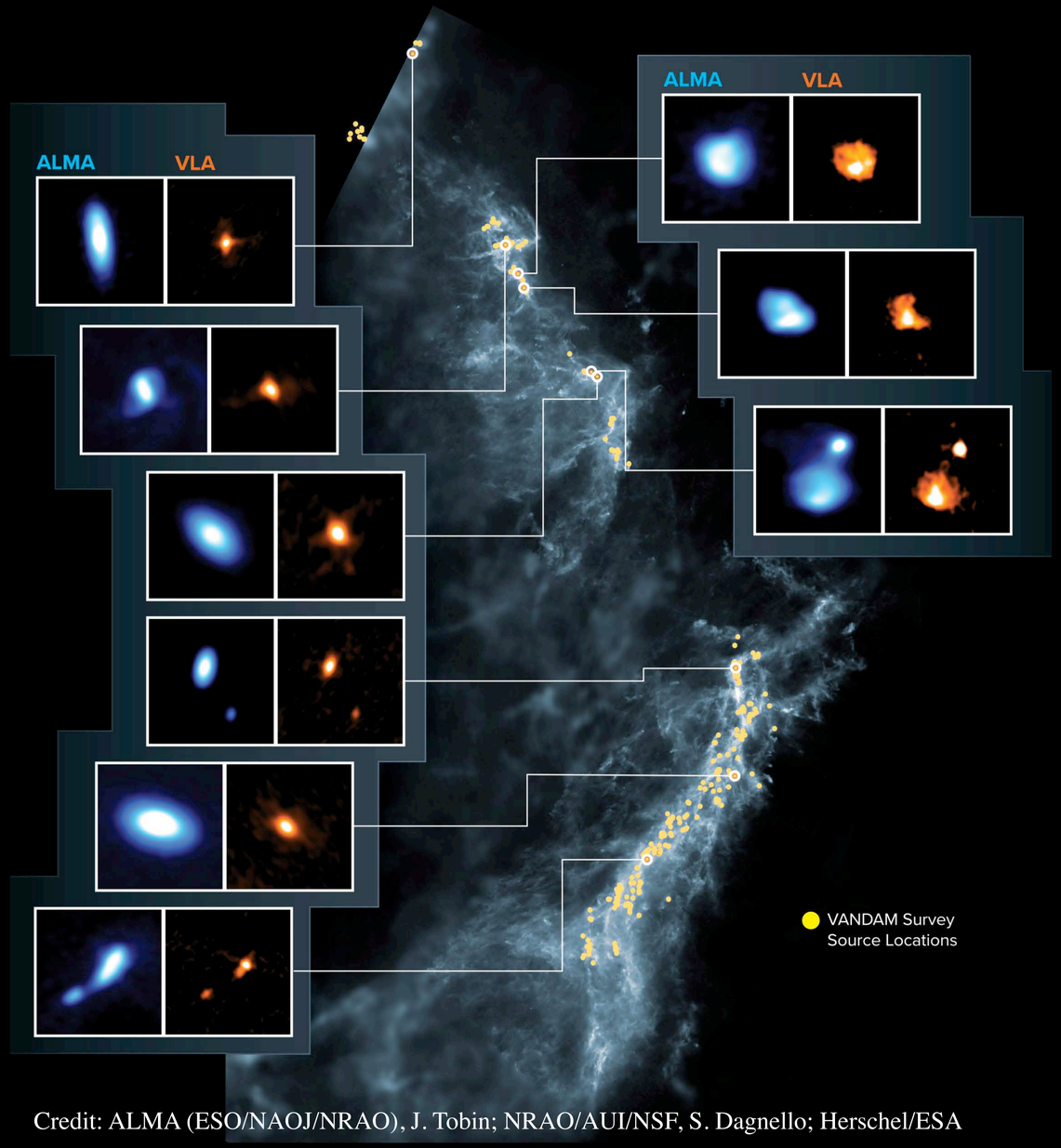
The Twisted Magnetic Field in a Protobinary System



