

RADIO OBSERVATION DATA  
AT SYOWA STATION, ANTARCTICA DURING 2002

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1. Introduction

Communications Research Laboratory has been observing the absorption of cosmic radio noise with a standard riometer (relative ionospheric opacity meter) at 30 MHz at Syowa Station, Antarctica since February 1966. This report presents the data observed in January 1 through December 31, 2002. The combined data plots also contain geomagnetic field provided by National Institute of Polar Research.

Comments on this report and requests for additional copies are welcome and should be sent to the following address:

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2. Location

Syowa Station			
Geographic		Geomagnetic	
Latitude (Deg.)	Longitude (Deg.)	Latitude (Deg.)	Longitude (Deg.)
69.00 S	39.58 E	-70.0	80.2

3. Observer

Noriaki OBARA (Communications Research Laboratory)

4. Instrumentation

The riometer receiver has a center frequency of 30 MHz and a band width of 7.5 kHz; it is connected to a vertically directed five-element Yagi antenna whose elements are oriented in the east-west direction. The antenna is designed to match

the 50-ohm coaxial cable (10D-2E), which is 100 m long. Noise from a reference noise diode, with power levels of 20000 K, 16000 K, 12000 K, 8000 K, and 4000 K, is inserted each day at 0800 of 45° EMT (Eastern Meridian Time: UT + 3 hours). The output signal of riometer is analog-to-digital converted every second and recorded on magnetic tapes in digital form.

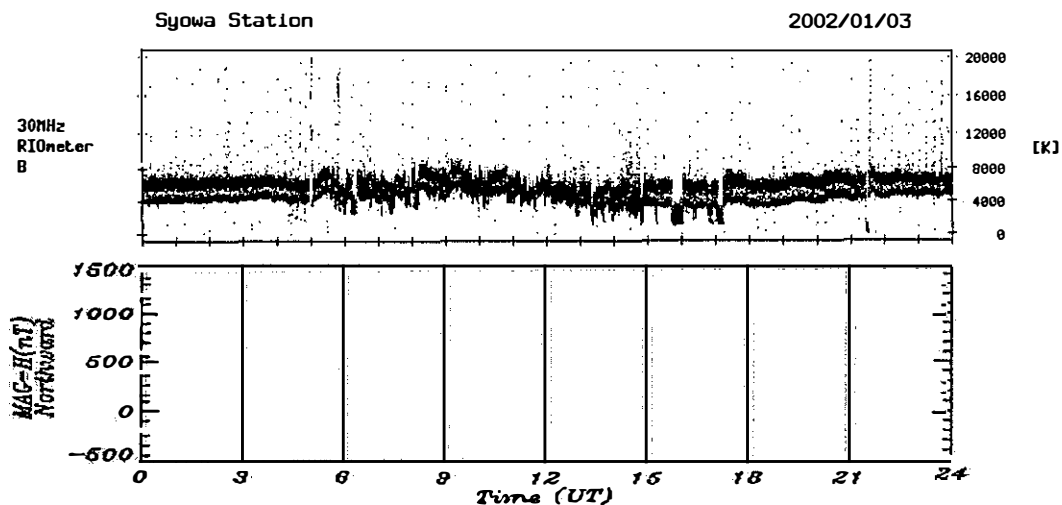
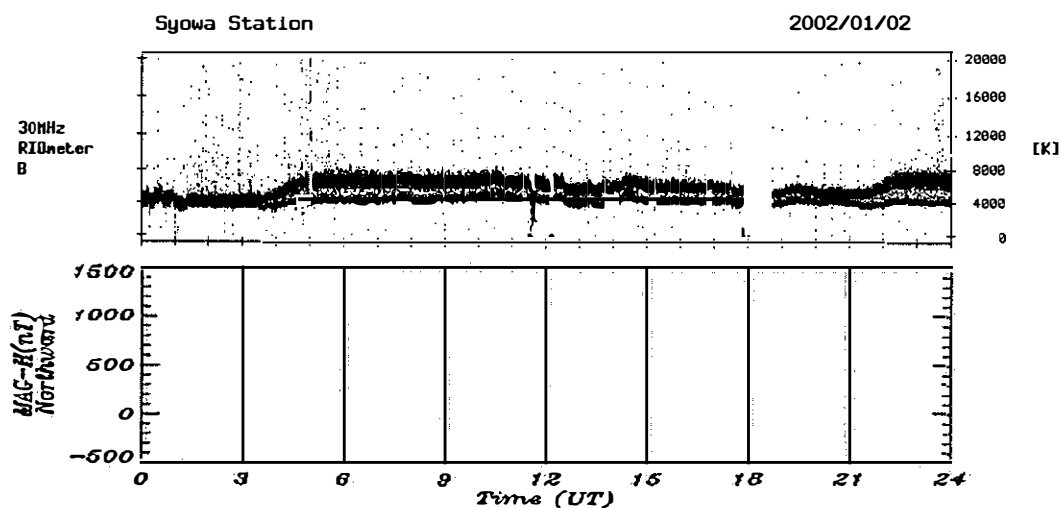
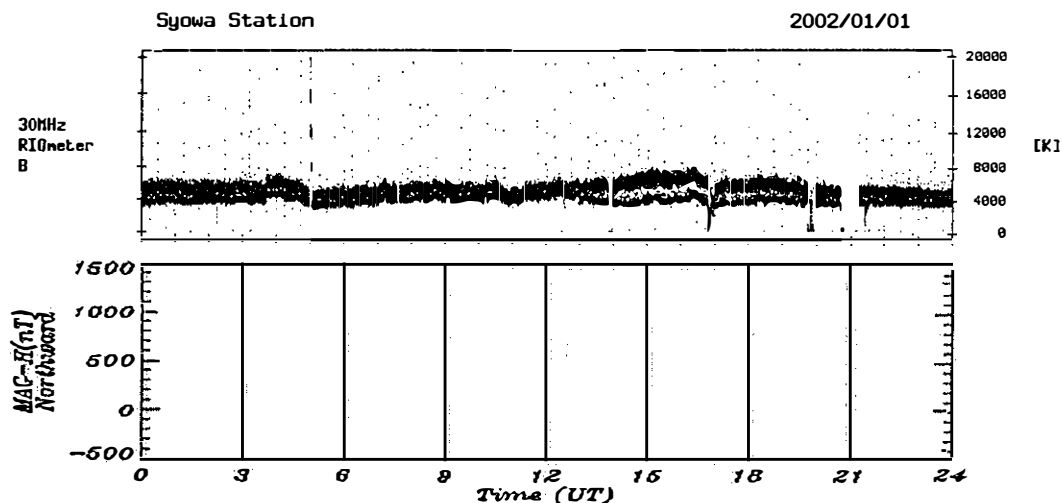
The cosmic noise power level shows a remarkable sidereal diurnal variation caused by the passage of the cosmic radio source across the zenith. Due to the earth's revolution, the time of the zenith passage of a particular cosmic radio source shifts by about four minutes earlier each day and returns to its initial time after one year. This diurnal variation of the cosmic noise power is deduced from the record on the quiet days.

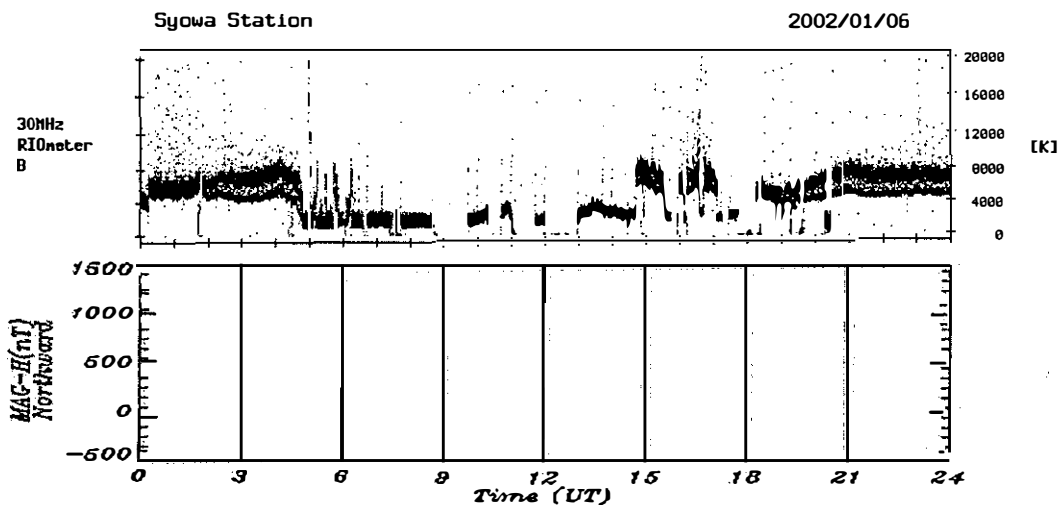
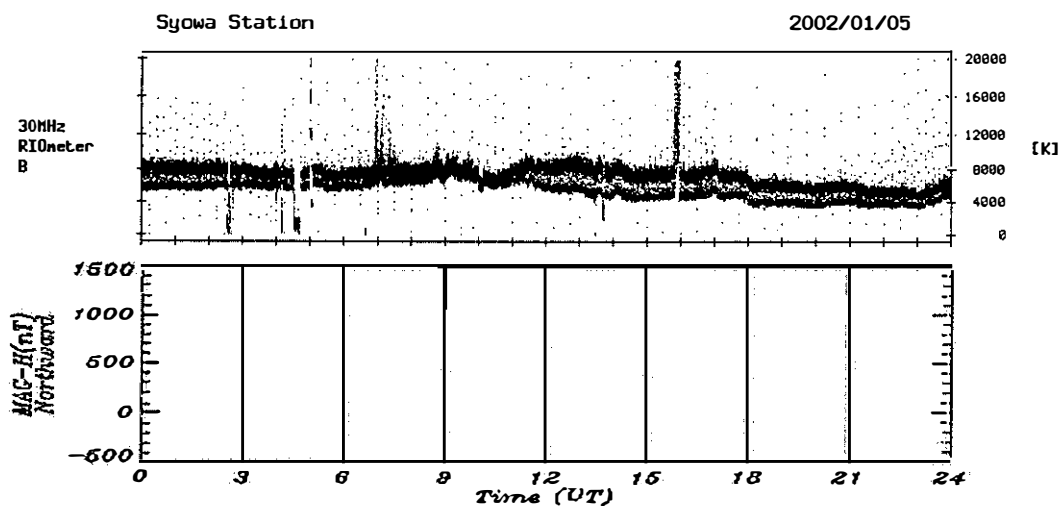
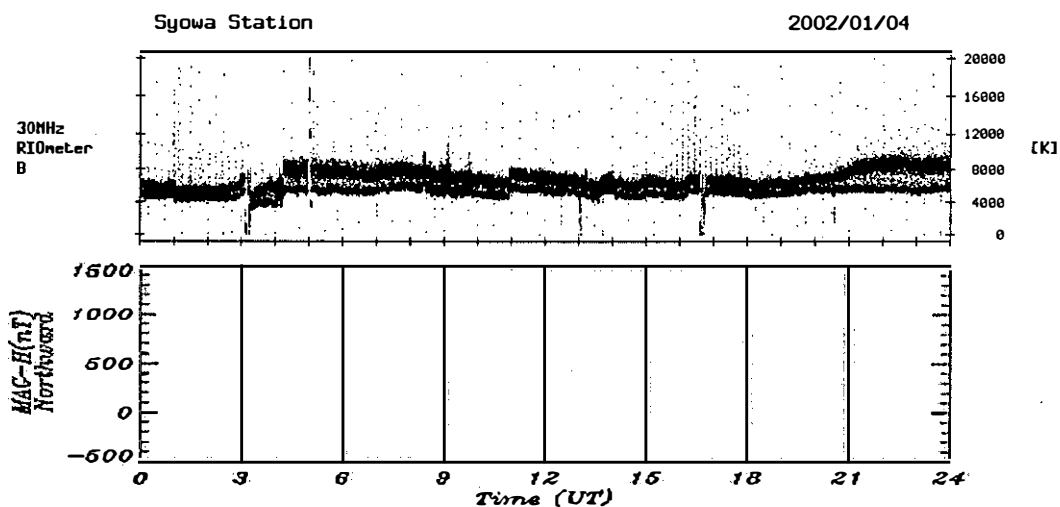
The ionospheric absorption in dB is obtained as follows:

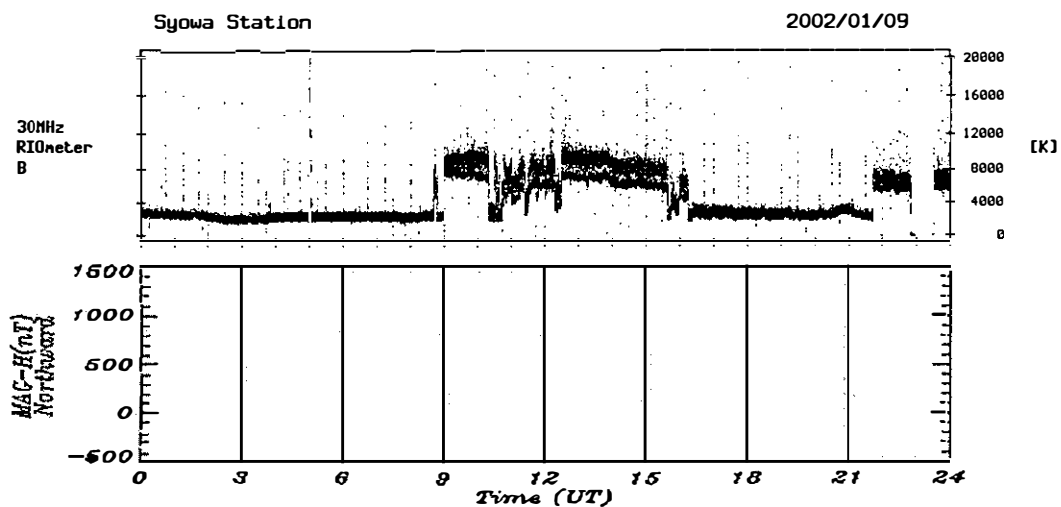
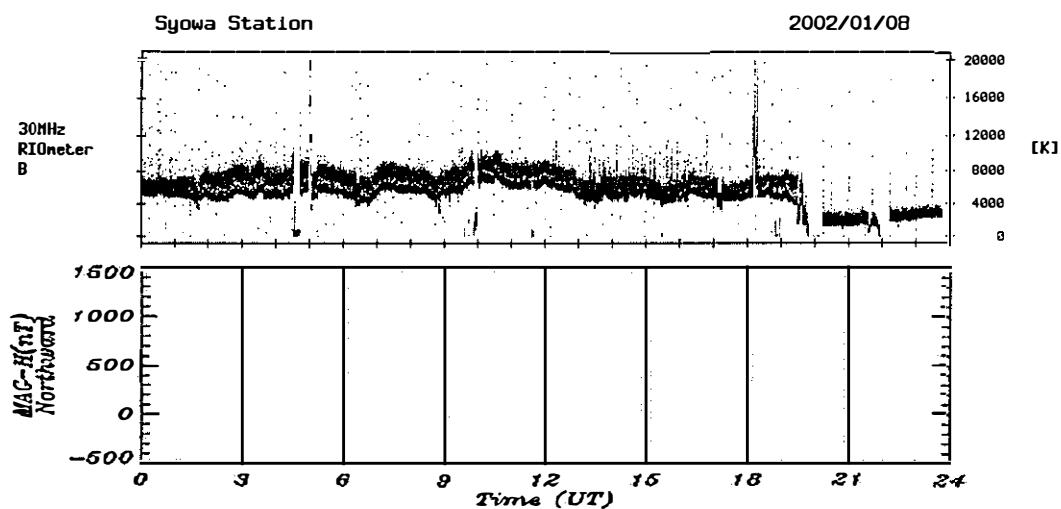
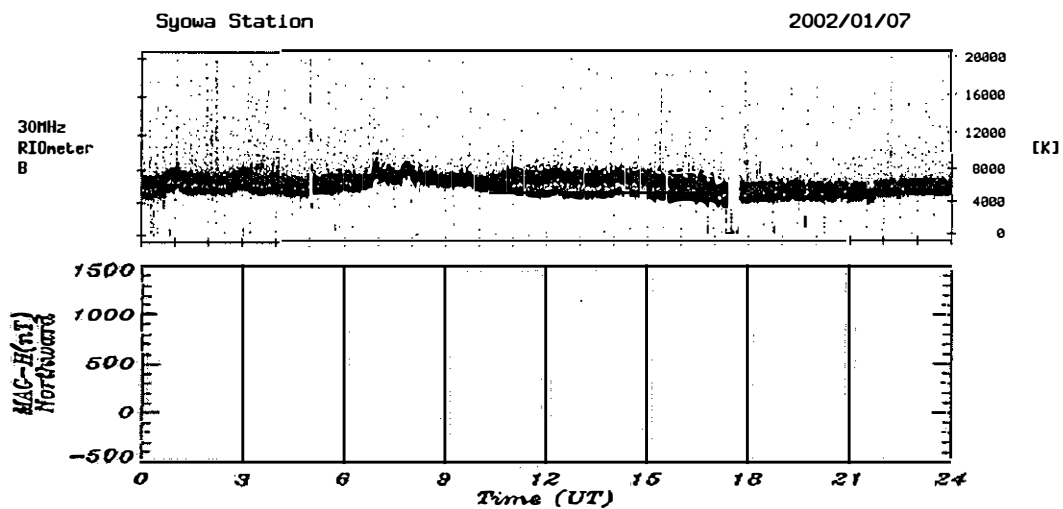
- 1) The reference sidereal diurnal variation of the cosmic noise power in K,  $T_0$ , is determined from the diurnal variations on several selected quiet days each month.
- 2) Actual received power,  $T_1$ , is read in K.
- 3) Ionospheric absorption A, in dB, is calculated with the following conversion equation:

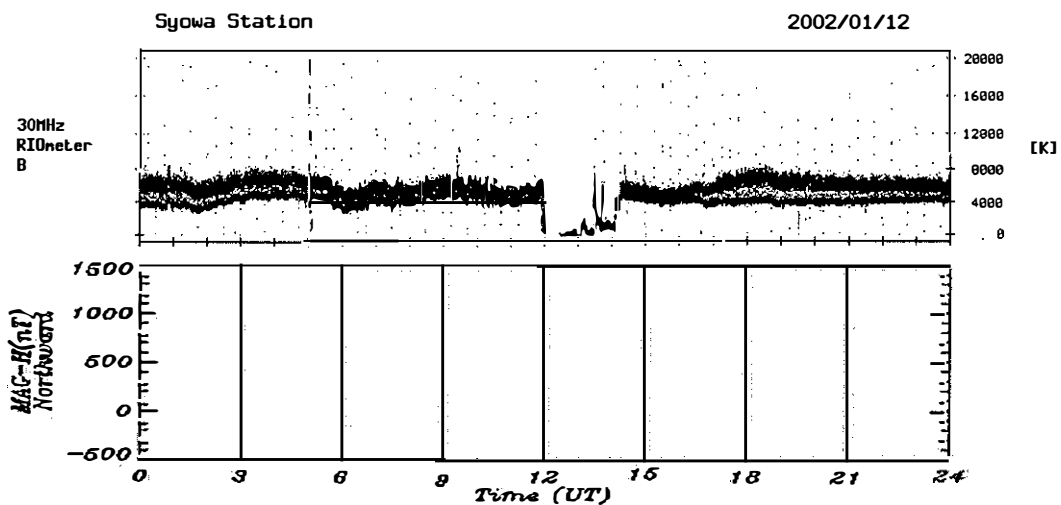
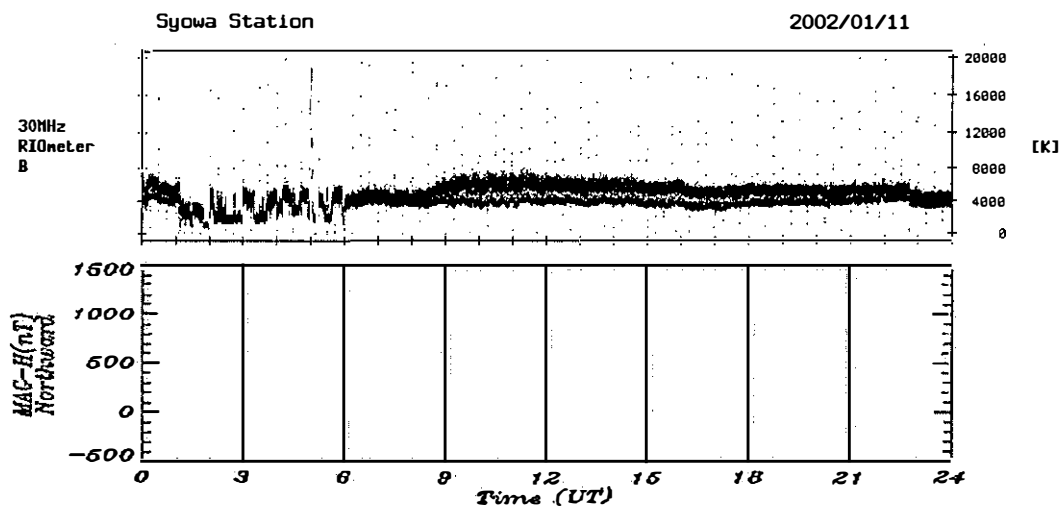
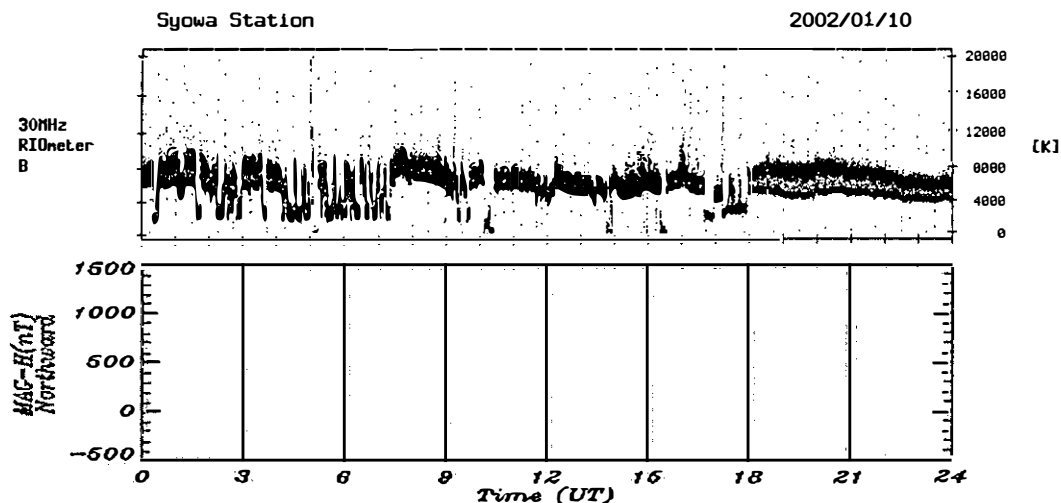
$$A = -10 \times \log \left( \frac{T_1}{T_0} \right)$$

