An Investigation of the Noise as Recorded by the SANAE SHARE Radar

E. Mravlag
Space Plasma and Atmospheric Research Group
School of Physics
University of KwaZulu-Natal
Priv. Bag X54001, Durban 4000, South Africa

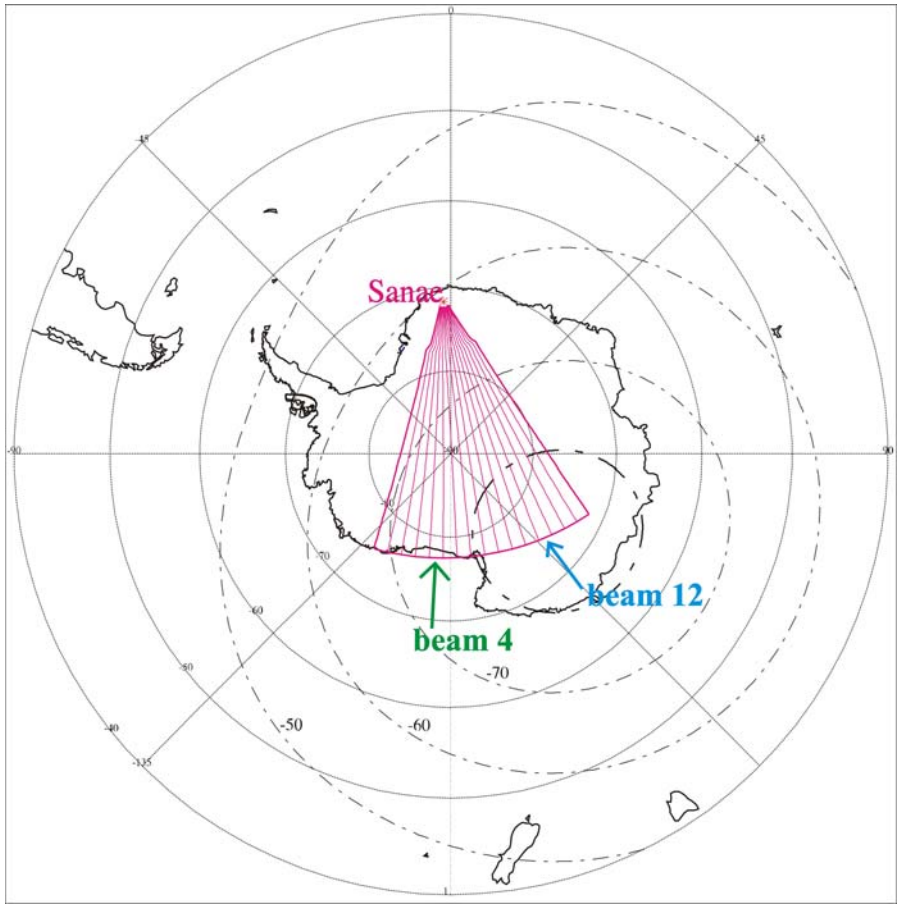
email: mravlag@ukzn.ac.za

SuperDARN 2008

Abstract:

The noise figures as recorded in the summary files of the SANAE radar are investigated. 11 years of data spanning one complete solar cycle are used to extract noise figures. These are then averaged over half-hour periods to be comparable to the previously reported statistics. Comparisons between different beams and different conditions have not yielded conclusive results as yet. However, the monthly plots reveal some interesting features, particularly as it appears there are two basic types of noise. Whether or even if these two types are instrumental or sky dominated is at present unclear.

SuperDARN 2008



Field of View SANAE

Beam 12 lies in the magnetic meridian.

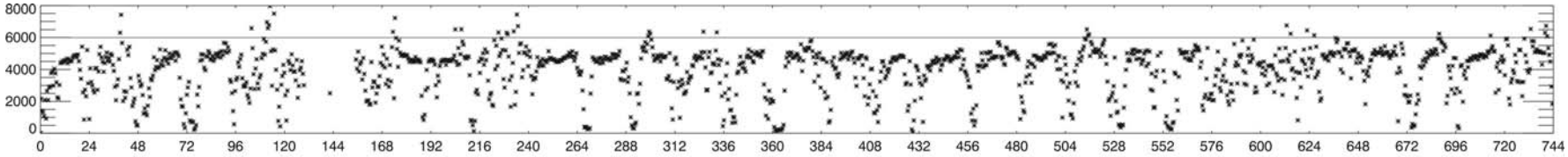
For a zonal beam we use mostly beam 4

Both beams are normally recorded in our summary files as reference beams.

Beams 5 and 6 are the beams touching the (geographic) South Pole.