Credit: ALMA (ESO/NAOJ/NRAO), J. Tobin; NRAO/AUI/NSF, S. Dagnello; Herschel/ESA

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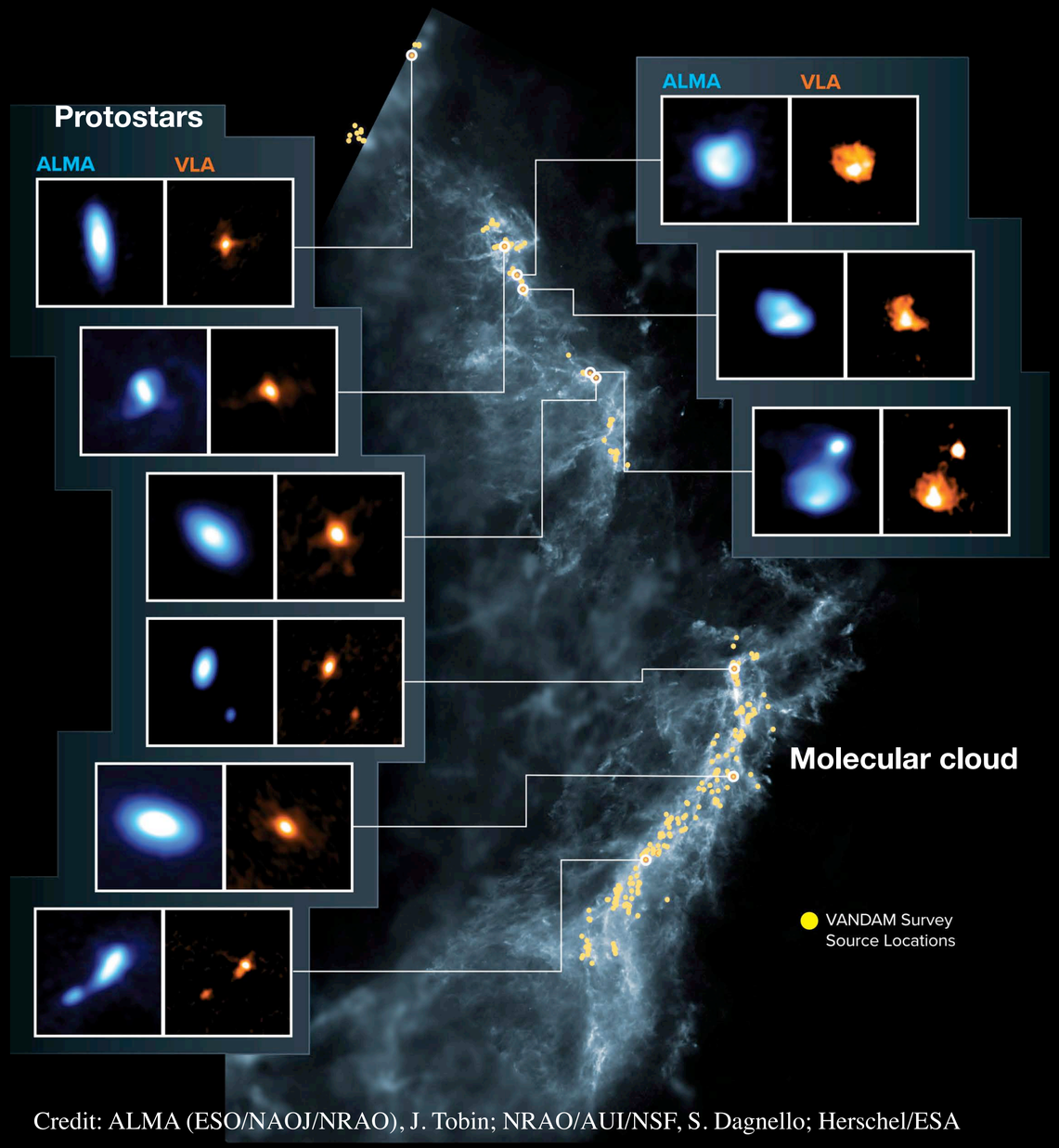