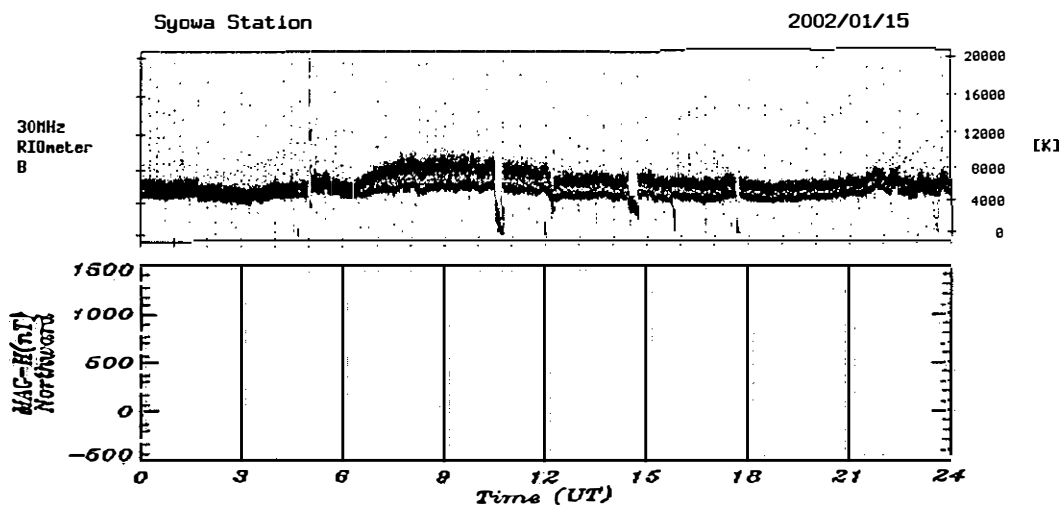
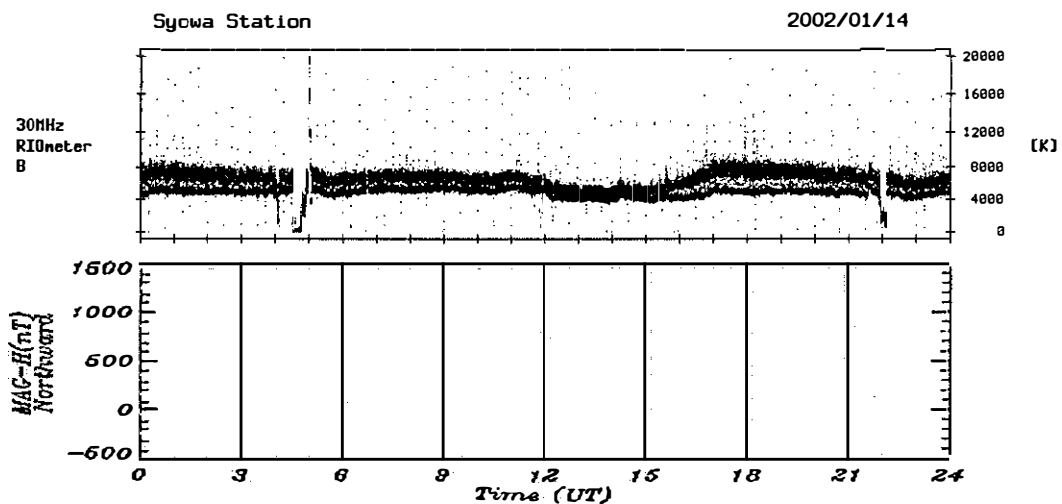
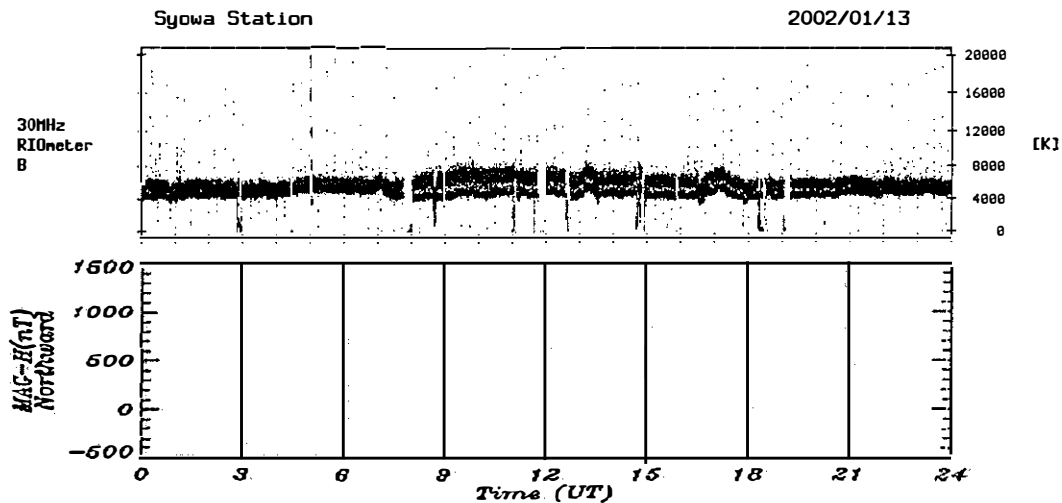
The combined data plots also include the variation of H-component of the geomagnetic field at Syowa Station.

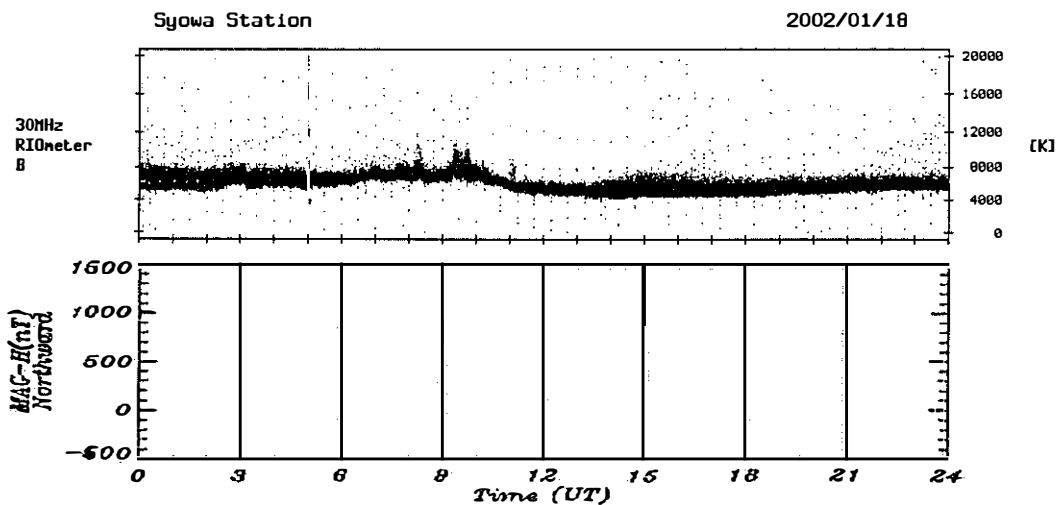
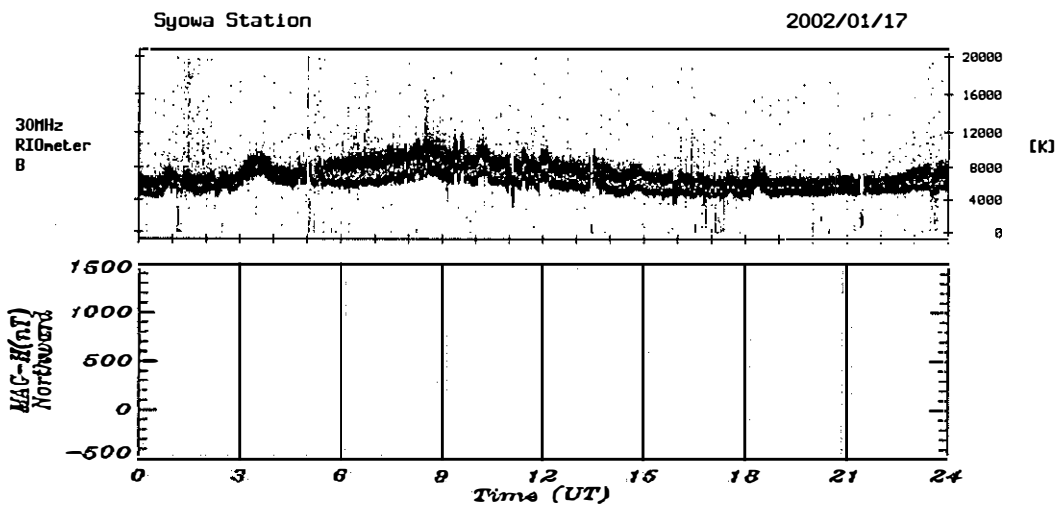
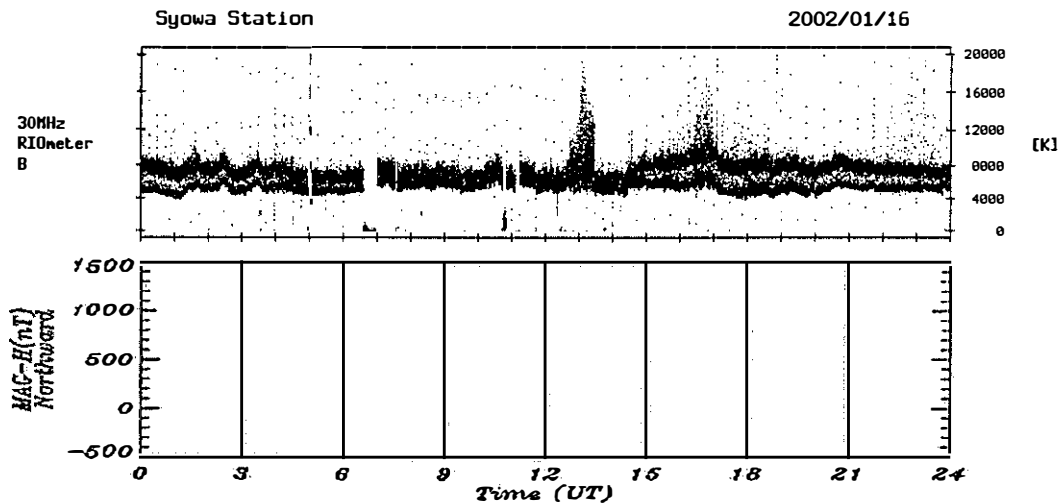


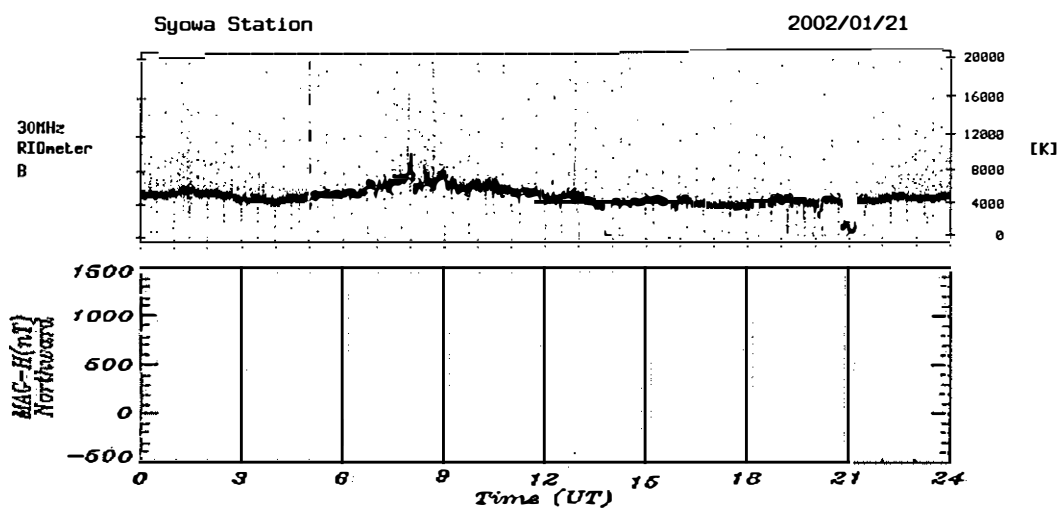
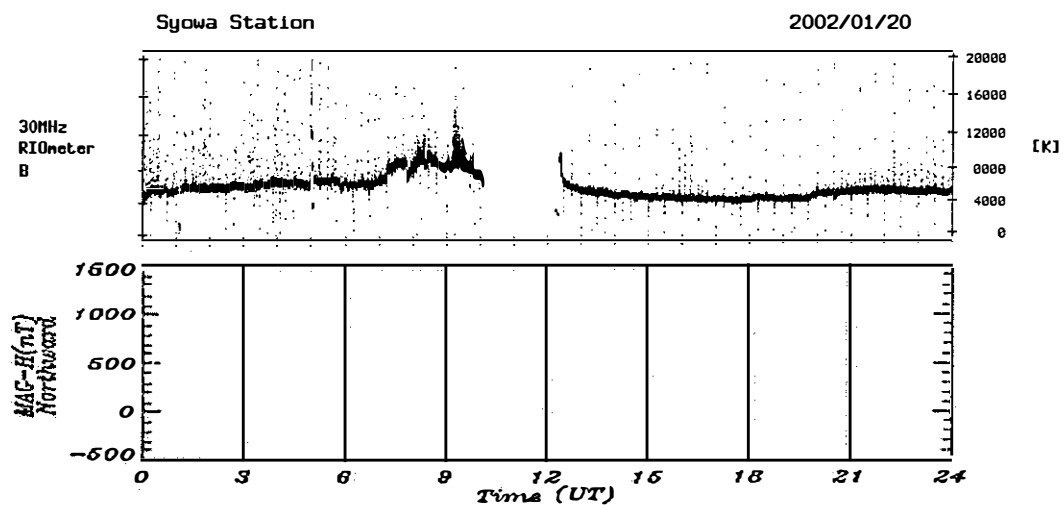
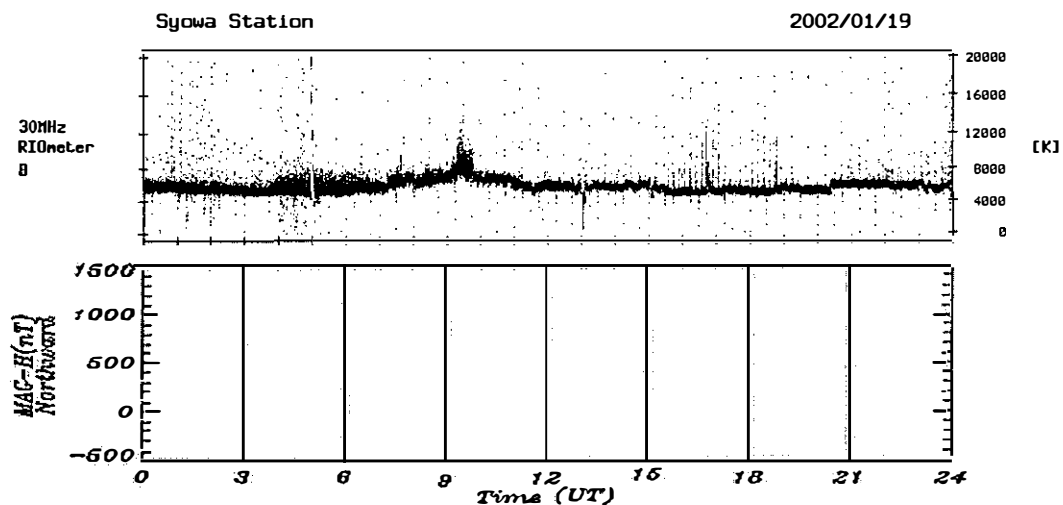


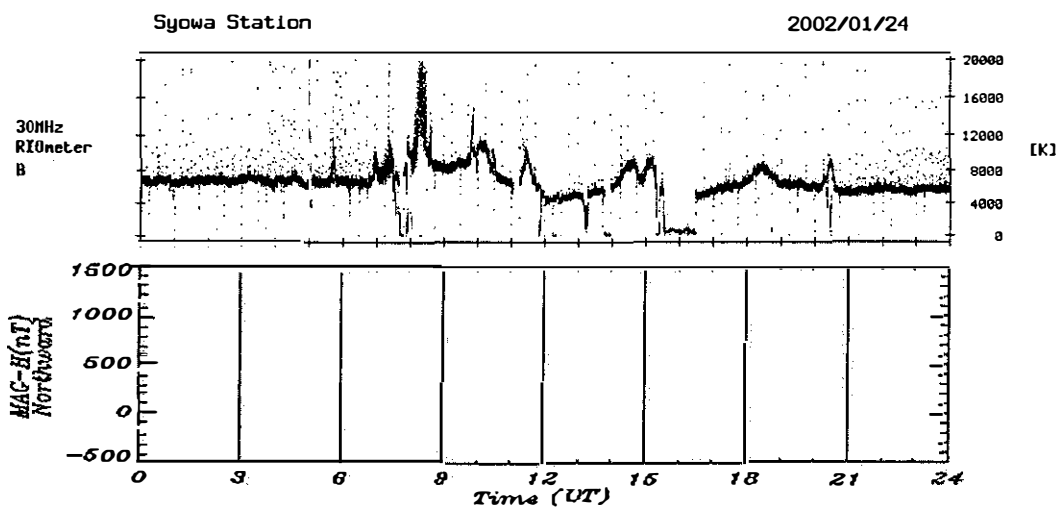
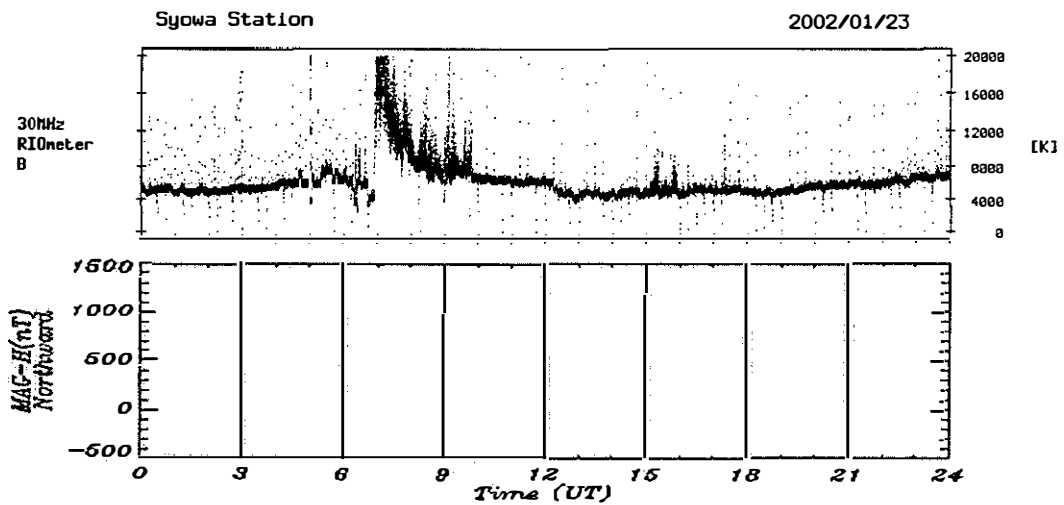
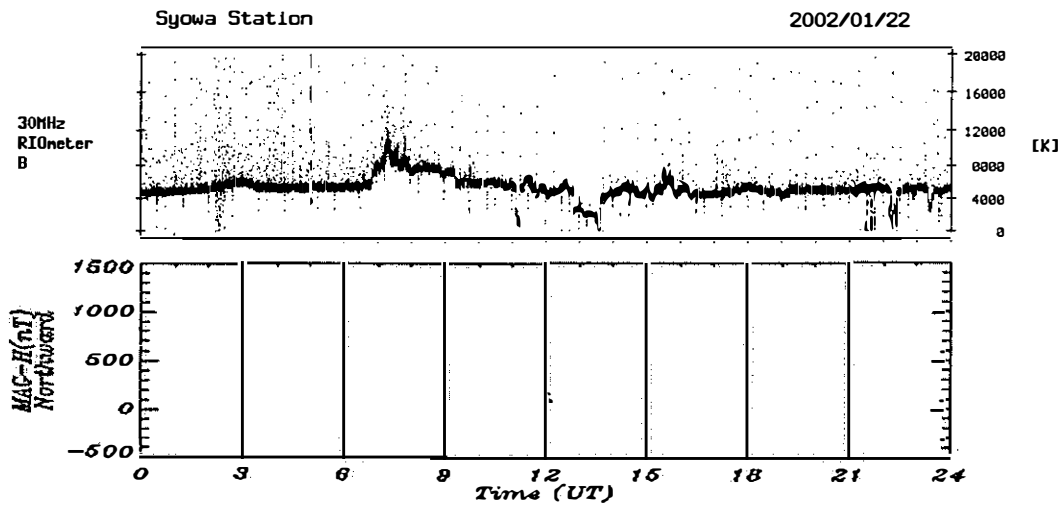


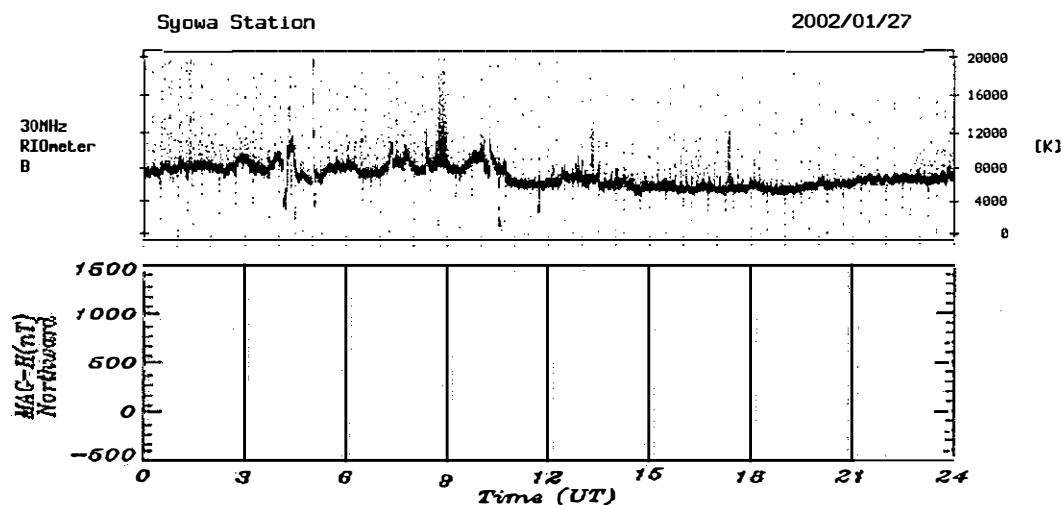
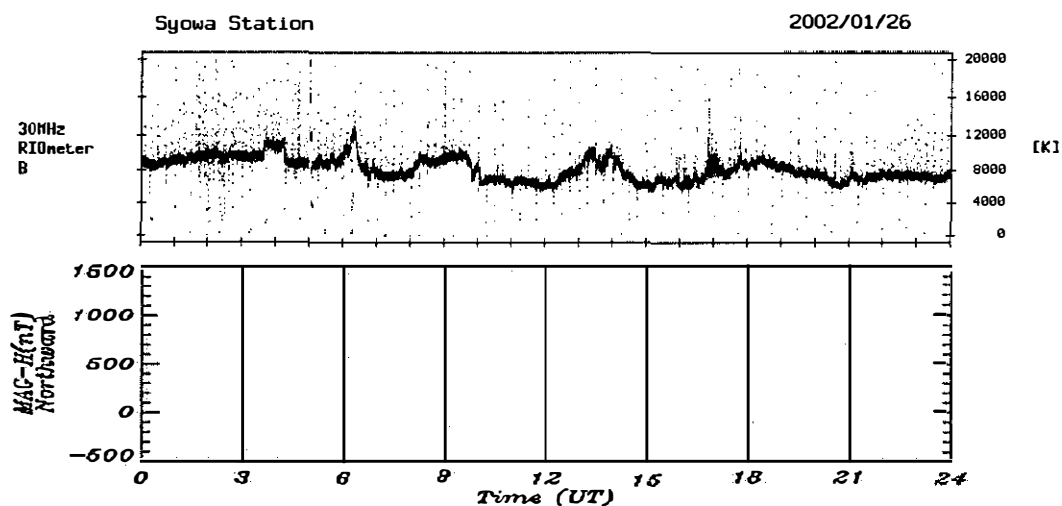
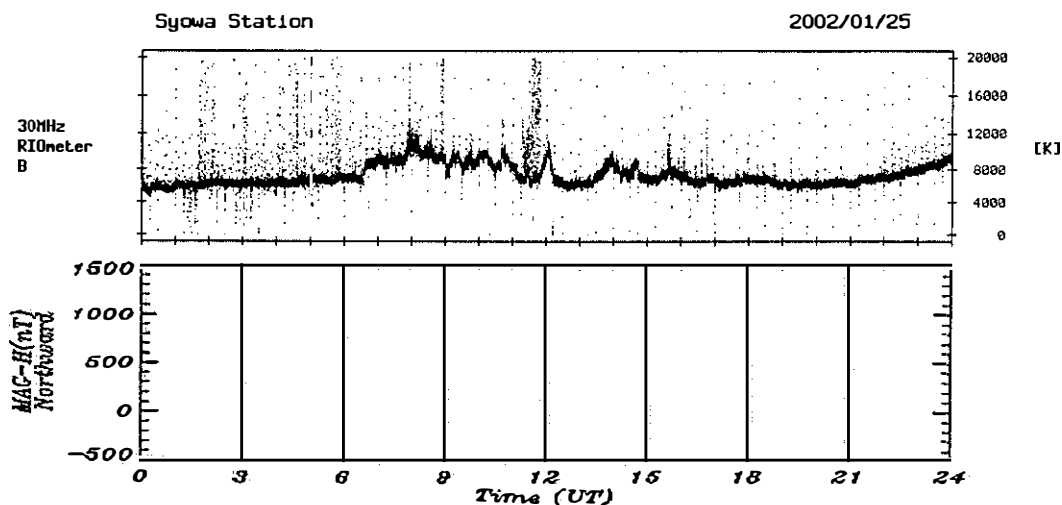


