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Neutrino Emissivities from Deuteron-Breakup and Formation in Supernovae SATOSHI NAKAMURA, SHOTA NASU, Osaka University, KOHSUKE SUMIYOSHI, Numazu College of Technology, TORU SATO, Osaka University, FRED MYHRER, KUNIHARU KUBODERA, University of South Carolina — Recently it was pointed out that there are abundant light nuclei, such as deuteron, triton and helium, in supernova environment. An interesting question is how much neutrino emissions from these light nuclei affect supernova mechanism. To address this question through a supernova simulation, neutrino emissivities from these light nuclei are necessary input. The deuteron is the simplest nucleus, and occupy a substantial portion of the light nuclei abundance. Thus in this work, we study neutrino emissions from electron/positron capture on the deuteron and the nucleon-nucleon fusion processes in the surface region of a supernova core. We evaluate these weak processes using one-nucleon impulse current supplemented by two-nucleon exchange currents, and nuclear wave functions generated by a high precision nucleon-nucleon potential. We present the neutrino emissivities from the deuteron calculated for typical profiles of core-collapsed supernovae. These novel neutrino emissivities are compared with the standard neutrino emission mechanisms. We find that the neutrino emissivity due to the electron capture on the deuteron is comparable to that on the proton in the deuteron abundant region. We discuss implications of the new channels involving deuterons for the supernova mechanism.

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