The Odd Couple:

The differing magnetic fields of neighbouring cores in L1689

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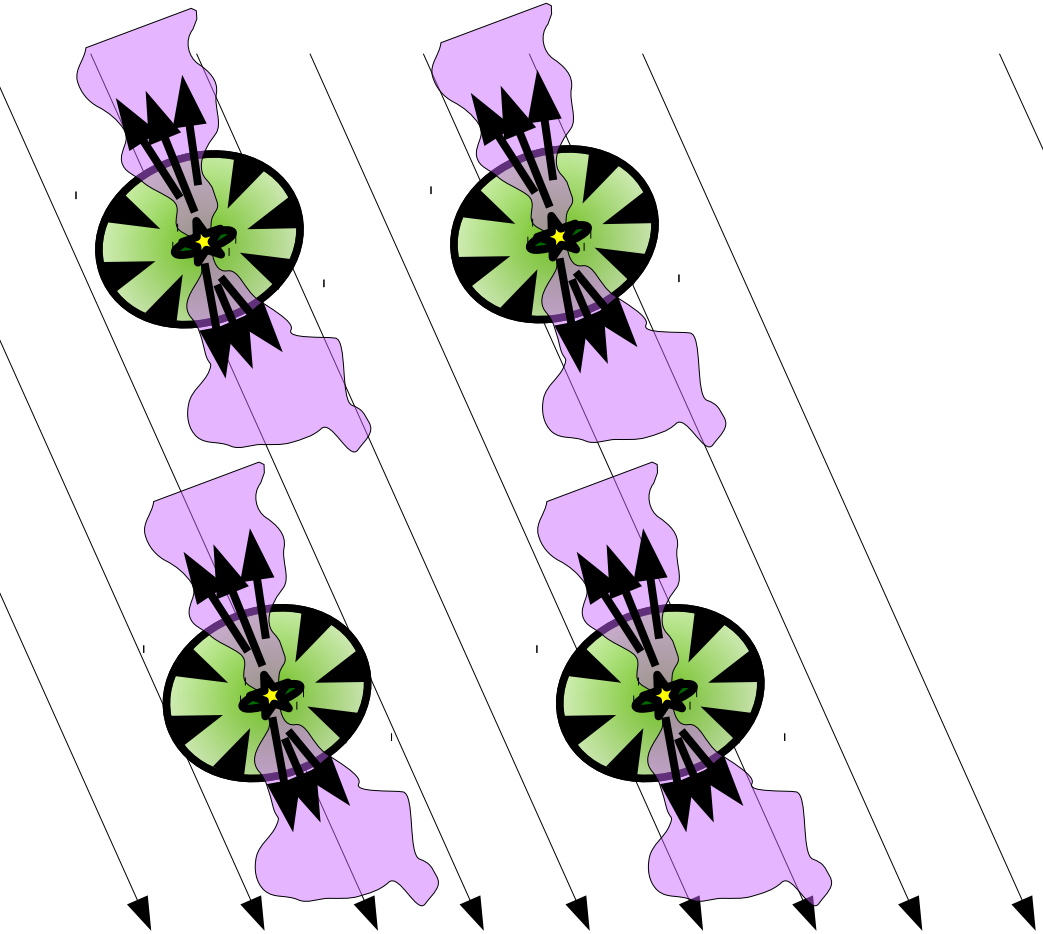
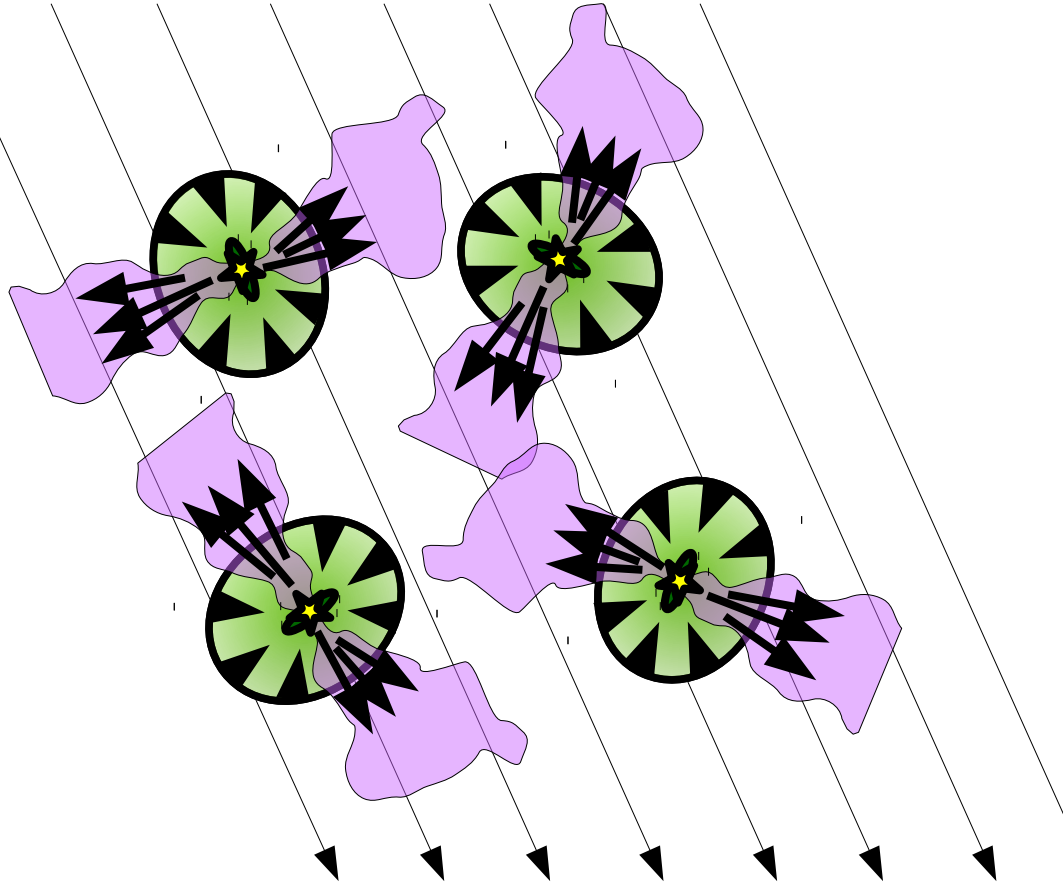
Are magnetic fields dynamically important in protostellar cores?

