

Long-Term VERITAS Monitoring and Multi-Wavelength Data on TXS 0506+056: Probing Intergalactic Cascades with VERITAS, Swift, and Fermi Observations

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In September 2017, the IceCube Neutrino Observatory detected a high-energy neutrino event, IceCube-170922A, associated with a gamma-ray flare from the blazar TXS 0506+056, with a probability of chance coincidence rejected at the 3σ level. This remains the most significant photon-neutrino correlation observed to date. Here, we present results from the long-term monitoring of TXS 0506+056 conducted by VERITAS, significantly expanding the observational coverage compared to previous studies. Data from *Swift* and *Fermi*-LAT further complement these observations. Using this comprehensive dataset, we compare the gamma-ray spectrum and neutrino observations to a hadronic model which uniquely includes a cosmic-ray induced cascade component in intergalactic space. We will discuss the implications of these findings for understanding the proton injection spectrum and constraints on proton escape luminosity.

Primary author: MOONEY, Connor (University of Delaware)

Presenter: MOONEY, Connor (University of Delaware)

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