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Searching for Dark Matter From The Sun With Ten Years of IceCube Data

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The existence of dark matter (DM) has been well-established by repeated experiments probing various length scales. Even though DM is expected to make up 85% of the current matter content of the Universe, its nature remains unknown. One broad class of corpuscular DM motivated by Standard Model (SM) extensions is weakly interacting massive particles (WIMPs). WIMPs can generically have a non-zero cross-section with SM nuclei, which allows them to scatter off nuclei in large celestial bodies such as the Sun, losing energy and becoming gravitationally bound in the process. After repeated scattering, WIMPs sink to the solar center, leading to an excess of WIMPs there. Subsequently, WIMPs can annihilate to stable SM particles, either directly or through a decay chain of unstable SM particles. Among stable SM particles, only neutrinos can escape the dense solar core. Thus, one may look for an excess of neutrinos from the Sun's direction as evidence of WIMPs. The IceCube Neutrino Observatory, which detects Cherenkov radiation of charged particles produced in neutrino interactions, is especially well-suited to such searches since it is sensitive to WIMPs with masses in the region preferred by supersymmetric extensions of the SM. In this contribution, I will present the results of IceCube's most recent solar WIMP search, which includes all neutrino flavors, covers the WIMP mass range from 10 GeV to 1 TeV, and has world-leading sensitivity over this entire range for most channels considered.

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