# Submm Polarimetric Observations of Magnetic Fields in Star Forming Regions

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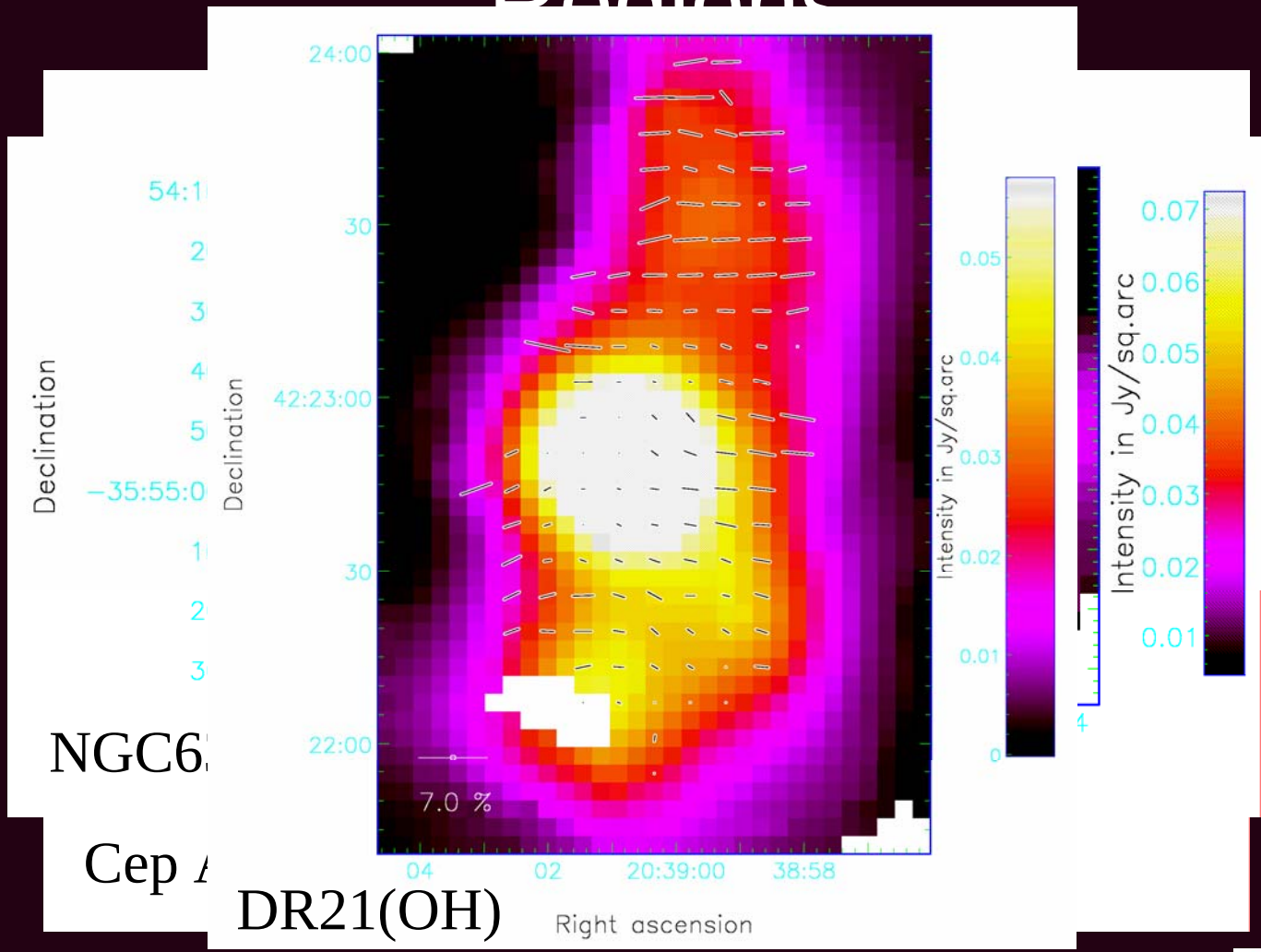
# Magnetic Fields in Star Formation

- Initially provide support to the cloud?
- Earliest stages of SF important
  - Help distinguish between SF models
- Remove excess angular momentum
  - Launching and collimation of jets and outflows
- One of the least studied (observationally) aspects of SF
  - Zeeman measurements (line of sight, points)
  - Submm polarimetry (plane of the sky, maps)

