STATISTICAL ANALYSIS OF THE RELATIVE ORIENTATION BETWEEN FILAMENTS AND MAGNETIC FIELDS IN STAR FORMING REGIONS

Jonathan Oers [1], Isabelle Ristorcelli [1], Katia Ferrière [1], Ludovic Montier [1]

[1] IRAP, Université de Toulouse III, CNRS, Toulouse, France
(email address: jonathan.oers@irap.omp.eu)

Over the past decade, it has become clear that studying the formation of dense structures at multiple scales in the interstellar medium (ISM) is important to understand the initial conditions of star formation. Recent observations show that most of these structures are filamentary, and it is in their densest parts that most clumps and prestellar cores, the cradles of star formation, are found.

Both simulations and observations suggest that magnetic fields play a key role in the formation and evolution of filaments and in the process of star formation, and yet their exact role is still poorly understood. In this context, the study of the relative orientation between filaments and magnetic fields has become a go-to method to obtain new insight.

Here, we use a dedicated method, FilDReaMS, to detect and extract filaments at multiple scales in the 116 fields of the *Herschel* 'Galactic Cold Cores' (GCC) key-project (18"-36" resolution), which measures dust emission in star-forming regions located in various Galactic environments. We then compare the filament orientations to the orientation of the magnetic field in the plane of the sky ($B_{\perp}$), inferred from *Planck* observations of the dust polarised emission (7' resolution).

We present results from our statistical analysis of these relative orientations as functions of filament spatial scale, gas column density (N_H), evolutionary stage and Galactic environment. In most *Herschel* fields, we find that small, low-N_H filaments tend to be roughly parallel to the magnetic field, while large, high-N_H filaments tend to be roughly perpendicular. Although this trend is not systematically observed, it is still prevalent, which confirms the existence of a coupling between magnetic fields at cloud scales and filaments at smaller scales.