

Name of research institute or organization:

Physikalisches Institut, Universität Bern

Title of project:

SONTEL - Solar Neutron Telescope for the identification and the study of high-energy neutrons produced in energetic eruptions at the Sun

Project leader and team:

Dr. Rolf Bütikofer

Project description:

The solar neutron telescope (SONTEL) at Gornergrat, Switzerland, has been in continuous operation since 1998 as the European cornerstone of a worldwide network for the study of high-energy neutrons produced in energetic processes at the Sun. The network consists of seven solar neutron telescopes that are located at high altitudes and at low to mid latitudes (short path through atmosphere) as well as at different longitudes.

SONTEL Gornergrat was in continuous operation during 2014, with only some short data gaps caused by electrical power outages. No energetic solar cosmic ray event had the magnitude to be observed by ground level detectors in 2014.

The radioactivity measurement with a GammaTracer device inside the detector housing of SONTEL was continued. Figure 1 shows the daily averaged radiation dose rates as measured by the GammaTracer in the time interval 2002-2014. As the data of the GammaTracer in operation at Jungfrauoch, the measurements of the GammaTracer at Gornergrat also show a clear yearly periodicity (see the report “Study of solar and galactic cosmic rays” in the Activity Report 2014 of the International Foundation HFSJG). At the beginning of 2009 the radiation dose rate was increased by about 10% until end of April 2009. This increase was also seen in the count rates of the SONTEL veto counters (not shown here), however it was not present in the different scintillator channels, see Figure 2, and it was also not observed in the counting rates of the neutron monitors at Jungfrauoch. In the past this effect was already measured several times during winter season.

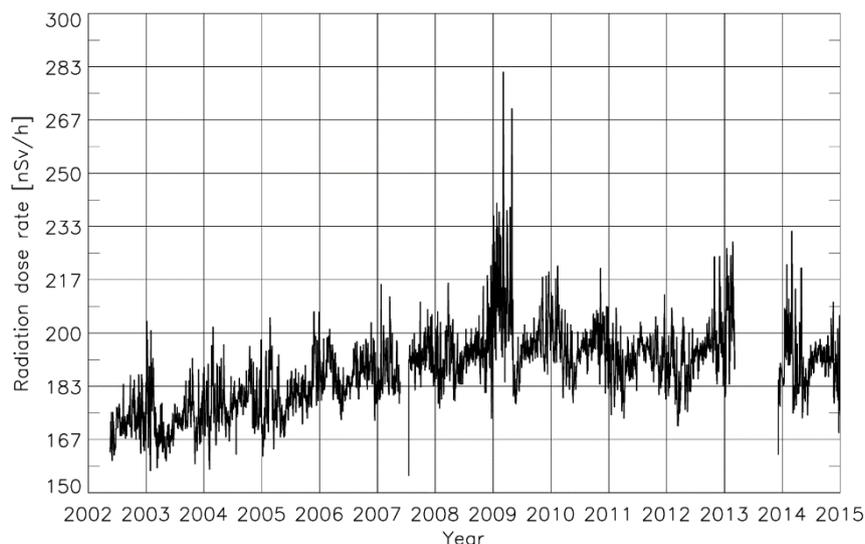


Figure 1. Daily averaged radiation dose rates measured by the GammaTracer unit in the SONTEL lab container at Gornergrat for the time interval 2002-2014.

Measurements in 2003 with a device to detect alpha radiation yield an enhancement of radon concentration in the detector housing during times with increased counting rates of the SONTEL proportional counter tubes (veto counters). We concluded that in winter time with increased snow accumulation around the SONTEL lab container, the space under the basement of the lab container is sealed by the snow, and the radon outgassing from the ground can elude only through an inlet for cables into the lab container. The daughter products of the radon cause increased counting rates of the detectors that are sensitive to radioactive radiation, i.e. GammaTracer and SONTEL proportional counters. The large gap in the data of the GammaTracer in 2013 was caused by an interruption of operation for the modification of the device by the manufacturer Saphymo GmbH, Frankfurt, Germany (see our report in the Activity Report 2013 of the International Foundation HFSJG).

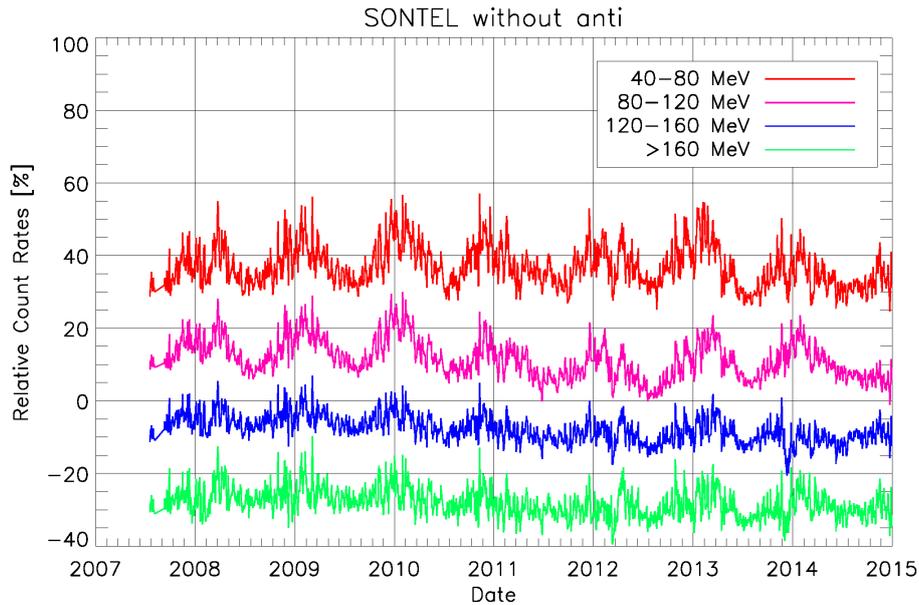


Figure 2. Daily averaged radiation dose rates measured by the GammaTracer unit in the SONTEL lab container at Gornergrat for the time interval 2002-2014.

Key words:

Astrophysics, cosmic rays, solar neutrons

Internet data bases:

<http://cosray.unibe.ch>

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

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