Note on the data of Mt. Norikura Neutron Monitor

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I. Introduction

The Super Neutron Monitor at Mt. Norikura has been in operation since 1968. First it started using 3NM64 from September, 1968. One counter has been added to the monitor on Sept. 18, 1970.One of the counter failed to operate from Sept. to July 4, 1997. Operation of 4NM64 was continued until Feb. 1989, The result of these observation until 1981 are already published in ICR-Report[1], and also it is in the data base of WDC CR-C2 at Stelab, University of Nagoya.

In Aug. 1988, 8 NM64 counters with Pb-producer and plastic-diffuser are added to the monitor in preparation for observation by 12NM64. By this addition, the counting rate of the 4NM64 monitor increased by about 4 percents. A digital barograph was installed on Dec. 1988, replacing old Mercury barograh.

From April 1,1989, observation by full 12NM64 monitor has been started. New recording system, capable of recording sinngle counts of every counter as well as multiplicity data was built with PC controled logics. Recording of counting rates with 10 sec time interval finaly began on Dec. 12, 1989. This observation has been terminated by failure of recording system at the end of June, 2003. The total counts of the monitor, however, was monitored by recorders of Cosmic Ray Laboratory, Stelab, Nagoya University, until present.

Processed data of 12NM64 were sent to WDCCR-C2 until Aug. 1992. By various reason, the data process work was suspended after Aug. 1992.

In the spring of 2004, the author decided to resume the data processing of Mt. Norikura Neutron Monitor, especially to see the long term variation of high rigidity cosimic rays. In the following, brief history of changes in NM observation, recorder, and data reduction scheme will be given for convenience of data user.

II. Neutron Monitor and its environments.

As shown in Fig. 1, the monitor is placed in a southern wing of Mt. Norikura Cosmic Ray Laboratory, Institute for Cosmic Ray Research, University of Tokyo. In 1968, Neutron Monitor(3NM64) was placed on the iron frame of about 2 m in height almost at the center in East-West line to minimize the absorption by piled up snow at west side wall and roof of the building. High Counting Meson Telescope of Nagoya University using 2 layers of 64 plastic scintillator detectors (each 1 m^2) are placed in the same room. Separation between 2 layers is 1.73m, so that the Neutron Monitor has good viewing condition in north-south direction.

From Mar. 1, 1989, the total count of 12NM64 monitor was recorded by the recording system. During March to June, the data has several gaps and sudden change of level, probably due to test operation or absorption of neutron by piled snow on the roof and side of the building. After Dec. 12, 1989, the new recording system was in operation, so that, the hourly count of ezch counter were recorded. Comparing the counting rate of each counter, it became possible to exclude intensity change due to the absorption by piled snow on the roof and west side of the building.An example of selection of data is shown in Table. 1 for 2000 This method was applied to the data of 1990 Jan. – 2003 Jun..

Table. 1 Channel selection table of year 2000.

ch1: west end counter, … ch12: east end counter

○ : data of this channel was selected.

×: data of this channel was not selected..

	Date interval	ch1	ch2	ch3	ch4	ch5	ch6	ch7	ch8	ch9	ch10	ch11	ch12	days
dayno.	2000													
1–85	Jan. 1 – Mar.25	○	○	○	○	○	○	○	○	○	○	○	○	85
86–91	Mar. 25–Mar.31	×	○	○	○	○	○	○	○	○	○	○	○	6
92 – 95	Apr. 1 – Apr.4	×	×	×	○	○	○	○	○	○	○	○	○	4
96–109	Apr.5 – Apr.18	×	×	×	×	×	○	○	○	○	○	○	○	14
110–131	Apr. 19– May 10	×	×	×	×	×	×	○	○	○	○	○	○	22
132–145	May 11– May 24	×	×	×	○	○	○	○	○	○	○	○	○	14
146–345	May26 – Dec.10	○	○	○	○	○	○	○	○	○	○	○	○	200
346–366	Dec. 11– Dec. 31	×	×	○	○	○	○	○	○	○	○	○	○	21
		285	291	312	330	330	344	366	366	366	366	366	366	366

III. Neutron Monitor Data:

Neutron Monitor data for the interval 1990 Jan. – 2004 Sep. are sent to WDC-C2. Tabulated values in the data files are hourly neutron monitor counts with sacling factor of 768 and corrected for atmospheric pressure variation. Free Air Pressure vvalues are used in this correction with barometric coefficient of -0.70%/hPa and corrected to 720.0 hPa. As mentioned above, absorption of cosmic rays by piled snow on the roof and the building was excluded from the data, by comparing the difference of counts of counters. In some year, there remains some fear this snow effect may not be excluded.

After Oct. 2004, electronic circuits, HV supply and recorder have been replace by new one for the winter operation with solar panel power supply. Data for this period are under processing and will be supplied in near futuru.

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Fig. 1 Mt. Norikura Cosmic Ray Laboratory
Neutron Monitor Arrangement.
(a) Plan view, (b) Side view.