A test: are protostellar outflows aligned with the magnetic field?

Dynamically important



Dynamically unimportant



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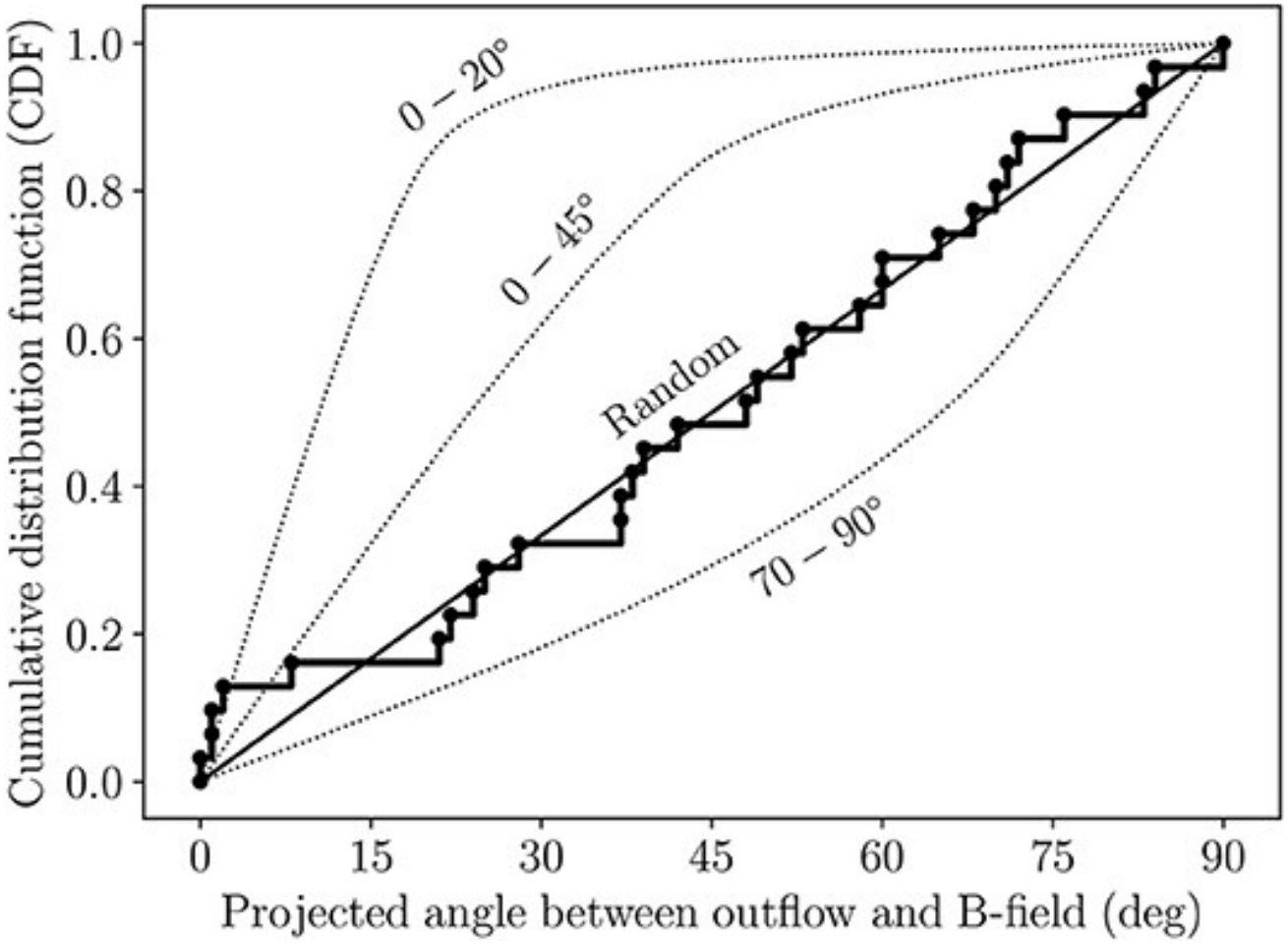