# Submillimetre Imaging Polarimetry

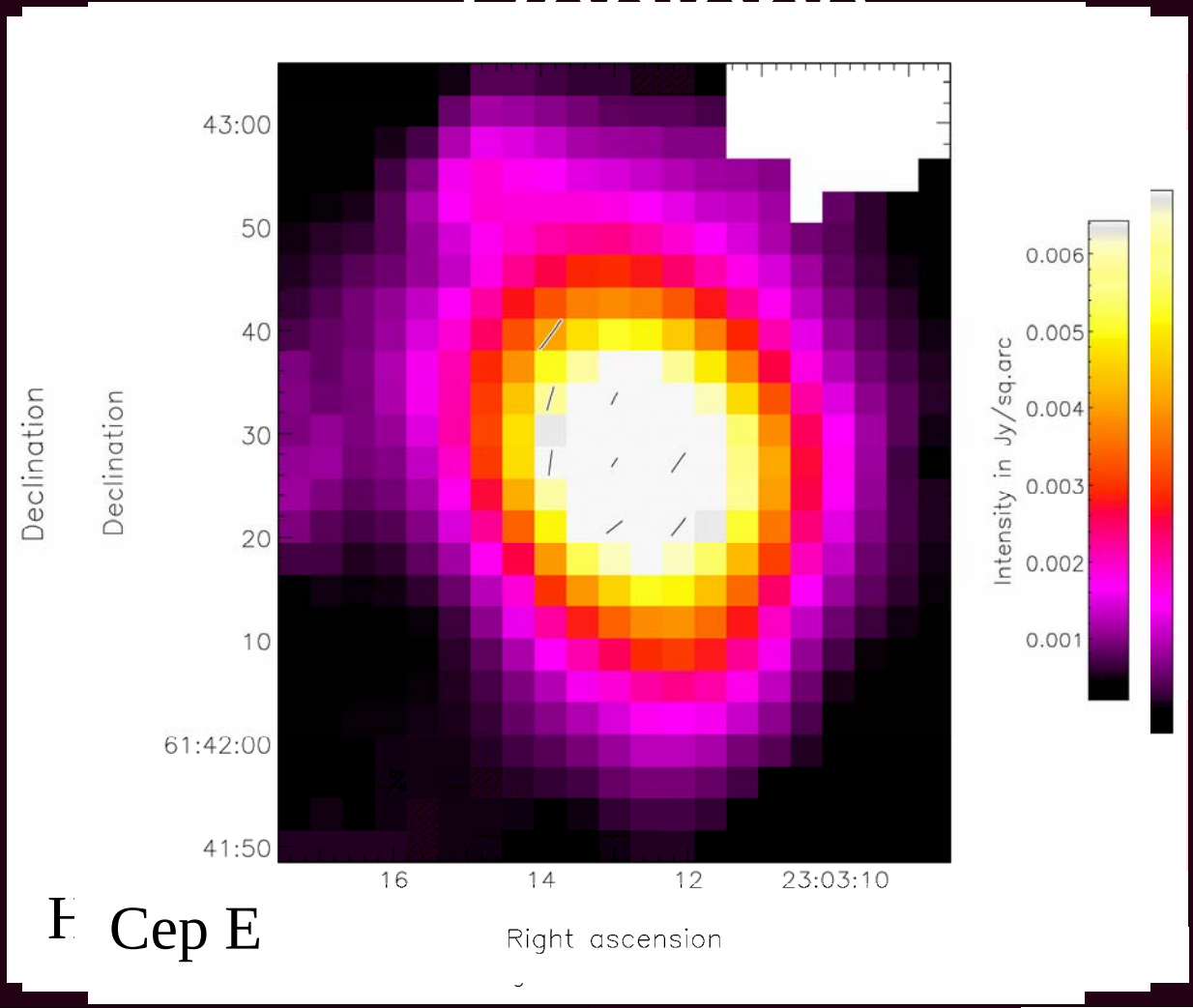
- Dust grains align to the magnetic field
  - short axis is parallel to the field lines
- Thermal emission from aligned grains
  - Produces partial polarisation
  - **E**-vectors are perpendicular to the plane-of-the-sky magnetic field direction
- Observations:
  - 18 High mass SFRs
  - 8 Low mass SFRs

# High-Mass Star Forming Regions




Curran & Chrysostomou, 2007, Sub.

# Low-Mass Star Forming Regions




H Cep E

Curran & Chrysostomou, 2007b, in prep.



