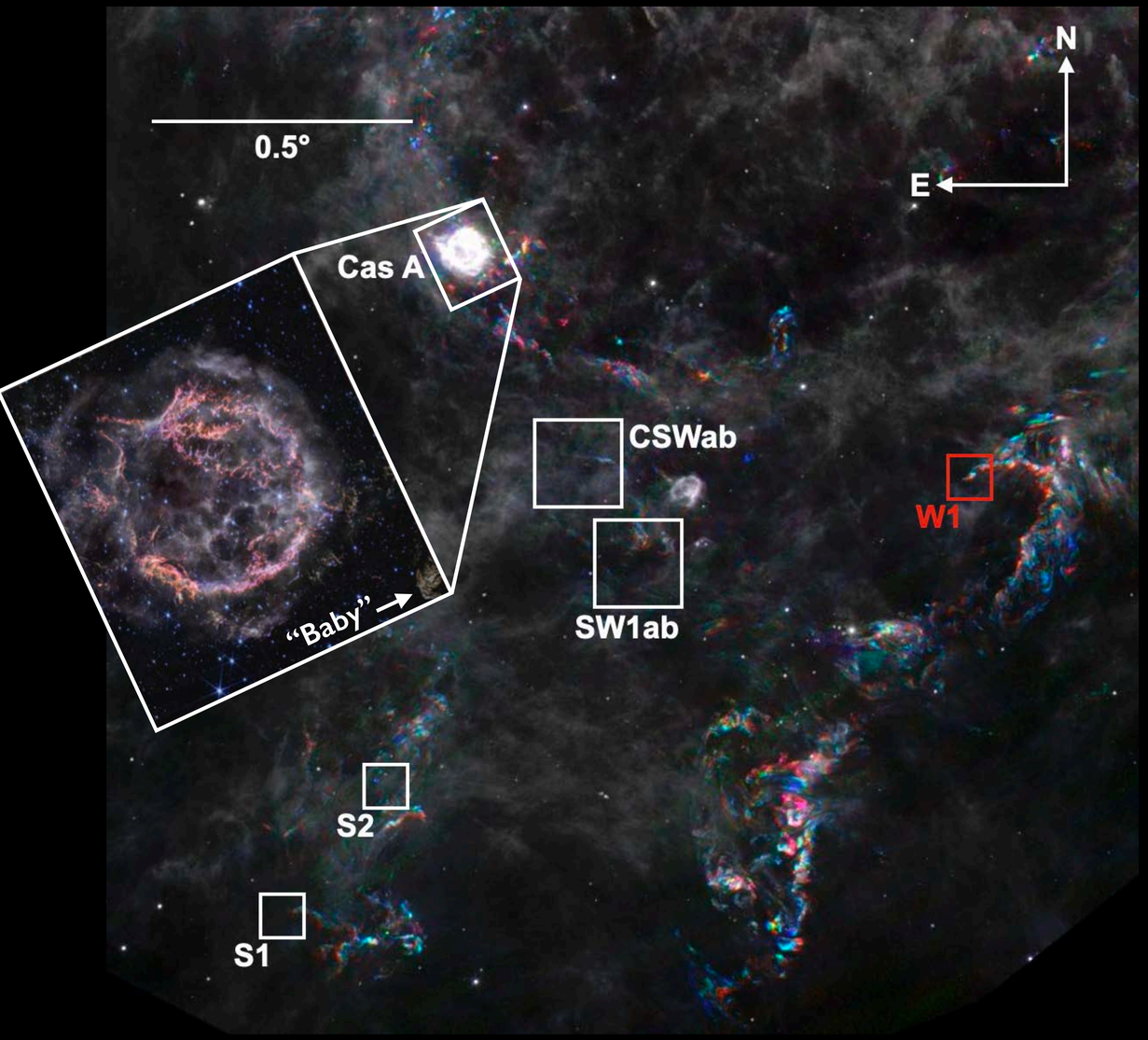

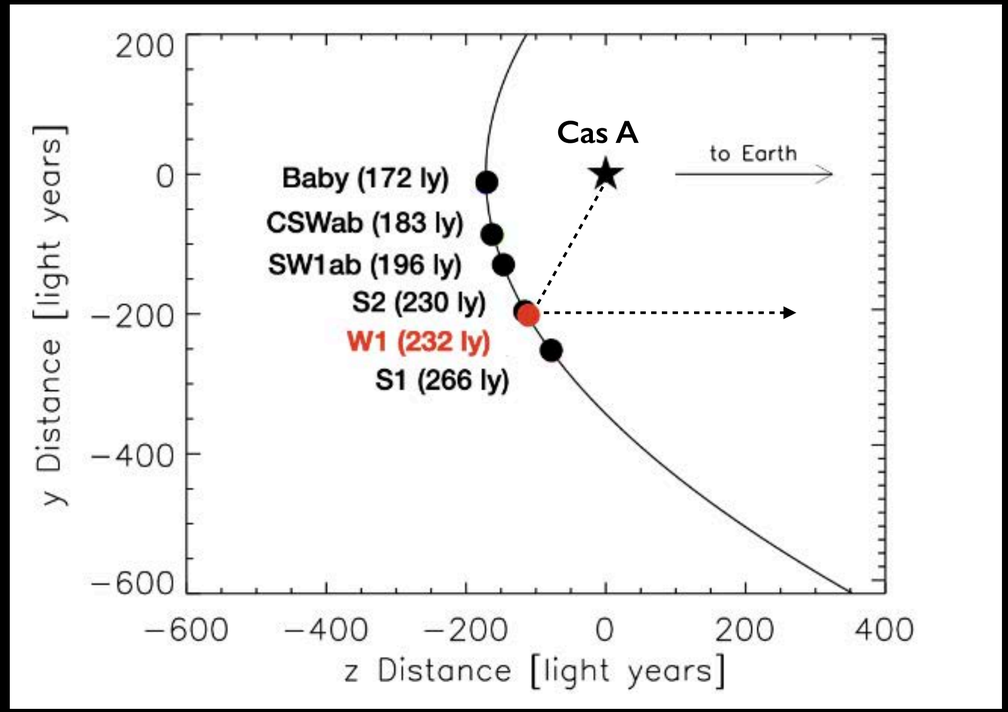

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