SuperDARN 2008

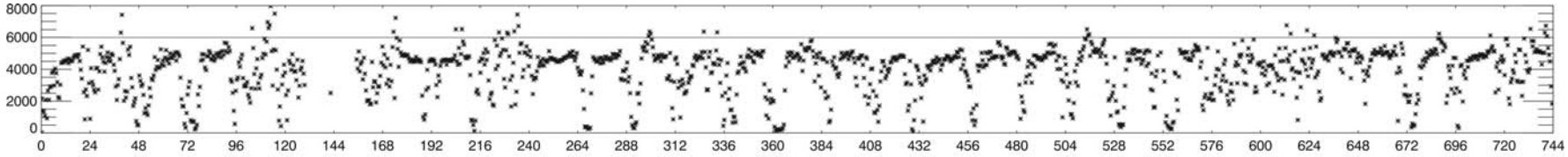
Noise types from visual inspection



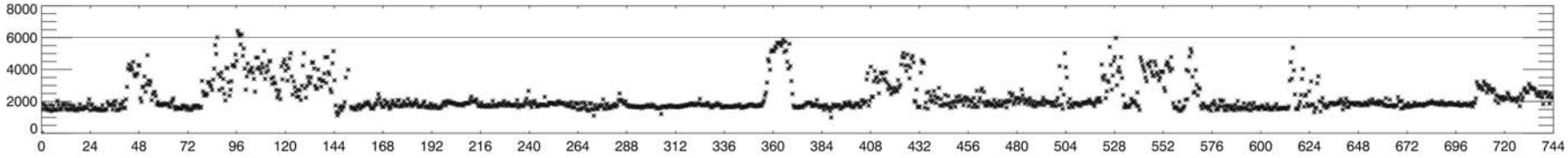
Note the top limit and the decrease of the noise level on an almost daily basis, generally near midnight.

SuperDARN 2008

Noise types from visual inspection



SANAE The usual noise type all beams Mar 2005

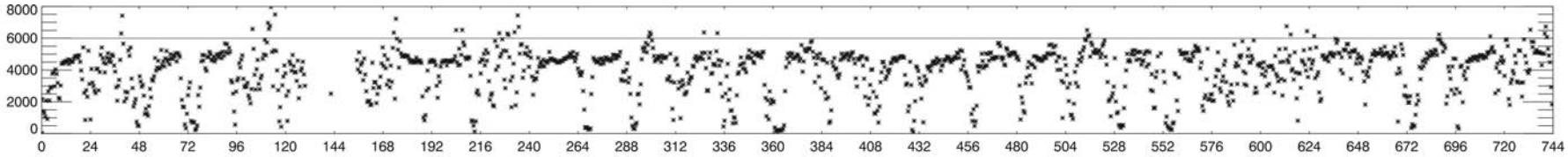


SANAE An unusual noise type all beams May 1999

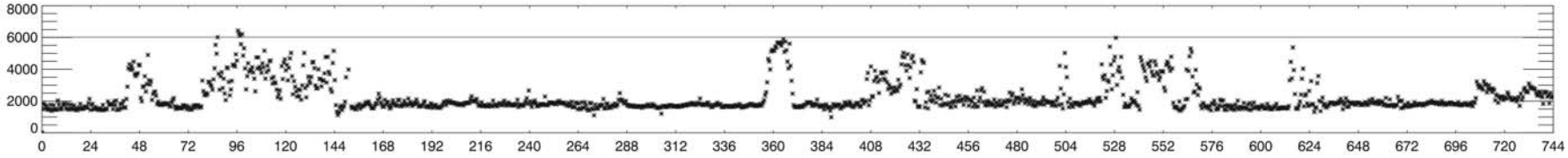
Note this pattern is the inverse of the normal one. However, top limit is mostly the same.

