Abstract Submitted
for the APR21 Meeting of
The American Physical Society

NuPyProp - A Pythonic Monte Carlo Neutrino/τ-lepton Simulation Package[1] SAMEER PATEL, The University of Iowa, NUSPACESIM COLLABORATION — The detection of upward-going extensive air showers sourced by neutrino interactions in the Earth is the goal of a range of terrestrial, balloon and proposed satellite instruments. Neutrino interactions and charged lepton propagation in the Earth is a key input to assessing an instrument's sensitivity to ultrahigh-energy neutrinos. The NuPyProp code models high- energy neutrino interactions in the Earth and calculates the outgoing lepton probability and energy distributions as a function of slant depth through the Earth. Part of the nuSpaceSim package, NuPyProp generates look-up tables for $\nu_\tau \rightarrow \tau$ and $\nu_\mu \rightarrow \mu$ propagation in the Earth. For incident ν_τ/ν_μ, the propagation through the Earth involves a series of neutrino interactions and τ/μ-lepton decays (regeneration). The code is designed to run with both stochastic and continuous electromagnetic energy losses for the lepton transit through the Earth. It has the flexibility to allow the user to input their own neutrino cross-section models and photonuclear energy loss models. We describe NuPyProp and use it to demonstrate the impact of inputs such as energy loss model and neutrino cross section on tau exit probabilities and the energy distributions of the air showers they produce.

[1]Work supported in part by NASA

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Date submitted: 08 Jan 2021 Electronic form version 1.4