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Signposts of shock-induced magnetic field compression in star-forming environments

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Abstract. In star-forming environments, shock-compressed magnetic fields occur in cloud-cloud collisions, in molecular clouds exposed to supernova remnants (SNRs), and in photo-dissociation regions (PDRs). Besides their dynamical role, they increase the cosmic ray flux above the Galactic average, and the trapped particles contribute to the heating of the shocked gas. The associated dust emission is polarized perpendicularly to the sky plane projection of the field, $B_{\rm sky}$. In edge-on viewed shock planes, highly ordered polarization patterns are expected. In search of such a signature, the dust emission from the Orion bar (a prototypical PDR) and from a molecular cloud/SNR interface (IC443-G) was studied with a $\lambda 870\,\mu$m polarimeter at the APEX (Wiesemeyer *et al.* 2014 and references therein). While our polarization map of OMC1 confirms the hourglass shape of $B_{\rm sky}$ (e.g., Schleuning 1998, Houde *et al.* 2004), a deep integration towards the Orion bar reveals an alignment of $B_{\rm sky}$ with the shock forming in response to the wind and to the ionizing radiation from the Trapezium cluster (Fig. 1). This structure suggests a compressed magnetic field accelerating cosmic-ray particles, a scenario proposed by Pellegrini *et al.* (2009) to explain the high excitation temperature of rotationally warm H_2 and CO (Shaw *et al.* 2009, Peng *et al.* 2012, respectively).

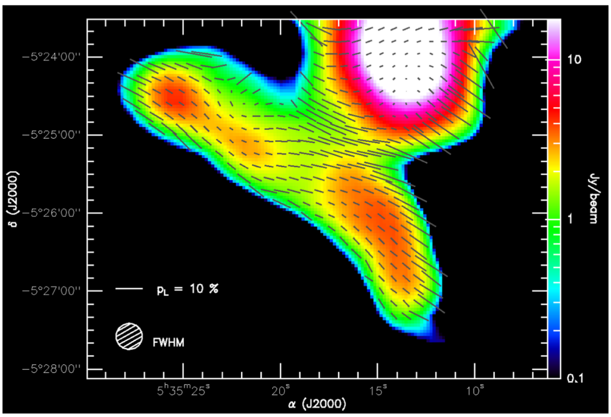

Figure 1. $B_{\rm sky}$ towards the Orion bar (corrected for instrumental polarization) with 345 GHz dust emission underneath. The Orion south core appears in the north-west.

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