ICEHAP Seminar

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"Probing deaths of massive stars with subphotospheric emission"

abstract

Gamma-ray bursts and supernovae are violent explosive phenomena in the Universe. Neutrinos can provide us with precious opportunities to probe these phenomena even deep under the photosphere, which cannot be seen by electromagnetic observations.

Nonthermal neutrinos from jets have been commonly considered assuming that cosmic rays are accelerated, but this is not guaranteed at subphotospheres. We derive general constraints for production of TeV-PeV neutrinos, and show that low-luminosity jets are more favored.

The same argument is applied to supernovae, and relativistic supernovae and super-luminous supernovae are found to be promising sources. Finally, we discuss roles of neutron-loaded outflows and show the importance of quasithermal neutrinos in the GeV-TeV range. The neutron-proton-conversion mechanism further boosts neutrino energies, enhancing the detectability of GeV-TeV neutrinos from gamma-ray bursts and supernovae.