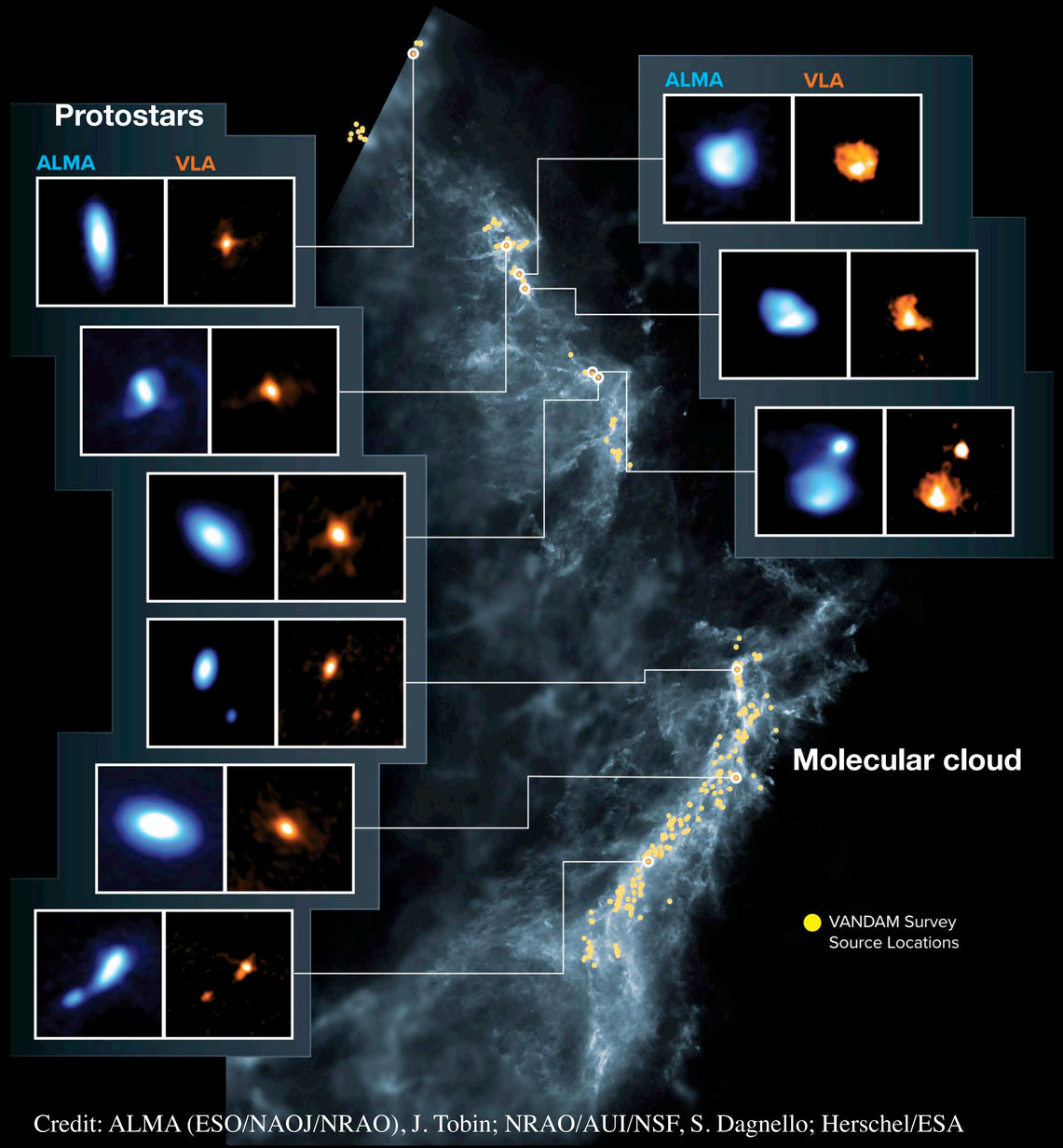
Credit: ALMA (ESO/NAOJ/NRAO), J. Tobin; NRAO/AUI/NSF, S. Dagnello; Herschel/ESA

