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Complete predictions for high-energy neutrino propagation in matter

We present complete predictions for the interactions of energetic neutrinos with matter as they propagate through Earth towards large-volume detectors. Our results are based on state-of-the-art calculations for the high-energy neutrino-matter interaction cross-sections. In addition to the dominant interaction process, deep inelastic scattering off quarks and gluons, we include the relevant subdominant channels: (in)elastic scattering off the photon field of nucleons, coherent scattering off the photon field of nuclei, as well as the scattering on atomic electrons via the Glashow resonance. Our predictions for the neutrino attenuation rates, based on this complete and reliable calculation, are provided by a new software package, NuPropEarth. We quantify the dependence of our results on the cross-section model, including nuclear corrections. Our results provide an important contribution to the scientific harvest of ongoing and next-generation high-energy neutrino detection experiments.

Mini-abstract

State-of-the-art calculations for high-energy neutrino propagation in matter.

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