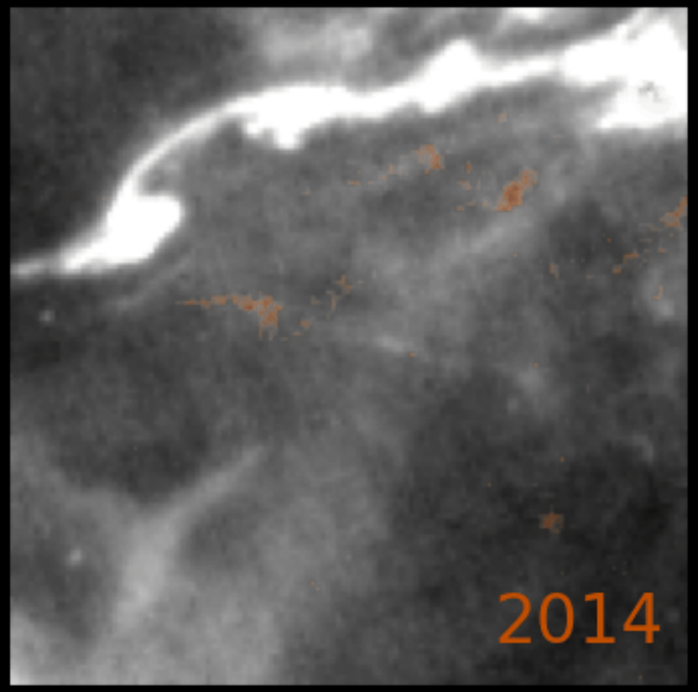
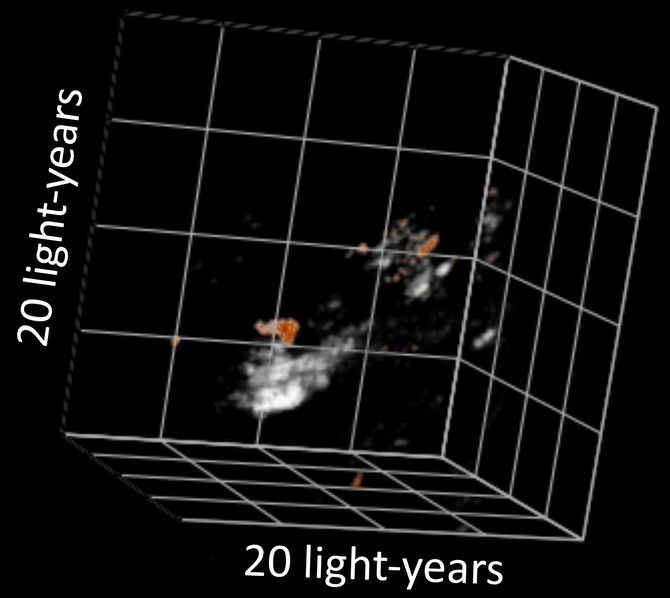
Times-series imaging creates a true 3D scan of interstellar gas and dust

