Search for correlations of ultra-high-energy cosmic rays and high-energy neutrinos

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Cosmic rays were discovered a century ago, however the sources of the ultra-high-energy events remain unidentified.

It is believed that the same environments that accelerate ultra-high-energy cosmic rays (UHECRs) also produce high-energy neutrinos via hadronic interactions.

Two out of three joint analyses of the IceCube Neutrino Observatory, the Pierre Auger Observatory and the Telescope Array yielded hints for a possible directional correlation of high-energy neutrinos and UHECRs. The first analysis is based on counting pairs of neutrinos and UHECRs, while the second analysis uses neutrino directions for a stacking approach.

The third analysis was based on using UHECR event regions as spatially extended signal templates.

The next step is to include neutrino data measured by ANTARES in order to increase sensitivity to possible correlations in the Southern Hemisphere.

Additionally, an improved analysis with an approach complementary to the other analyses has been developed.

This analysis searches for neutrino point sources in windows around UHECRs

with window extensions estimated from deflections by galactic magnetic fields.

We present this new analysis for searching common hadronic sources as well as recent results of all correlation analyses with updated data from all contributing experiments.

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