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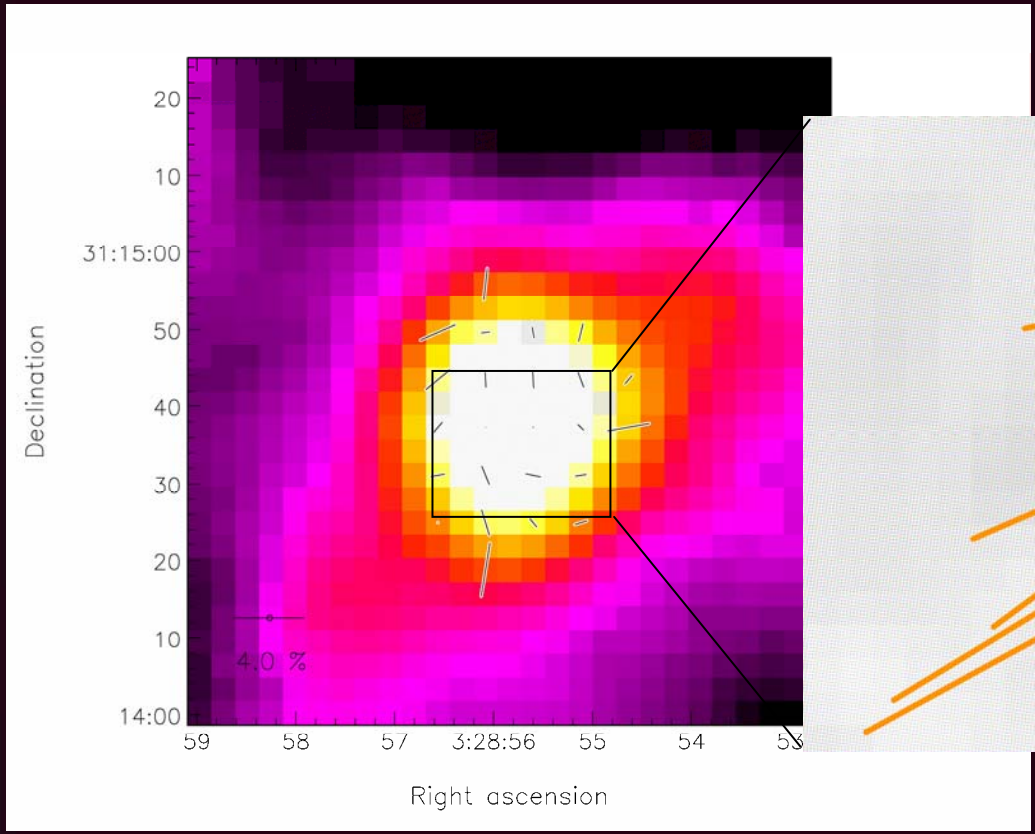
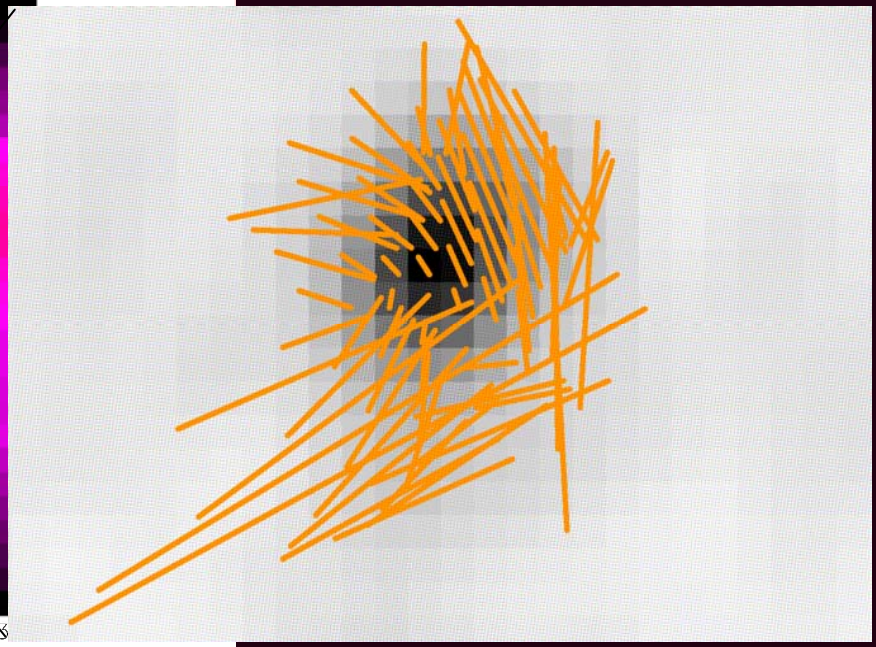
# NGC1333 IRAS 2 – A closer look

