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Search for High-Energy Neutrinos from Infrared Flares with IceCube archival data

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IceCube has detected a diffuse flux of high energy neutrinos, with two significant observations of extragalactic sources identified to-date being the accreting supermassive black holes (SMBHs) TXS0506+056 and NGC1068. This suggests that other SMBHs may also contribute to the observed neutrino flux. It is possible that some fraction of the IceCube neutrinos originate in time-variable SMBH accretion events. External studies that made use of IceCube data identified candidate sources which include AT2019dsg, which is likely a stellar tidal disruption event (TDE), and AT2019dfr, an AGN flare. Both of these transients exhibit strong dust echoes, characterized by delayed infrared (IR) emission relative to the initial optical outburst. This emission can be interpreted as the reprocessing of X-rays to optical light of the flare by dust located in a torus around the SMBH. An additional study using an optically detected sample of 63 accretion flares revealed another candidate as a potential high-energy neutrino counterpart: AT2019aalc, which is also accompanied by a dust echo. However, follow-up stacking analysis of the 63 nuclear flares using the full IceCube data sample did not show any significant excess over background. Motivated by these three suggested neutrino-TDE correlations, we analyze a more extensive catalog of IR flares, 823 dust-echo-like flares identified using WISE satellite data, against the IceCube 10-year sample of track events from the Northern Sky to assess the potential detectability of neutrino emission from these types of accretion flares.

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