Riometers and Solar proton events

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Introduction

- The Canadian Riometer array is a partnership between the University of Calgary and Natural Resources Canada.

- Enhanced levels of ~10 MeV protons can cause absorption of radio waves in the D region (~60 - 90 km) of the ionosphere.

- Absorption caused by protons are highly asymmetric, with an intensification in the sunlit ionosphere as compared with dark period.

- Data from the Canadian riometer network and GOES satellites are used to evaluate how much absorption.
How a riometer works
Riometer Equipment

Antenna

Computer and Riometer

Data sampler
Earth Sciences Sector

- Saskatoon
- Resolute
- Ottawa
- DRAO - Penticton
- Hall Beach

Canada
What does a Riometer measure?

Ionospheric absorption (in the D region ~90 km)

- Auroral absorption
- Solar radio noise bursts
- X-ray induced absorption
- Polar cap absorption (solar protons)

Typical riometer frequencies are 30.0, 38.2, and ~50 MHz.
Canadian Riometer Array
Quiet day curve

Galactic noise variation over a sidereal day
PCA monitoring

Dec 6, 2006 event

Shaded areas are daytime periods

Abs, dB

Log Flux

Taloyoak
PCA day-night effect
Oct 28, 2003
Effective 30 MHz absorption, dB
We thank the ACE EPAM instrument team and the ACE Science Center for providing the ACE data.
GOES protons

Corrected protons@GOES-11 (1 minute)

Corrected protons: 0.8 - 4 MeV
Corrected protons: 4 - 9 MeV
Corrected protons: 9 - 15 MeV
Corrected protons: 15 - 40 MeV
Corrected protons: 40 - 80 MeV

We thank the National Geophysical Data Center for the GOES data. http://spidr.ngdc.noaa.gov/spidr/index.jsp
Polar Cap Absorption
Conclusion

• Riometer data has been collected since ~1990 under CANOPUS.
• NRCan riometers were install after 2006
• A new website will be available for accessing absorption values
• For further information/ clarification / data send email to: ddanskin@NRCan.gc.ca

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