Hull & Zhang 2019, FrASS 6 3

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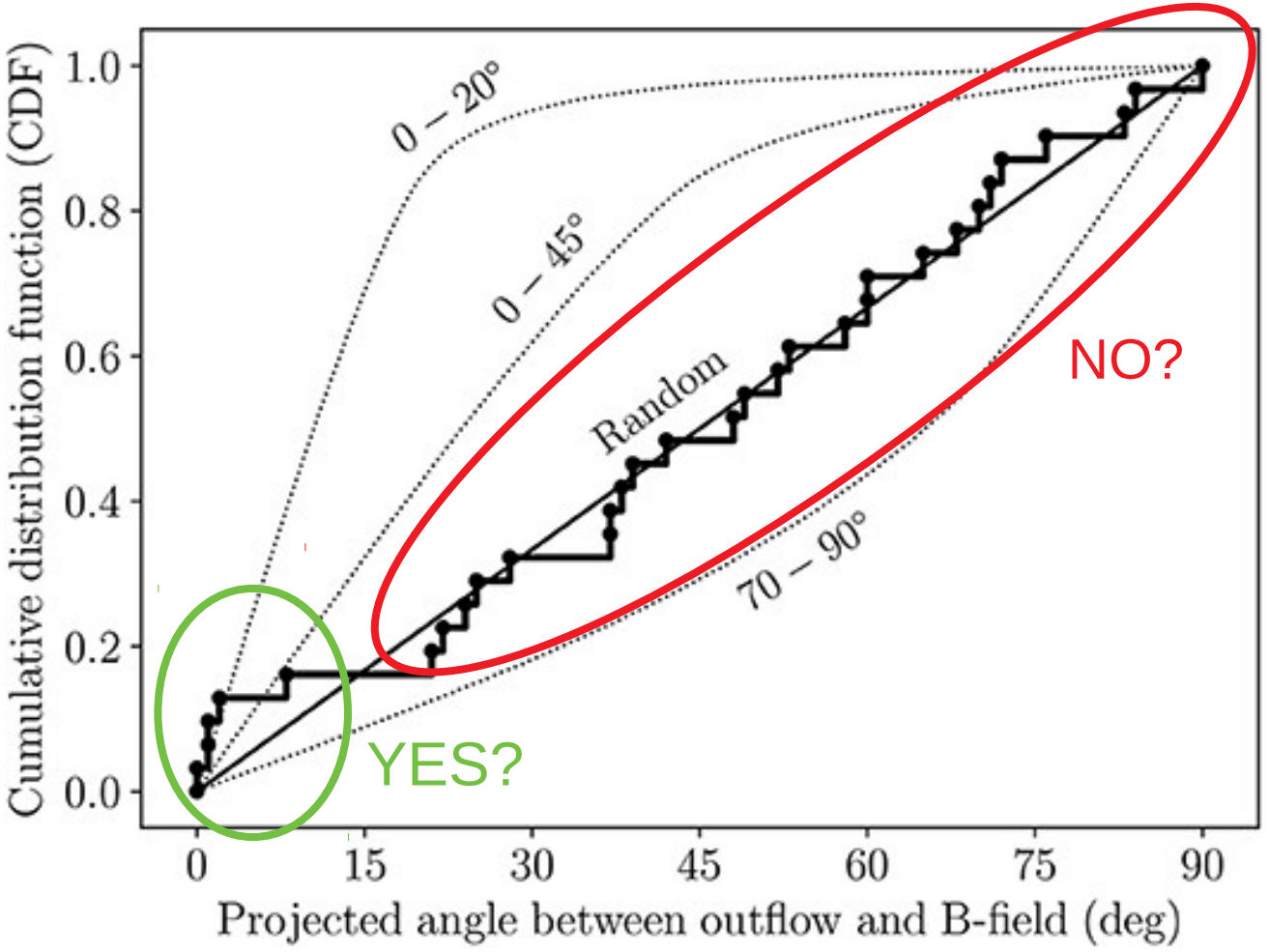