SuperDARN 2008

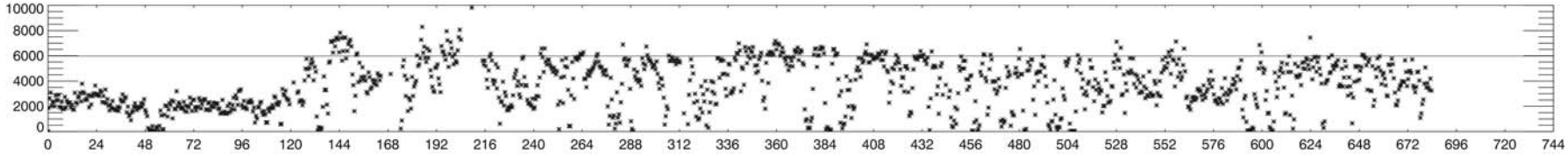
Noise types from visual inspection



SANAE The usual noise type all beams Mar 2005



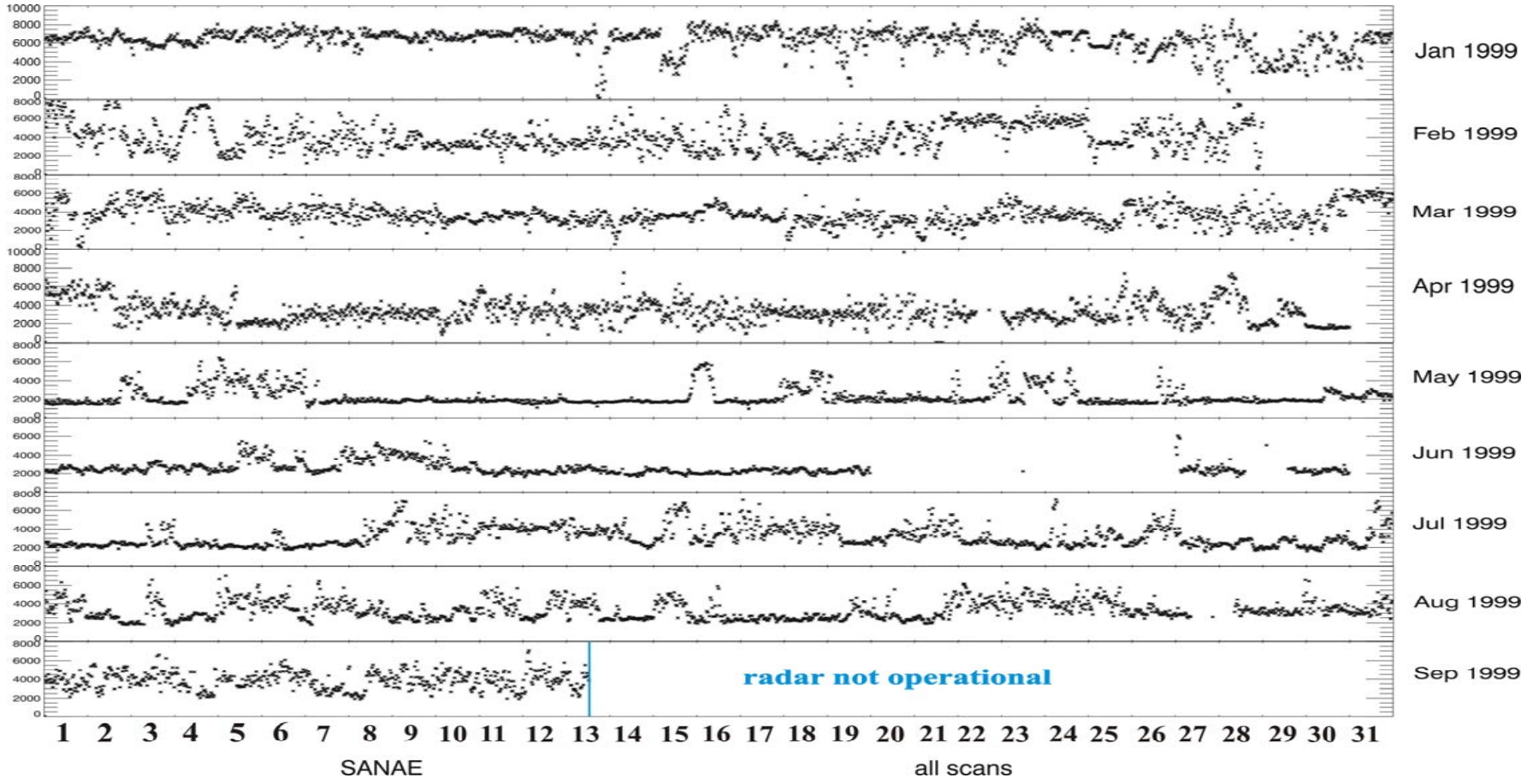
SANAE An unusual noise type all beams May 1999



