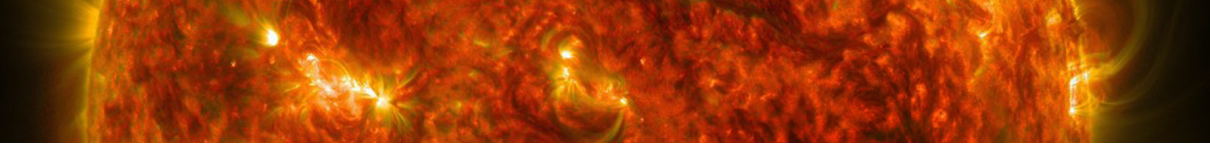
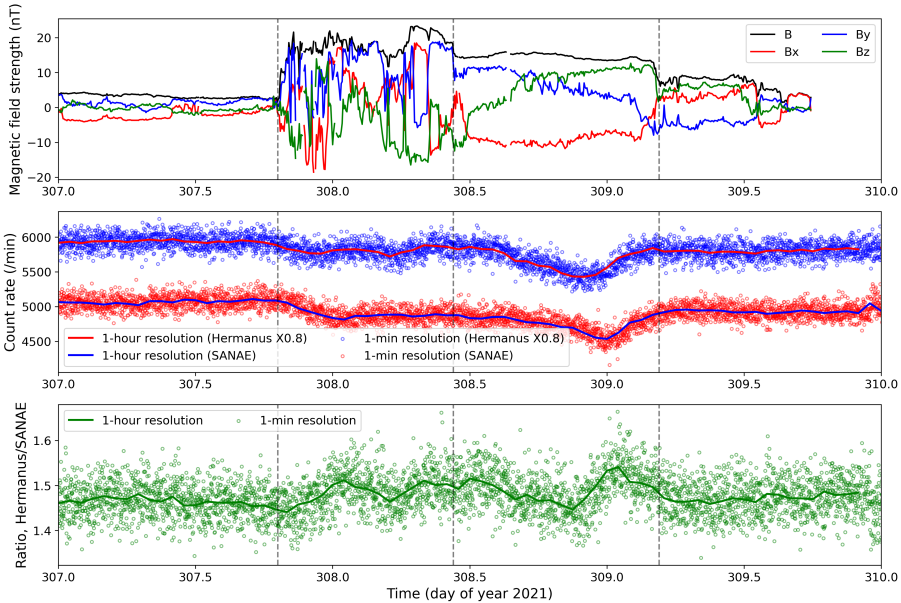


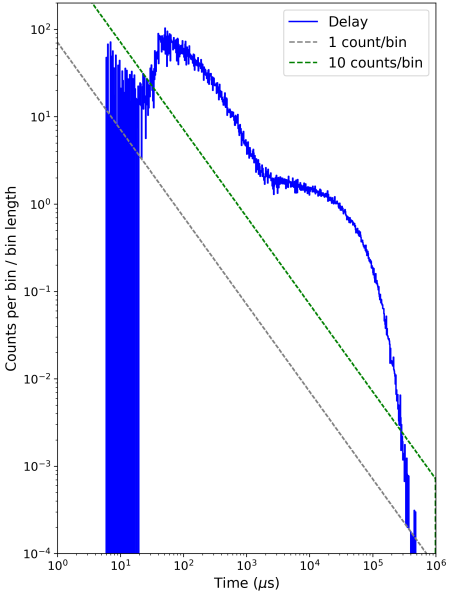
Measuring neutron monitor multiplicities at SANAE

Du Toit Strauss[1] (dutoit.strauss@nwu.ac.za), and many others . . .

[1]Center for Space Research, North-West University, South Africa

EGU 2022; 27 May 2022


Magnetic field strength (nT)
B
Bx
By
Bz
Count rate (/min)
1-hour resolution (Hermanus X0.8)
1-hour resolution (SANAE)
1-min resolution (Hermanus X0.8)
1-min resolution (SANAE)
Ratio, Hermanus/SANAE
1-hour resolution
1-min resolution
Time (day of year 2021)