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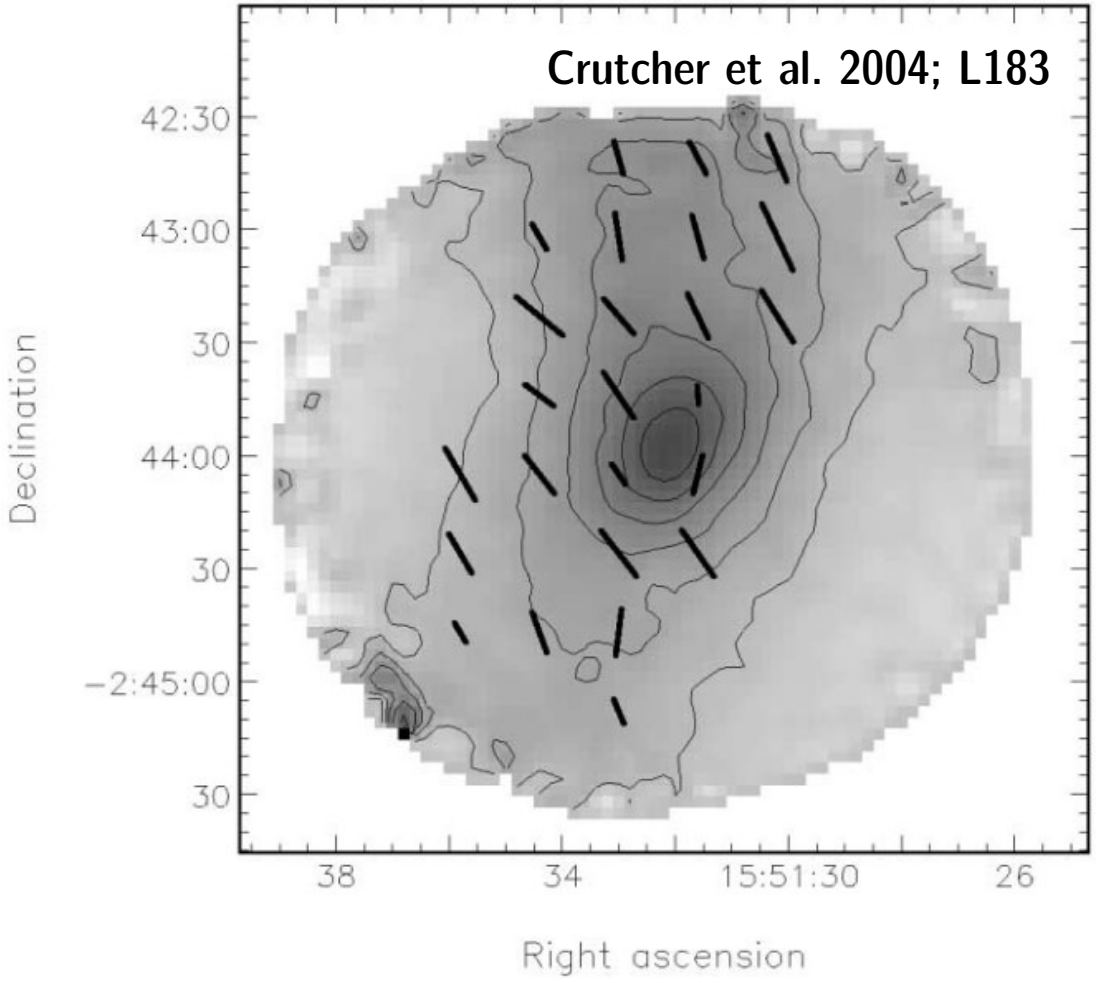
Are magnetic fields dynamically important in *prestellar* cores?