Spitzer 24 µm - Cold dust



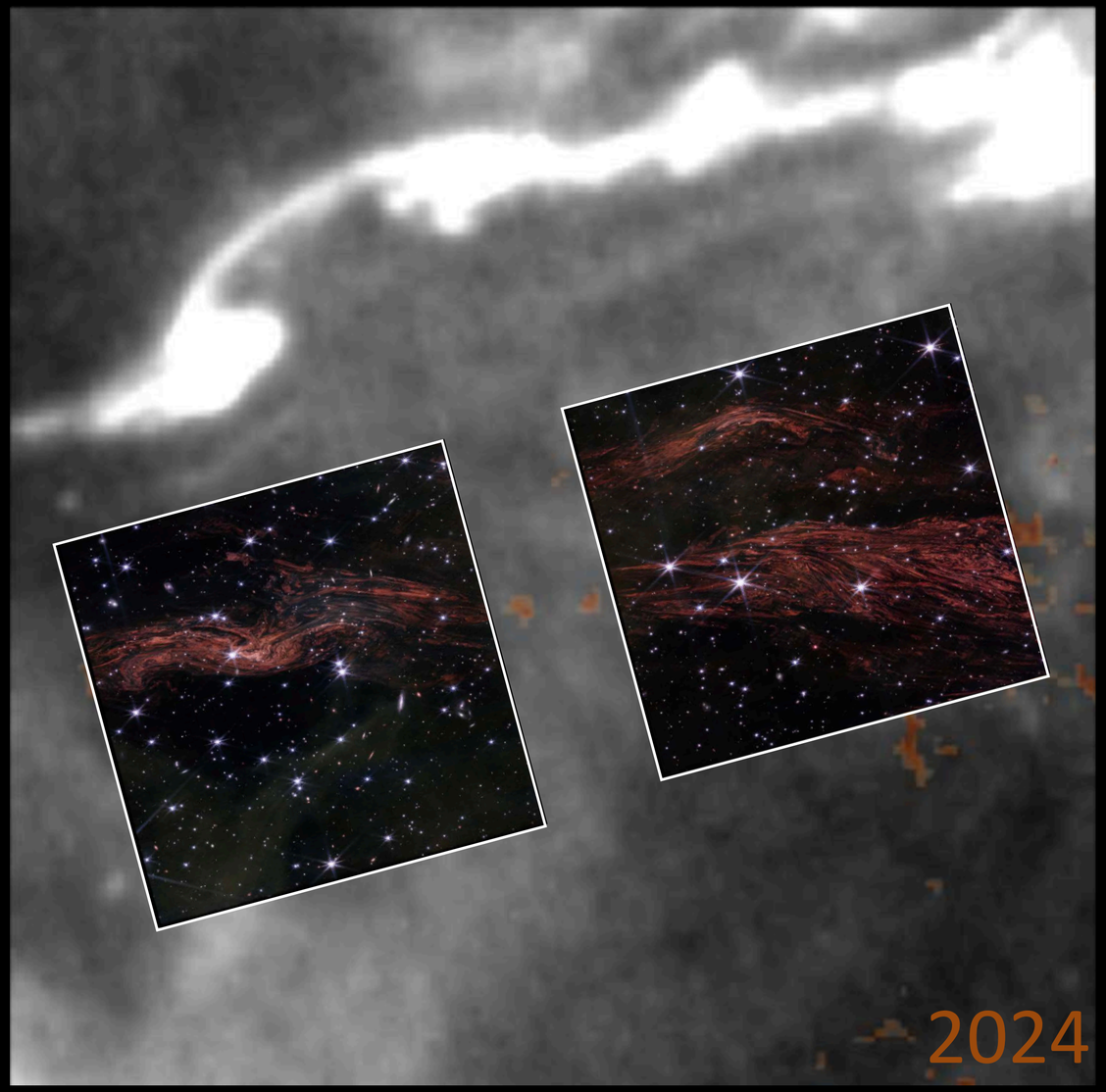
NEOWISE 4.6 µm - Echo



- Short pulse (~days) of supernova radiation illuminates a thin layer of dust, allowing us to trace 3D structure

