

PRECISE MEASUREMENT OF ATMOSPHERIC MUON FLUXES AT SEA LEVEL

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The vertical absolute fluxes of atmospheric muons and the muon charge ratio have been measured precisely at different geomagnetic locations by using the BESS spectrometer. The observations have been performed at 30 m above sea level in Tsukuba, Japan, and at 360 m above sea level in Lynn Lake, Canada. The vertical cutoff rigidities in Tsukuba ($36.2^{\circ}N, 140.1^{\circ}E$) and in Lynn Lake ($56.5^{\circ}N, 101.0^{\circ}W$) are 11.4 GV and 0.4 GV, respectively. We have obtained vertical fluxes of positive and negative muons in a momentum range of 0.6 to 20 GeV/ c with an estimated systematic error of 2.4 % for positive muons and 2.2 % for negative muons in Tsukuba and 2.2 % for positive muons and 1.9 % for negative muons in Lynn Lake. By comparing the data collected at two different geomagnetic latitudes, we have seen an effect of cutoff rigidity. An atmospheric effect and a solar modulation effect have also been confirmed. Those precise measurements of the muon fluxes at sea level are important to understand the cosmic-ray interactions inside the atmosphere and to evaluate the parameters of atmospheric neutrino oscillation.