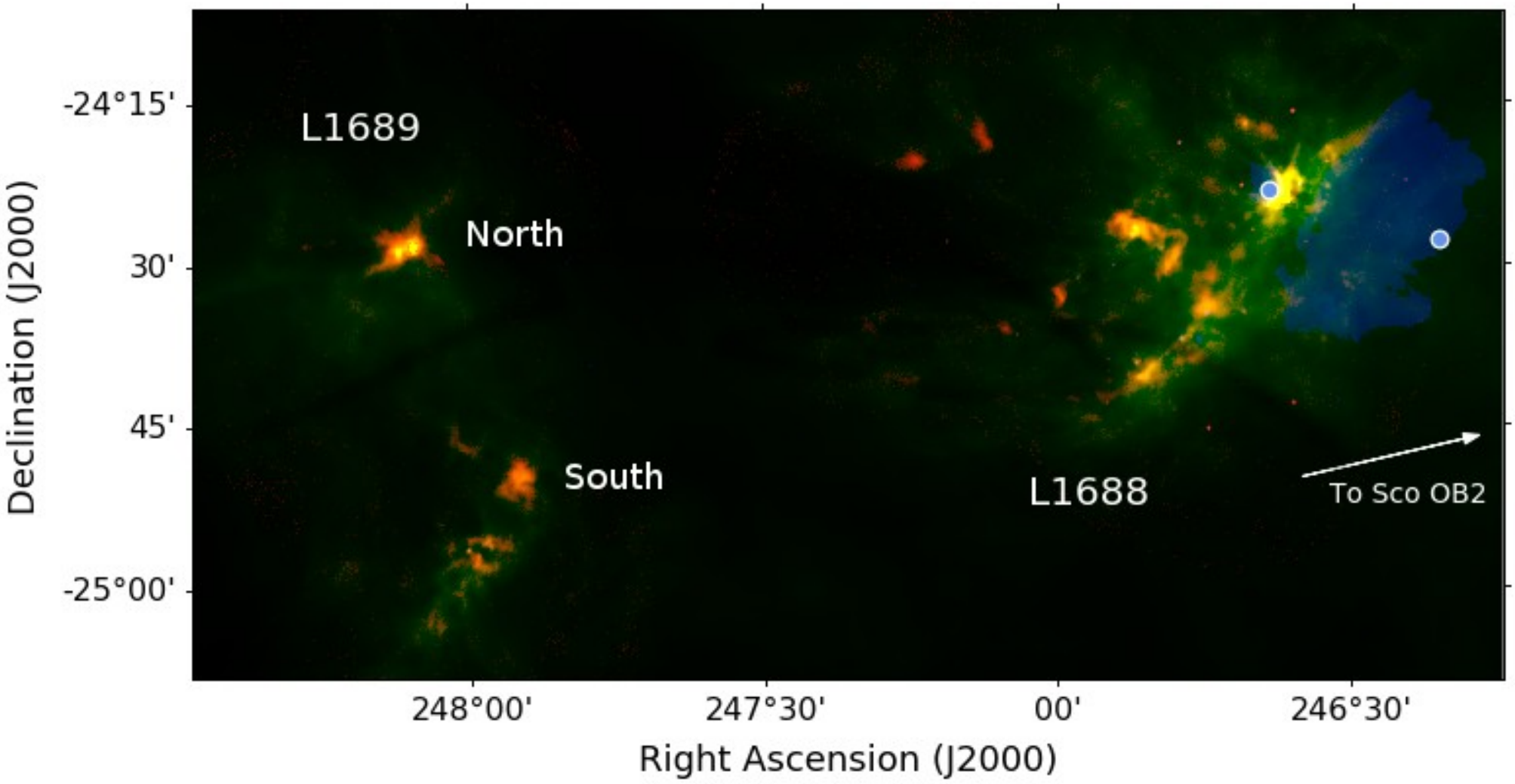
Prestellar core magnetic fields are:

