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The Line-of-Sight Magnetic Field Structure in Filamentary Molecular Clouds

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Magnetic fields pervade in the interstellar medium (ISM) and are believed to be important in the process of star formation, yet probing magnetic fields in star formation regions is challenging. We present a new method to find the line-of-sight strength and direction of magnetic fields in star forming regions using Faraday rotation measurements. Tahani *et al.* (2018) describes the method, in details. In this technique, we use Taylor *et al.* (2009) rotation measure data and adopt a simple approach, based on relative measurements, to estimate the amount of rotation measure induced by the molecular clouds versus that from the rest of the Galaxy. We then use a chemical evolution code, along with Kainulainen *et al.* (2009) extinction maps of each cloud, to find the electron column density of the molecular cloud at the position of each rotation measure data point. Combining the rotation measures produced by the molecular clouds and the electron column density, we calculate the line-of-sight magnetic field strength and direction.

We applied this method to four relatively nearby regions of Orion A, Orion B, Perseus, and California. In the California cloud and Orion A, we found clear evidence that the magnetic fields at one side of these filamentary structures were pointing towards us and were pointing away from us at the other side. This behaviour is consistent with a helical magnetic field morphology. In the vicinity of available Zeeman measurements in Orion A, Orion B, and Perseus, we found magnetic field values of -23 ± 38 μG, -129 ± 28 μG, and 32 ± 101 μG, respectively, which are in agreement with the Zeeman measurements.

References

J. Kainulainen, H. Beuther, T. Henning and R. Plume, 2009, *A&A*, 508, L35
M. Tahani, R. Plume, J. C. Brown and J. Kainulainen, 2018, *A&A*, 614, A100
A. R. Taylor, J. M. Stil and c. Sunstrum, 2009, *ApJ*, 702, 1230