SANAE What noise type? Apr 2000

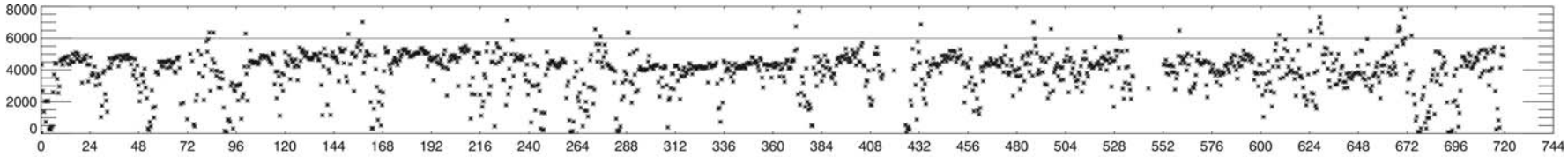
SuperDARN 2008

Noise for 1999 – change between the two noise types

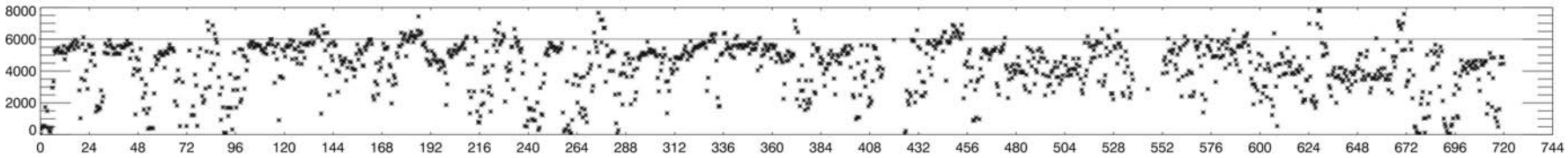


SuperDARN 2008

Comparison between different beams



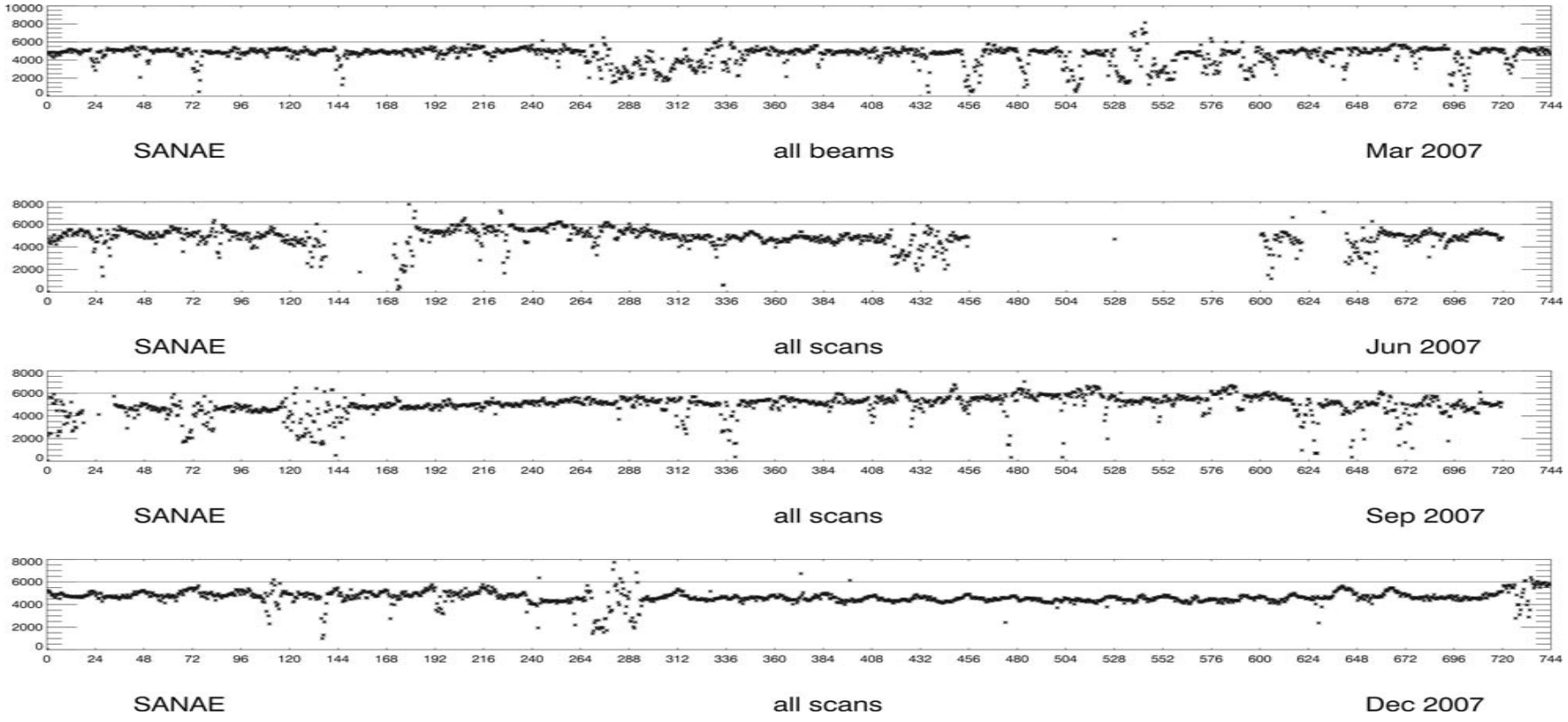
