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Analytic approach to three-neutrino oscillations in the Earth

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"Using the Magnus expansion of the evolution operator in the adiabatic basis, we find an approximate solution to the problem of three–neutrino oscillations in a medium with a symmetric, but otherwise arbitrary, density profile. The evolution operator of the system is written as the product of factors corresponding to effective two-neutrino problems for a low and a high energy regime.
By virtue of such factorization the approximation works well over a wide range of energies. In the case of atmospheric neutrinos traversing the Earth, the oscillation probabilities calculated using our approach are in good agreement with the results of numerical calculations."

Primary author: ACERO, Mario A. (Univ. Atlantico)

Co-authors: AGUILAR-AREVALO, Alexis (Mexico U., ICN); D'OLIVO, Juan Carlos (Mexico U., ICN)

Presenter: ACERO, Mario A. (Univ. Atlantico)

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