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Supernova Neutrinos and the HALO detector

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Stanley Yen (TRIUMF) for the HALO and HALO-1kT collaborations

Neutrinos provide a nearly-prompt view of the nuclear and particle processes that occur in the bowels of a core-collapse supernova. Most existing detectors are primarily sensitive to electron anti-neutrinos, but a complete picture requires complementary detectors to observe all flavours of neutrinos and antineutrino emitted in the different phases of the explosion. The lead-based HALO detector at SNOLAB is the first and so-far only operational detector in the world primarily sensitive to electron neutrinos. It has been taking data since 2012 and has been a member of the global SuperNova Early Warning System since 2015. Plans are underway for HALO-1kT, a larger lead detector at Gran Sasso. The unexpected and still-contentious early burst of neutrinos related to SN1987A, observed only at the Mont Blanc detector, may be an indication that our understanding of the explosion mechanism is incomplete, and the next galactic supernova may yet yield surprises.

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