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Status and prospects for probing astrophysical GeV neutrino emissions with IceCube and KM3NeT

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In the last decade, Cherenkov neutrino telescopes have provided valuable insights into the sources and acceleration mechanisms responsible for the high-energy neutrino flux observed at Earth. These instruments utilise large volumes of naturally occurring optically transparent materials, such as the Antarctic ice for IceCube and the Mediterranean Sea water for KM3NeT. Specifically, IceCube, encompassing a cubic kilometre of glacier, and KM3NeT, currently being deployed and soon reaching a similar size, offer complementary sky coverage, ushering in a new era of neutrino astronomy.Although optimised for detecting GeV to TeV neutrinos, recent advancements in analysis techniques have lowered the energy thresholds and increased sensitivity to astrophysical GeV neutrinos. Despite high background rates at low energies, the large instrumented volumes allow for stringent constraints on theoretical predictions for transient sources. We examine the case of GRB221009 and the follow-up analysis of the initial observing runs of Ligo-Virgo-Kagra. Furthermore, we discuss ongoing efforts to enhance these sensitivities through dedicated machine learning techniques aimed at improving signal-to-noise discrimination down to 100 MeV.

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