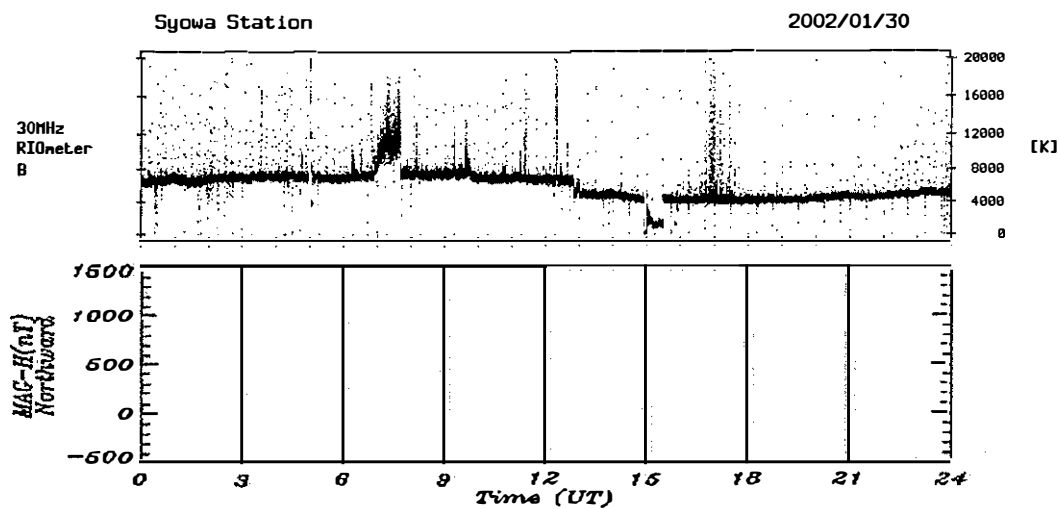
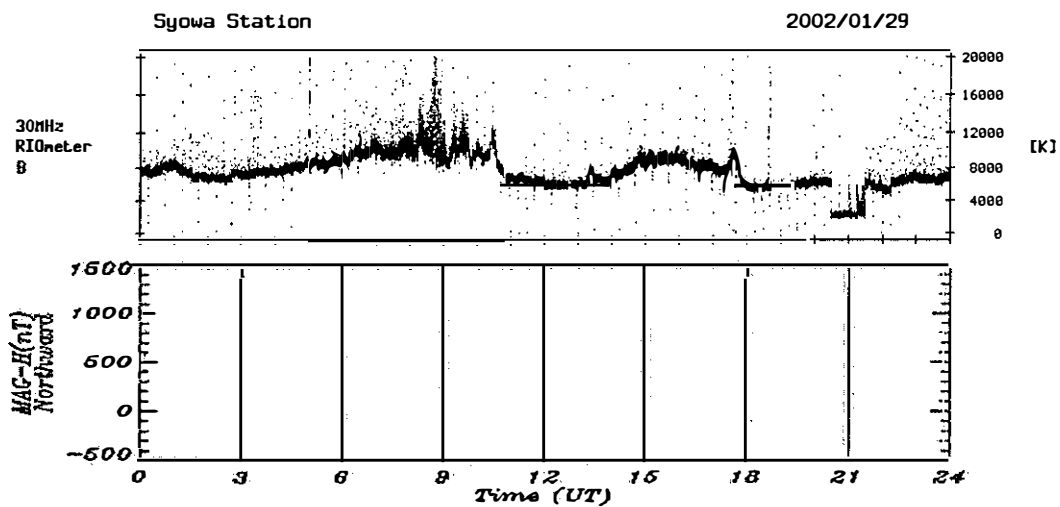
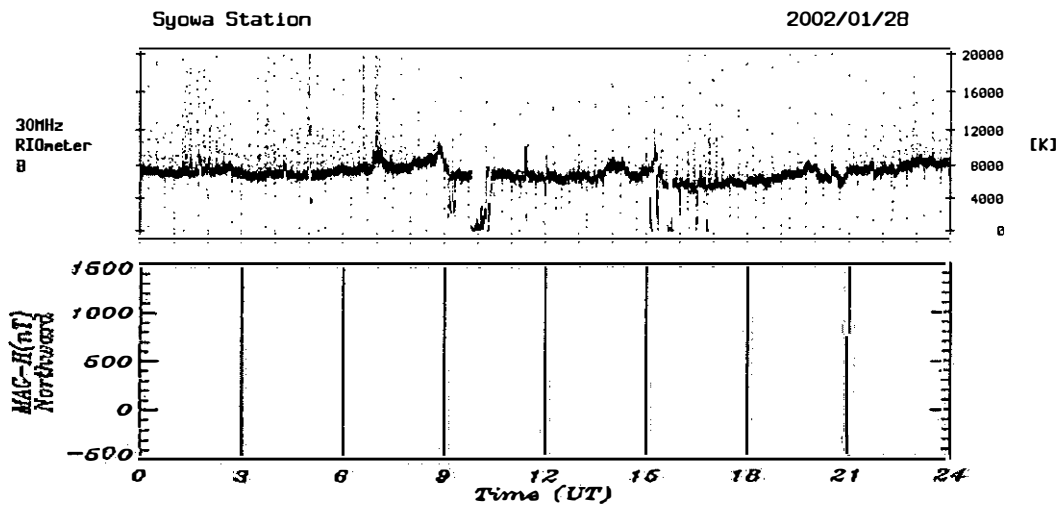


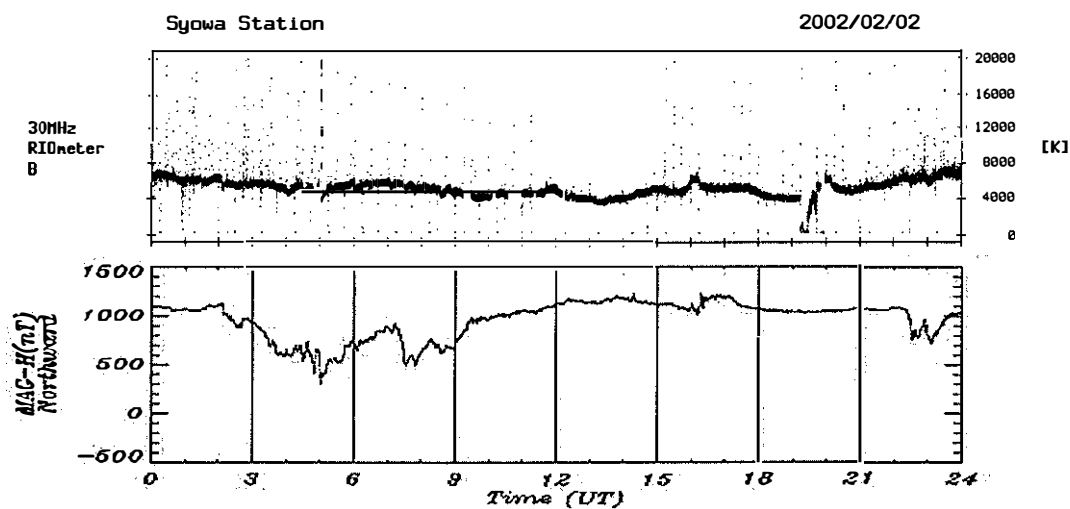
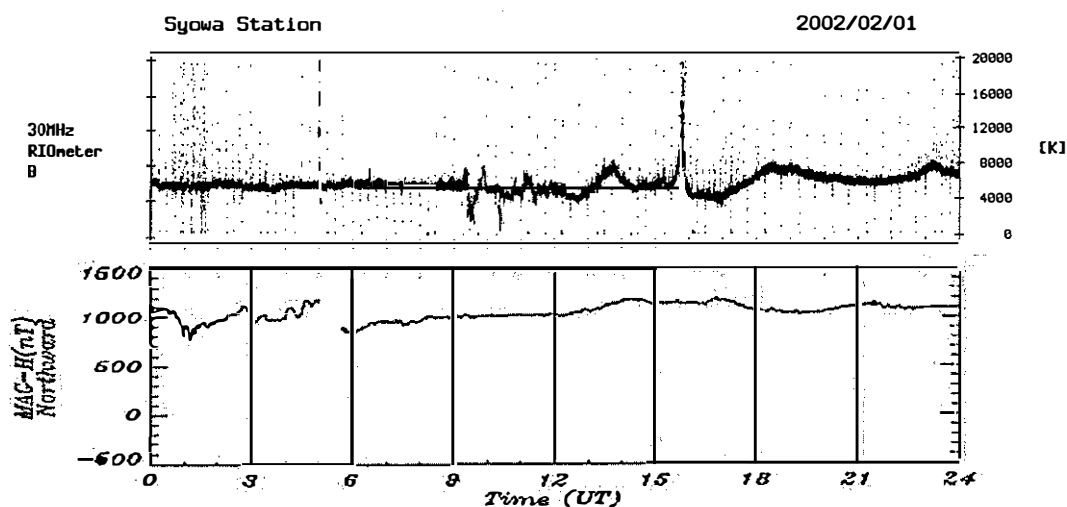
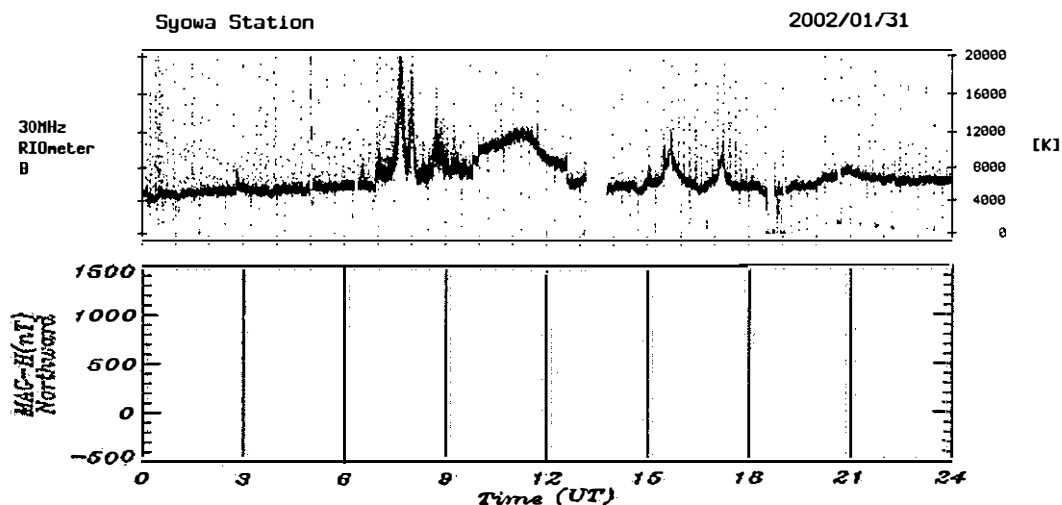






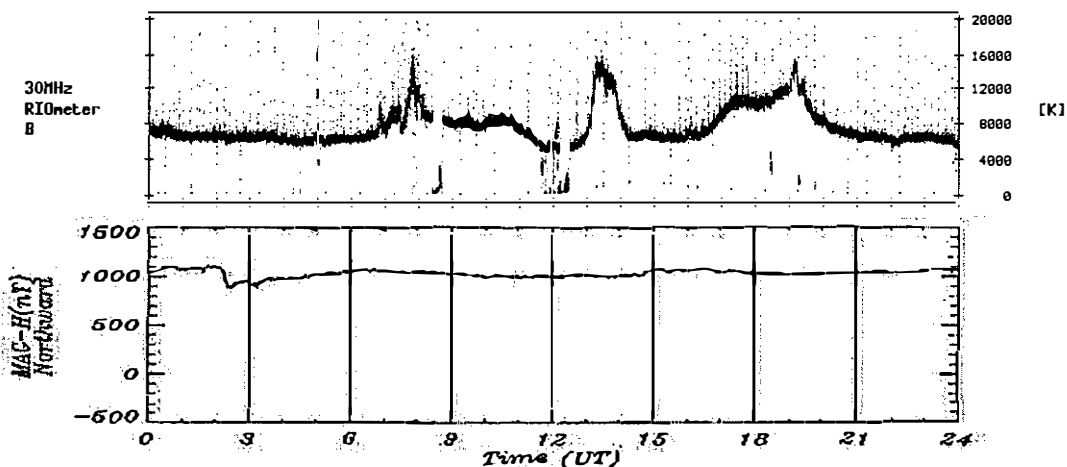






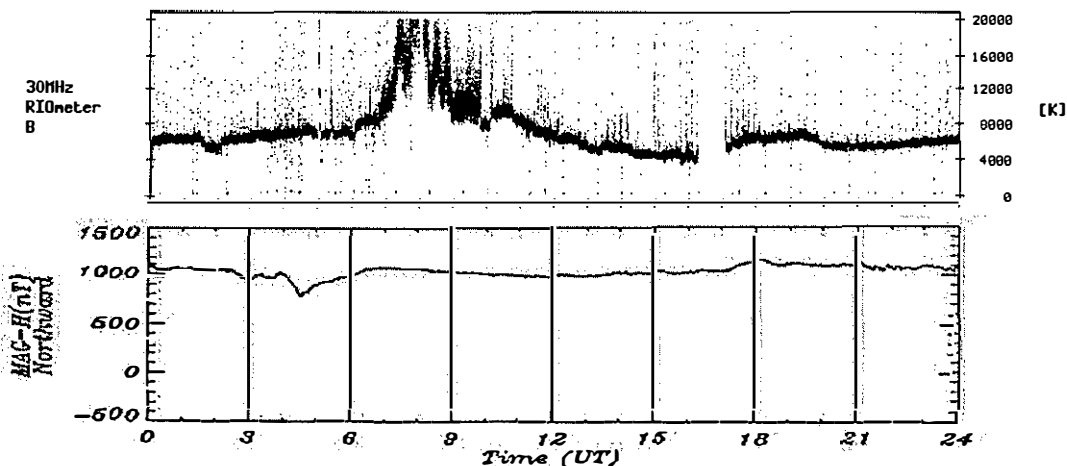
Syowa Station

2002/02/03



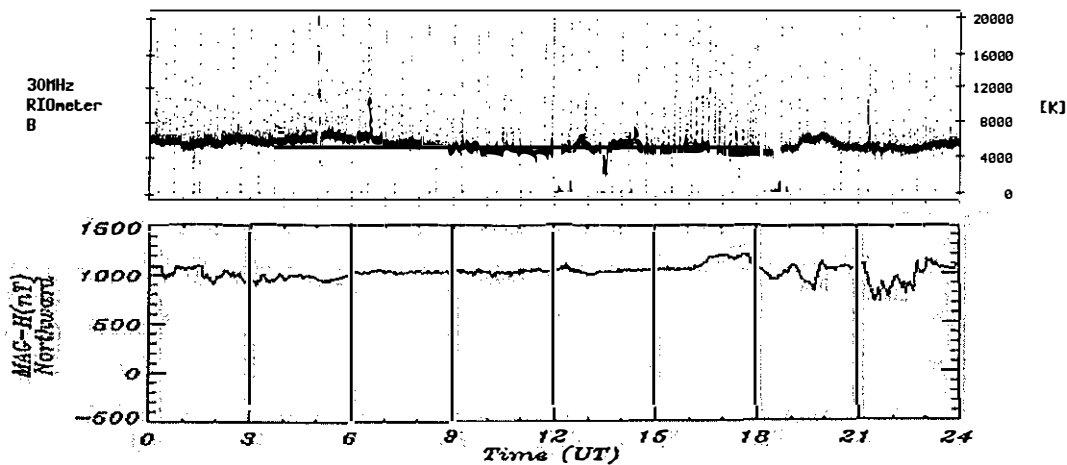
Syowa Station

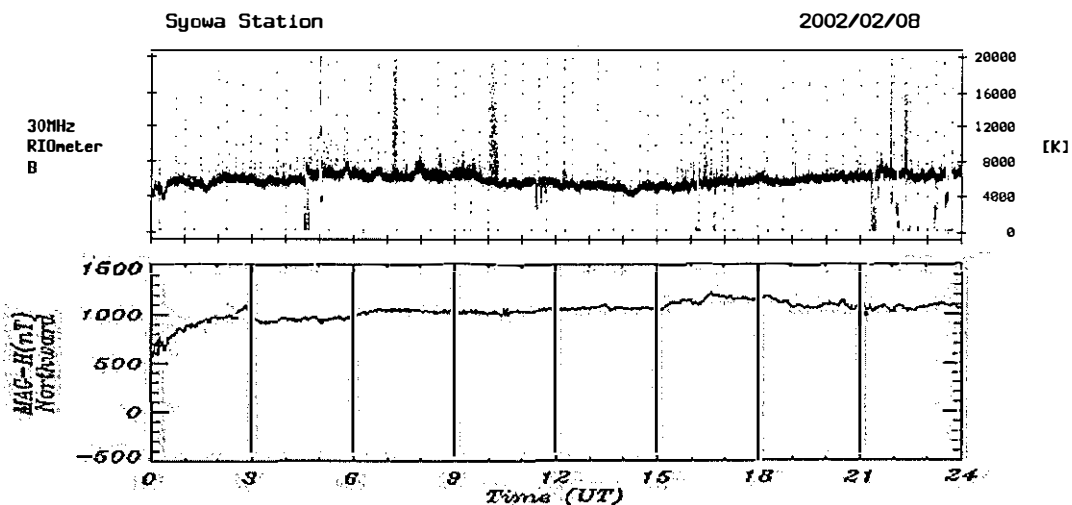
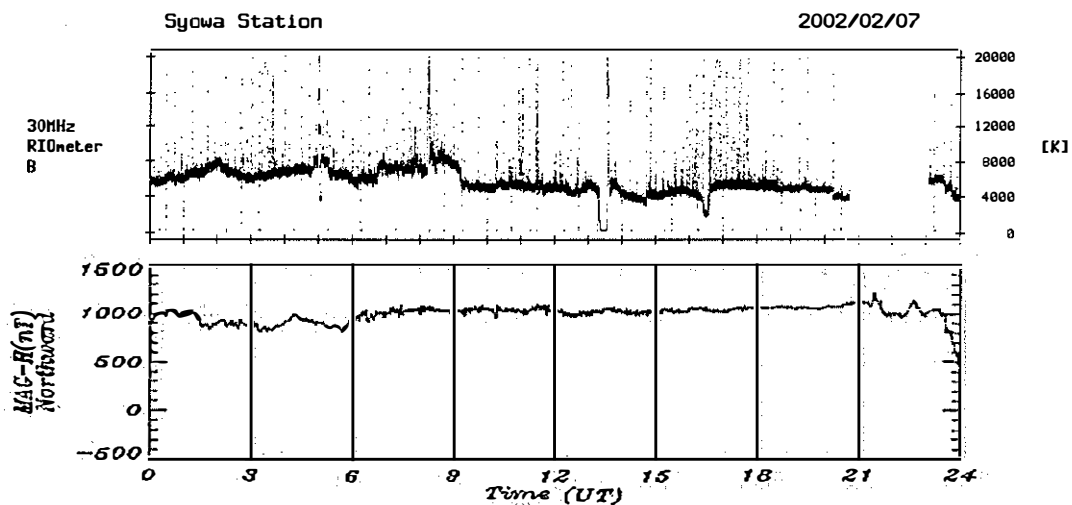
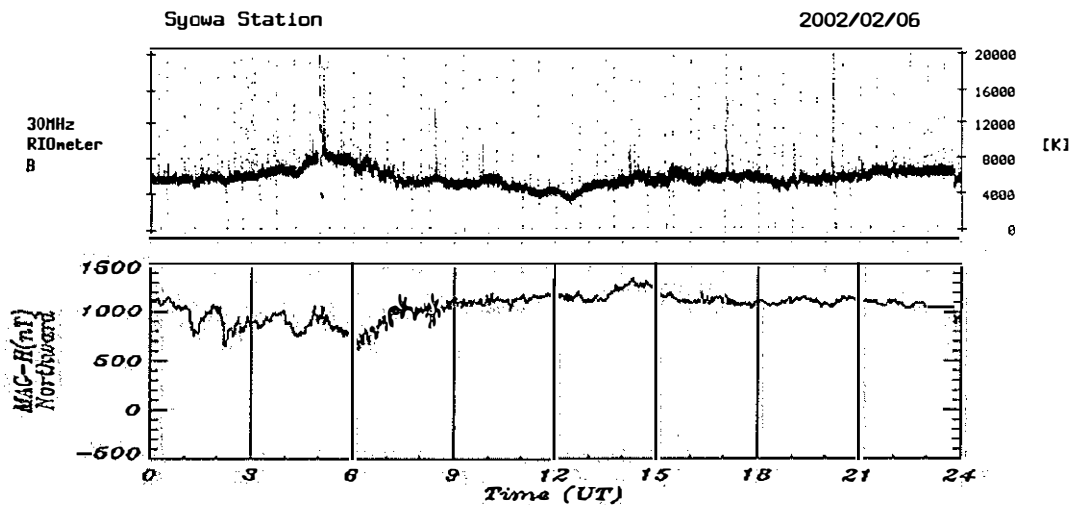
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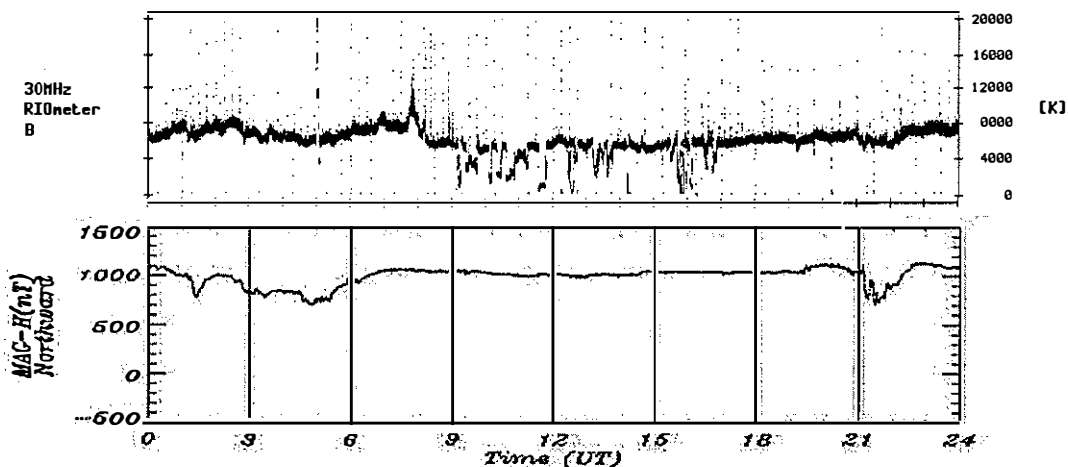
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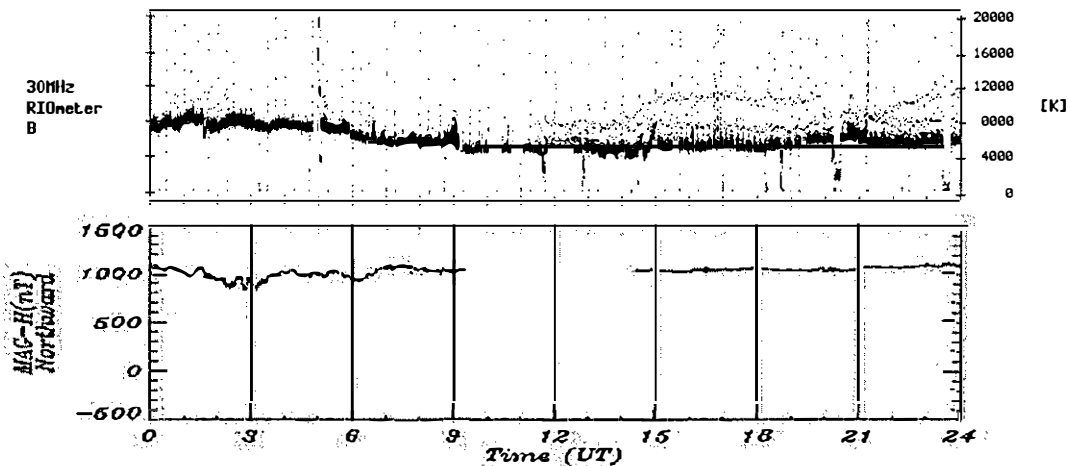
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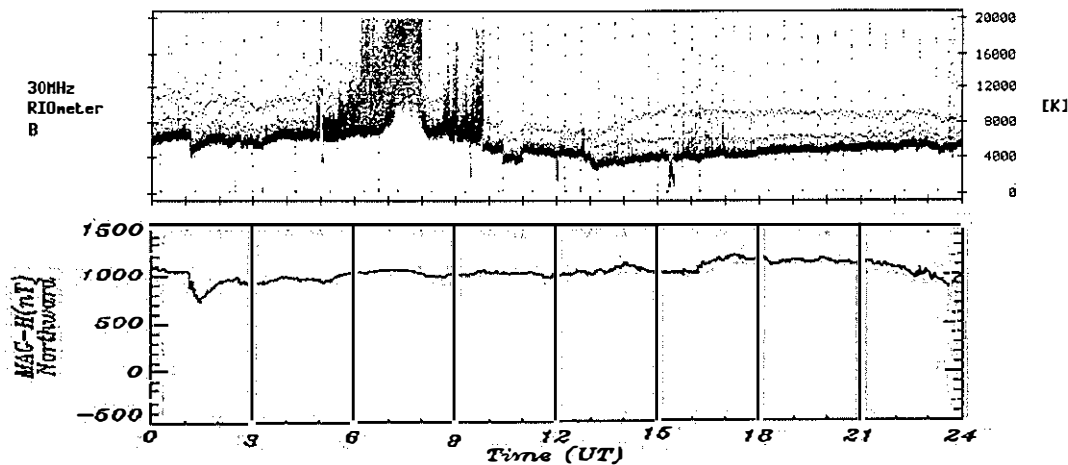
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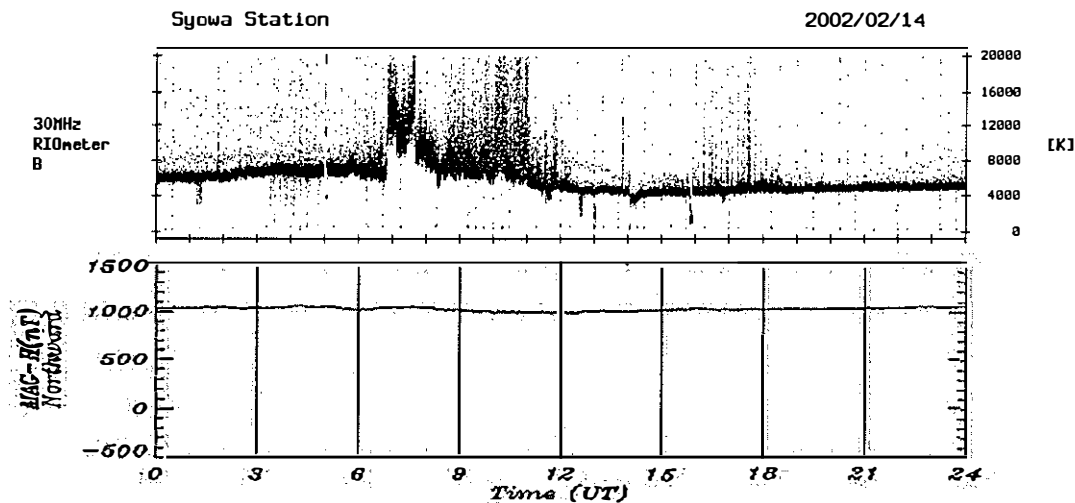
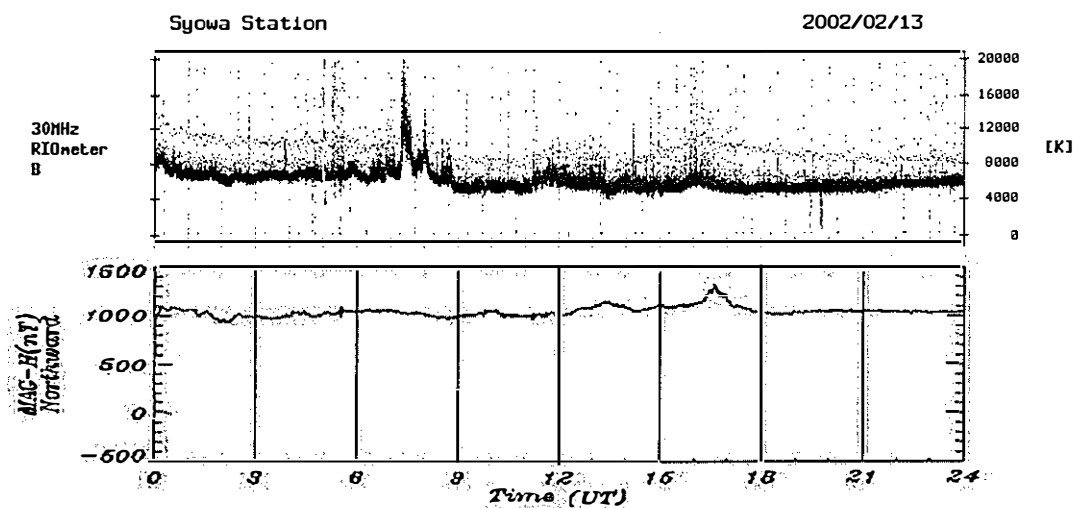
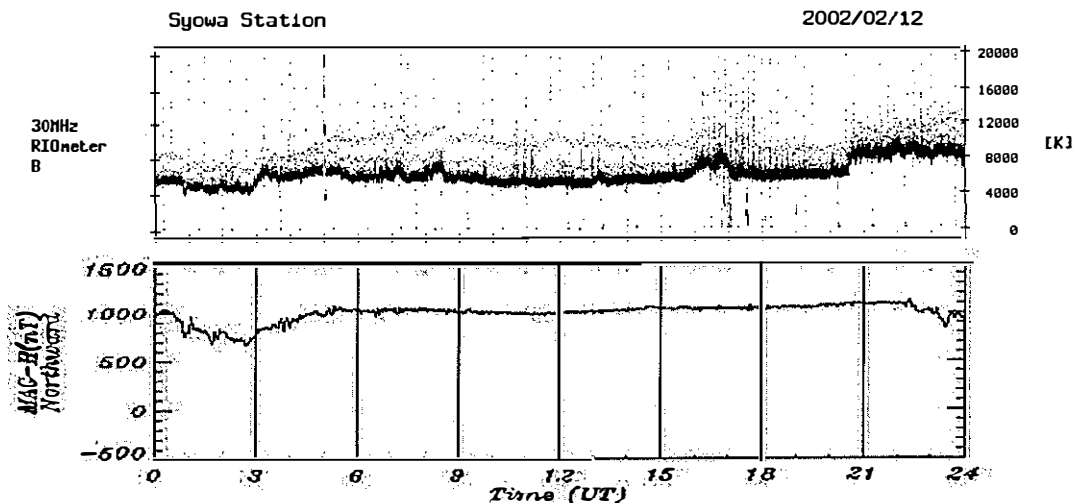
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Syowa Station

