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Studies of systematic uncertainty effects on IceCube's real-time angular uncertainty

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Sources of astrophysical neutrinos can be potentially discovered through the detection of neutrinos in coincidence with electromagnetic or gravitational waves. Real-time alerts generated by IceCube play an important role in this search since they act as triggers for follow-up observations with instruments sensitive to other wavelengths.

Once a high-energy event is detected by the IceCube real-time program, a complex and time-consuming method is run in order to calculate an accurate localisation. To investigate the effect of systematic uncertainties on the uncertainty estimate of the location, we simulate a set of high-energy events with a wide range of directions for different ice model realisations. This makes use of a novel simulation tool, which allows the treatment of systematic uncertainties with multiple continuously varied nuisance parameters. These events are then reconstructed using various reconstruction methods. This study will enable us to include systematic uncertainties in a robust manner in the real-time direction and error estimates.

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Collaboration

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Subcategory

Experimental Methods & Instrumentation

Primary authors: LAGUNAS GUALDA, Cristina (Z_ICE (IceCube+NG)); ASHIDA, Yosuke (IceCube); SHARMA, Ankur (Uppsala University)

Presenter: LAGUNAS GUALDA, Cristina (Z_ICE (IceCube+NG))

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