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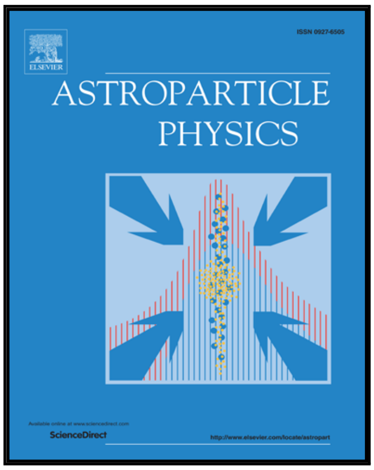

High energy neutrinos from the Sun

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High energy neutrinos from the Sun

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Abstract

The Sun is a main source of high energy neutrinos. These neutrinos appear as secondary particles after the Sun absorbs high-energy cosmic rays, that find there a low-density environment (much thinner than our atmosphere) where most secondary pions, kaons and muons can decay before they lose energy. The main uncertainty in a calculation of the solar neutrino flux is due to the effects of the magnetic fields on the absorption rate of charged cosmic rays. We use recent data from HAWC on the cosmic-ray shadow of the Sun to estimate this rate. We evaluate the solar neutrino flux and show that at 1 TeV it is over ten times larger than the atmospheric one at zenith $\theta_z = 30^\circ/150^\circ$. The flux that we obtain has a distinct spectrum and flavor composition: it is harder and richer in antineutrinos and tau/electron neutrinos than the atmospheric background. This solar flux could be detected in current and upcoming neutrino telescopes. KM3NeT, in particular, looks very promising: it will see the Sun high in the sky (the atmospheric flux is lower there than near the horizon) and expects a very good angular resolution (the Sun's radius is just 0.27°).