SANAE Beam: 4 Apr 2005



SANAE Beam: 12 Apr 2005

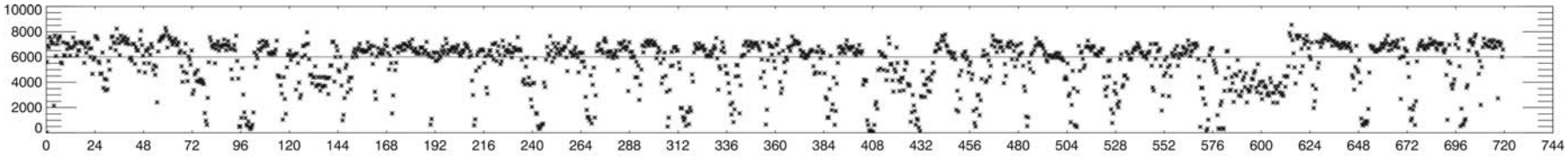
SuperDARN 2008

Change of noise with the seasons

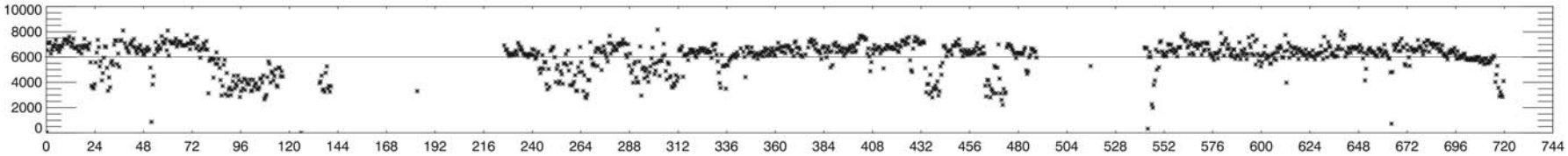


SuperDARN 2008

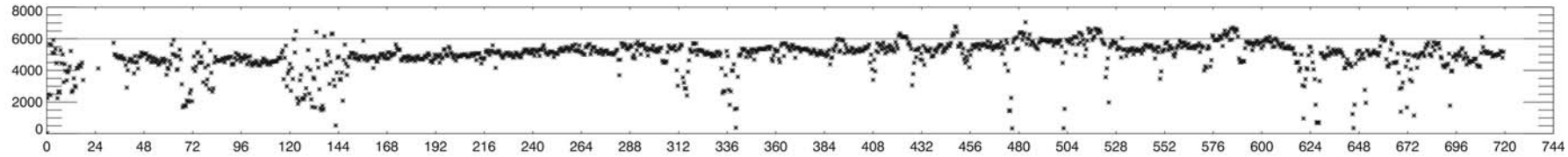