- Approximately linear, often ~30° to the core's minor axis (a projection effect; Basu 2000)
- Generally without a clear hourglass morphology
- ~10^1-10^2 μG



The Ophiuchus Molecular Cloud

Clustered low-to-intermediate-mass star formation, located at ~140 pc (Ortiz-Léon et al. 2017).



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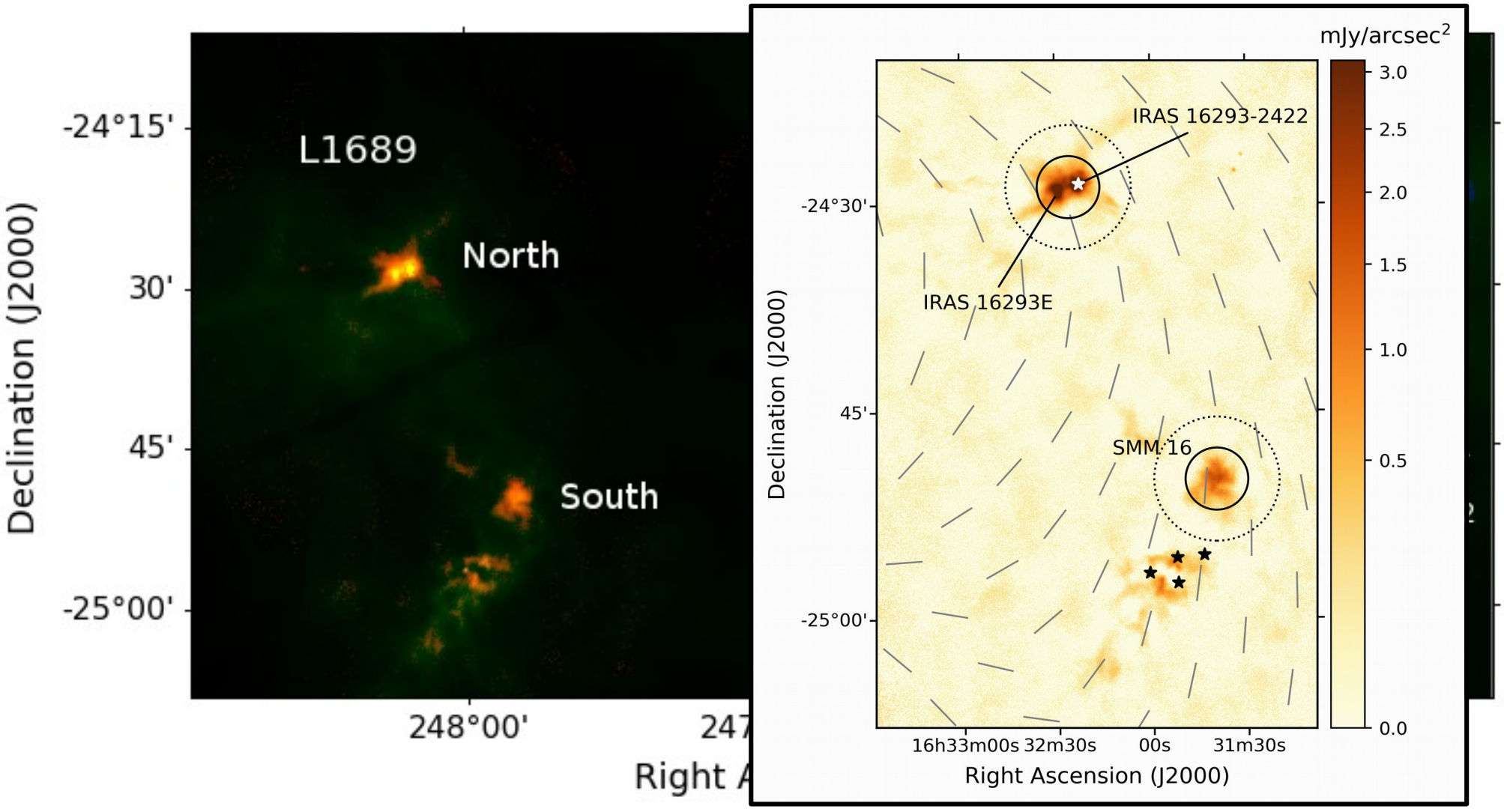


