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Energy calibration and atmospheric corrections of a space weather particle detector, located at the Argentine Marambio base in the Antarctic Peninsula

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Neurus is a particle detector operated by the Argentinean space weather laboratory (LAMP, Laboratorio Argentino de Meteorología del esPacio), and located in the LAMP-Antarctic branch, in the Argentine Marambio base at the Antarctic Peninsula; the particle detector is part of the LAGO Collaboration (Latin American Giant Observatory). The main goal of this detector, based on the Water-Cherenkov effect, is to make observations of the flux variability of low-energy galactic cosmic rays (GCRs) for making space weather studies. Since 2020, the data acquisition system developed by LAGO, which consists of a commercial board Red Pitaya STEMLab working in an FPGA mode, has been operated autonomously and uninterruptedly. This allows us to obtain the flux of detected particles and the deposited energy in the water by them (mostly electrons, positrons, gammas, and muons). The passage of vertical muons through the detector can be identified as a hump in the histogram of the deposited energy, and this hump can be used to make the energy calibration of the detector. Thus, the evolution of particle fluxes may be discriminated against using different deposited energy bands, which can be useful to study the heliospheric modulation for different energies. In this work, we present the atmospheric corrections and energy calibration for two bands: electromagnetic and muonic. The results of this work will permit the implementation of an operative mode for the provision of real-time observations of the GCRs variability at different energies.