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Results from searches for astrophysical neutrino sources in the southern sky and galactic plane using IceCube starting track events

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Over the past decade, the IceCube detector has gone from the discovery of an astrophysical neutrino flux at earth to the identification of two neutrino sources, TXS 0506+056 and NGC 1068. However, efforts continue within IceCube to pull more astrophysical neutrino events out of the data. Here, we present the results from a new IceCube event sample which selects for starting track events created by muon neutrinos that interact inside of the IceCube detector. Selecting for this morphology allows us to remove not only the incoming muon background but also atmospheric neutrinos in the southern sky, which can be accompanied into the detector by muons from the same air shower. This additional background rejection creates a high purity astrophysical neutrino sample at energies below 100 TeV improving IceCube's sensitivity to the southern equatorial sky. We conducted four analyses looking for an excess of events coming from any given direction and from the direction of bright gamma-ray sources, galactic plane TeV gamma-ray source classes, and the entire galactic plane. While the analyses using this starting track event selection did not return any statistically significant results, we set competitive upper limits on the neutrino emission from pulsar wind nebulae and on the diffuse galactic plane emission. We also show that our results are consistent with the recent IceCube results for NGC 1068 and diffuse galactic plane emission

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