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 <h2>From the Planck Scale to the Electroweak Scale</h2>

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IceCube bounds on sterile neutrinos above 10 eV

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We study the capabilities of IceCube to search for sterile neutrinos with masses above 10 eV by analyzing its $\nu\mu$ disappearance atmospheric neutrino sample. We find that IceCube is not only sensitive to the mixing of sterile neutrinos to muon neutrinos, but also to the more elusive mixing with tau neutrinos through matter effects. The currently released 1-year data shows a mild (around 2σ) preference for non-zero sterile mixing, which overlaps with the favoured region for the sterile neutrino interpretation of the ANITA upward shower. Although the null results from CHORUS and NOMAD on $\nu\mu$ to $\nu\tau$ oscillations in vacuum disfavour the hint from the IceCube 1-year data, the relevant oscillation channel and underlying physics are different. At the 99% C.L. an upper bound is obtained instead that improves over the present Super-Kamiokande and DeepCore constraints in some parts of the parameter space. We also investigate the physics reach of the roughly 8 years of data that is already on tape as well as a forecast of 20 years data to probe the present hint or improve upon current constraints.

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