in compression of the fluid. In this sense, the specific energy of a fluid element depends not exclusively on its velocity but also on its density. If the energy transfer rate is written as $\dot{\epsilon} \sim \rho\delta v^2/(l/\delta v) \sim \rho\delta v^3/l$, one may introduce the variable $\delta u \equiv \rho^{1/3}\delta v$. The power spectrum of δu develops a standard Kolmogorov's slope (i.e. $\alpha = -5/3$), but $\alpha \sim -2$ for δv.

2. THE TURBULENT ISM

In the past few decades many important observational studies have proven the turbulent nature of the interstellar medium (ISM), being (i) the distribution of gas (or column density maps), and (ii) the dispersion of line profiles, the two major indicators of it.

Armstrong, Rickett, & Spangler (1995) presented the seminal work in which they used the scintillation of background radiation by the turbulent flows in the ISM in order to obtain the density spectrum along the line of sight. Assuming that the density may be considered a passive scalar –it is true for the warm and diffuse part of the ISM– the power spctrum may also be obtained. Their impressive result was a single Kolmogorov slope ranging for more than 6 orders of magnitudes in lengthscale. The data from the density distribution in this case corroborated with the previous findings of Larson (1981). Larson compiled the velocity dispersion distributions observed for several molecular clouds and determined the empirical scaling law $\delta v \propto l^a$, with $a \sim 0.3-0.5$ (on should remember that Kolmogorov's theory predicts $a = 1/3$, and for supersonic turbulence $a \sim 1/2$), as shown in Figure 1 (top).

However, in the past decade new and more sensitive observations of molecular clouds have shown a different picture. When dense cores are plotted together with the data compiled by Larson a less coherent scaling relation appears. The bottom image of Figure 1 (extracted from Ballesteros-Paredes et al. 2011) shows that the smaller scales present a broad range of observed dispersions of velocities, and that the Larson relation is not followed by all clouds. Ballesteros-Paredes et al. (2011) interpreted these observations as an indication that these cores were actually contracting. The gravitational collapse would result in an increase of the velocity dispersion at the scales of the denser cores.

Magnetic fields can also be used in order to study the ISM turbulence. Polarization maps –in the optical for dust absorption, and in the infrared by dust emission– are useful in unreaveling the topology of the magnetic field in the plane of sky. The perturbations in the general trend of the field lines,

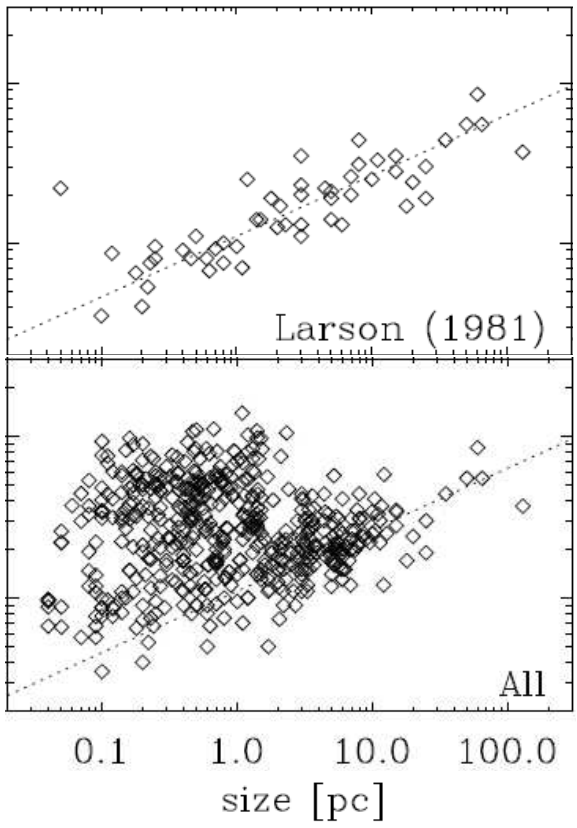

Fig. 1. Dispersion of velocity vs lengthscale for typical large molecular clouds (top) –original Larson relation– and for all structures, including the dense massive cores (bottom) (extracted from Ballesteros-Paredes et al. 2011).

i.e., the uniform component, are usually associated to the turbulent motions in the plasma. In the Chandrasekhar-Fermi approximation the equipartition between the magnetic perturbation and the turbulent kinetic energy is assumed. In this case it is possible to estimate either the magnetic pressure or the dispersion of velocity once the other is known.

2.1. *Results from numerical simulations*

One of the main difficulties faced by observers in studying turbulence from the observations is its three dimensional nature. Observations are either 1-D, when projections along the line of sight are considered (e.g., dispersion of velocities, scintilation of background radiation), or 2-D when maps in the plane of the sky are used (e.g. column density statistics and polarization maps). The conversion from the observed quantities to the actual physics of turbulence is not straightforward (see Burkhart et al. 2009). In this sense numerical simulations represent