Attempts at characterizing the structures of high dissipation in the interstellar medium.

P. Lesaffre[1], G. Momferratos[1] , E. Falgarone[1] and G. Pineau des Forêts[2,1].

[1] *LERMA, UMR85912 du CNRS, ENS/LRA, 24 rue Lhomond, 75231, Paris Cedex 5 - France*

[2]*IAS, Université de Paris Sud, Centre universitaire d'Orsay bât. 121, 91405 Orsay Cedex - France*

Regardless of the mechanisms which stir the interstellar gas, the damping of its turbulent motions must occur at much smaller scales, where microscopic dissipative processes such as viscous friction, Ohmic resistivity or ambipolar diffusion can take place. The resulting heating is therefore likely to be extremely localised and intense, thus highly susceptible to open new chemical routes. The chemical species produced in the wake of such hot spots should therefore help us to study observationnally the turbulent dissipation mechanisms in the interstellar gas.

We first present 3D magnetohydrodynamic simulations (with ambipolar diffusion) of decaying turbulence in which we extract the structures of high dissipation. We show that these structures are highly coherent and that their geometrical properties obey remarkable statistical scalings. We present attempts at characterizing their location in the plane of the sky through maps of centroid line velocities or polarisation angle increments.

We then examine small scale 2D hydrodynamic simulations (with chemistry) of decaying turbulence. In this 2D set up, highly dissipative structures are along ridges and we observe a strong molecular enhancement in their wake. We fit steady-shocks locally to these structures and we examine the statistics of their entrance parameters. We finally examine how much these shocks can account for the average chemical abundances in our simulations, to estimate when other forms of dissipation (such as shearing sheets / vortices) are needed or not.

References

[1] Momferratos G., Lesaffre P., Falgarone E., Pineau des Forêts G. (2014), MNRAS in press

[2] Falgarone E., Momferratos G., Lesaffre P. (2014), in "Magnetic Fields in Diffuse Media", eds. E. de Gouveia Dal Pino, A. Lazarian, C. Melioli, Springer.