# Multi-scale dynamics in star-forming regions: the interplay between gravity and turbulence

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In the multi-scale view of the star formation process the material flows from large molecular clouds down to clumps and cores. In this paradigm it is still unclear if it is gravity or turbulence that drives the observed supersonic non-thermal motions during the collapse, in particular in high-mass regions, and at which scales gravity becomes eventually dominant over the turbulence of the interstellar medium [1, 2].

To investigate this problem we have combined the dynamics of a sample of 70 micron quiet clumps, selected to cover a wide range of masses and surface densities, with the dynamics of the parent filaments in which they are embedded. The clump scales are analysed combining two surveys of 70 $\mu$m quiet clumps aimed to trace the kinematics with high-density tracers such as $N_2H^+$ (1-0) an $HCO^+$ (1-0) and carried out with the IRAM 30m telescope [3,4,5]. The filaments have been extracted from the Hi-GAL survey and their dynamics has been evaluated with ancillary CO data [6].

We observe a continuous interplay between turbulence and gravity, where the former creates structures at all scales and the latter takes the lead when a critical value of the surface density is reached, $\Sigma \simeq 0.1$ g cm$^2$. In the densest filaments this transition can occur at the parsec, or even larger scales, leading to a global collapse of the whole region and most likely to the formation of the massive objects [5].

**References**

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