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Milena Benedettini - The Forgotten Quadrant Survey: a 12CO and 13CO (1–0) survey of the Galactic Plane in the range 220°<l<240°, -2.5°<b<0°

Tuesday 13 June 2023 14:30 (20 minutes)

I will present the Forgotten Quadrant Survey (FQS), a project that used 700 hr of the 12m antenna at the Arizona Radio Observatory to map a strip of the Milky Way plane in the range 220°<l<240° and -2.5°<b<0°, both in 12CO and 13CO (1–0). These data show how the molecular dense gas is organised at different spatial scales: from the spiral arms, traced by the giant clouds with their denser filamentary networks, down to clumps and cores that host new-born stars. From these high-quality spectroscopic data we can derive the distance of the emitting gas and obtain reliable estimates of its key physical parameters such as size, mass and virial parameter. Catalogues of molecular clouds are produced self-consistently by using the FQS data of the two transitions. They contain 263 and 87 structures for the 12CO(1-0) and 13CO(1-0) catalogues, respectively, that is many more molecular clouds than previously found in the same area by older surveys. Indeed, the sensitivity, spatial and spectral resolution of FQS data allow us to detect not only the classical giant molecular clouds, but also small clouds, namely sub-parsec structures that cannot be in gravitational equilibrium and are likely transient or confined by external pressure, and to resolve the clouds structure at the sub-parsec scale up to a distance of a few kiloparsec. I will present the statistical properties of the physical parameters of the molecular clouds and compare the results of the two FQS catalogues. The comparison shows that the structures traced by 13CO are overall less extended and less massive than the molecular clouds identified in the 12CO (1–0) data-set, since they trace the brightest and densest part of the 12CO (1–0) clouds. Conversely, the distribution of aspect ratio, equivalent spherical radius, velocity dispersion and virial parameter in the two catalogues are similar. I have also studied the variation of the mass surface density of molecular clouds with the galactocentric radius between 1 and 15 kpc, complementing the FQS catalogues with other two catalogues of molecular clouds extracted from similar CO surveys, the GRS and the SEDIGSM catalogues. I find that, even if the mass surface density of molecular clouds spans about an order of magnitude over the single clouds, its mean value is almost constant across the galactocentric radius, indicating that this parameter, which is a proxy of star formation, is highly influenced by local conditions.

Session Classification: Milky Way