JCMT – **B**-vectors

BIMA – **E**-vectors



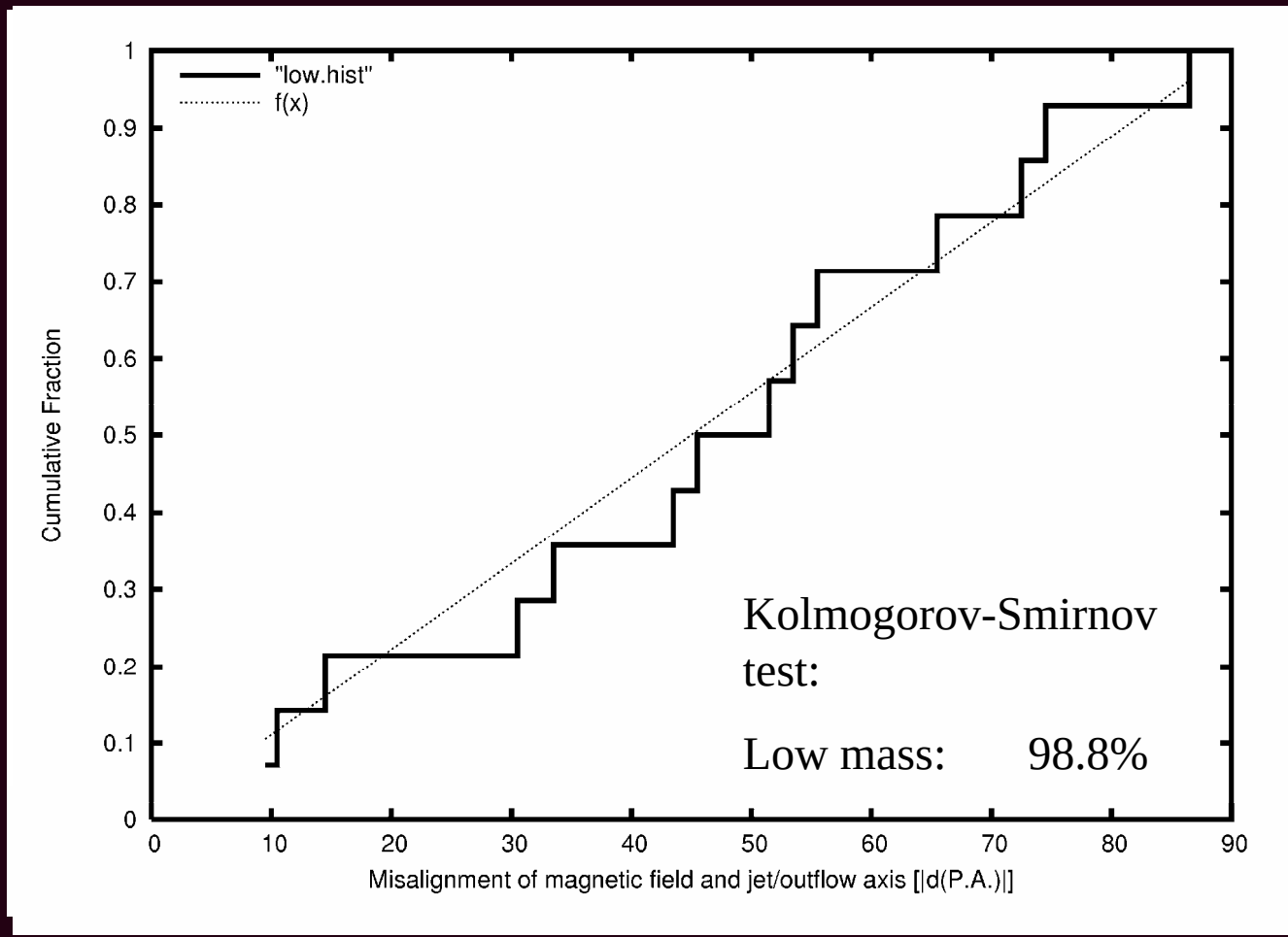
Curran, Chrysostomou & Matthews, 2007, in prep.