- Spitzer analysis indicated highly clumped filamentary structure at ~0.5 light-year scales

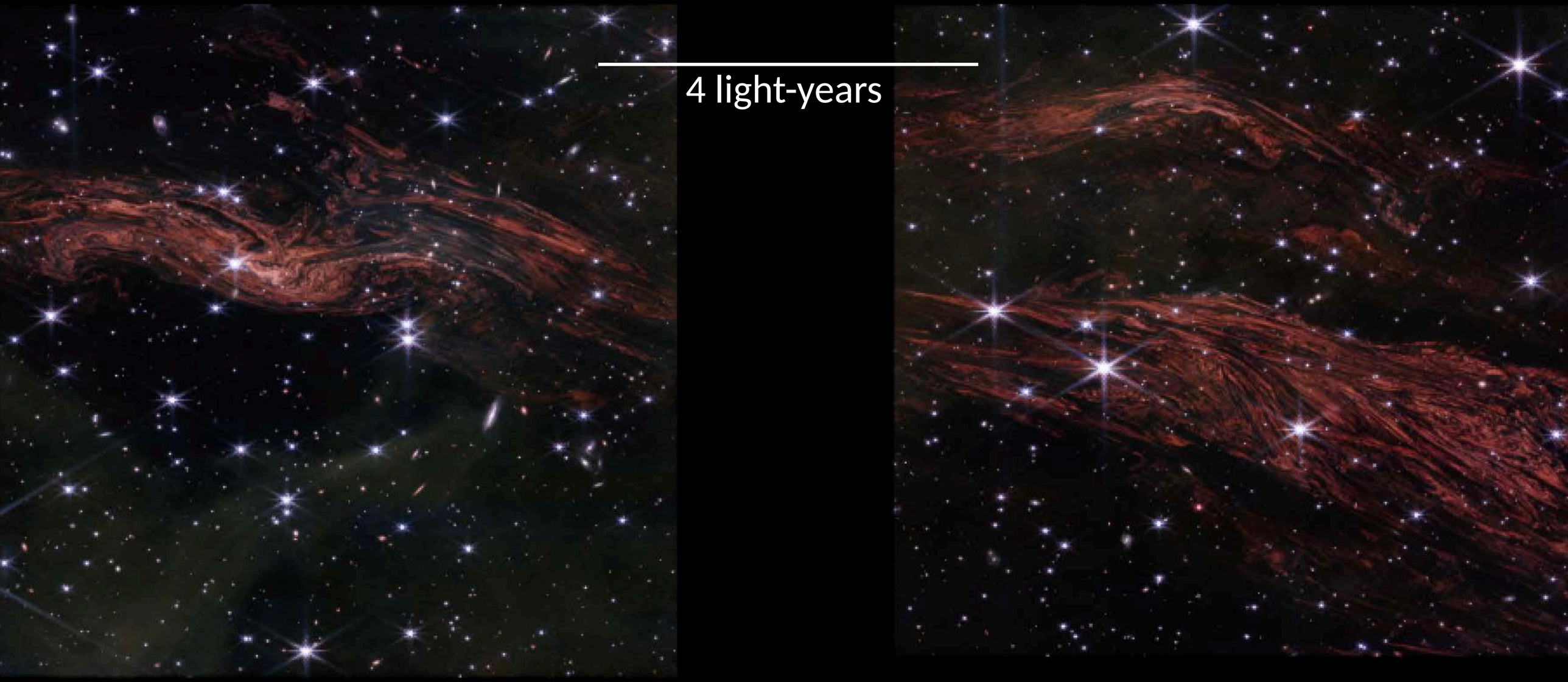
Cas A’s echoes enable JWST to peer within interstellar clouds



- 50-fold improvement in resolution, probing scales comparable to individual stellar systems
- Access to these scales opens new regimes in fundamental physics of the interstellar medium

