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Advancing Neutrino Astrophysics with the IceCube Upgrade

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The IceCube Neutrino Observatory at the geographic South Pole has achieved major milestones in neutrino astrophysics, including the discovery of a high-energy astrophysical neutrino flux and correlations with flaring blazars and Seyfert galaxies. Building on this success, the IceCube Upgrade is scheduled for completion during the 2025/26 Antarctic summer season. This upgrade will deploy seven new strings of densely instrumented optical sensors, primarily near the bottom of the detector, substantially enhancing event reconstruction and improving the selection efficiency of atmospheric and astrophysical neutrinos down to a few GeV. These advancements will enable unique opportunities to study neutrino oscillations, conduct high-precision measurements of tau neutrino appearance, and detect GeV-scale neutrinos from astrophysical transients.

This contribution will present the current status of the IceCube Upgrade ahead of the upcoming construction season, with a focus on its scientific capabilities and its extensive calibration program.

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