

# Response functions of semi-leaded neutron monitor count rates and leader rates from latitude surveys during 2019-2020

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We have developed a portable “Changvan” neutron monitor with three counters for latitude surveys to investigate cosmic ray spectral variations. This uses the NM64 design except the middle counter lacks the lead producer, so we call this a “semi-leaded” neutron monitor. The Changvan was operated on two voyages on the Chinese icebreaker Xuelong between China and Antarctica during 2019 and 2019-2020. The standard measurement during a latitude survey is the count rate as a function of geomagnetic cutoff rigidity, i.e., the response function of the total count rate. Repeated measurements with the same detector over different phases of the solar cycle provide precise information about cosmic ray spectral variation. In addition, we have tested two techniques to track spectral variations, which have or could be implemented at fixed stations. 1) The count rate ratio of unleaded vs. leaded counters varies strongly with geomagnetic cutoff rigidity, indicating sensitivity to the cosmic ray spectrum. This measurement could be implemented at fixed stations and may have advantages relative to using a “bare” counter in that this “unleaded” counter is shielded from the environment by the reflector and has a higher count rate due to the adjacent lead. 2) We use histograms of the time delay between successive neutron counts to determine the leader fraction, as previously used to monitor short-term and solar-cycle spectral variations. Thus we report measurements of the response functions of the count rates and leader rates of the unleaded and leaded counters during these two latitude surveys.

## Keywords

neutron monitor; latitude survey; Leader fraction; time delay histograms

## Collaboration

## other Collaboration

## Subcategory

Experimental Methods & Instrumentation

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