Stars form in dusty, gaseous clouds

At the start of the collapse they produce outflows

The collapsing stars form disks around them

The Twisted Magnetic Field in a Protobinary System



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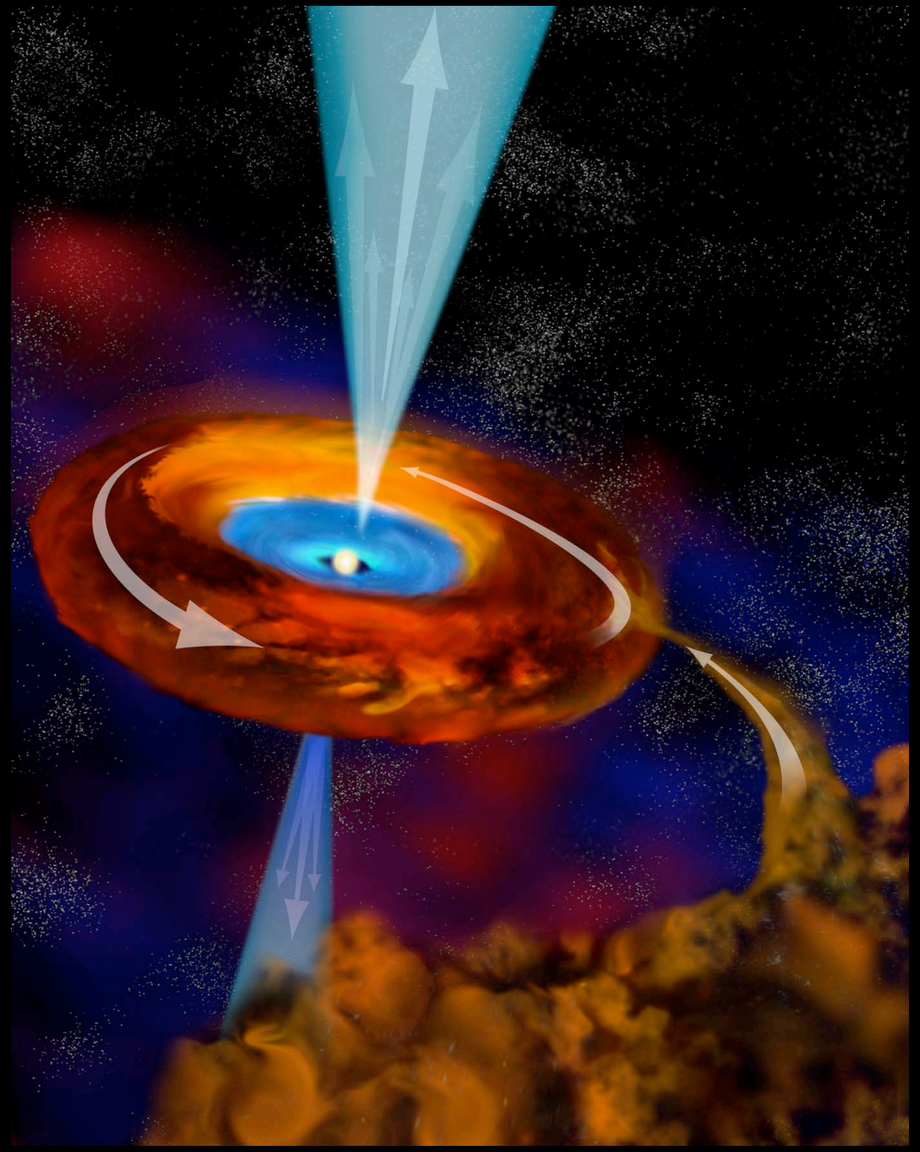


