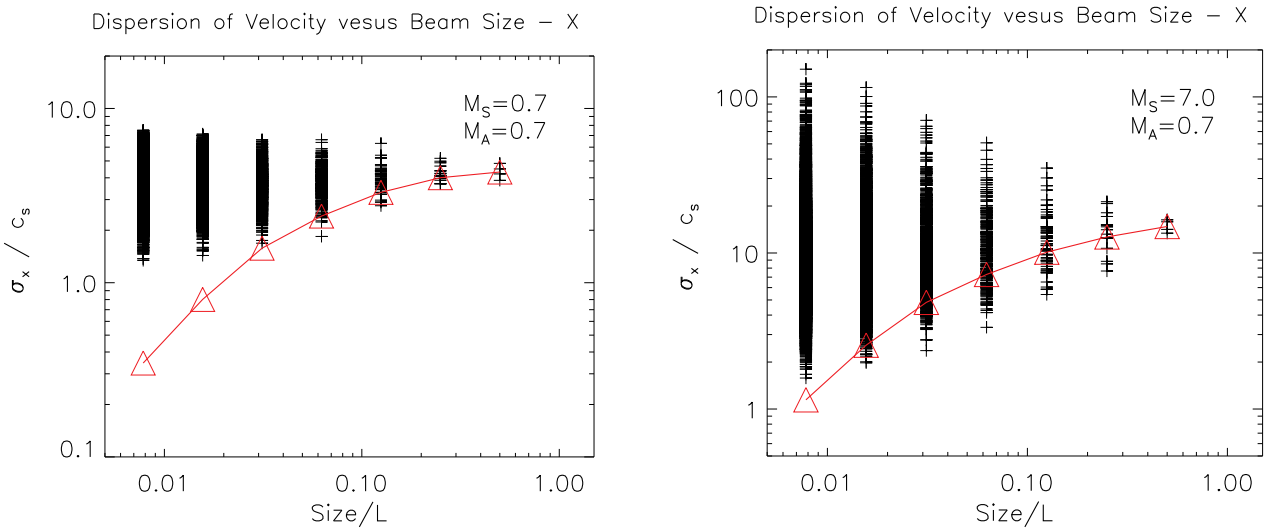

Fig. 2. Dispersion of velocity vs lengthscale, obtained for all LOS's with beam sizes $l \times l$, for two 3D-MHD numerical simulations. Left: subsonic/subalfvenic and right: supersonic/subalfvenic (extracted from Falceta-Gonçalves, Lazarian, & Houde 2010). The line corresponds to the actual three dimensional scaling, i.e. l^3.

a powerful tool. It is possible to simulate three dimensional turbulent flows and reconstruct observables from these cubes, considering any position for the observer.

In Falceta-Gonçalves, Lazarian, & Houde (2010) we calculated synthetic observations of line profiles and presented dispersion of velocity vs lengthscale relationship for different turbulent regimes (Figure 2), being subsonic (left) and supersonic (right). It is clear in these calculations, even more in the supersonic case, that the range of velocity dispersions at small scales is very large. Is it gravity the main cause for that? Actually, these simulations were MHD, isothermal, non selfgravitating models. The main issue is that the "small scale" in the plot does not truly corresponds to the smaller turbulent cells. Since the line profiles are obtained integrating along the line of sight, it is obtained in a volume $V = l \times l \times L$, being L the largest scale. Within the LOS, many small dense structures –each being subject to a drift velocity of the order of the largest scale amplitude– are intercepted and contribute to the total dispersion.

The origin of the condensations is related to the turbulence sonic Mach number. It reveals that shocks are the most important mechanism in generating dense structures in the ISM (Ballesteros-Paredes, Vázquez-Semadeni, & Scalo 1999).

Regarding the magnetic fields, numerical simulations have shown that even subalfvenic turbulence, at large scales, may present superalfvenic flows at smaller scales (Falceta-Gonçalves, Lazarian, & Kowal 2008). When shocks occur predominantly perpendicular to the mean field lines the density increases but the magnetic pressure not. Within the denser regions, the alfven speed (as it scales with $\rho^{-1/2}$) decreases and may become smaller than δv_l. The superalfvenic turbulence at the small scales is responsible for the bending of the field lines and, e.g., the decrease in the polarization degree, as observed in dense molecular cores.

3. IMPLICATIONS ON STAR FORMATION

It is well stablished that the ISM turbulence plays a key role in the star formation process, together with the magnetic field. In the same time, stellar energy feedback (mostly SNe) triggers the turbulence at large scales. Therefore, a full understanding of the turbulence cascade and the evolution of magnetic fields in turbulent flows is mandatory.

Uniform magnetic field lines are able to prevent the gravitational collapse of a cloud in the perpendicular direction, though not efficient in preventing the collapse as a whole. Alfvenic motions within the collapsing clouds may be effective in slowing down the inward fluxes of gas and, therefore, reduce the star formation efficiency (Falceta-Gonçalves, de Juli, & Jatenco-Pereira 2003).

Another important issue is the survival of the dense cores to the turbulence itself. In one hand, the turbulent motions result in shocks and the formation of the dense clouds. In the other hand, the turbulence is responsible for the diffusion of the gas