

Solar neutron observations at Tibet in association with two solar flares

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<http://stelab.nagoya-u.ac.jp/ste-www1/div3/CR/Neutron/index.html>

Solar neutrons were detected using new type of solar neutron detector located at Yangbajing, Tibet (N30, E90, 4300 m above sea level) in association with two solar flares.

First detection using the Tibet solar neutron detector was made in association with X3.3 solar flare, which occurred at 4:54UT on 1998 November 28th. And in association with X2.6 solar flare, whose onset time was 9:32UT, solar neutrons were also detected successfully.

Both detections were made using function of measuring directions of incident neutrons. This function makes it possible to reduce background neutrons which are produced by secondary cosmic rays in the earth atmosphere.

As a result, Signal to noise ratio increased and solar neutrons could be detected successfully in association with two solar flares. On the other hand, neutron monitors, which have been used since 1950's for solar neutron observations, have no such function. Therefore, the neutron monitor located at the same place could not detect solar neutrons significantly.

In these events, there is another important point in terms of attenuation of solar neutrons in the earth atmosphere. At the onset time of both solar flares, zenith angle of the sun was 53 and 60 degrees respectively. These conditions were not good for solar neutron observations. However, Monte Carlo simulation taking account into refraction effect of solar neutron in the earth atmosphere showed it was possible that solar neutrons could arrive at Yangbajing level in such hard condition.

We discuss that particle acceleration on

solar surface in both solar flares, combining the observations of the Tibet solar neutron detector and soft/hard X ray data obtained by satellites.