Physical conditions in the magnetic protoneutron star winds

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The neutrino-driven wind from protoneutron stars has been conceived as a likely astrophysical site for rapid neutron- capture nucleosynthesis which is sensitive to the physical conditions in the wind. The three key physical parameters that characterize the wind include the flow entropy, the electron fraction and the dynamical expansion timescale. Most of previous investigations have shown the failure of robust r-process nucleosynthesis in the wind. Having included the effects of an ordered dipole magnetic field, Thompson (2003) found that a strong magnetic field could trap the outflow in the neutrino heating region, thus increasing the asymptotic entropy sufficiently for r-process nucleosynthesis. We consider the effects of the strong magnetic field on the microphysical processes in the wind and find that the magnetic field increase the electron fraction significantly which is not helpful for r-process nucleosynthesis.