

Analytical evaluation of muon intensities in the atmosphere and underground

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Abstract. Using the BESS - 98 flight proton and alpha-particle spectra improves the agreement between our calculated sea level proton spectrum (25ICRC) and the measured sea level proton spectrum. We then calculate the atmospheric muon spectrum and charge ratio using models for pion and kaon production. The calculated sea level muon charge ratio exhibits a minimum at about 50 GeV for vertical muons; and at somewhat higher energy for near horizontal muons; due to decrease of the π^+ / π^- ratio before kaon

decay increases the muon charge ratio at higher energies. Considering neutrinos associated with muons, we obtain the muon-neutrino intensity which we use to derive the neutrino-induced muon intensity underground. The charge ratio of neutrino-induced muons underground is found to have a maximum of 0.49 at about 10 GeV for vertical muons, and a maximum of 0.50 at about 200 GeV for horizontal muons, approaching 0.40 at high energies.