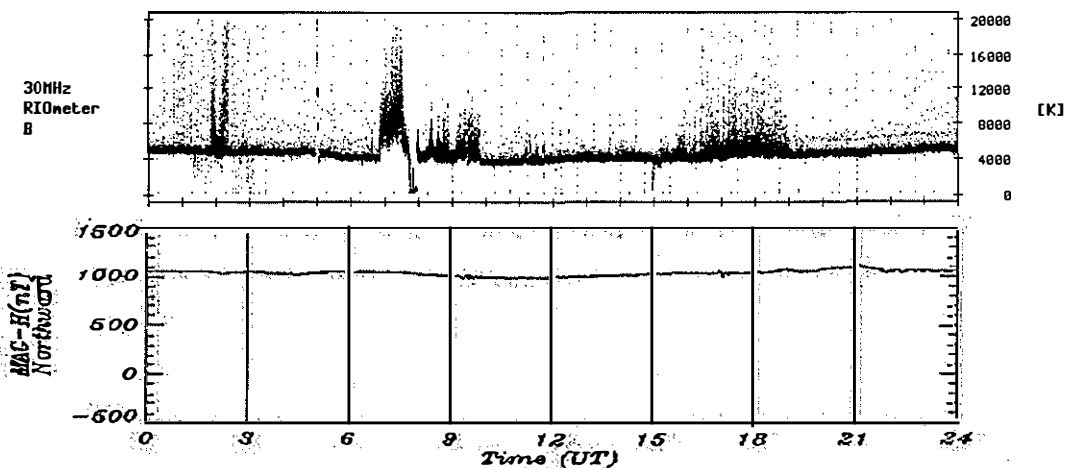
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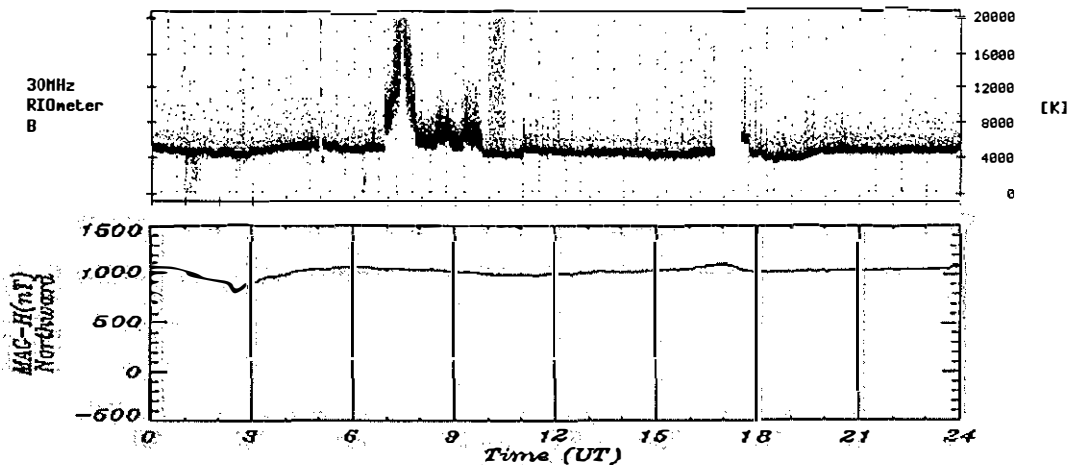
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2002/02/15



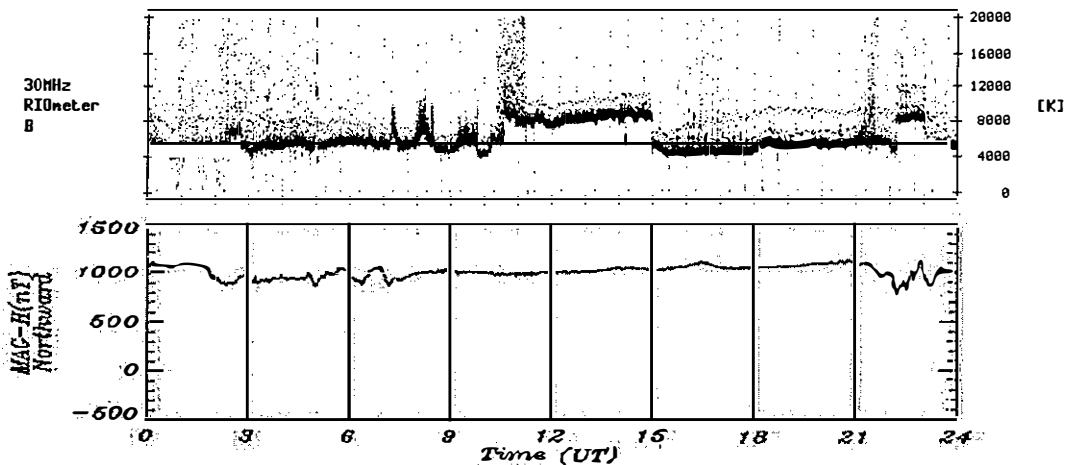
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2002/02/16



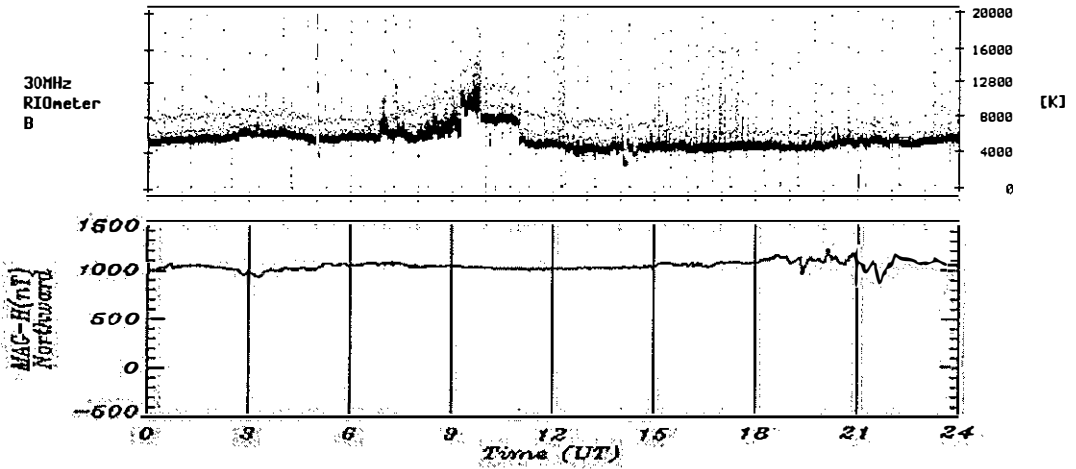
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2002/02/17



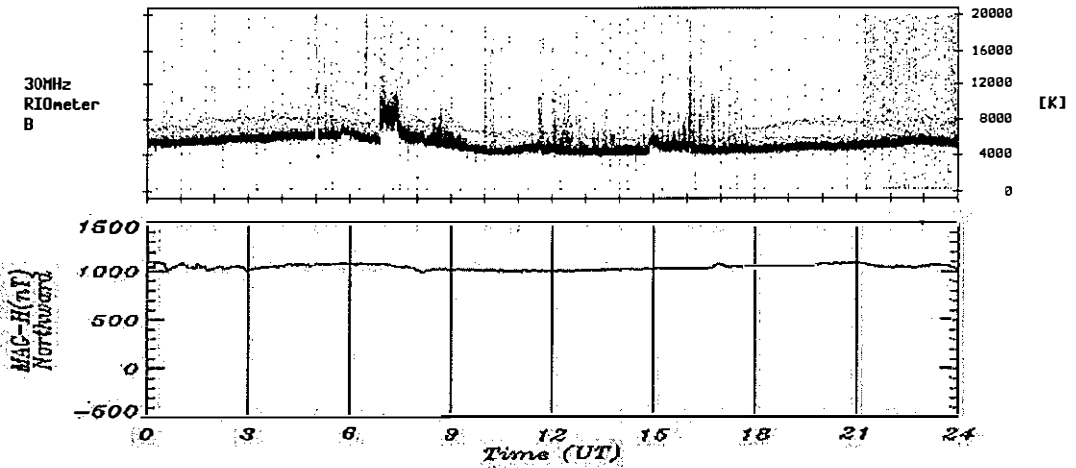
Syowa Station

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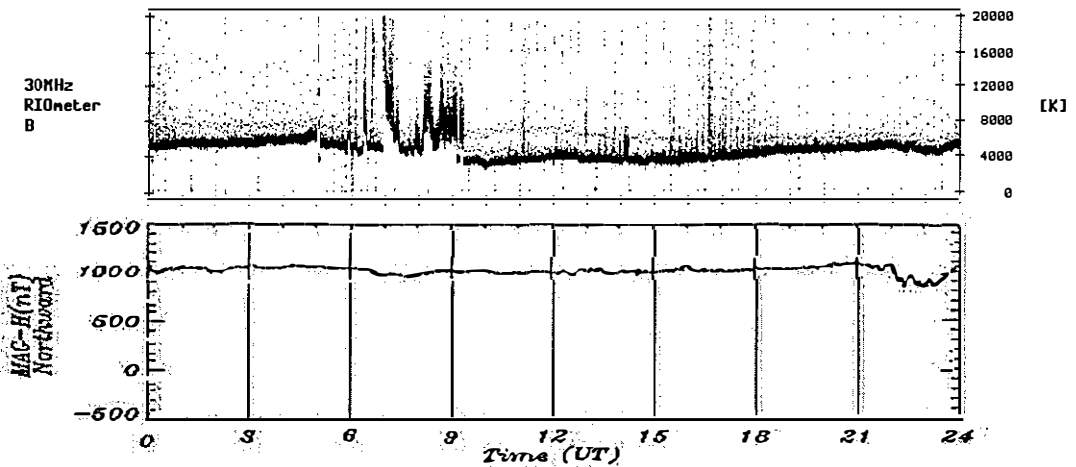
Syowa Station