# B-field – Jet/Outflow Comparison

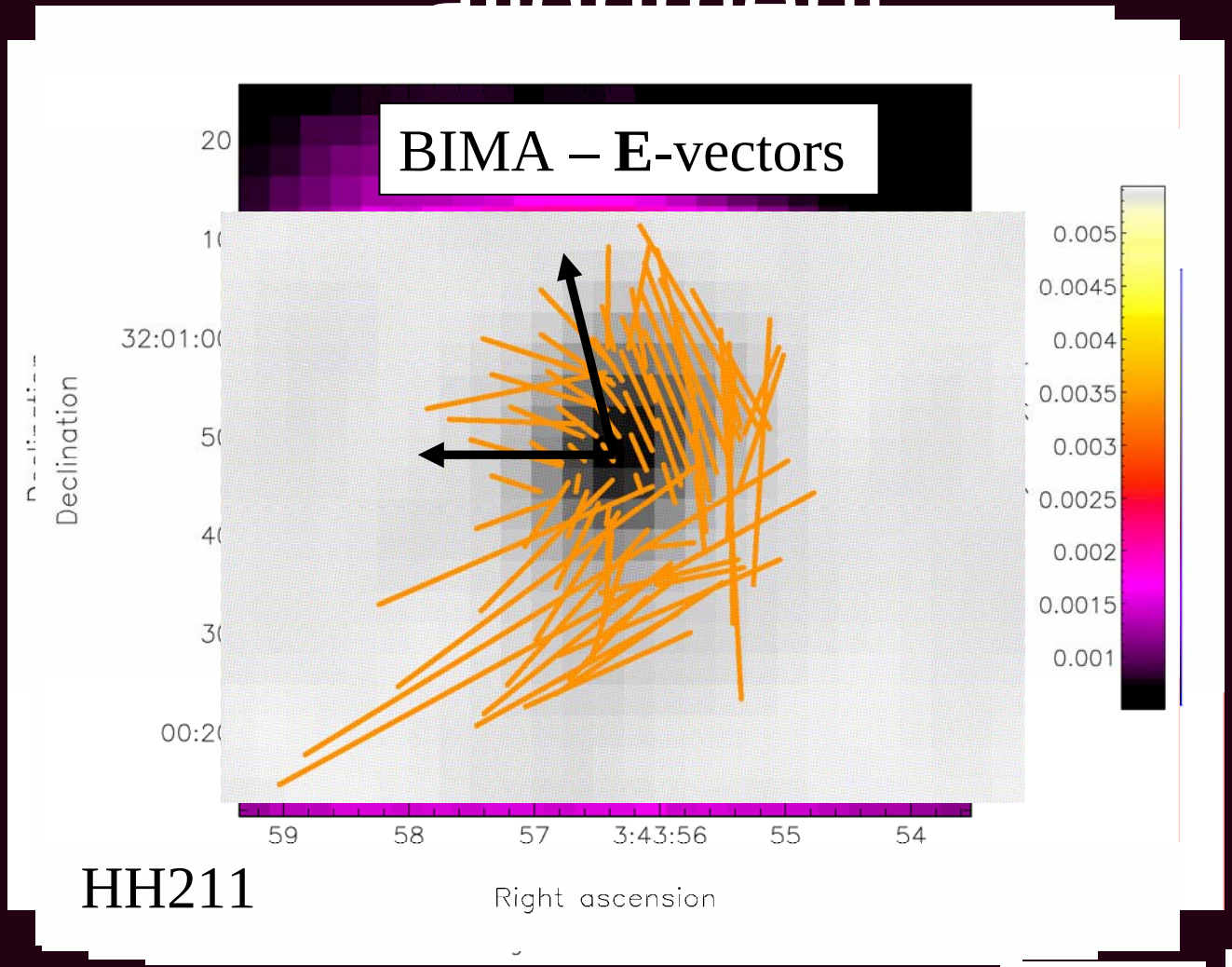
- On Small scales (*just* becoming available observationally), we might expect to see a relation between the magnetic field direction and the jet/outflow axis
  - Models of Jet launching use a magnetic field at an angle of 60 to the disc plane
  - Toroidal fields are used to collimate the jets

Question: Are the magnetic fields observed in the envelopes related to the expected magnetic field direction in the disc/outflow system?

# Mean B-field P.A. vs Jet/Outflow P.A.



# Visual Inspection of alignment



# Conclusions

- We observe many different field morphologies
  - High mass regions have more complex morphologies
- ~Half of cores exhibit depolarisation with increasing total intensity
  - Higher resolution observations of one of these regions (NGC1333 IRAS 2) reveal a complex field structure
- Outflow/field alignment:
  - Comparisons of mean B-vector P.A. with jet/outflow P.A. show no relation
    - Magnetic field in envelope randomly oriented wrt jet/outflow axis
  - Visual inspection of maps suggest ~ alignment in 7 out of 15 high mass regions and 3 out of 8 low mass regions