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Turbulence modes and molecular cloud evolution in M33

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The nature of turbulence in molecular clouds is one of the driving factors that influence the efficiency by which the gas is converted to stars. In the Milky Way, it is speculated that the high star formation efficiency observed in spiral-arm clouds is linked to the prevalence of compressive curl-free) turbulent modes in the motion of molecular gas, while the shear-driven solenoidal (divergence-free) modes appear to be the main cause of the low star formation efficiency that characterizes clouds in the Central Molecular Zone. We proved the inverse proportionality between the solenoidal and the star formation efficiency in the plane molecular clouds in the Milky Way in the CHIMPS survey and, in addition, that the solenoidal modes decrease with a shallow gradient with the distance from the centre of the Galaxy. This shallow gradient is unaffected by the presence of spiral arms. In this investigation, we perform a similar analysis of turbulence on a sample of clouds spanning all galactic environments in the Triangulaum galaxy (M33). At a distance of 840 kpc with its nearly face-on inclination, M33 is an ideal target to probe how large-scale mechanisms affect gas motions in giant molecular clouds, thus impacting the clouds' evolutionary state and star forming efficiency. Using ACA and ACA+IRAM observations of 13CO(2-1) and 12CO(2-1) molecular lines, we explore how solenoidal turbulence varies with galactocentric distance and within various galactic features. We then compare the star-forming properties of the clumps (evolution quantified by the amount of HII emission) and their location to the amount of power in the solenoidal modes of turbulence.

Section

Star Formation

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