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A New Approach to Probe Non-Standard Interactions in Atmospheric Neutrino Experiments ANIL KUMAR, Institute of Physics, Bhubaneswar, AMINA KHATUN, Comenius University, Bratislava, Slovakia, SANJIB KUMAR AGARWALLA, Institute of Physics, Bhubaneswar, AMOL DIGHE, Tata Institute of Fundamental Research, Mumbai , INDIA-BASED NEUTRINO OBSERVATORY (INO) COLLABORATION — We propose a new approach to explore the neutral-current non-standard neutrino interactions (NSI) in atmospheric neutrino experiments using oscillation dips and valleys in reconstructed muon observables, at a detector like ICAL. We show that the non-zero value of NSI parameter $\varepsilon_{\mu\tau}$ shifts the oscillation dip locations in L/E distributions of the up/down event ratios of reconstructed μ^- and μ^+ in opposite directions. We introduce a new variable Δd representing the difference of dip locations in μ^- and μ^+, which is sensitive to $\varepsilon_{\mu\tau}$, and is independent of the value of Δm^2_{32}. We further note that the oscillation valley in the (E, $\cos\theta$) plane of the reconstructed muon observables bends in the presence of NSI, its curvature having opposite signs for μ^- and μ^+. We illustrate how the measurement of contrast in the curvatures of valleys in μ^- and μ^+ can be used to estimate . Using these proposed oscillation dip and valley measurements, the achievable precision on $|\varepsilon_{\mu\tau}|$ at 90% C.L. is about 2% with 500 kt·yr exposure including the effects of statistical fluctuations, systematic errors, and uncertainties in oscillation parameters.

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