Change of noise due to the solar cycle



SANAE all scans Sep 1998



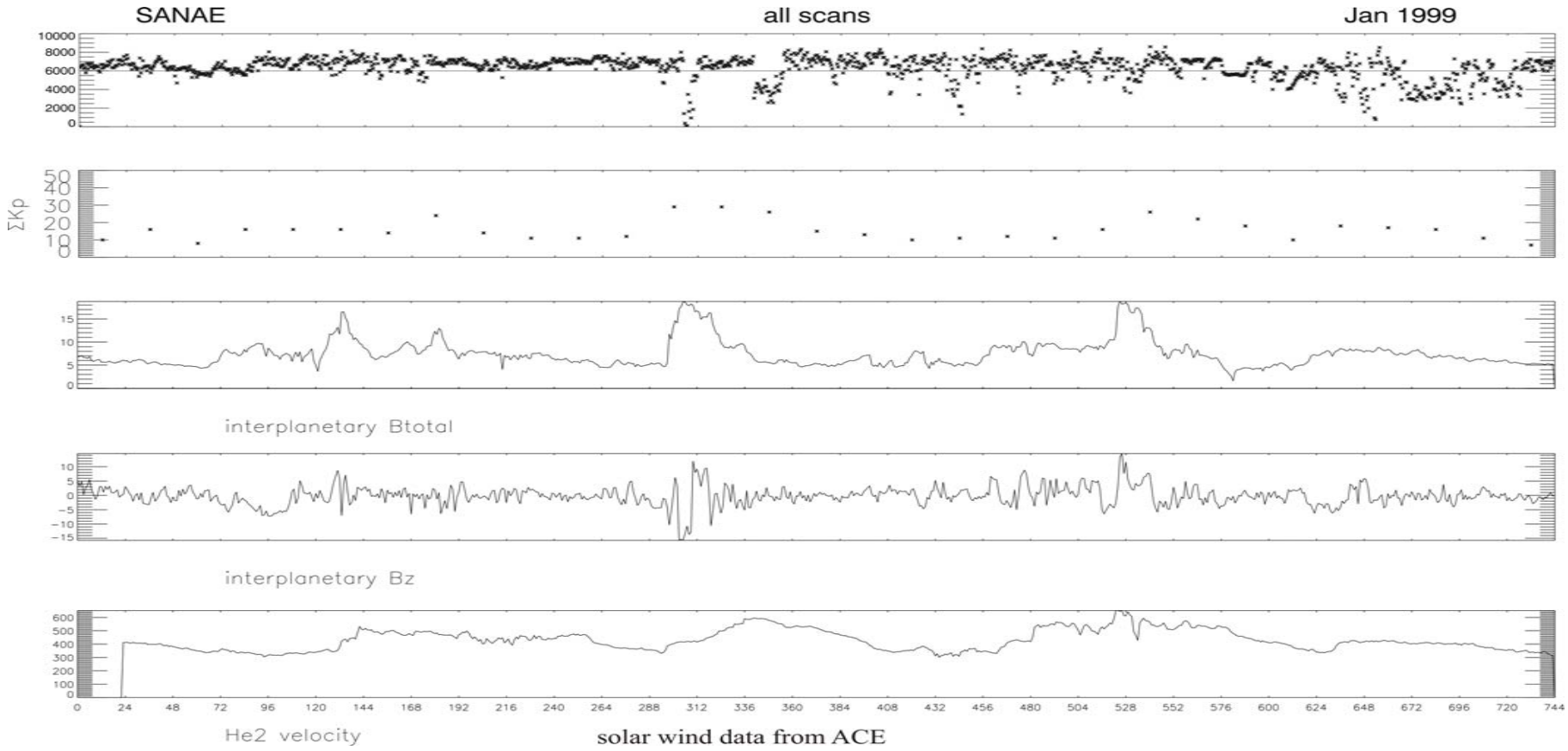
SANAE all scans Sep 2001



SANAE all scans Sep 2007

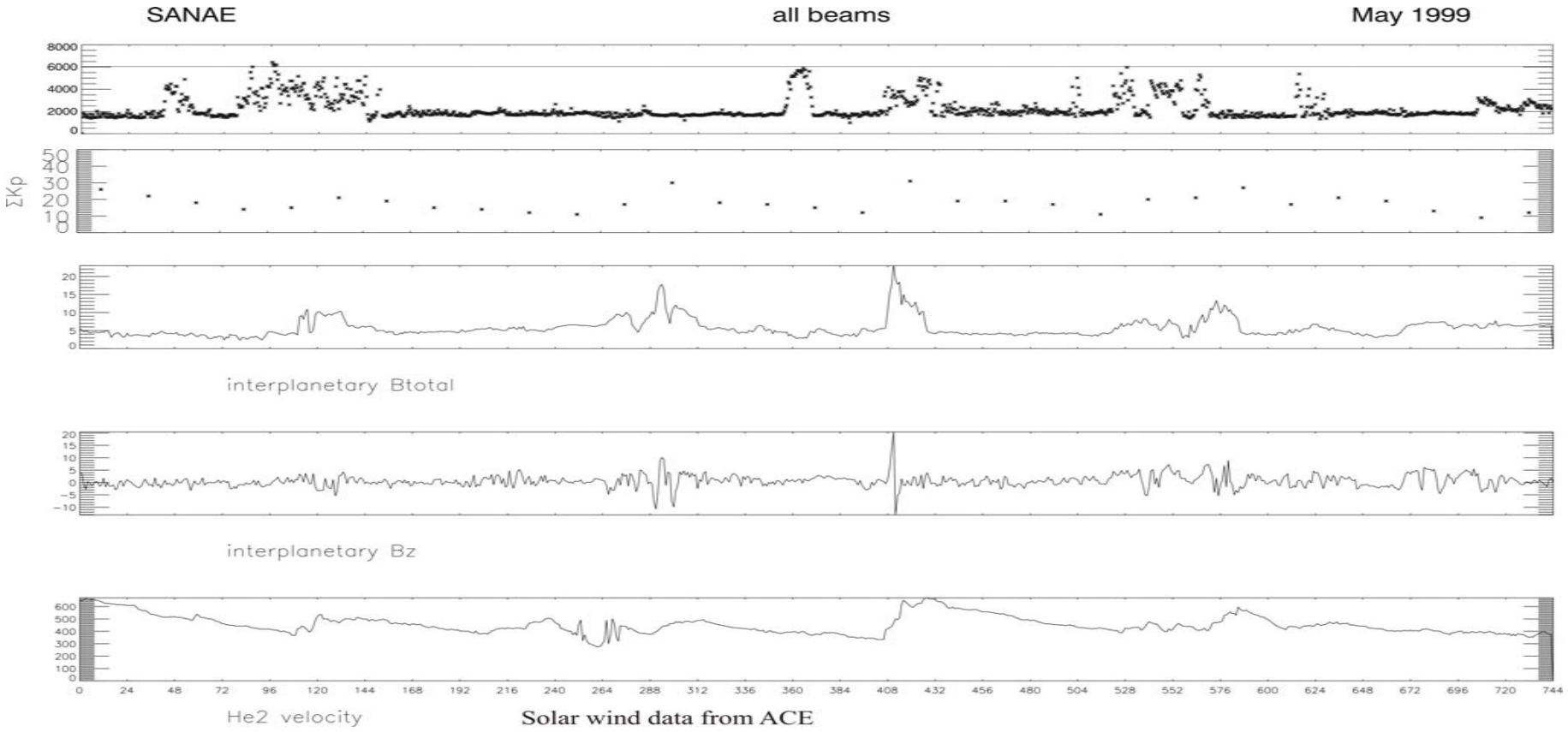
SuperDARN 2008

Noise and solar wind parameters – normal pattern