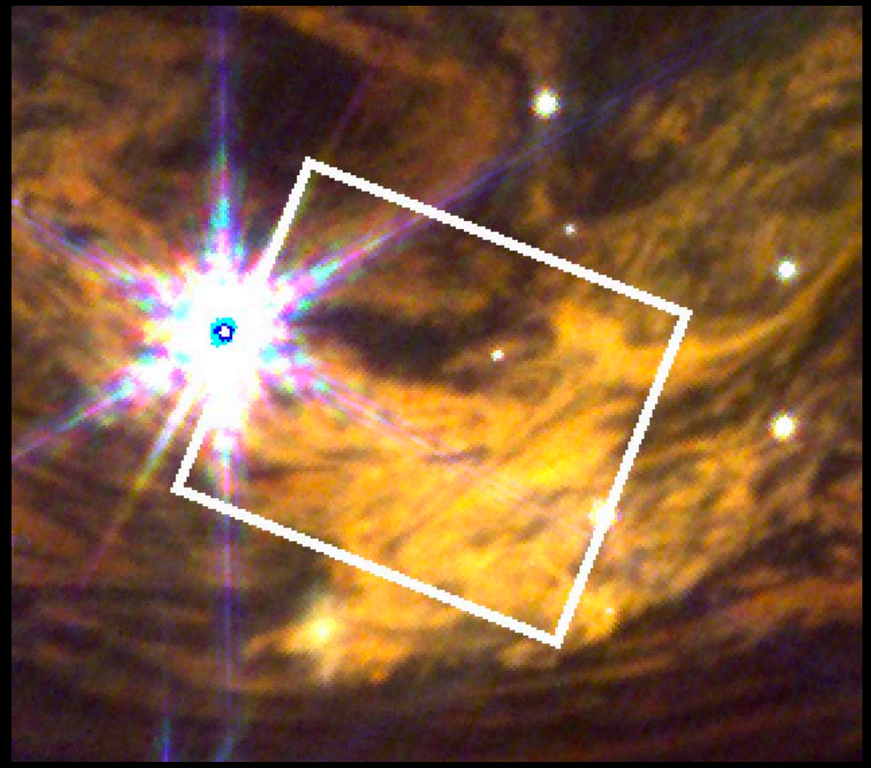
More in next talk by Josh Peek!

NIRCam imaging reveals highly intricate and diverse structures

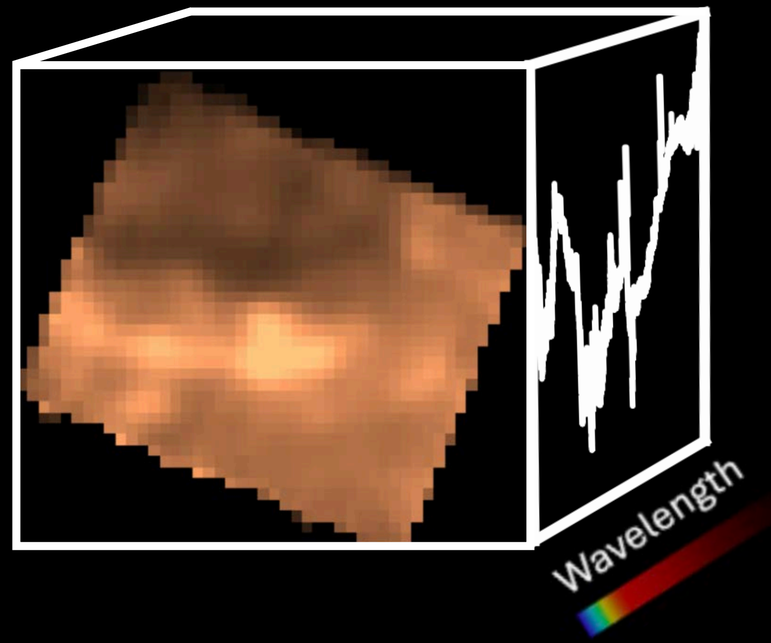


Time-series spectral imaging may allow us to see processing of interstellar material in real time

