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Magnetic field morphologies at mpc scale

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We report our new results of the magnetic field (B) morphologies toward W51 North,traced with the linear polarization of the dust continuum at wavelengths of 870 μm. The B morphologies are resolved with an angular resolution of typically 1" using the Submillimeter Array (SMA). Dense structures with a number density 10^5 to 10^7 cm^{-3} are traced. In comparison, the B morphologies of sources at different evolutionary stages, from the collapsing core in W51 e2 (Tang *et al.* 2009a) and part of Orion BN/KL (Tang *et al.* 2010) to the ultra-compact HII region G5.89-0.39 (Tang *et al.* 2009b) clearly exhibit different morphologies, likely suggesting different roles of the B fields at different stages.

In the W51 North region we analyze field structures at three different physical scales (Tang *et al.* 2012). In a sequence of increasingly higher resolution observations - from CSO/JCMT single dish at 2 pc to the SMA highest resolution at about 10 mpc - it becomes manifest how the field morphologies change from the envelope surface layer to the inner core and disk. Structures vary from uniform to cometary and hourglass-like. We quantify these changes, providing evidence that the interplay of the B field with other forces, such as gravity, evolves with scale. Additionally, new analysis methods to interpret these observational results and to derive B field strength maps are also discussed (Koch *et al.* 2012a,b,c).

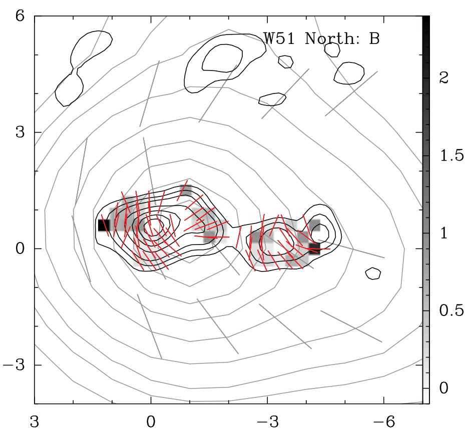

Figure 1. The figure in the left presents the B field morphologies observed in two different SMA configurations, which trace the B fields at two different scales. The dust continuum emission traced at these two scales is shown in contours. The magnetic-field-to–gravity force ratio map, derived from our newly developed method, is shown in grey scale. The ratio is smaller toward the denser regions, suggesting a varying role of the B field as a function of scale.

References

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