

# Why sub-mm dust continuum emission is not a faithful tracer of the nature of faint filaments in molecular clouds

E. Falgarone<sup>1</sup>, P. Hily-Blant<sup>2</sup>, S. Delcamp<sup>2</sup>, M.-A. Miville-Deschênes<sup>1</sup>,  
B. Godard<sup>1</sup>

<sup>1</sup> *LPENS, Ecole Normale Supérieure, Paris*

<sup>2</sup> *IPAG, Université Grenoble-Alpes, Grenoble*

Turbulent dissipation is a central issue in the star and galaxy formation process. Its fundamental property of space-time intermittency remains elusive in cosmic turbulence. The statistical method designed to locate extrema of dissipation in a turbulent field is applied to numerical simulations of compressible magneto-hydrodynamical turbulence dedicated to dissipation scales. Increments of several observables computed at the smallest lags do detect coherent structures of intense dissipation, found to be slow and fast shocks, current sheets and rotational discontinuities [1].

Applied to IRAM-30m CO(2-1) observations of a nearby diffuse molecular cloud, the Polaris Flare, this method discloses a straight pc-scale structure that is a velocity shear about 100 x larger than the average value of molecular clouds. It is barely detected by Herschel/SPIRE in the dust continuum emission, but is ten times brighter in CO emission than its two neighbouring filaments, also barely detected in the sub-mm. Observed in CO(1-0) with the IRAM-NOEMA interferometer, it harbours a number of straight structures: these are not filaments but sharp edges of thin and extended CO-sheets at different velocities. When coinciding, these sharp edges trace even larger velocity shears.

Interestingly, 12 micron WISE data and spectral decomposition of HI GBT and DRAO spectra suggest that one of these extremely large velocity shears is also present at the interface of the cold and warm neutral media in the North Celestial Pole Loop. These observational results open new routes in unravelling the origin and growth of filaments in molecular clouds.

## References

[1] Lesaffre P., Falgarone E., Hily-Blant P., 2024, The intermittency of turbulence in MHD simulations and in the cosmos, *Atmosphere* 15, 211L