A Galactic radio survey of jets from MYSOs: An unobscured insight into massive star formation

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With their unobscured, radio emission, an important avenue into furthering our understanding of massive star formation processes lies with the collimated jets of plasma, launched as a by-product of the mechanism by which forming stars accrete matter. Towards massive young stellar objects (MYSOs), they can be launched at velocities exceeding 1000 km/s and extend over many parsecs. These jets are intrinsically coupled to accretion discs and, towards sites of low-mass star formation, have been commonly observed. However, despite their obvious impact and importance on large scales, we know little about them or how prevalent they are towards MYSOs. As well as many physical properties, mechanism(s) responsible for their collimation and launch are not clear. In this proposed talk I shall inform the audience on the results of a large-scale, Galactic, VLA/ATCA radio survey towards a well-selected sample of MYSOs from the RMS survey. For the first time, a statistically-sized sample of MYSOs harbouring jets has been identified. A subsequent analysis of this sample's properties shows that ionised jets are a common consequence of massive star formation and that many of their properties scale in the same way as for their low-mass brethren, implying that disc-based processes must be intimately linked to star formation across all mass regimes. Through interaction with the environment, it is calculated that, on average, a forming massive star deposits $\sim 10^{41}$ - 10^{42} J, driving turbulence on larger scales. Unexpectedly, synchrotron emission is observed towards approximately half of the jets, indicating a shock-accelerated, relativistic population of electrons as well as the presence of magnetic fields in the jet's stream. This implies that ionised jets from MYSOs must be launched/collimated magnetically and also that, through diffusive shock acceleration, they produce cosmic rays capable of driving chemistry within their environments. Given the results of the work discussed above, it is clear that collimated jets are an important phenomenon associated to massive star formation and that they are similar in many ways to their low-mass counterparts. However, many open questions remain. Therefore, to finish this talk, I shall introduce the audience to the EASY (Ejection Accretion Structures in YSOs) project whose goals include establishing how these jets are produced using high-resolution eMERLIN, LOFAR, VLA and JWST observations. This will include a brief summary of preliminary VLA results and a discussion of how to conduct future studies to progress our understanding of these highly important phenomena.

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