NIRCam F200W/F335M/F444W

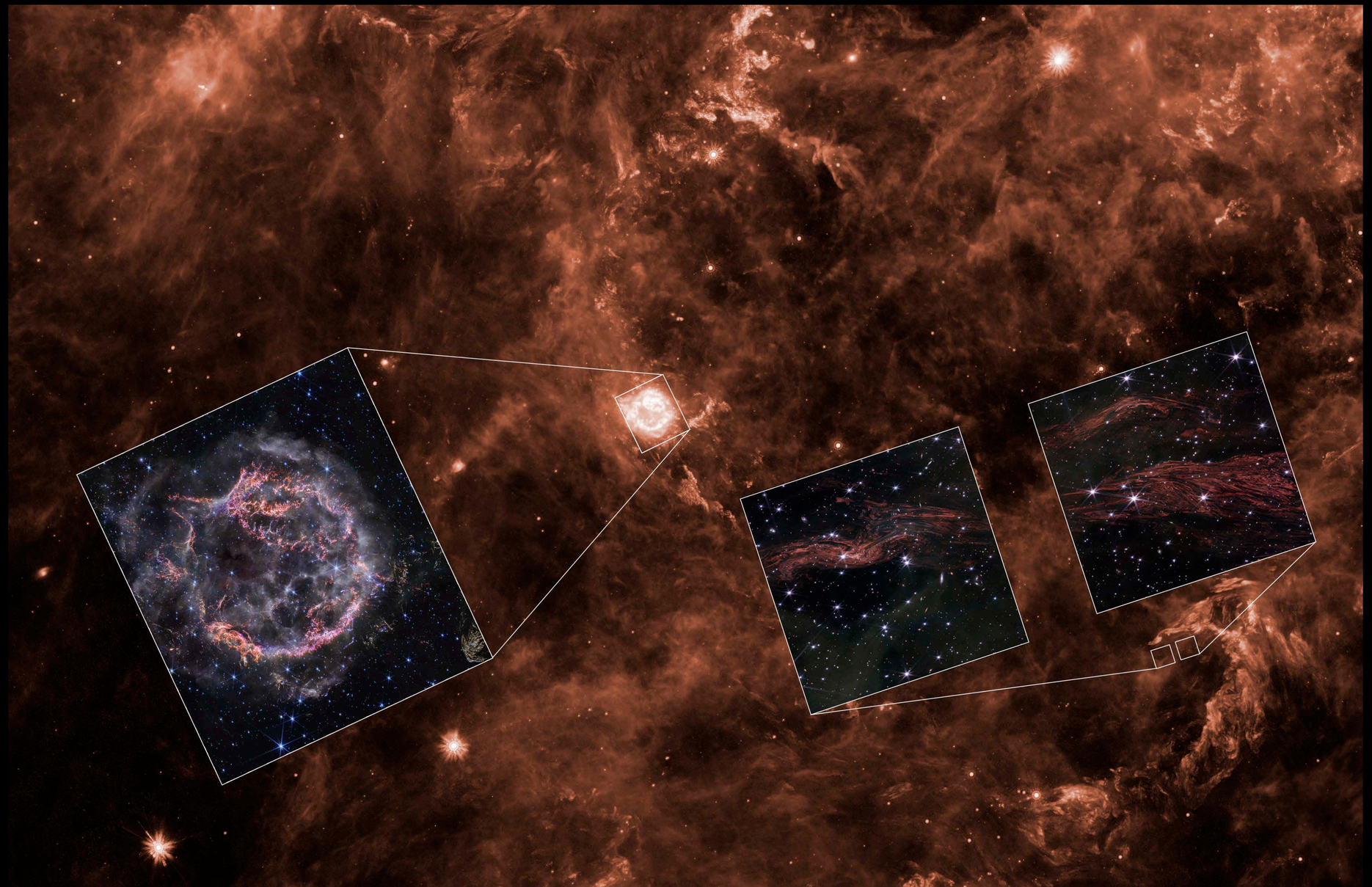


MIRI/MRS data cube



- What is the cloud made of?
- How bright was the supernova UV burst?
- How does supernova radiation affect interstellar material?

JWST imaging of Cas A's echoes offers an unprecedented view of the interstellar medium



Time-series NIRCam imaging reveals intricate 3D structures down to scales of stellar systems, only visible with Cas A's echoes

Newly discovered morphologies open a new regime in understanding formation of strucutre in interstellar clouds

MIRI/MRS spectroscopy will search for signatures of grain processing by burst of supernova radiation