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Probing the Local Dark Matter Halo with Neutrino Oscillations

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Dark matter particles can form halos gravitationally bound to massive astrophysical objects. The Earth could have such a halo where depending on the particle mass, the halo either extends beyond the surface or is confined to the Earth's interior. We consider the possibility that if dark matter particles are coupled to neutrinos, then neutrino oscillations can be used to probe the Earth's dark matter halo. In particular, atmospheric neutrinos traversing the Earth can be sensitive to a small size, interior halo, inaccessible by other means. Depending on the halo mass and neutrino energy, constraints on the dark matter-neutrino couplings are obtained from the halo corrections to the
neutrino oscillations.

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