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High Energy Astroparticles from Antarctica

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Cosmic rays are high-energy particles from space, i.e., the sun, the supernova explosion of stars, and other currently unknown sources by processes that are not fully understood. Magnetic fields influence the propagation of these particles in the solar wind and the magnetosphere of the Earth. We can investigate changes in these magnetic fields by recording variations and fluctuations in the cosmic ray intensity. Ground-or-sea-based neutron monitors are a standard tool for detecting atmospheric showers from 20 GeV-range primary cosmic rays of either solar or galactic origin. Configurations of neutron detectors may not be completely identical, and these differences lead to different energy-dependent effective areas (yield functions). Near Polar regions, the earth's magnetic field is less effective in keeping cosmic rays from reaching the atmosphere than near the equator; so lower-energy particles from the sun are admitted. We, in Thailand, have developed portable neutron monitors to investigate the energy spectrum of cosmic rays during ocean voyages to/from Antarctica and its solar modulation, i.e., variations over the typically 11-year sunspot cycle. The interesting new findings from these voyages and future approaches will be discussed.

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