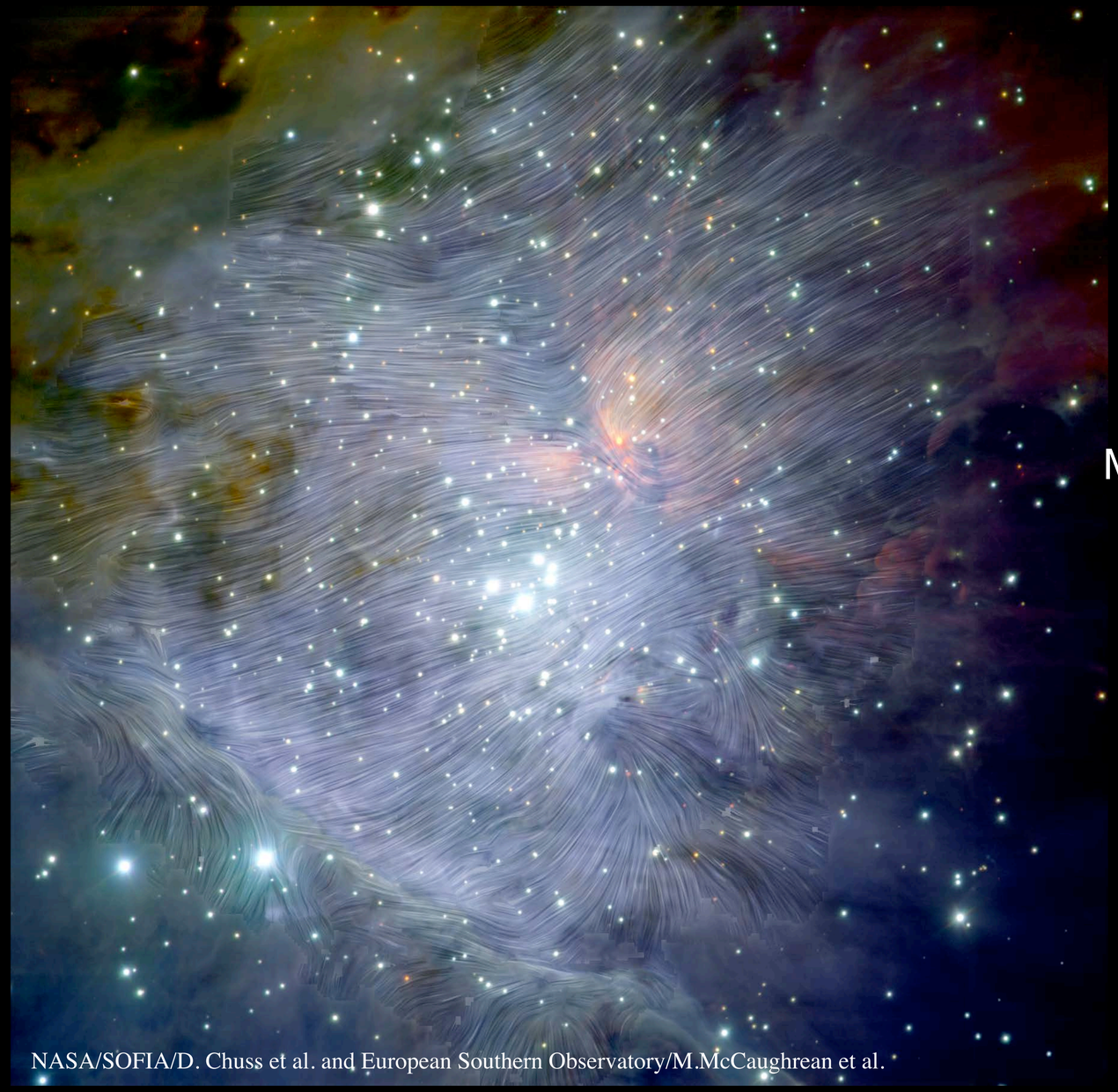
Credit: B. Saxton, NRAO/AUI/NSF

The Twisted Magnetic Field in a Protobinary System

Wide Binaries	Close Binaries
> 500 au separation	< 500 au separation
Turbulent Fragmentation	Disk Fragmentation
Occurs in the core/envelope	Occurs in the disk

Complication: Computer simulations show wide binary stars can migrate inward.

The Twisted Magnetic Field in a Protobinary System



NASA/SOFIA/D. Chuss et al. and European Southern Observatory/M.McCaughrean et al.