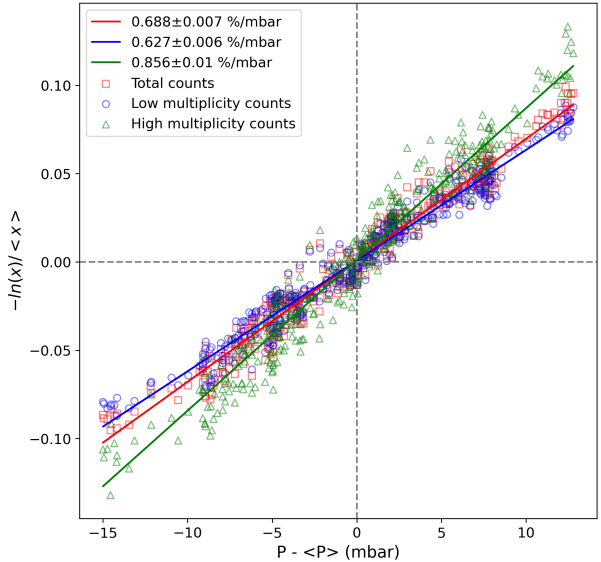


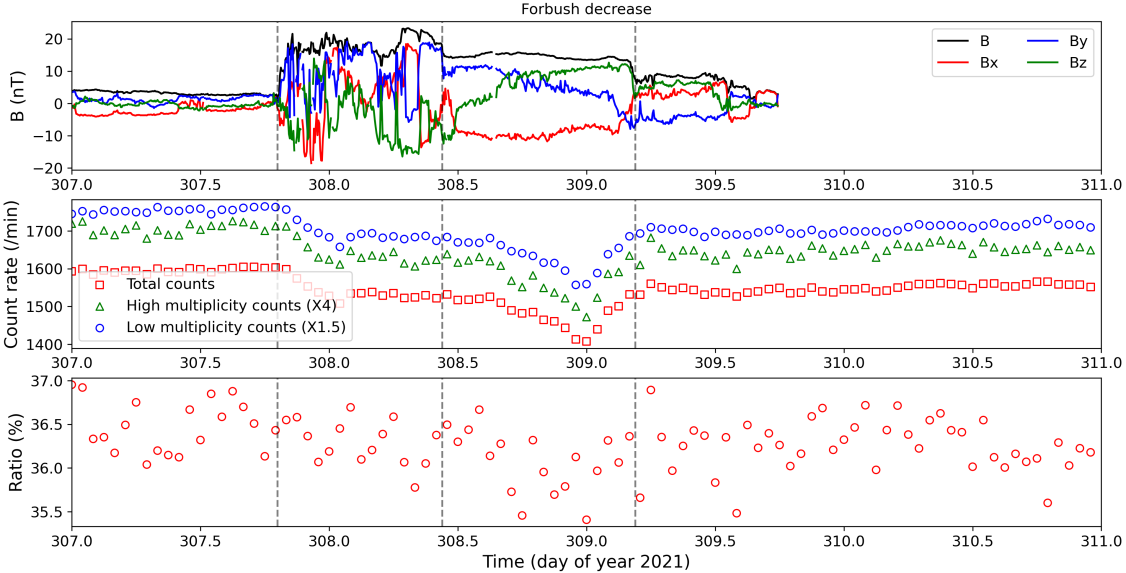
– Low multiplicity counts (long waiting time between counts, $> 20\mu s$) formed by atmospheric neutrons/protons interacting randomly with the detecting gas

– High multiplicity counts (short waiting time, $< 20\mu s$) fomed by evaporation neutrons produced in the lead producer. Multiple evaporation neutrons for each incident particles; scales with energy

– By tracking the ratio of the high/low multiplicity counts, we should be able to get a proxy for the spectral index of the incident radiation

– Here we determine the (pressure corrected) high and low multiplicity countrates, and total the total countrate, as a function of time


0.688±0.007 %/mbar
0.627±0.006 %/mbar
0.856±0.01 %/mbar
Total counts
Low multiplicity counts
High multiplicity counts
0.10
0.05
0.00
−0.05
−0.10
−15
−10
−5
0
5
10
P - <P> (mbar)
−ln(x)/ < x >
0.23±0.007 %/mbar
0.04
0.02
0.00
−0.02
−0.04
−15
−10
−5
0
5
10
P - <P> (mbar)
−ln(x)/ < x >


Forbush decrease
B (nT)
B
Bx
By
Bz
Count rate (/min)
Total counts
High multiplicity counts (X4)
Low multiplicity counts (X1.5)
Ratio (%)
Time (day of year 2021)

– Using the waiting time distribution, a single neutron monitor station can, in principle, track spectral changes of the incident radiation

– Our methodology summarized in recent paper using results of ENTOTO neutron monitor, Strauss et al. (2022), AISR, in press

– Here we start applying this technique to measurements from the SANAE neutron monitor, featuring upgraded electrons (see Strauss et al., 2021, AISR)

– Results for SANAE look encouraging, but unfortunately not conclusive yet...

– fin –