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Seeking for magnetic fields in rotating disk/jets with ALMA polarimetry

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Abstract. The Atacama Large Millimeter/submillimeter Array (ALMA) is providing important advances in studies of star formation. In particular, polarimetry can reveal the disk magnetic configuration, a crucial ingredient in many processes, as, for example, the transport of angular momentum. We analized ALMA Band 7 (870 μm) polarimetric data at 0.″2 resolution for the young rotating disk/jet systems DG Tau and CW Tau, to find magnetic signatures. From the Stokes I, U, Q maps, we derive the linear polarization intensity, $P = \sqrt{Q^2 + U^2}$, the linear polarization fraction, and the polarization angle. The alignment of the latter with the disk minor axis (Fig. 1) shows that self-scattering of dust thermal emission rather than magnetic alignment dominates the polarization in both targets (Bacciotti *et al.* 2018). However, several dust properties can be diagnosed comparing the polarization data with the models of self-scattering (e.g. Kataoke *et al.* 2017, Yang *et al.* 2017). The maximum grain size turns out to be in the range 50 - 70 μm for DG Tau and 100 - 150 μm for CW Tau. The asymmetry of the polarized intensity in DG Tau, observed for the first time around a T Tauri star, indicates that the disk is flared. Moreover, the observed belt-like feature may betray the presence of a disk substructure. In contrast, the polarization maps of CW Tau indicate that here the grains have settled to the disk midplane. Polarimetry is thus very important in studies of the dust evolution.

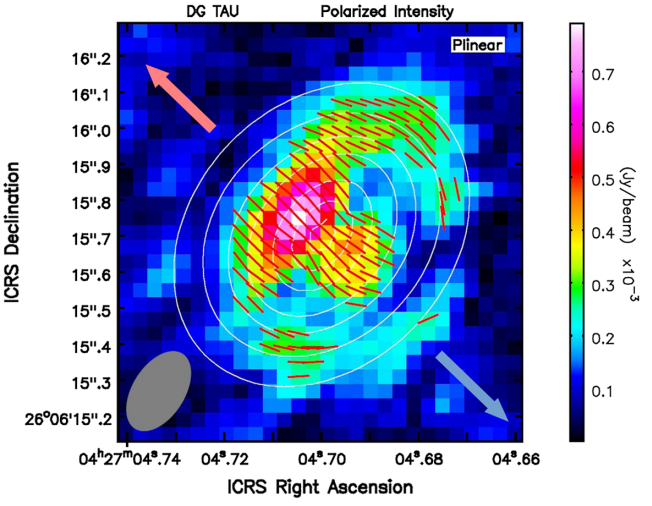

Figure 1. Linearly polarized intensity in the DG Tau disk, with superposed total intensity contours. The alignment of the polarization vectors (fixed length segments) along the disk minor axis supports self-scattering of the dust emission as the origin of the polarization. The higher polarized intensity toward the disk near-side (toward the receding jet lobe (red arrow)) suggests a flared disk geometry (Bacciotti *et al.* 2018).

References

Bacciotti, F., Girart, J. M., Padovani, M., *et al.* 2018, *Astroph. J. Lett.*, 865, L12
Kataoka, A., Tsukagoshi, T., Pohl, A., *et al.* 2017 *Astroph. J. Lett.*, 844, L5
Yang, H., Li, Z.-Y., Looney, L. W., Girart, J. M. & Stephens, I. W. 2017 *M.N.R.A.S.*, 472, 373

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