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Ice surface roughness modeling for effect on radio signals from UHE particle showers

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For radio antenna neutrino and cosmic ray detectors located in or above the Antarctic ice sheet, the reconstruction of both ultra-high energy (UHE) neutrino and cosmic ray air shower events requires knowledge the transmission and reflection properties of the air-ice interface. To better understand these properties, in-lab and field data will be obtained and analyzed. The in-lab experiment will measure reflected power from rough surfaces of a granular material in the frequency range of 2-3GHz. These measurements are used to determine a model capable of predicting reflected power as a function of elevation angle and frequency based on measurable parameters of the surface and material. Field data is taken in the form of stereoscopic images of the surface as part of the Antarctic Geophysics Along the Vostok Expedition (AGAVE). 3D data from the stereoscopic images will be used to create similarly rough and appropriately scaled surfaces in the lab for comparison to the results of the reflection model and to the models currently being used for simulation and reconstruction of shower events.

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