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Neutrinos as a new tracer of the gas distribution in the Milky Way Centre

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The centre of the Milky Way hosts the most massive and dense clouds of molecular hydrogen gas in our Galaxy. The inferred star formation efficiency at the Galactic Centre is however surprisingly low given the large gas reservoir. Yet the huge uncertainty in the measurement makes the comparison between observations and theories difficult. Measurements of the gas density based on different mass tracers yield inconsistent results, even when using conventional probes such as CS and dust. We propose using neutrinos as an alternative, independent gas tracer to resolve this ambiguity. Neutrinos are produced when cosmic rays interact with the cloud gas, with their surface brightness directly proportional to the cloud's density integrated along the line of sight. In this talk, we quantify the impact of future neutrino data from the next generation of telescopes —KM3NeT, Baikal-GVD, and P-ONE—which offer angular resolutions better than a tenth of a degree for detecting muon neutrinos from the Galactic Centre. We show how neutrinos will improve the measurement on the gas density, allowing for more robust test of star formation theories.

Collaboration(s)

Author: LAI, Paul Chong Wa (University College London)

Co-authors: CRUDELE, Beatrice (icl); AGOSTINI, Matteo; Mr NG, Hayden Ping Hei (UCL); OWEN, Ellis; Ms VARMA, Nishta (UCL); WU, Kinwah (University College London)

Presenter: LAI, Paul Chong Wa (University College London)

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