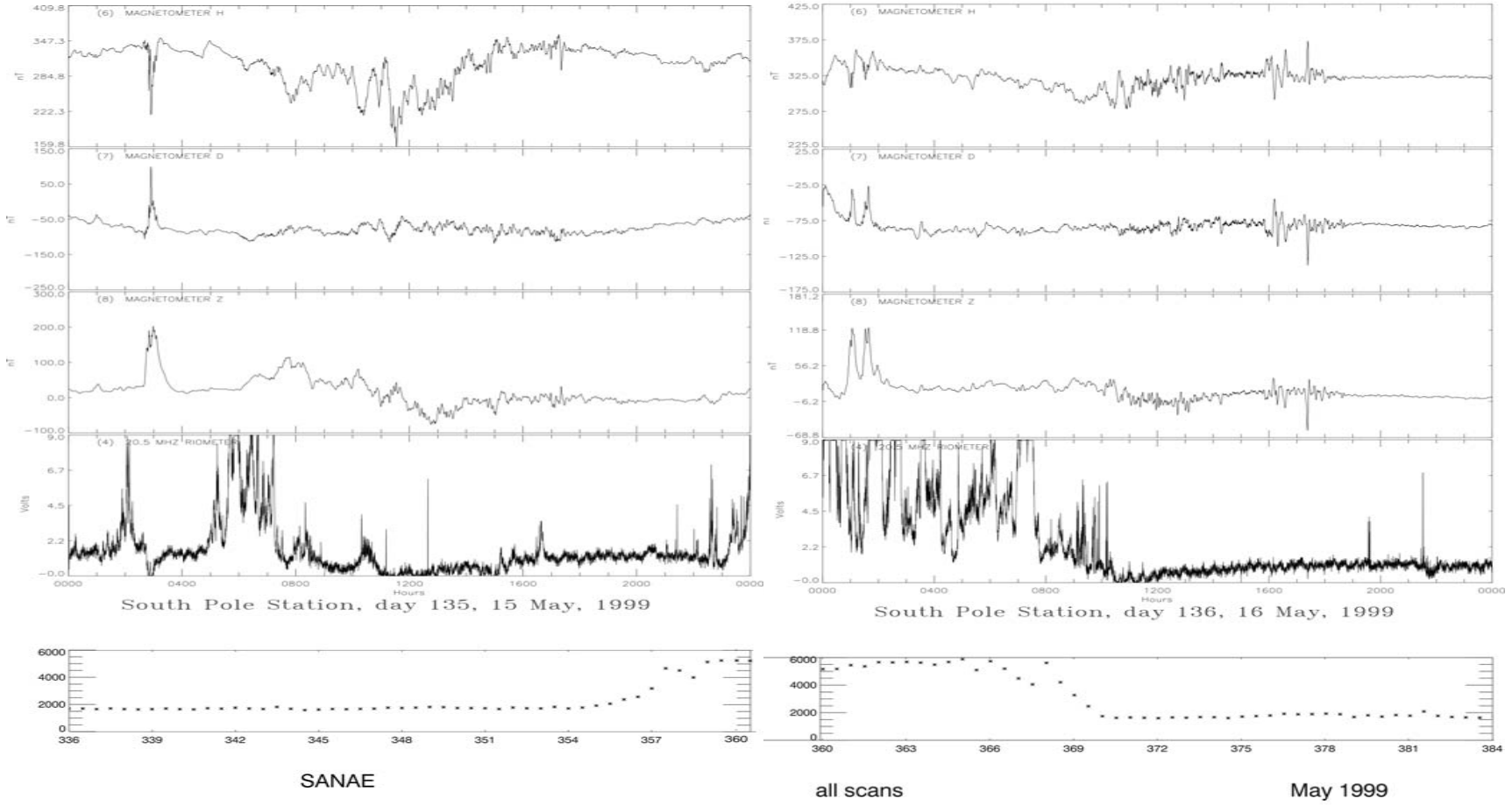
SuperDARN 2008

Noise and solar wind parameters – unusual pattern



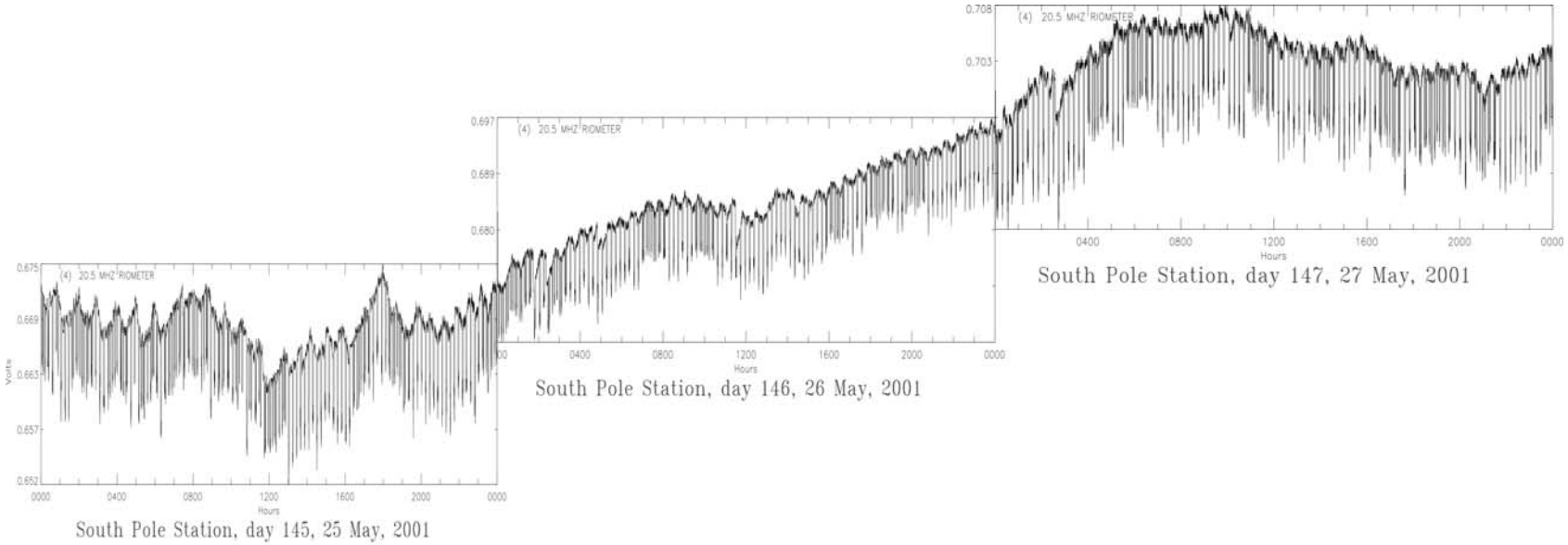
SuperDARN 2008

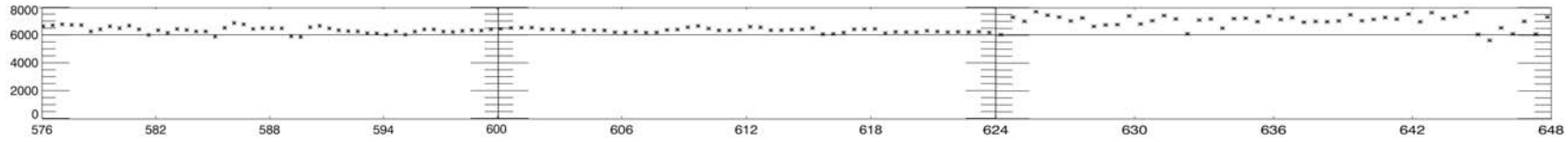
Compare noise and riometer signal from South Pole