This slide consisted entirely of unpublished data

Polarization efficiency as a measure of grain alignment

$$p(I) = p_0 \left(\frac{I}{I_0} \right)^{-\alpha}$$

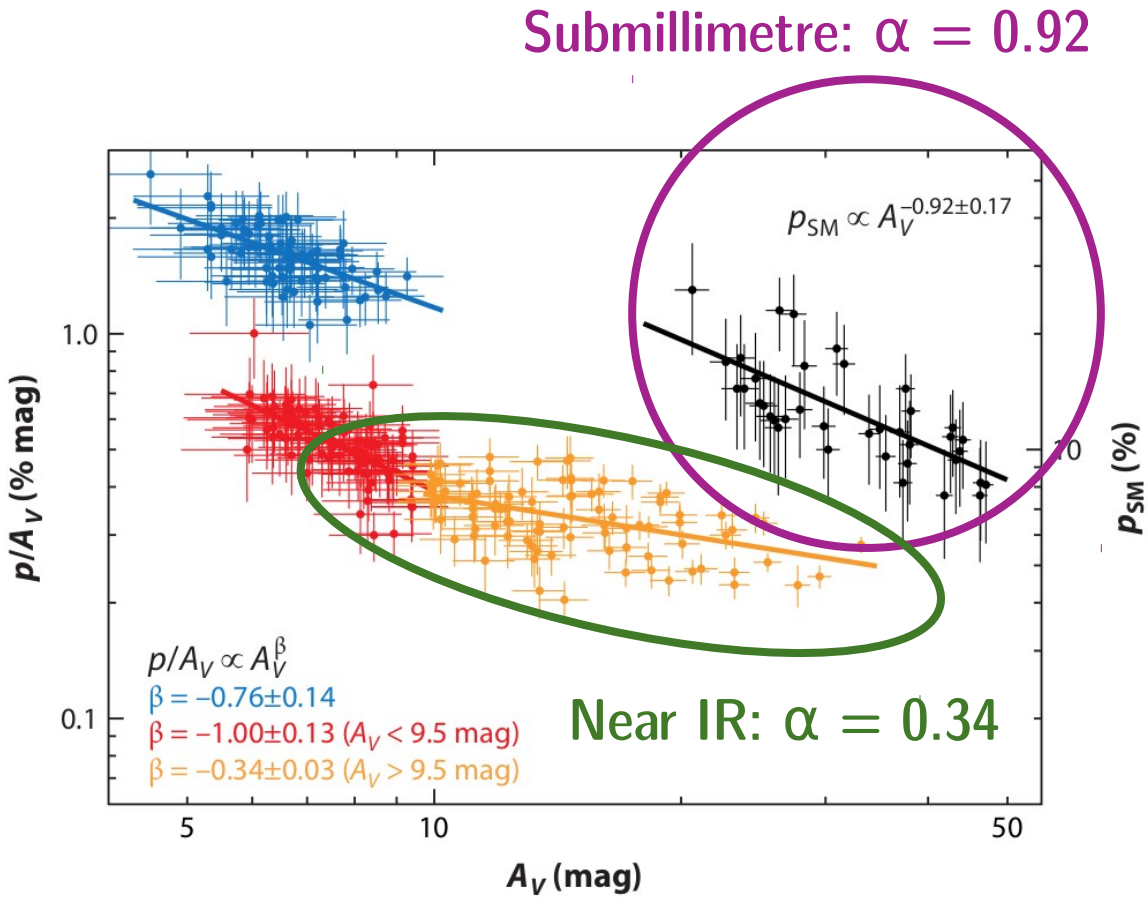
We expect $0 < \alpha < 1$

$\alpha = 0$ indicates all grains are equally aligned – no depolarization

$\alpha = 1$ indicates statistical noise in Stokes Q and U

Two possibilities:

- A genuine lack of signal in Q and U: complete depolarization
- Insufficient signal-to-noise to detect Q and U emission

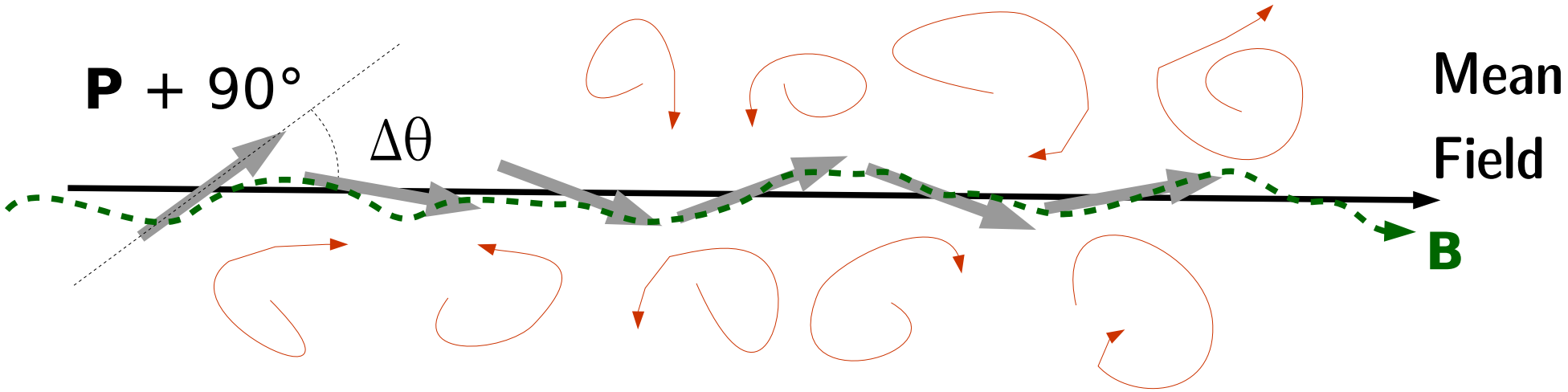


Alves et al. 2014 A&A 569 L1

This slide consisted entirely of unpublished data

A recap of the (Davis-)Chandrasekhar-Fermi Method

Assumes equipartition between non-thermal motions and the magnetic field: deviation in angle from the mean field direction is taken to be the result of distortion of the field by small-scale non-thermal motions (see Chandrasekhar & Fermi 1953, Davis 1951).



$$B_{\rm pos} = Q\sqrt{4\pi\rho}\,\frac{\sigma_v}{\sigma_\theta}$$

(c.f. Crutcher et al. 2004)

All subsequent slides consisted entirely of unpublished data