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Realtime Alerts and Archival Searches for Time-Evolving Neutrino Flares Using the IceCube Gamma-Ray Follow-Up (GFU) Platform

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The discovery of a high energy neutrino from IceCube coincident in time with flaring activity in gamma-rays from TXS 0506+056 solidified neutrinos as an integral part of the emerging field of multimessenger astrophysics. From the direction of the source, an archival neutrino flare was also identified and contributed to the significance of TXS 0505+056 as a neutrino source. An alert stream for time-evolving neutrino flares comprised of sub-threshold events had been developed for IceCube; however, TXS 0506+056 was not among the considered sources due to a lack of redshift information. These flare alerts were optimized to look for AGN flares from nearby sources such that imaging air Cherenkov telescopes (IACTs) could follow-up the alerts by looking for high energy gamma-ray emission. Therefore, lists of sources for each IACT were developed and monitored for neutrino flares. Additionally, an all-sky version of the alert was developed to provide a model independent search but requires a higher threshold to trigger an alert due to the increased number of trials. In this presentation, we discuss the structure of the alert platform and also give results from archival searches using the analysis. We will also cover future developments for this neutrino flare alert stream including improving the performance and also expanding the scope.

Primary author: MANCINA, Sarah Louise (Univerit  degli Studi di Padova)

Presenter: MANCINA, Sarah Louise (Univerit  degli Studi di Padova)

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