Energy and Xmax Reconstruction for Cosmic-Ray Events Recorded by a Prototype Station of the IceCube Surface Enhancement

Thursday, 9 June 2022 10:20 (20 minutes)

The IceTop array, located at the surface of the IceCube Neutrino Observatory, is currently used as a veto for the in-ice neutrino detection as well as a cosmic-ray detector. Over the years, snow accumulated on the IceTop detector reducing its sensitivity and resolution. In order to mitigate this issue as well as further increase the accuracy of cosmic-ray measurements, an enhancement is planned in the next few years. It consists of an array of scintillation detectors and radio antennas that will be deployed within the whole IceTop footprint. Upgrading IceTop with radio antennas will provide precise \( X_{\text{max}} \) measurements, a variable widely used to reconstruct the cosmic-ray mass composition.

In January 2020, a prototype station comprising three antennas and eight scintillation panels was deployed at the South Pole. We developed the tools necessary to use a template-matching method for energy and \( X_{\text{max}} \) reconstruction and applied it to some of the radio events recorded. This template method uses Monte Carlo simulations and compares them to recorded data. For this, a set of simulated air showers was created using the values reconstructed by IceTop as input to the CORSIKA/CoREAS simulation software. In this talk, we will present the method and discuss the preliminary results obtained with this technique.

Primary authors: SCHRÖDER, Frank; TURCOTTE-TARDIF, Roxanne
Presenter: TURCOTTE-TARDIF, Roxanne
Session Classification: Air Data Analysis & Tools 3