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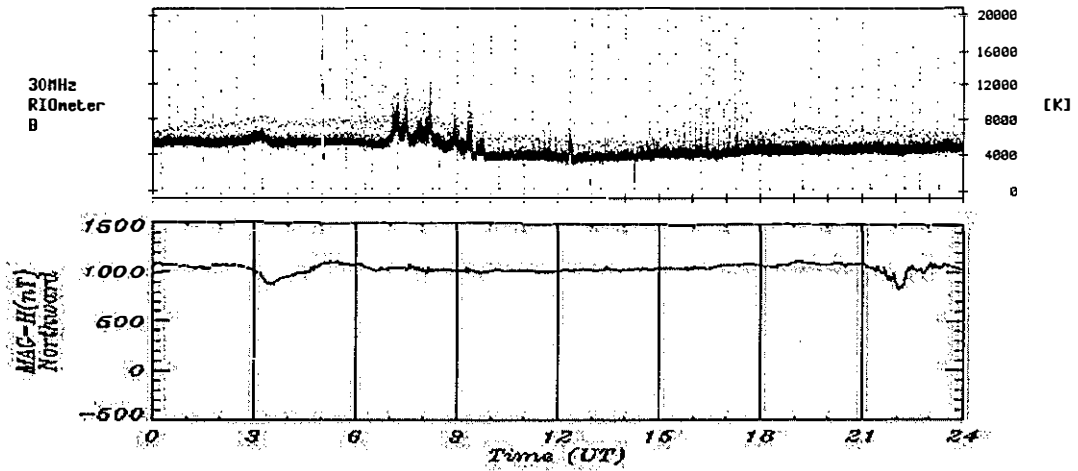
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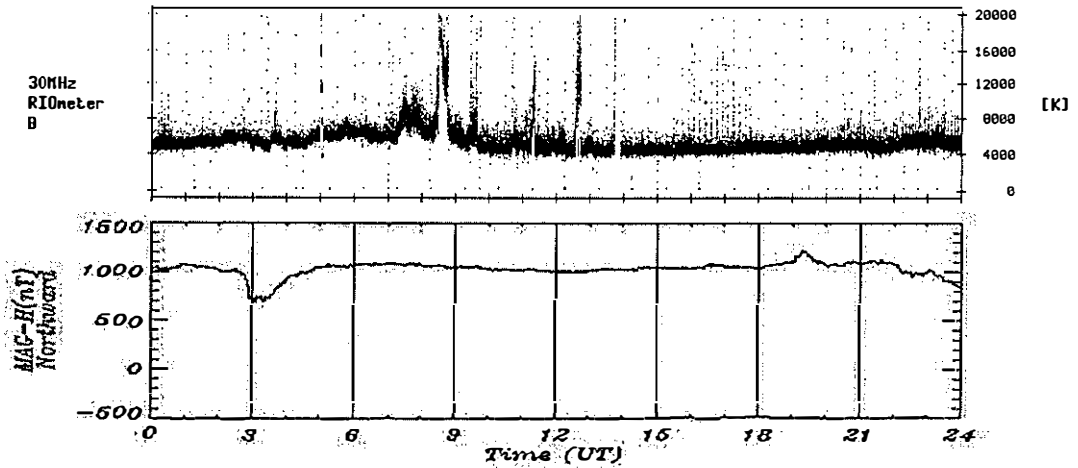
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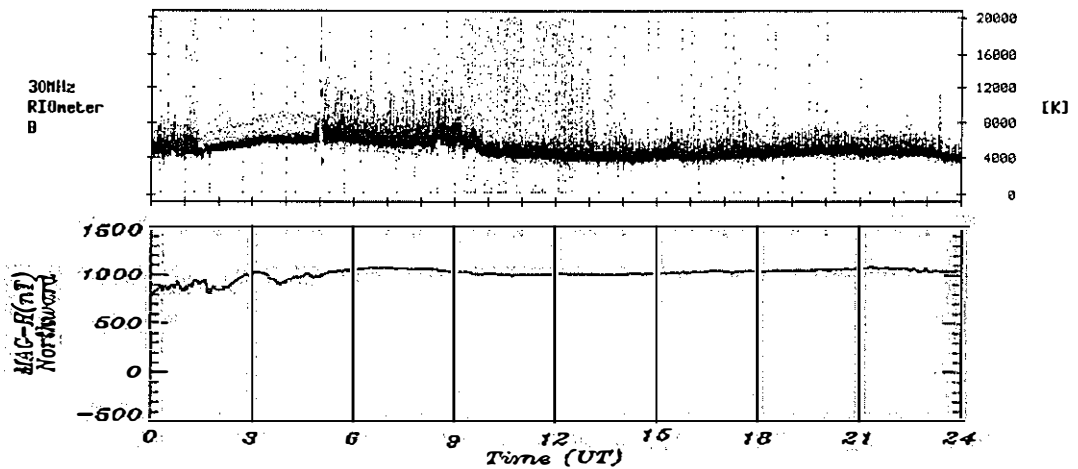
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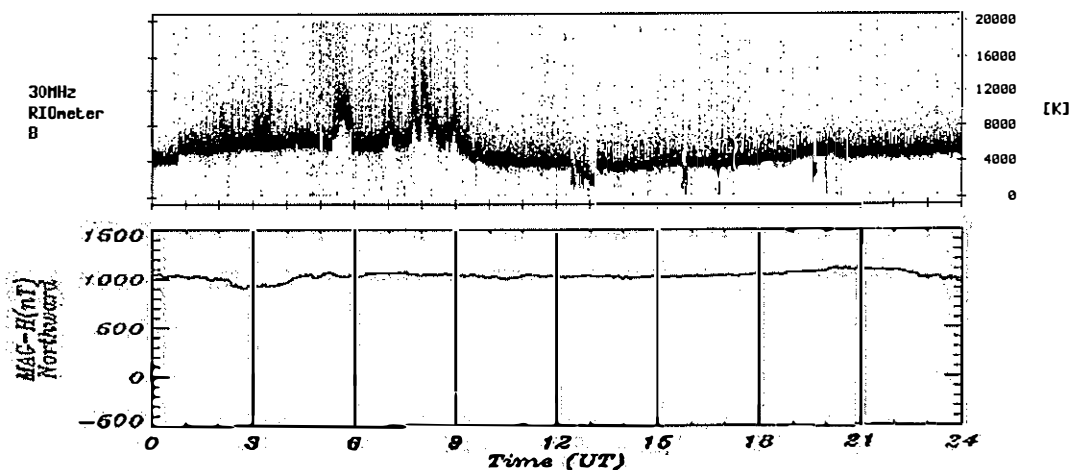
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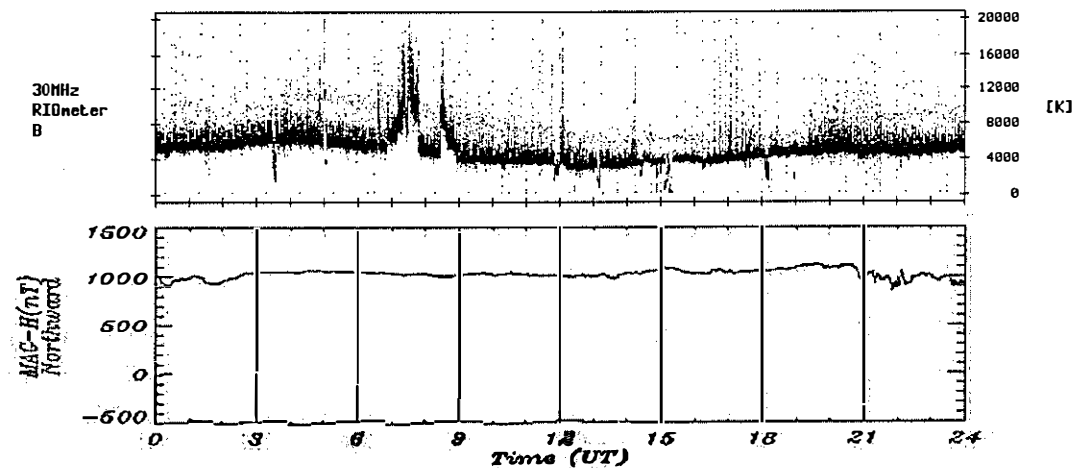
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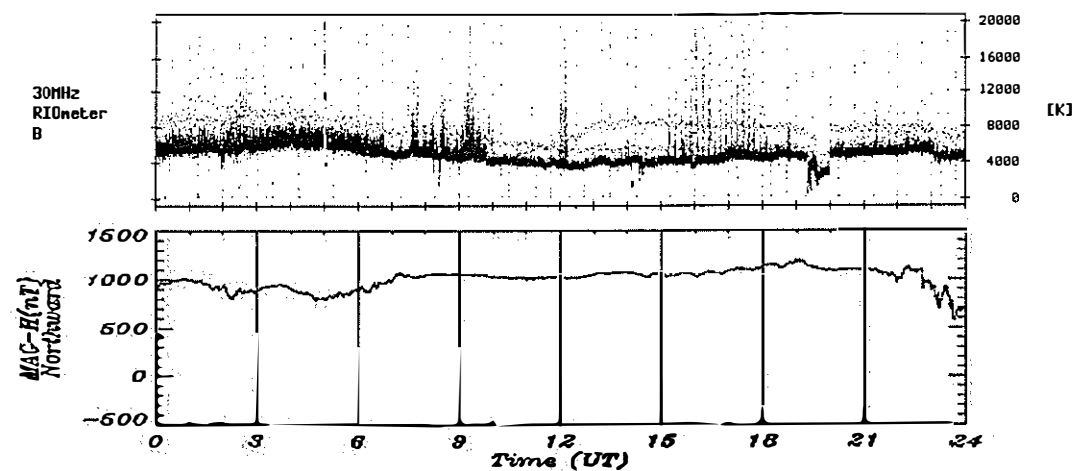
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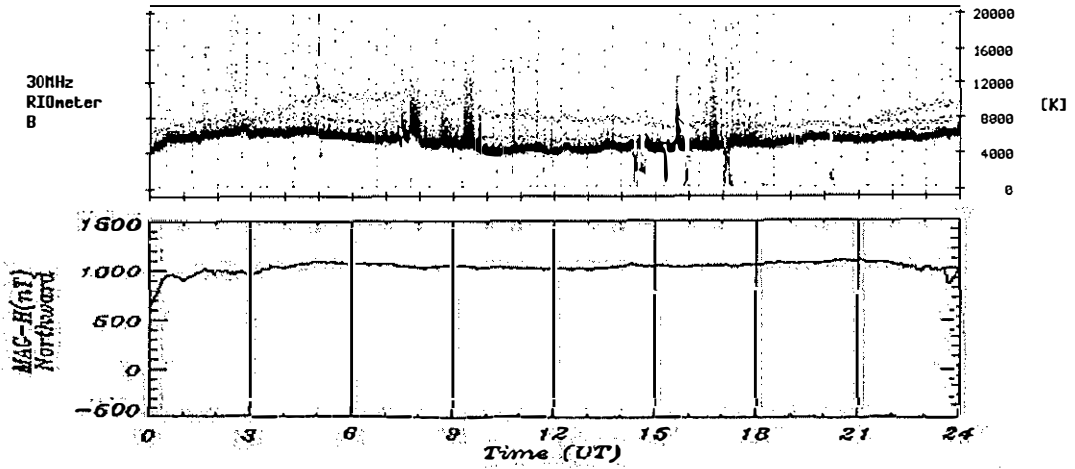
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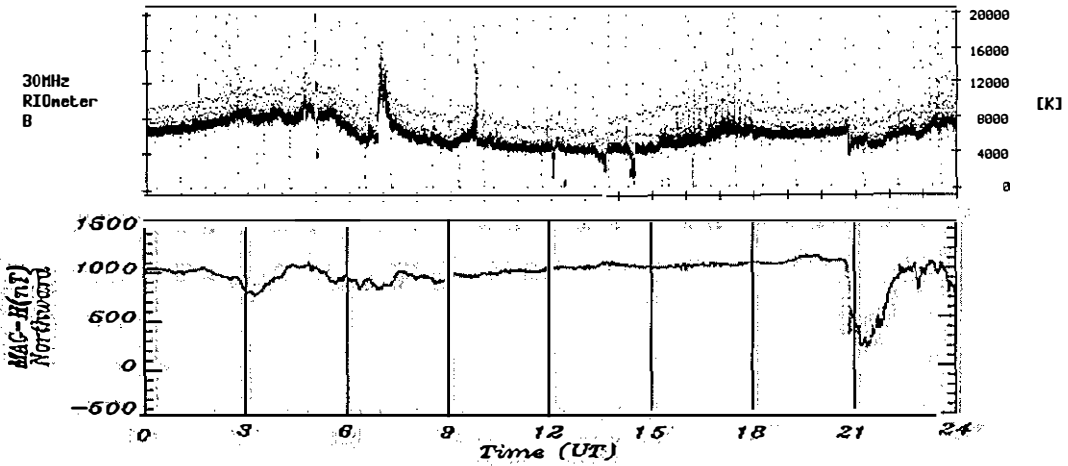
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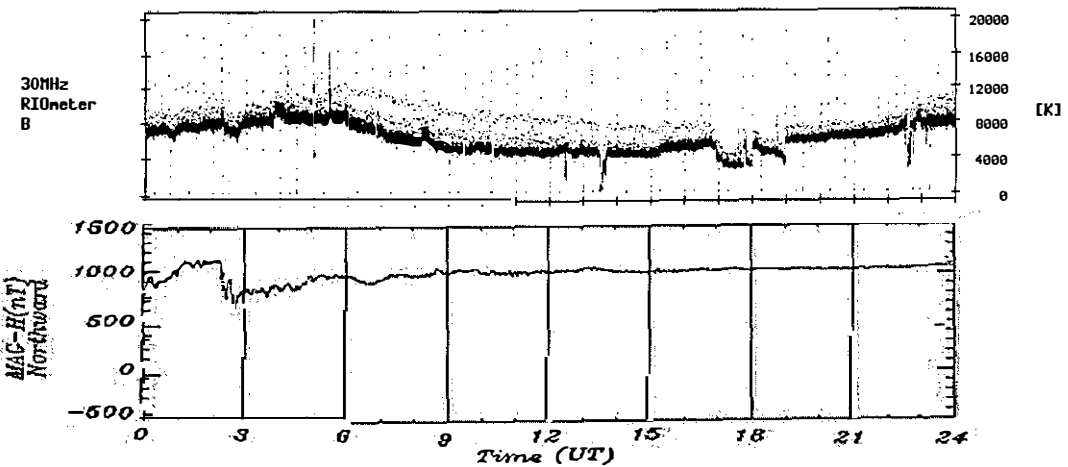
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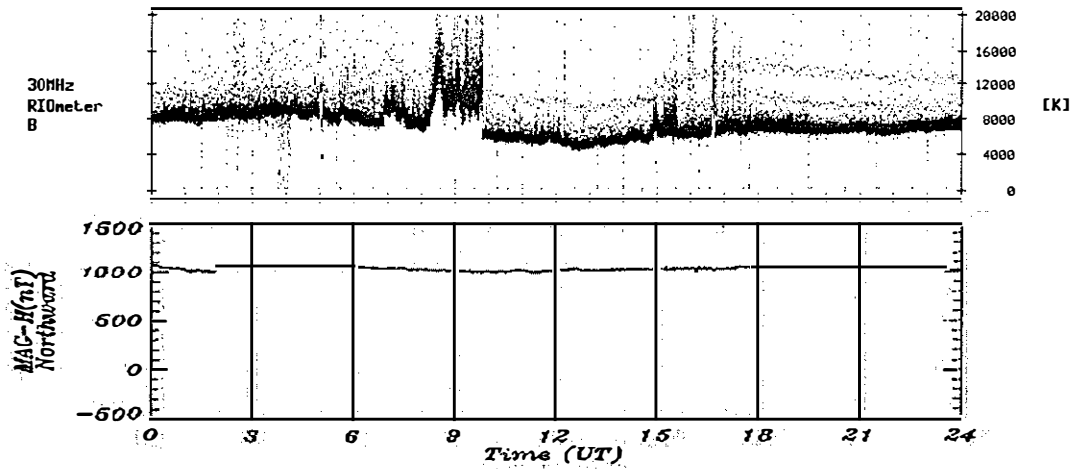
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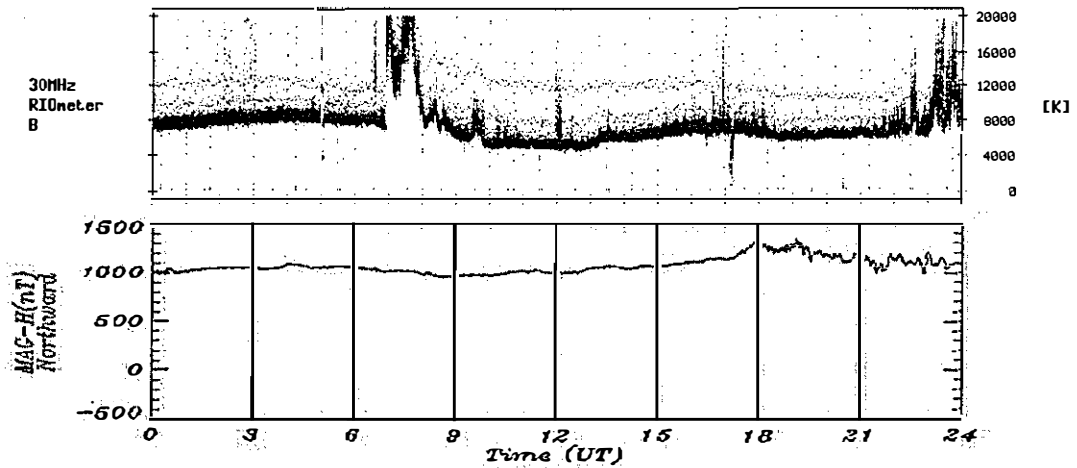
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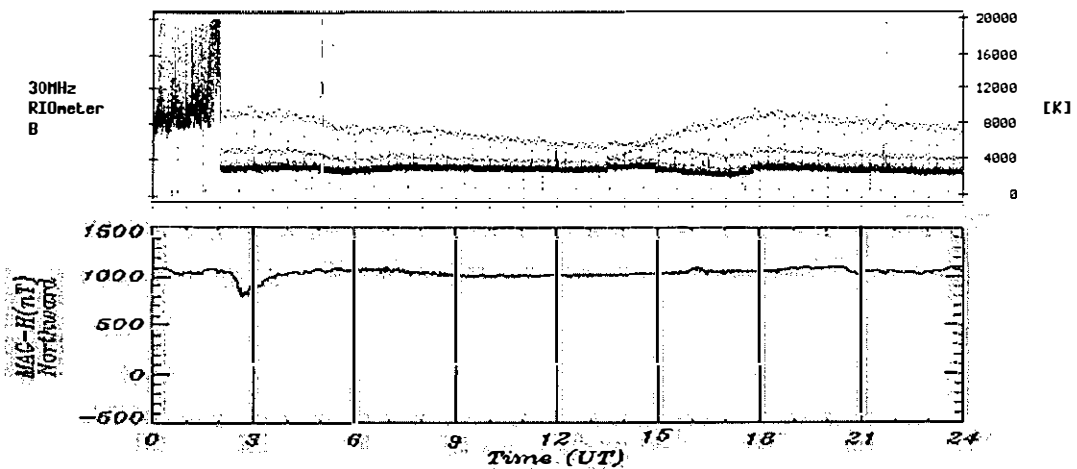
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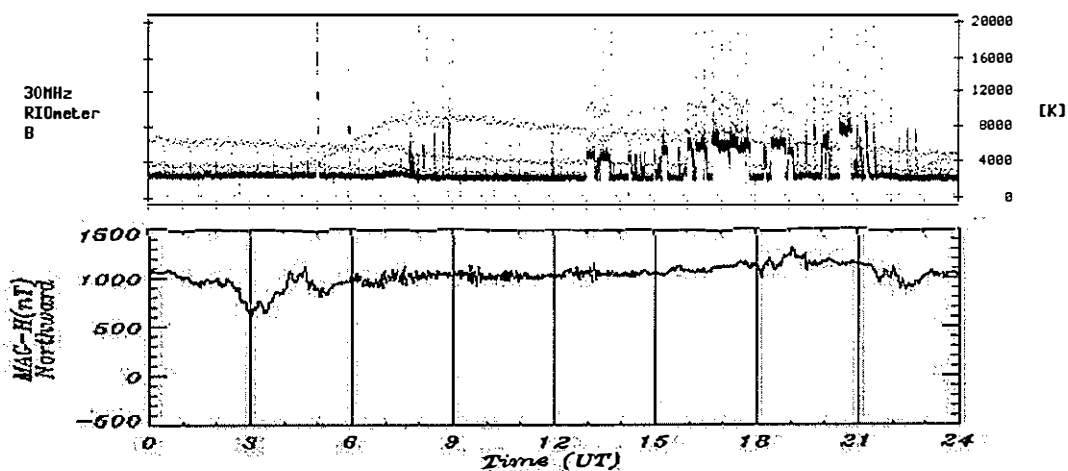
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2002/03/04



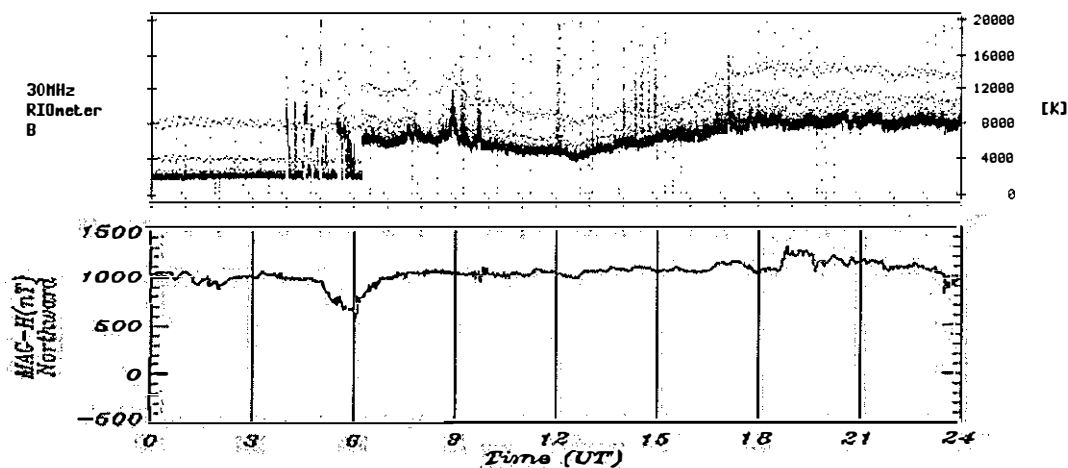
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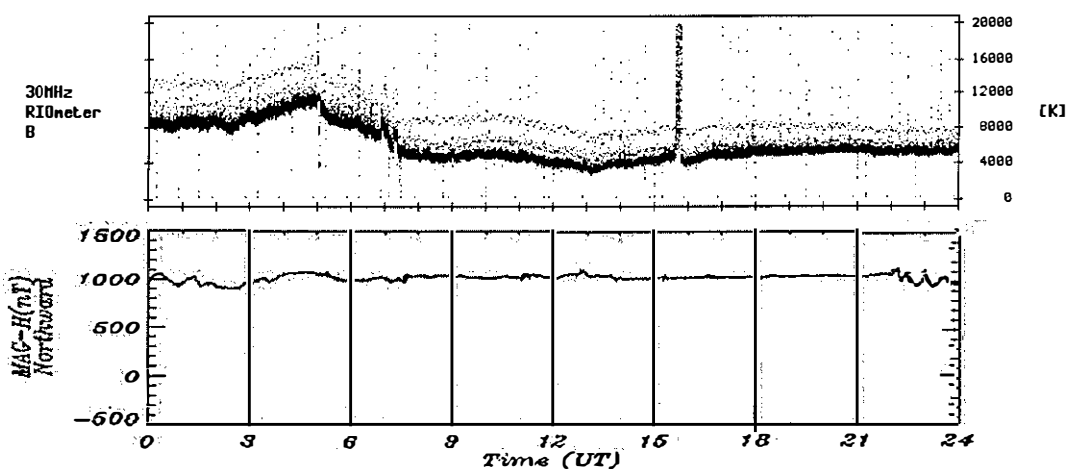
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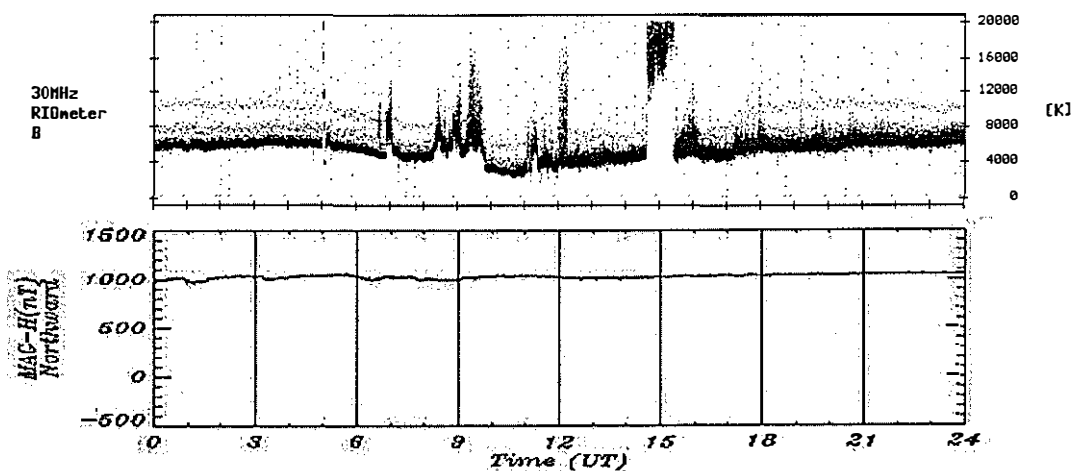
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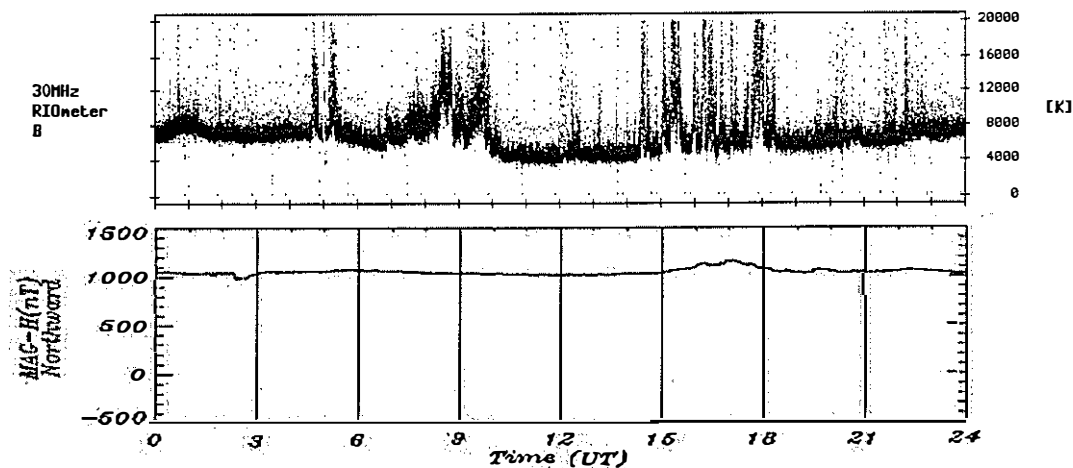
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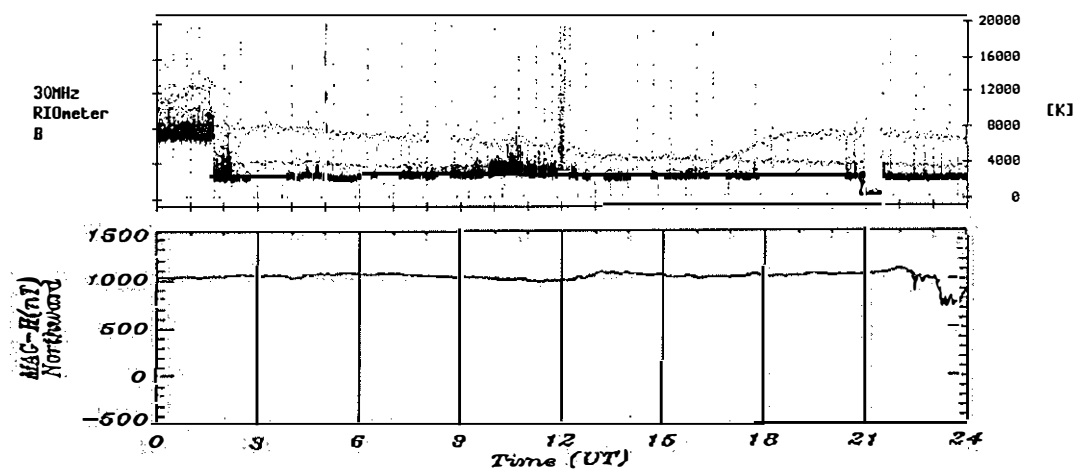
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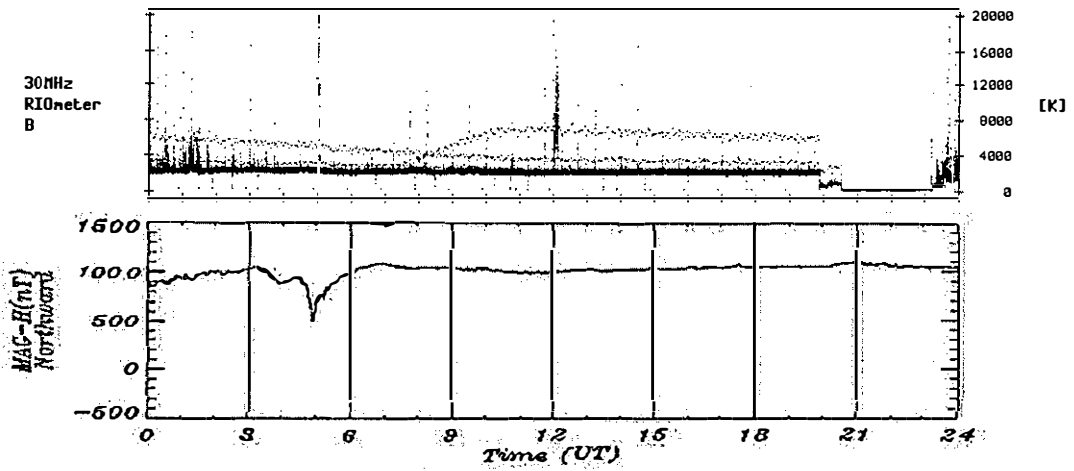
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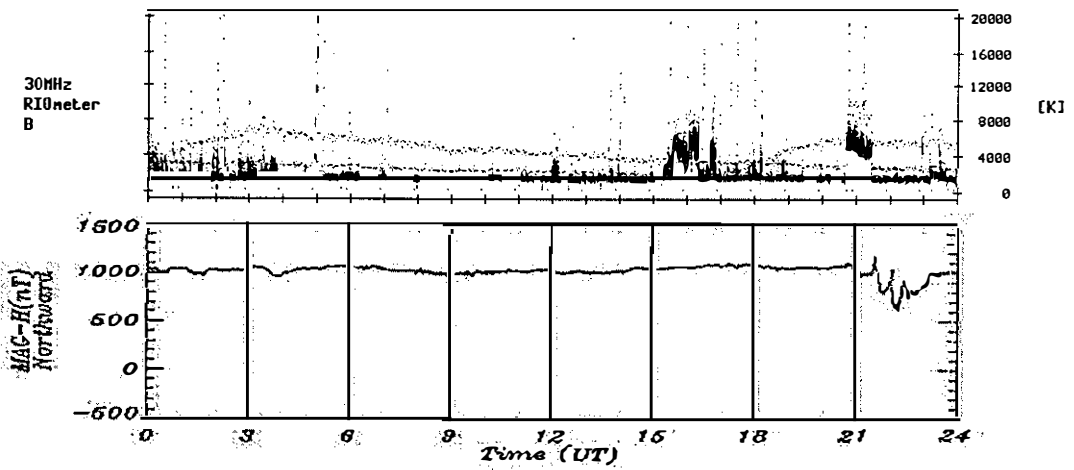
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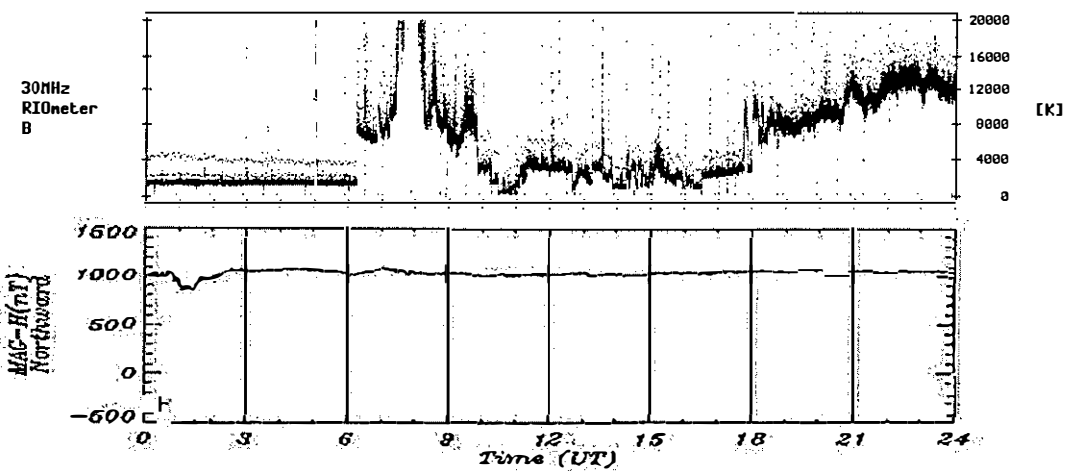
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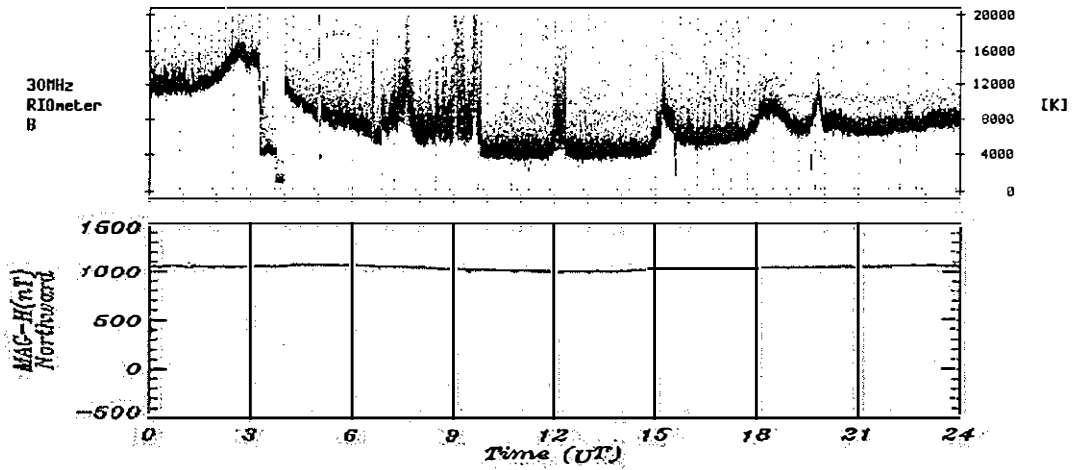
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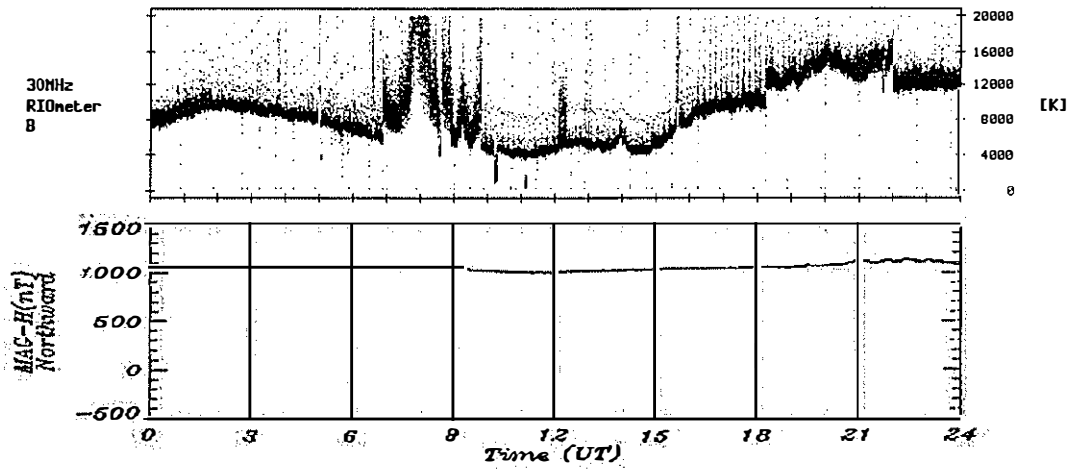
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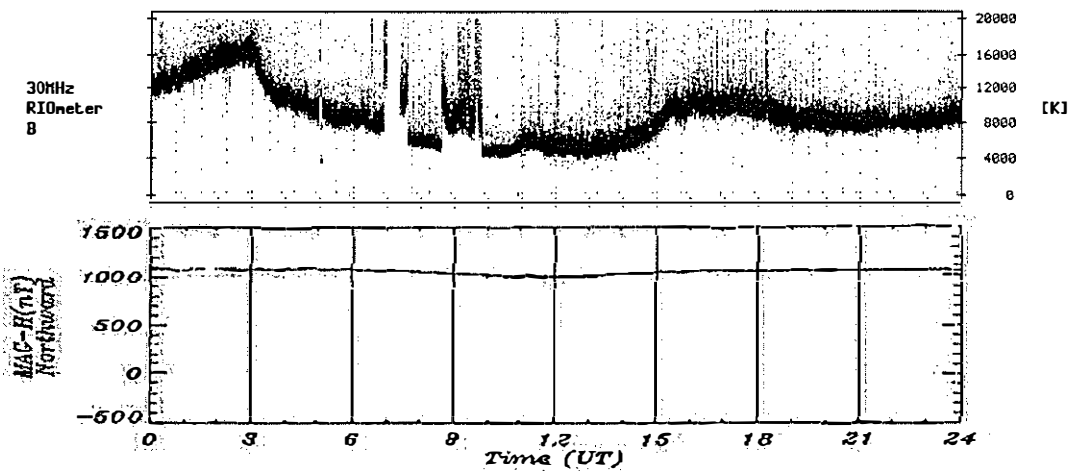
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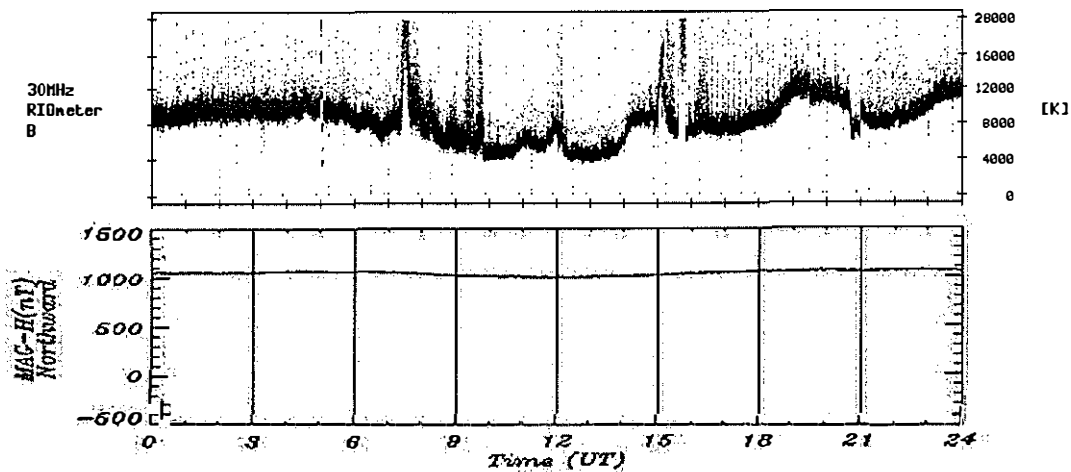
Syowa Station

