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Neutral current events from supernova neutrinos

The next galactic core-collapse supernova will provide an unparalleled number of neutrino observations here on Earth. The flavor content of this signal is expected to be very different from the one emitted by the proto-neutron-star, due to the explosion dynamics as well as the properties of the neutrino. The plethora of complex information carried by these little messengers, thus, need to be carefully teased out. Using the neutral current events in water Cherenkov and scintillator detectors to establish a baseline for the neutrino signal, will allow us to disentangle the multiple threads of information. We have used SNOwGLOBES in combination with a Markov Chain Monte Carlo algorithm to investigate how well one can reconstruct the values, at emission, of the neutrino luminosities and energies, their decay time scales, and the spectral pinch parameter, from an observed neutral current neutrino signal. When combined with information from inverse beta decay events, these reconstructed values will allow us to extract information on neutrino mixings, the mass hierarchy and the explosion dynamics.

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