SuperDARN 2008

Compare noise and riometer signal from South Pole

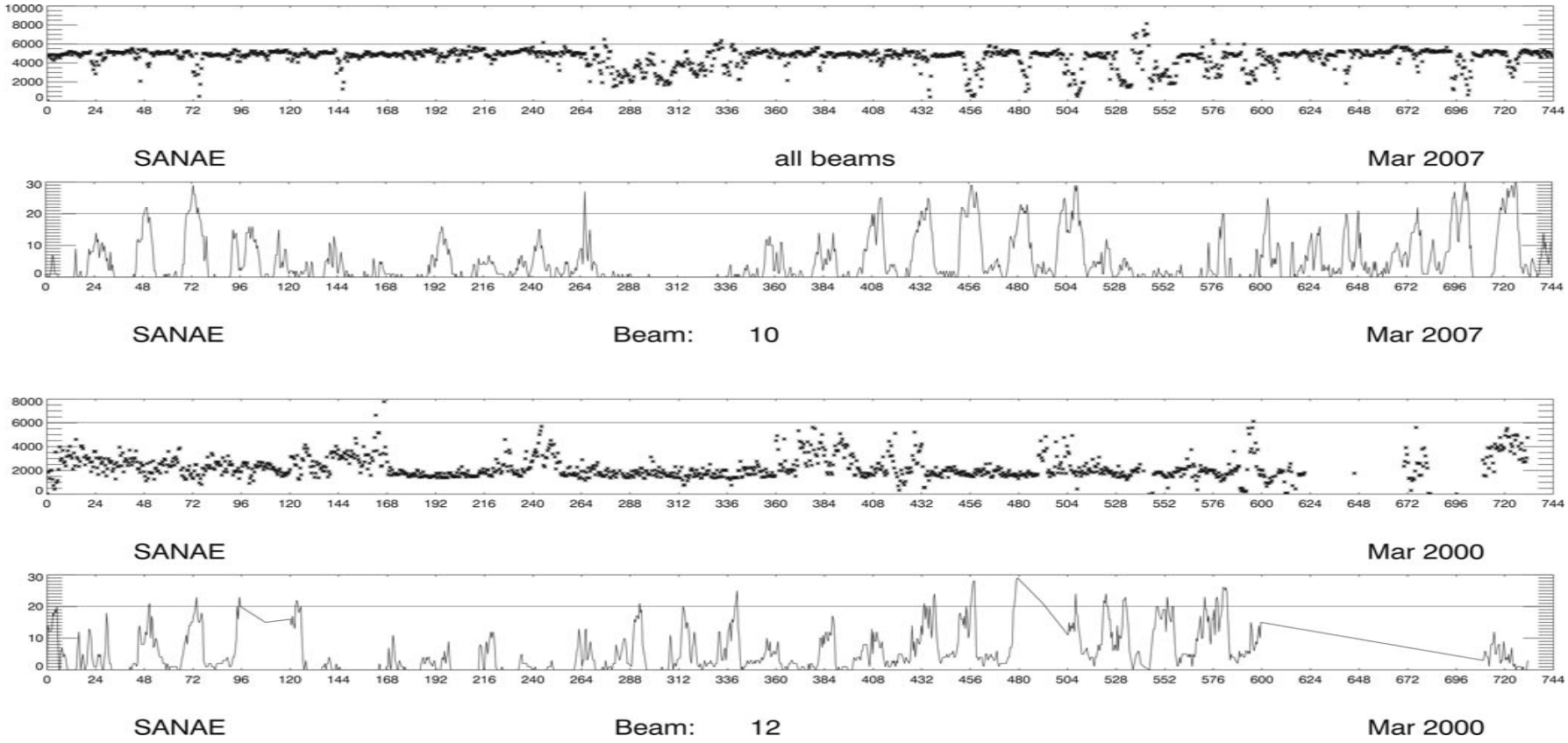




SANAE all scans May 2001

SuperDARN 2008

Comparison noise and number of good ranges



Conclusions:

- Noise differences between different beams as expected
- There does not seem to be a link between interplanetary indices and the recorded noise figures
- There does not seem to be a link between ionospheric activity (riometer activity) and the recorded noise figures
- There are no obvious differences between the seasons or between solar maximum and solar minimum
- There appears a close link between lack of good ranges and noise

Still to come:

- Close investigation of the SANAE base noise environment
- Compare the noise figures as recorded in the .dat files to the ones recorded in the .smr files
- Check SANAE riometer data
- Check engineering reports about the long-term technical status of our radar