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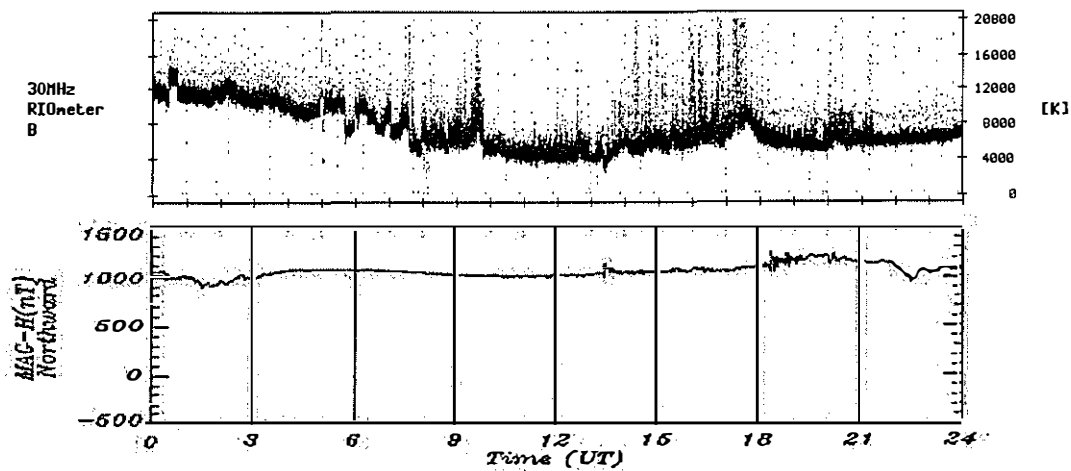
Syowa Station

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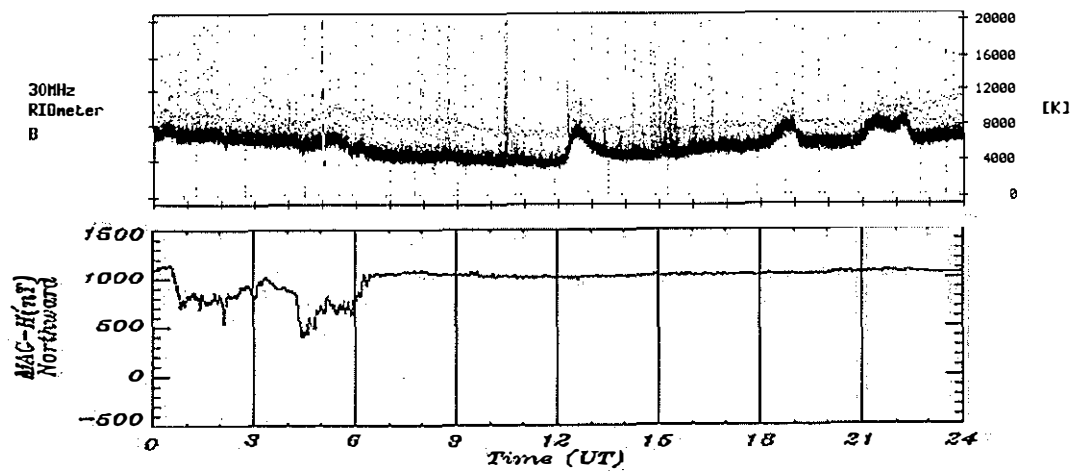
Syowa Station

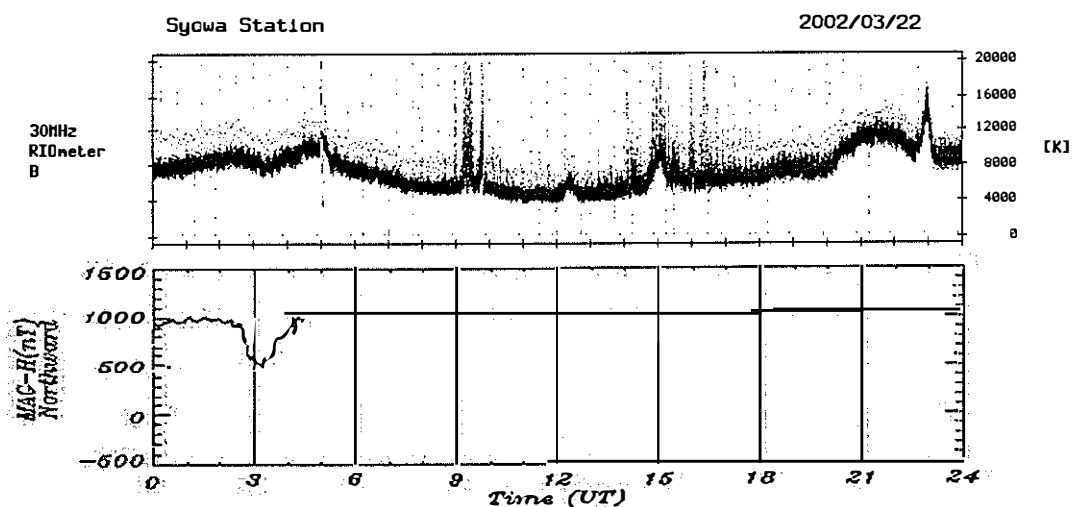
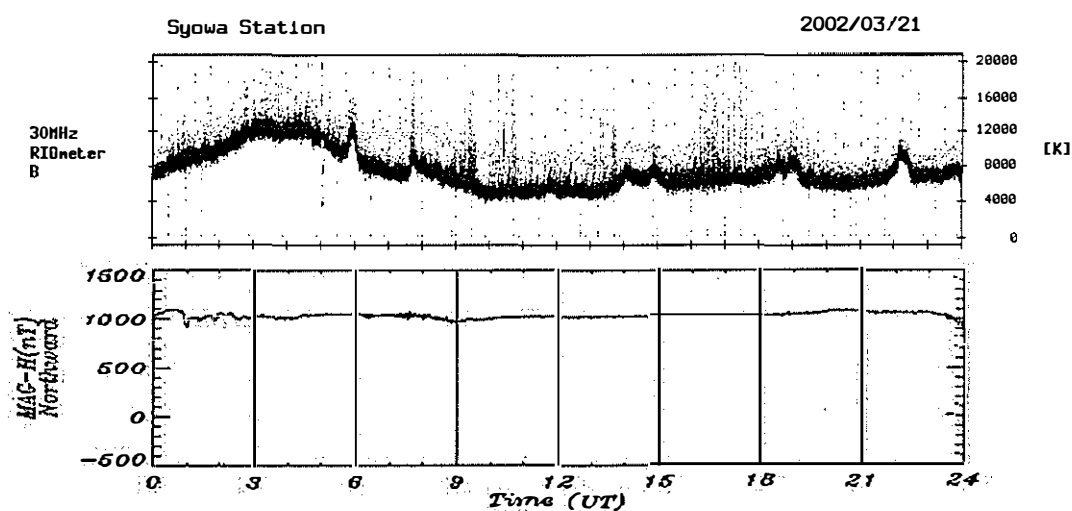
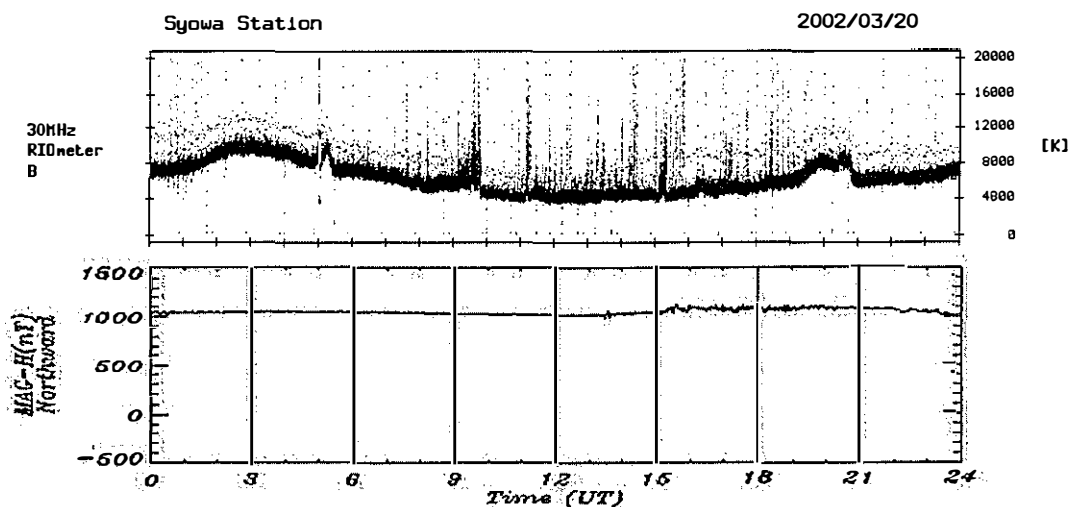
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Syowa Station

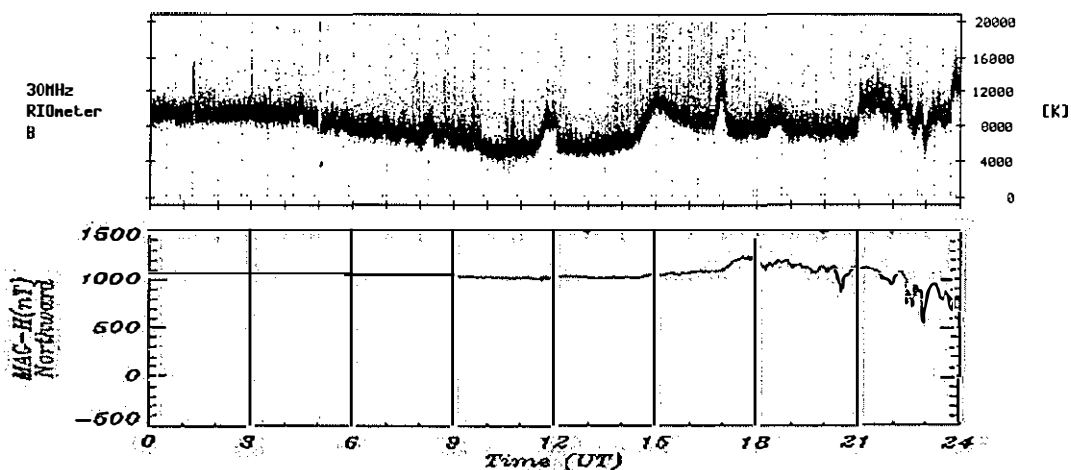
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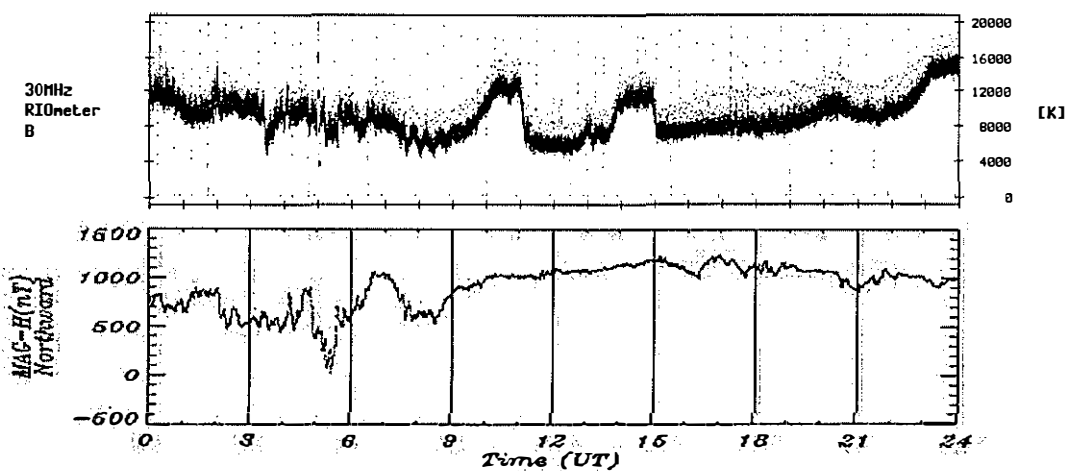
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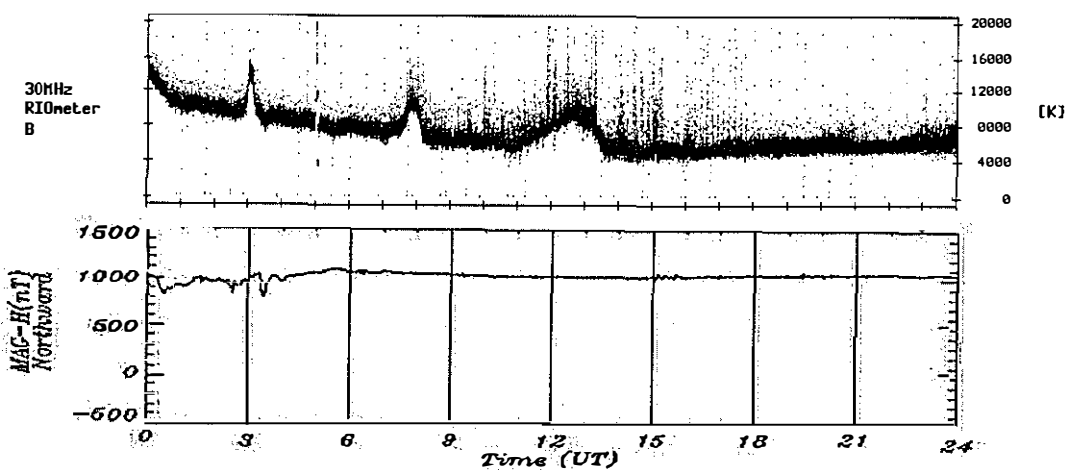
Syowa Station

