Synthetic CO spectra of molecular clouds

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The Initial Mass Function (IMF) describes the mass distribution of stars that form in a single molecular cloud. A key question is the universality of the IMF [3]. The current paradigm is that the IMF originates from the dense core mass function (DCMF), the mass distribution of the dense cores that are, within molecular clouds, the regions that lead to protostars [1]. However, if the universality of the IMF is likely, the universality of the DCMF remains highly debated; the direct link between DCMF and IMF is even questioned.

My PhD work focuses on the role of molecular clouds turbulence in the formation of dense filaments and cores. More specifically, our aim is to explore the transition from supersonic to subsonic turbulence in the vicinity of dense filaments. To achieve this goal, we first build synthetic data cubes of CO emission from molecular clouds from three-dimensional numerical (magneto-)hydrodynamical simulations. The emergent spectra result from the complex interplay between the CO abundance and velocity field along the line of sight. In a first step, our approach is based on a semi-analytical treatment of the radiative transfer and use simple prescriptions for the CO abundance based on state-of-the-art numerical models [2]. In this Poster, I present the overall methodology and the resulting spectra obtained with HD and MHD simulations from the CATS and GALACTICA databases, and covering a range in sonic and Alfvénic Mach numbers. These synthetic position-position-velocity cubes are then used to benchmark the centroid velocity technique used in turbulent studies.

References

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