Magnetic fields thread star forming molecular clouds

The Twisted Magnetic Field in a Protobinary System

Multi-wavelength and multi-scale study of the star forming globule L483

Pico dos Dias Observatory

SOFIA

ALMA

"The Twisted Magnetic Field of the Protobinary L483"

Cox, Novak, Sadavoy, Looney, Lee, et al. (2022), *The Astrophysical Journal*, 932, 34 (arXiv:2206.00683)

The Twisted Magnetic Field in a Protobinary System

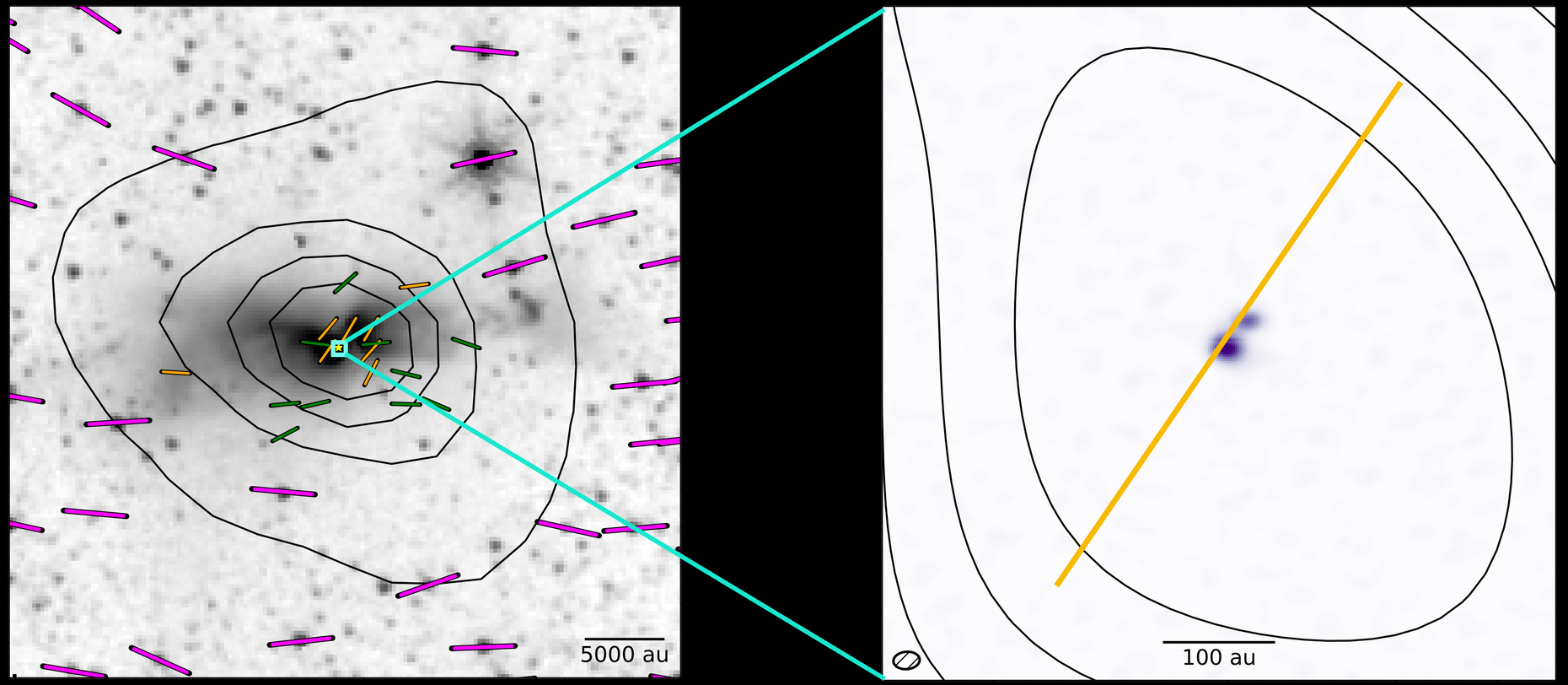
L483

Close by ~200 pc

Relatively isolated

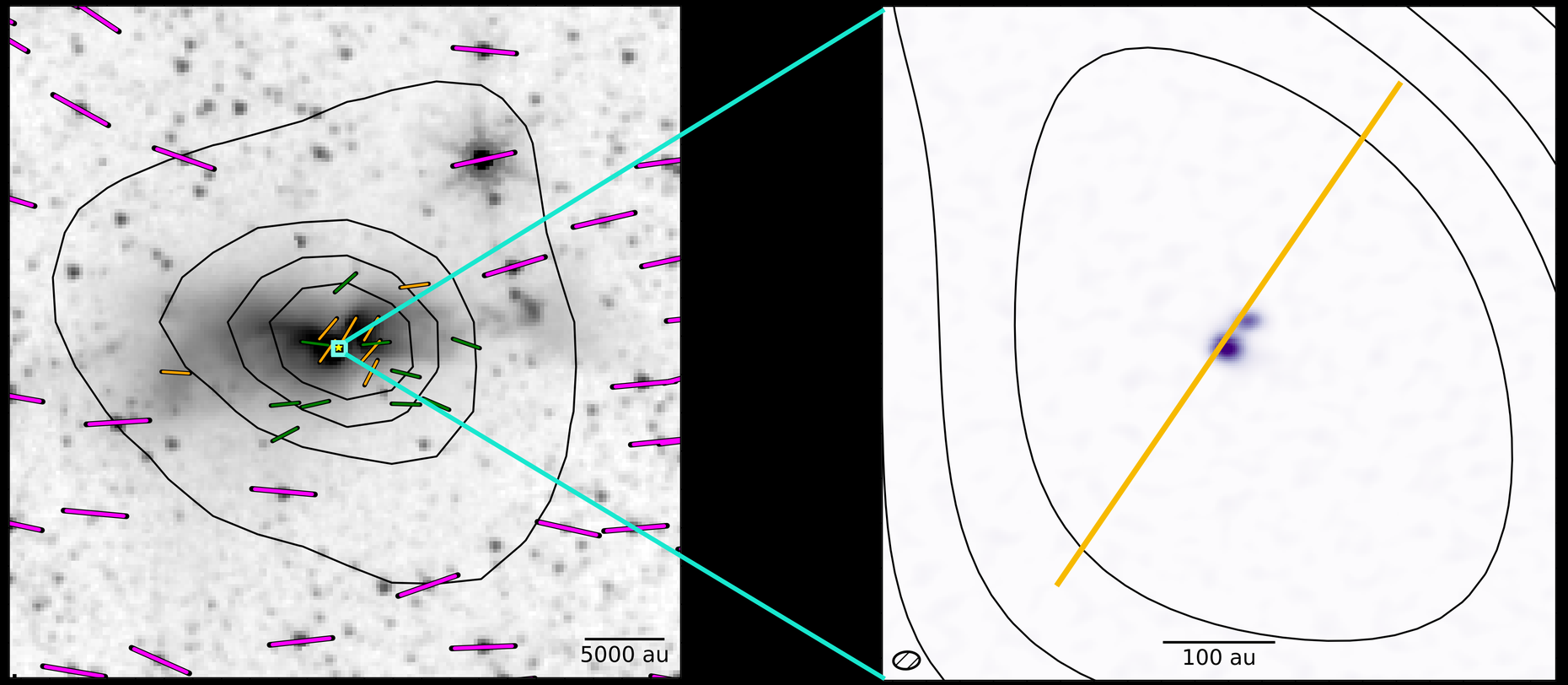
E-W outflow

The Twisted Magnetic Field in a Protobinary System



- Parallel magnetic field on core scales
- Twisted magnetic field in protostellar envelope
- Close binary (~Neptune’s orbit)

The Twisted Magnetic Field in a Protobinary System



- Binary stars make up over half of the stars in our galaxy
- Constraining young binaries will help us understand Tatooine planets

The Twisted Magnetic Field in a Protobinary System

Recap:

- Used multiple telescopes to investigate the magnetic field of L483
- Discovered a magnetic field that is initially parallel to the outflow with a twist on protostellar envelope scales
- **Surprise! L483 is a close binary**

Tobin et al. 2010

The Twisted Magnetic Field in a Protobinary System

Recap:

- The geometry of the twist and binary suggest it may be possible to use the field as a signature of how the binary formed
- Binary formation interesting for understanding Tatooine planets
- Follow up observations of a larger sample of protobinary stars

Tobin et al. 2010