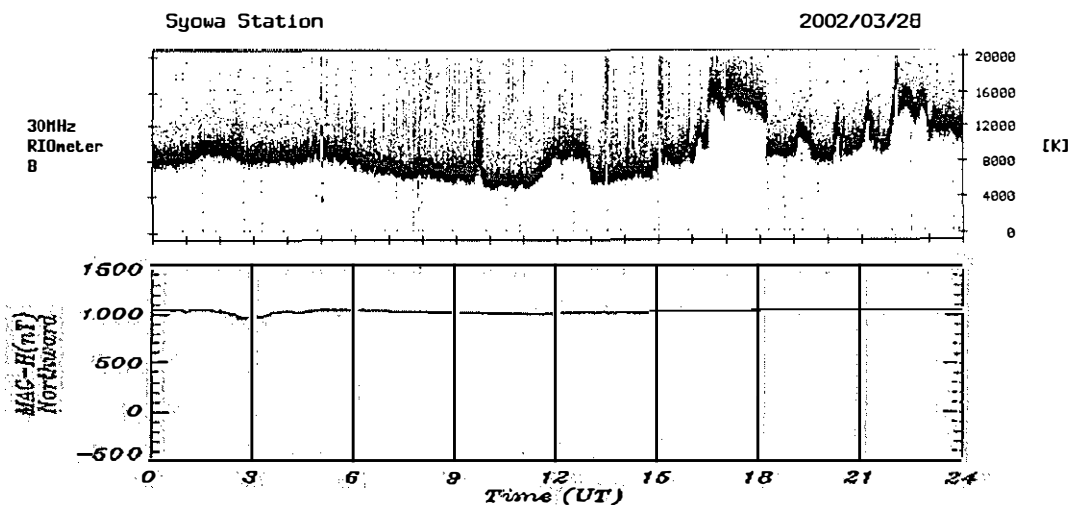
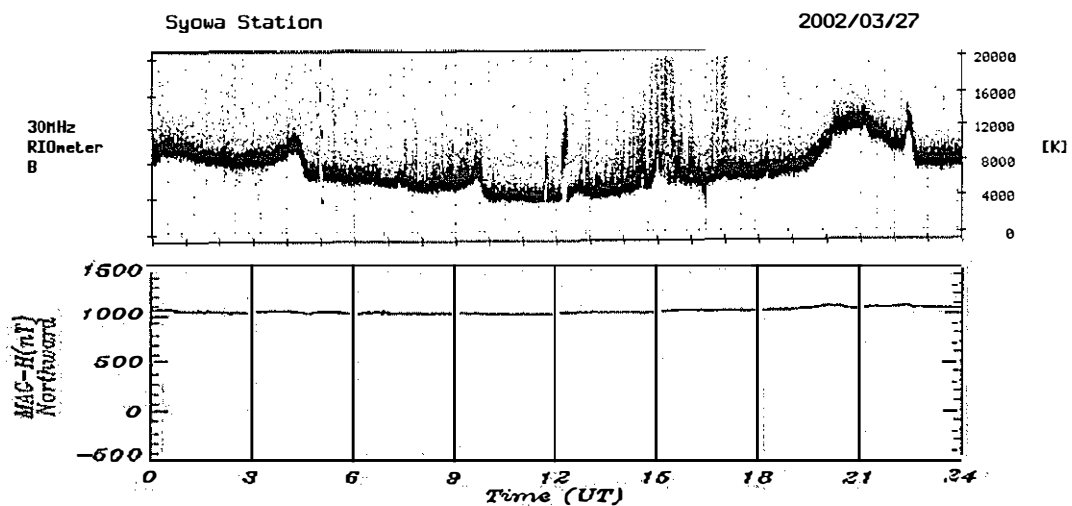
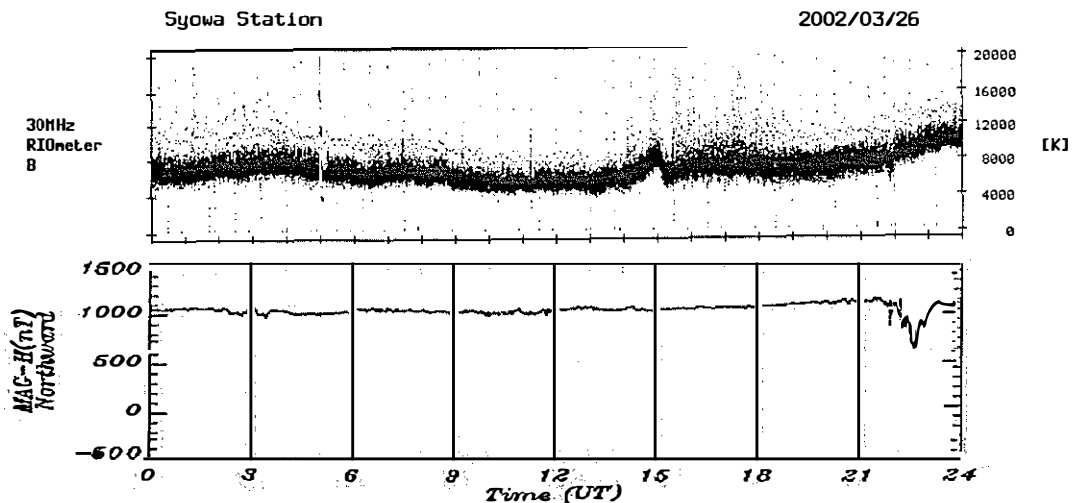
2002/03/24



Syowa Station

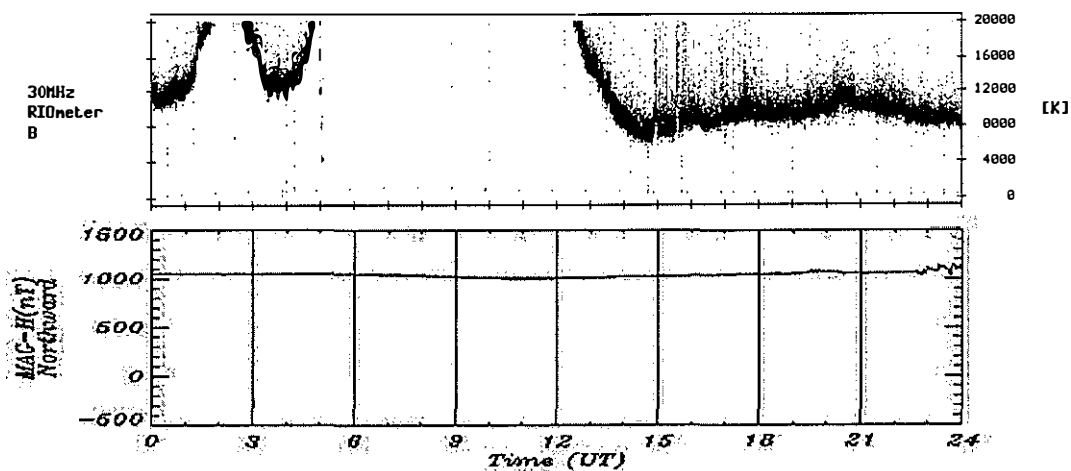
2002/03/25





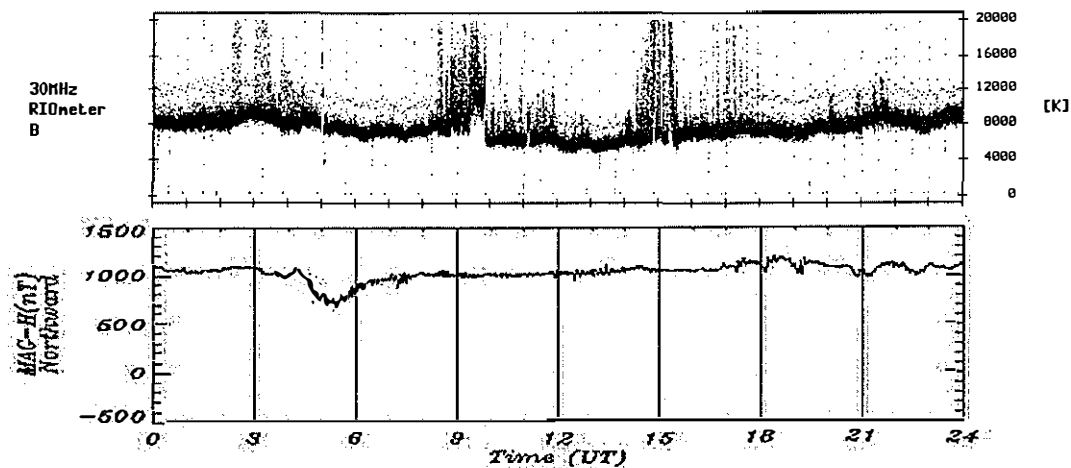
Syowa Station

2002/03/29



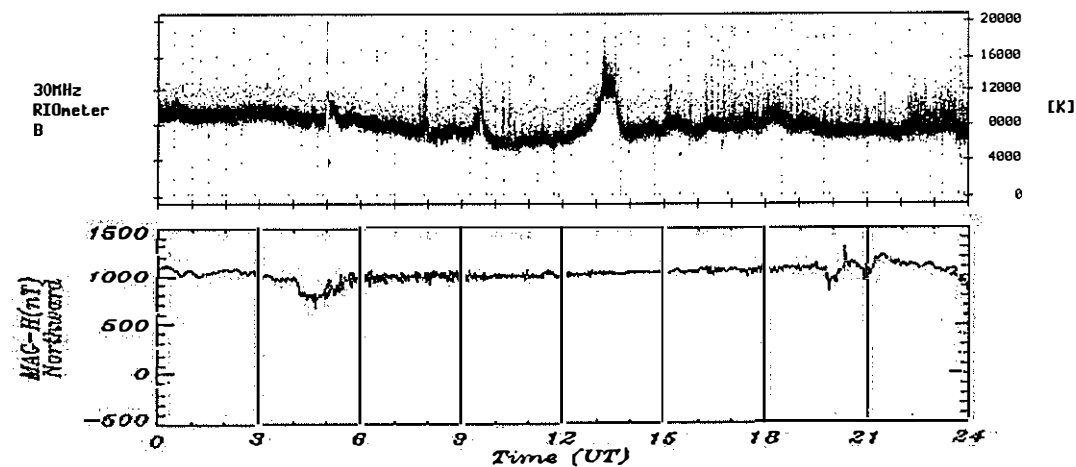
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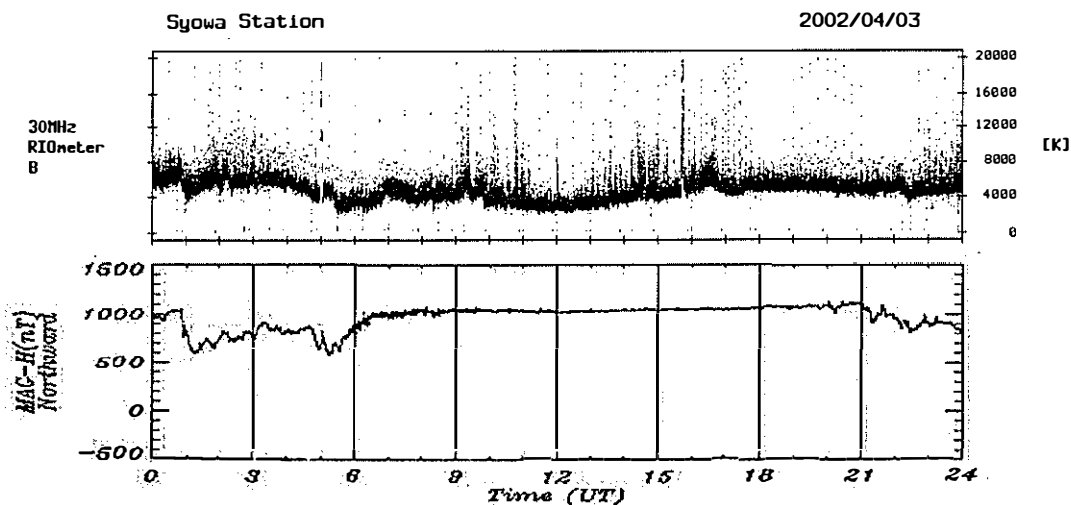
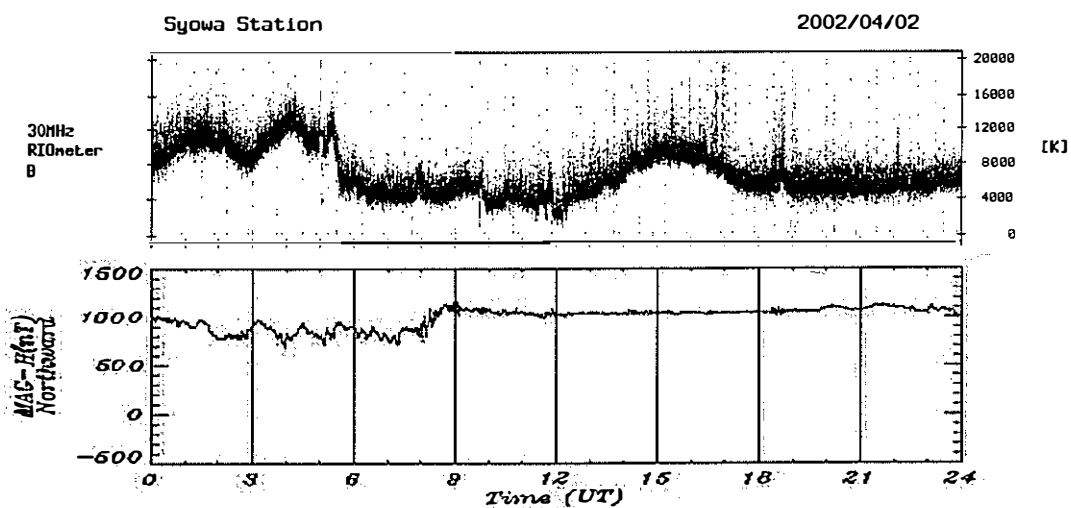
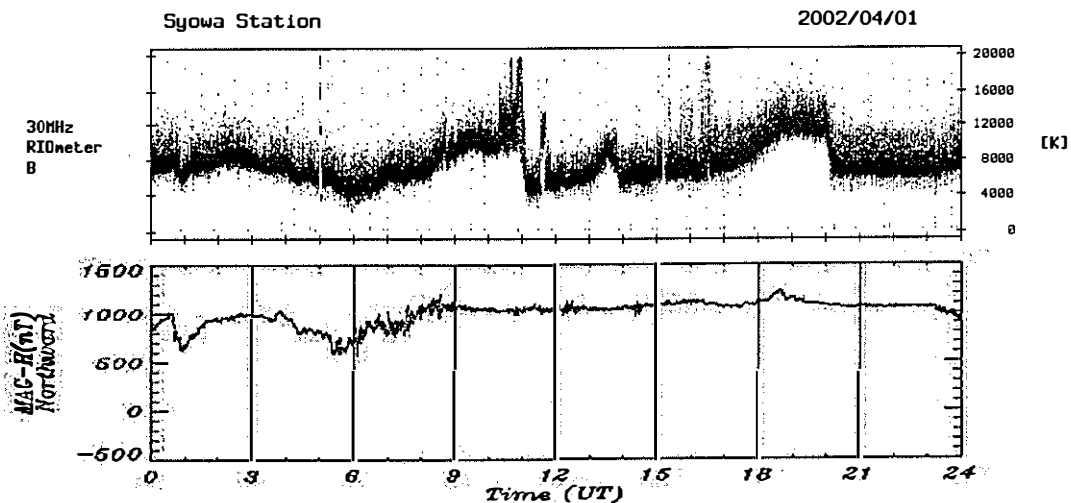
2002/03/30



Syowa Station

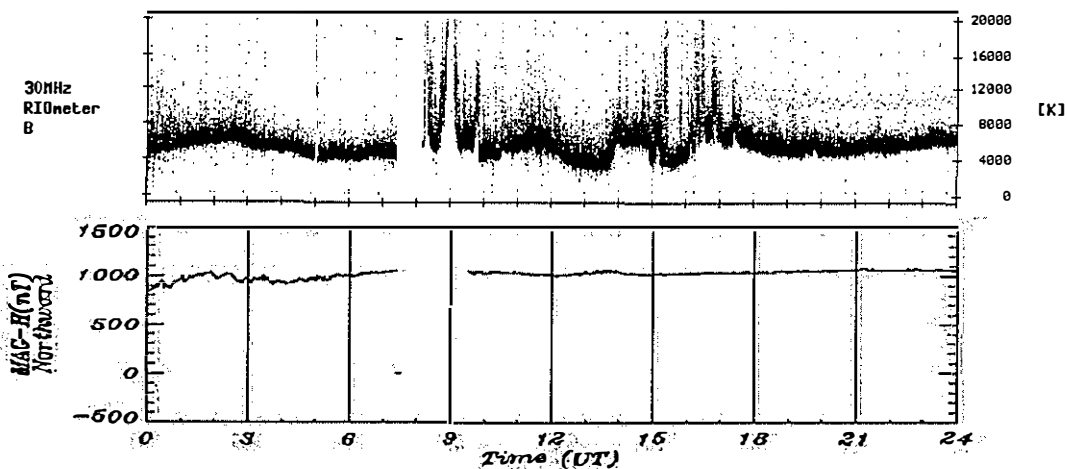
2002/03/31





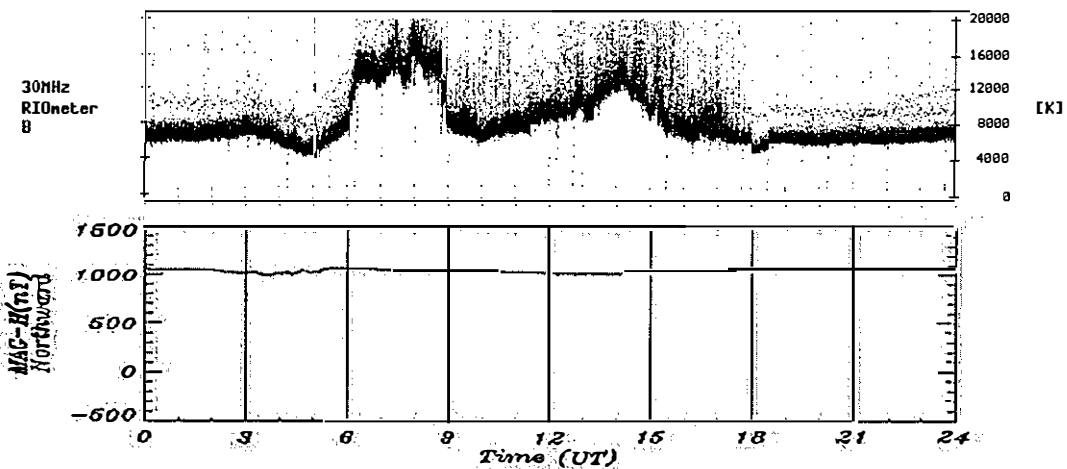
Syowa Station

2002/04/04



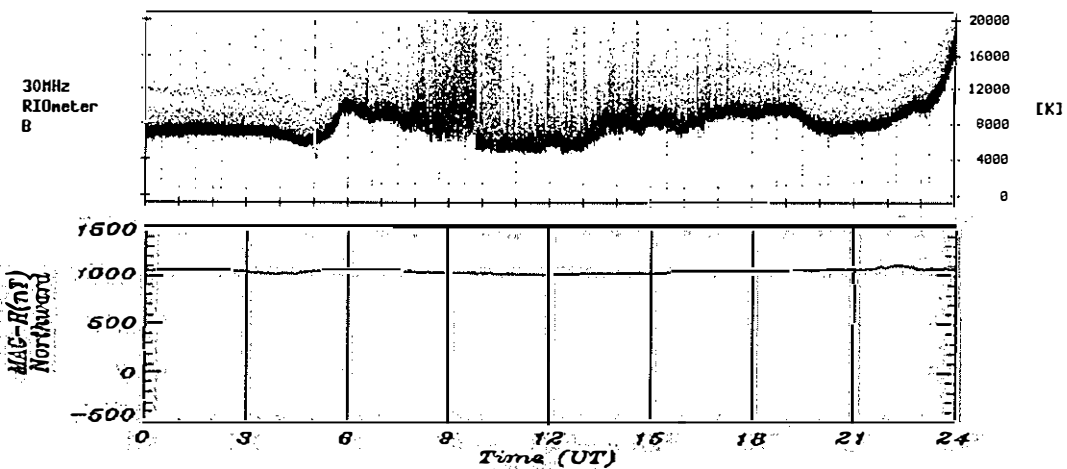
Syowa Station

2002/04/05



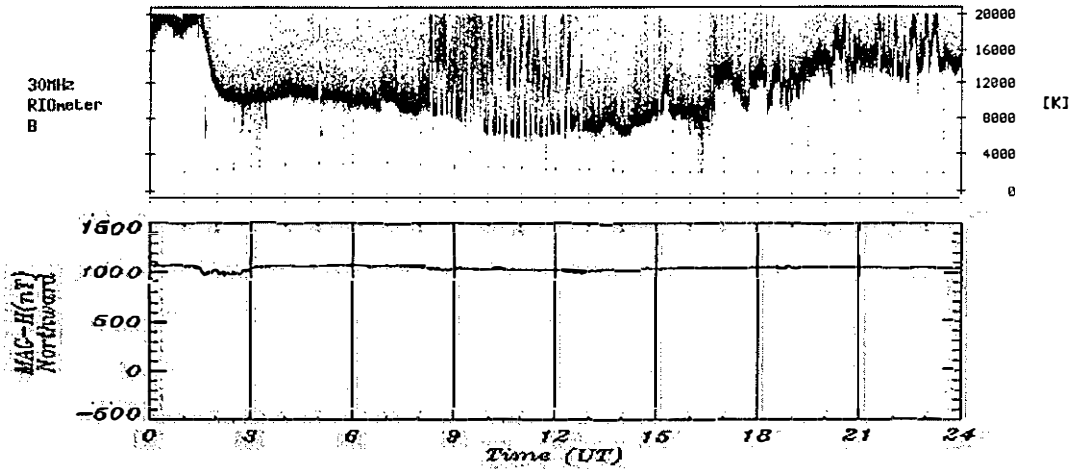
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2002/04/06



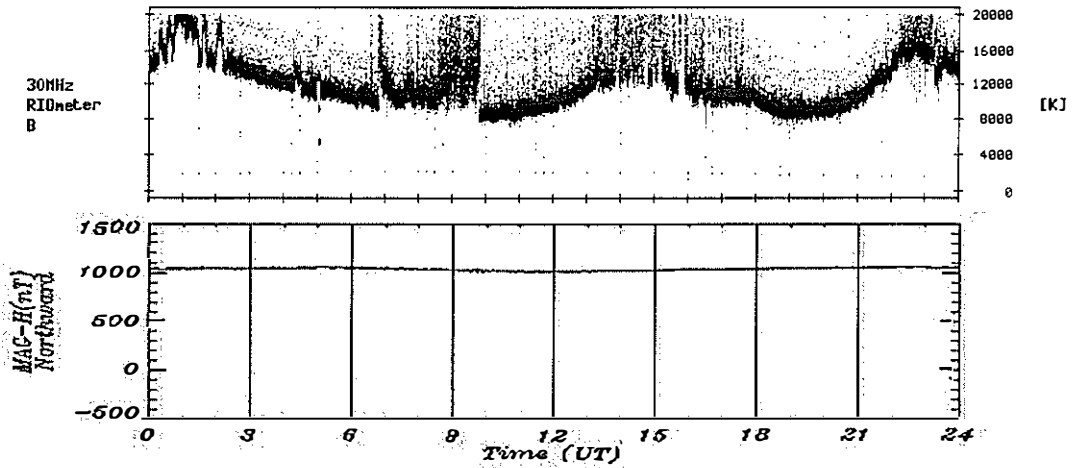
Syowa Station

2002/04/07



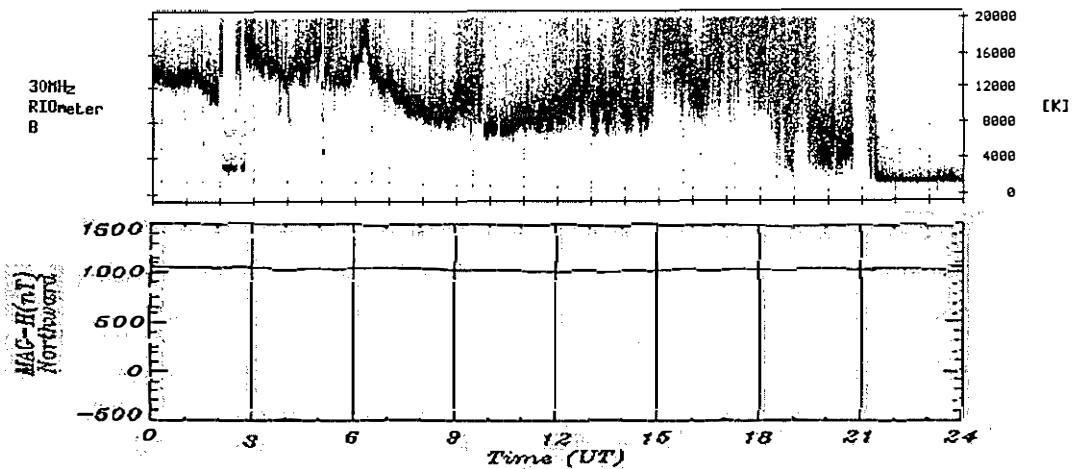
Syowa Station

2002/04/08



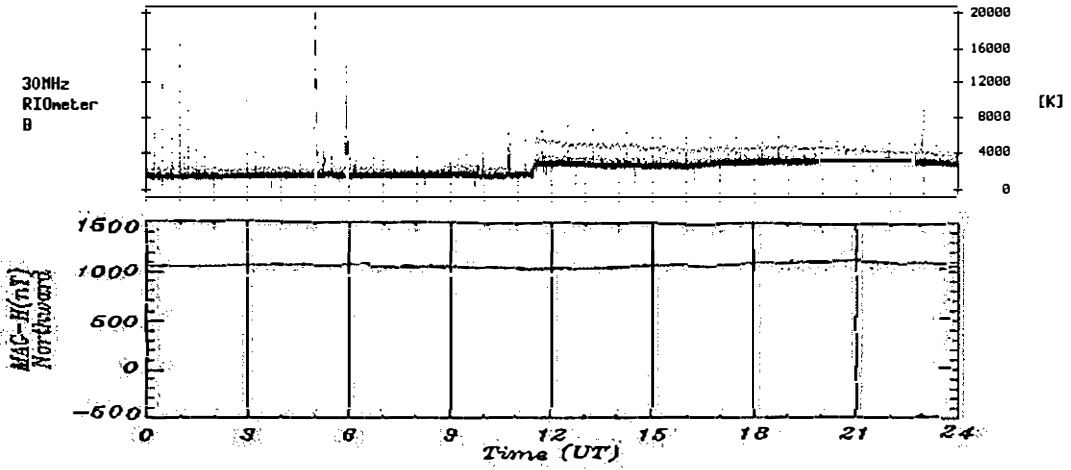
Syowa Station

2002/04/09



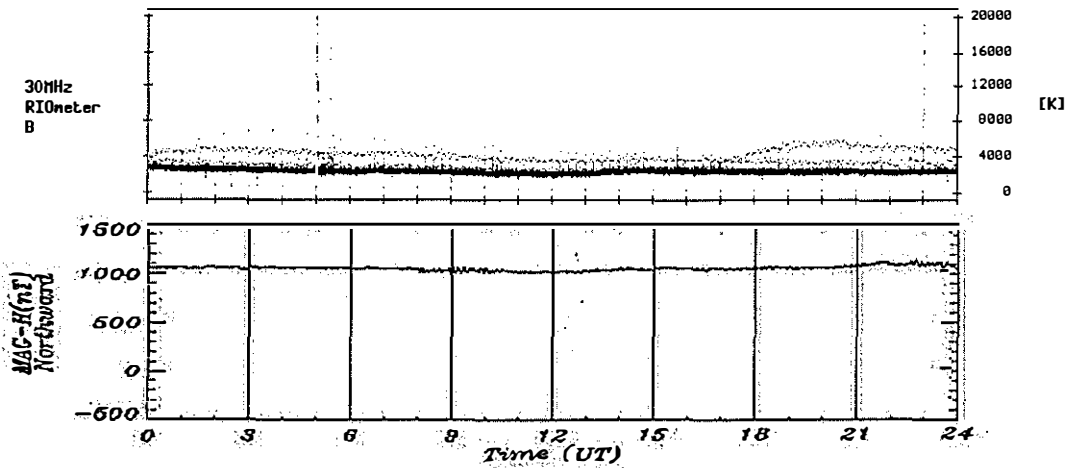
Syowa Station

2002/04/10



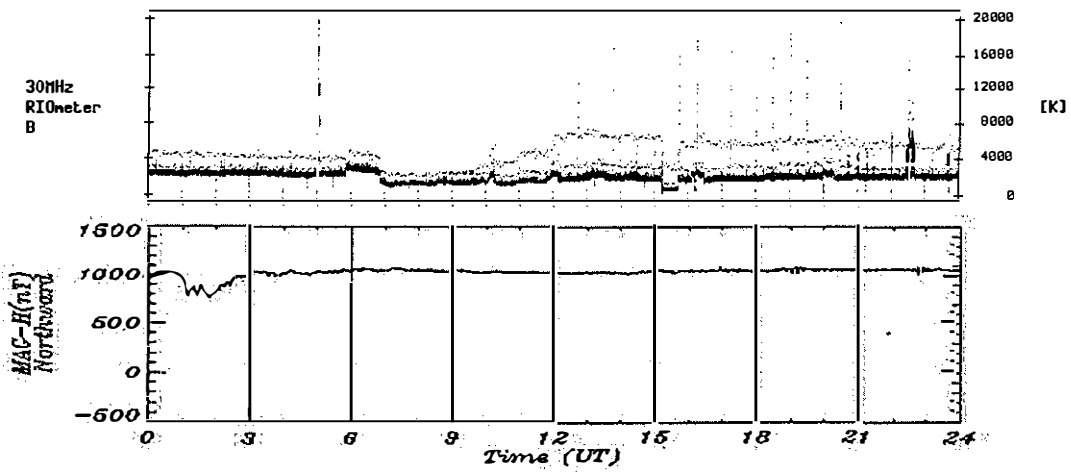
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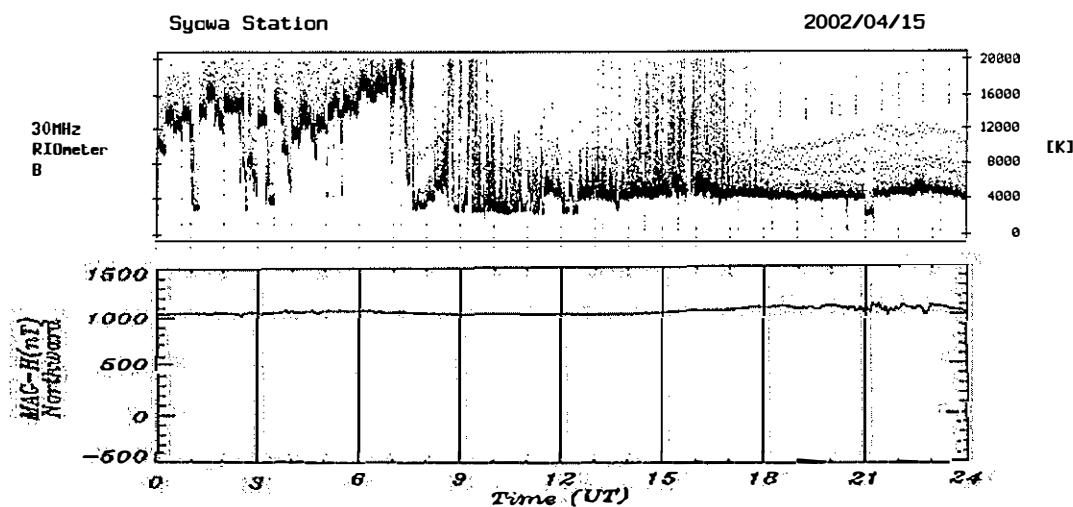
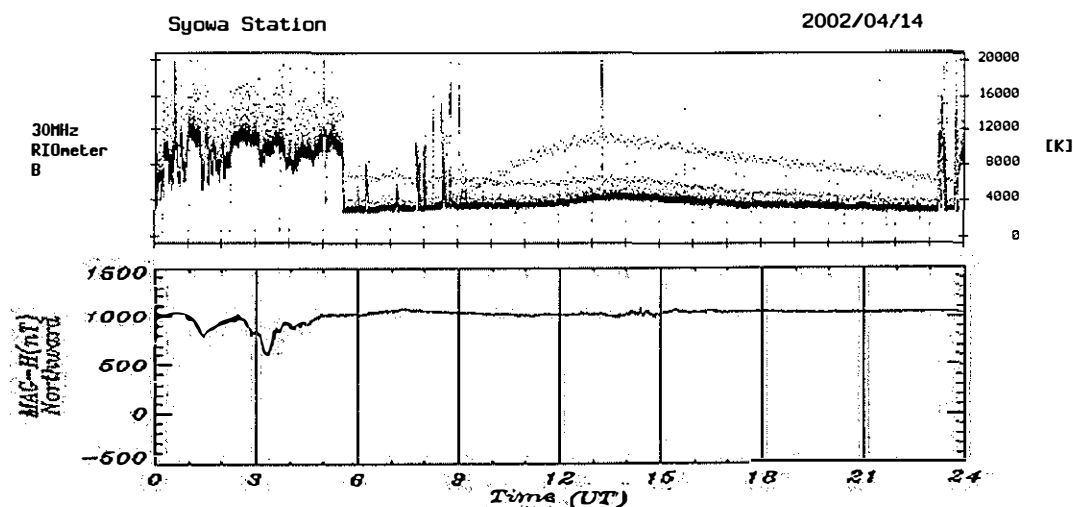
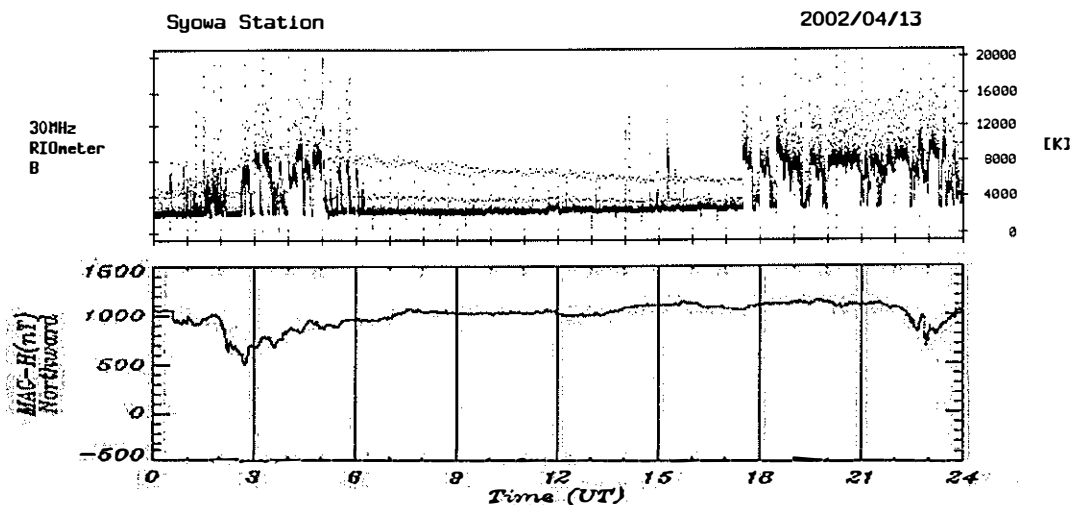
2002/04/11



Syowa Station

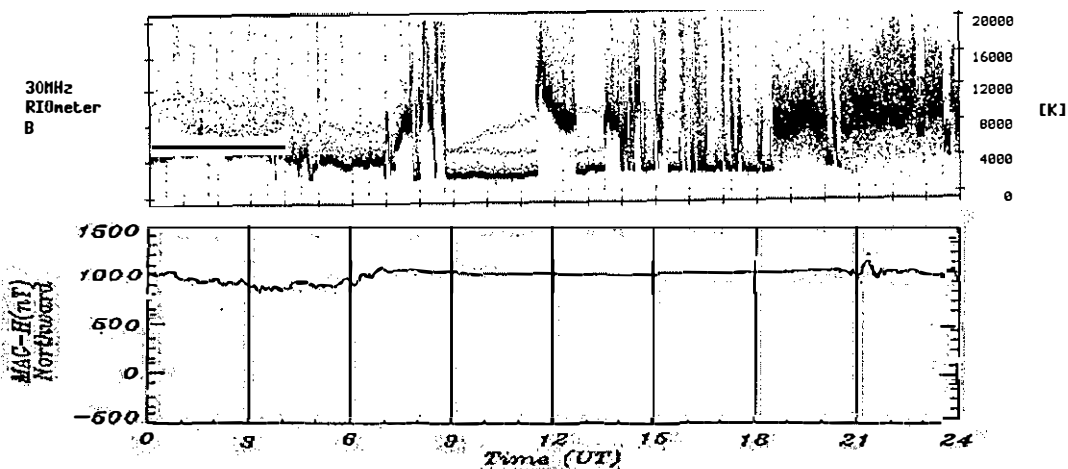
2002/04/12





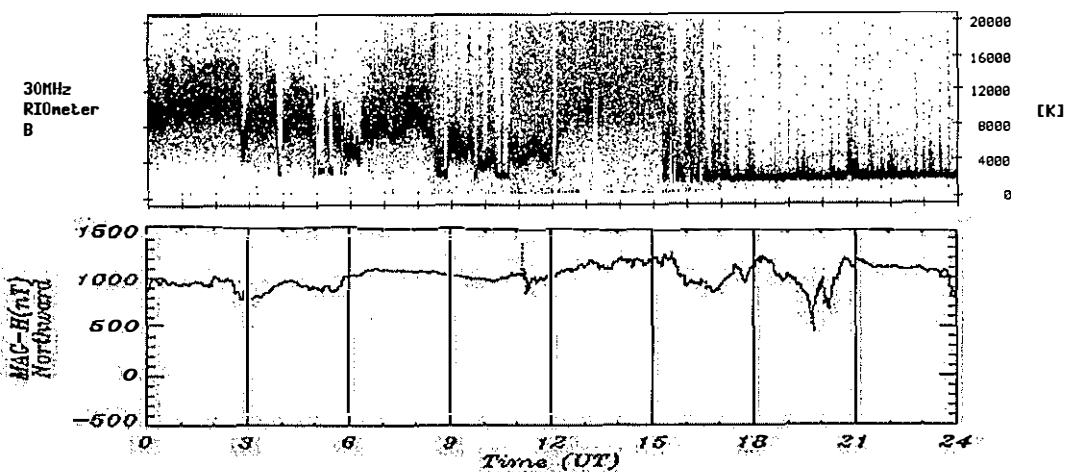
Syowa Station

2002/04/16



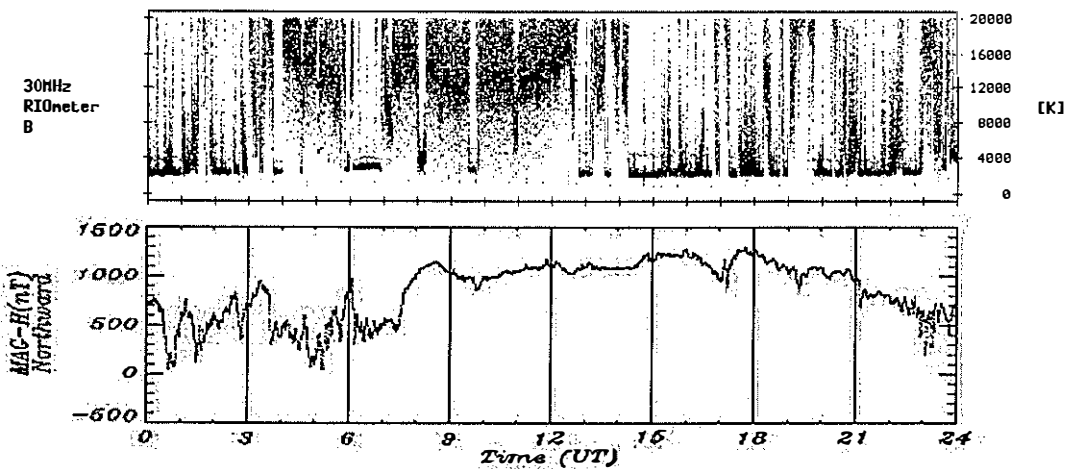
Syowa Station

2002/04/17



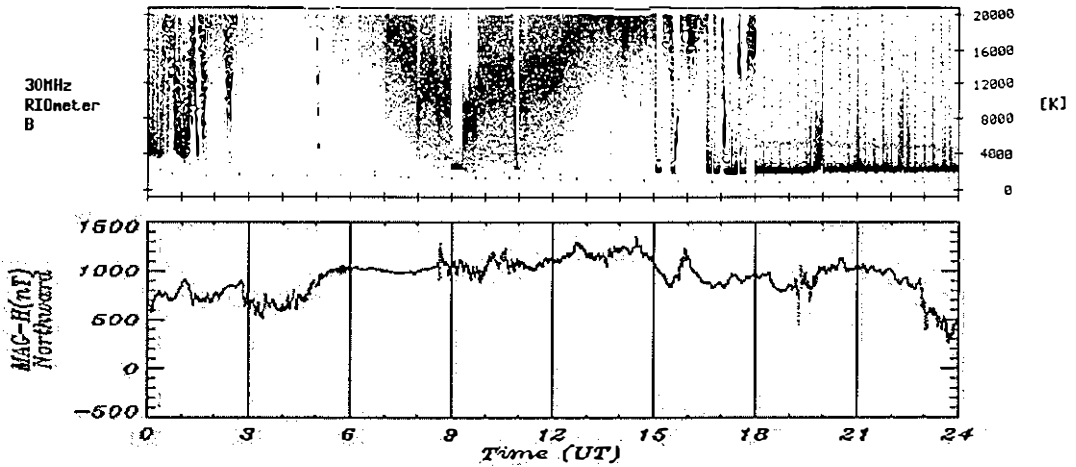
Syowa Station

2002/04/18



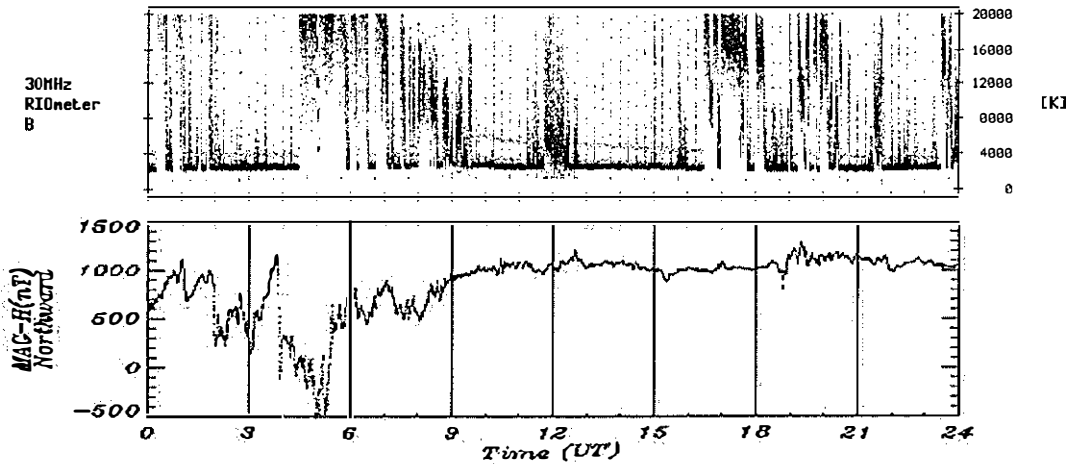
Syowa Station

2002/04/19



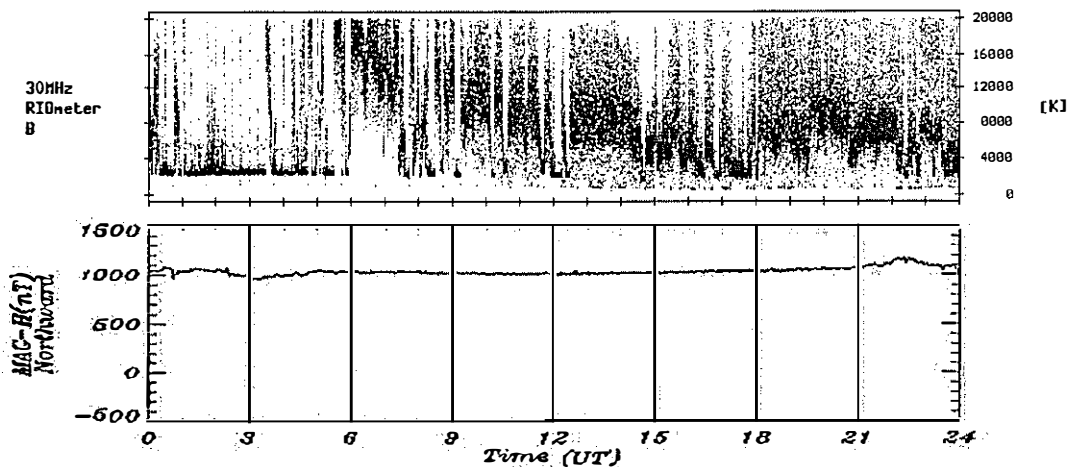
Syowa Station

2002/04/20



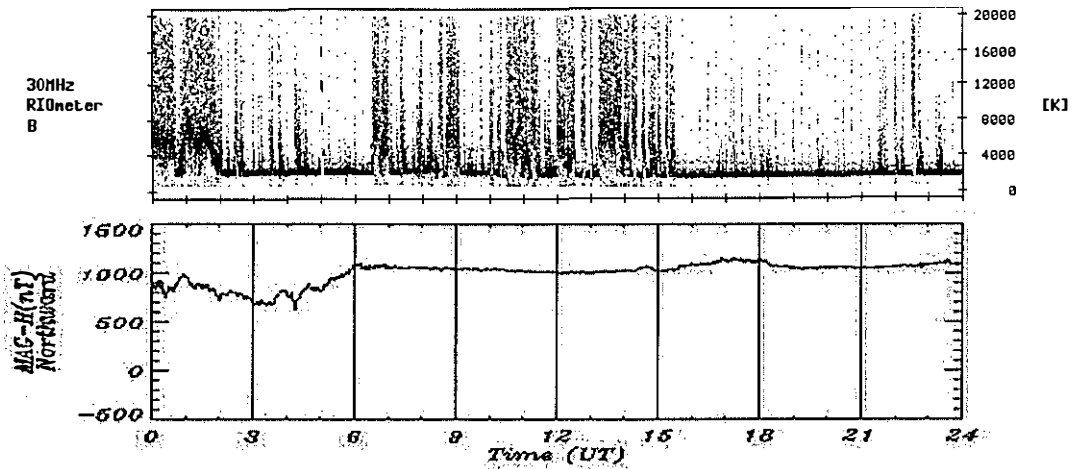
Syowa Station

2002/04/21



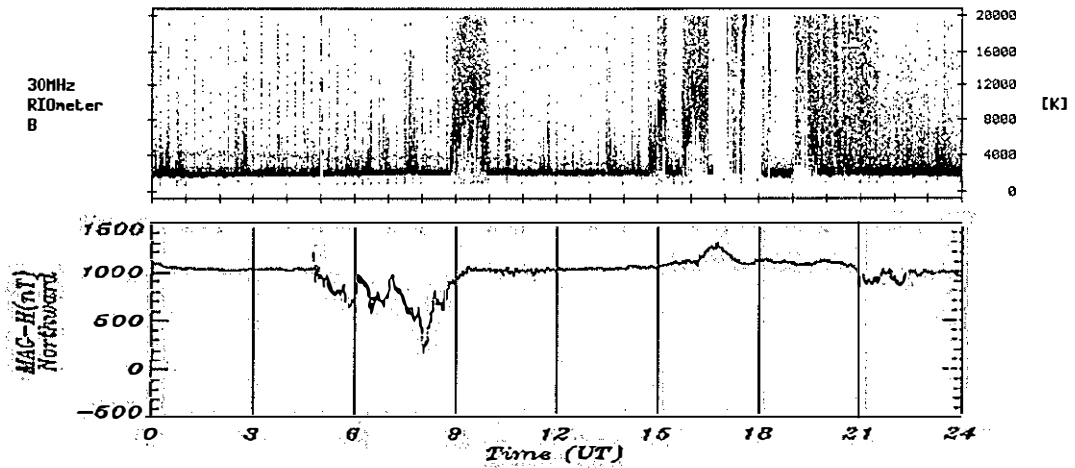
Syowa Station

2002/04/22



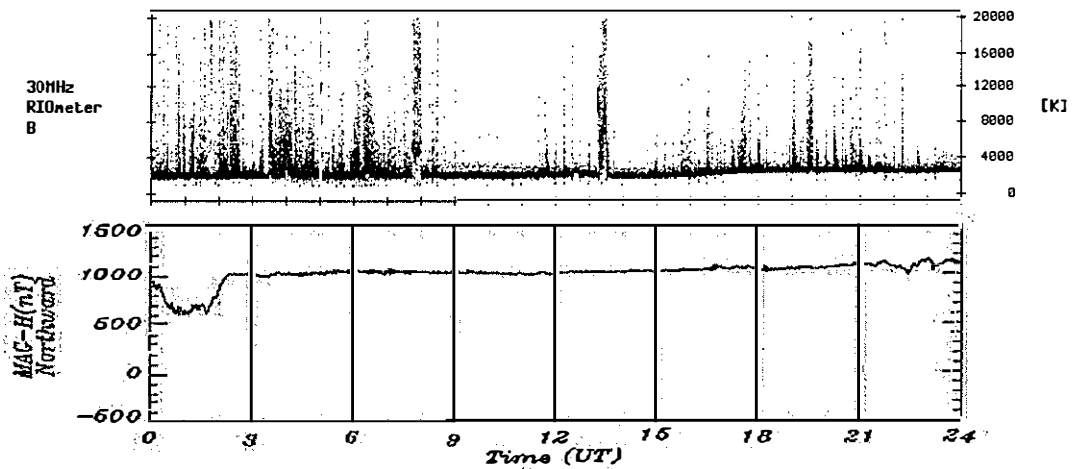
Syowa Station

2002/04/23



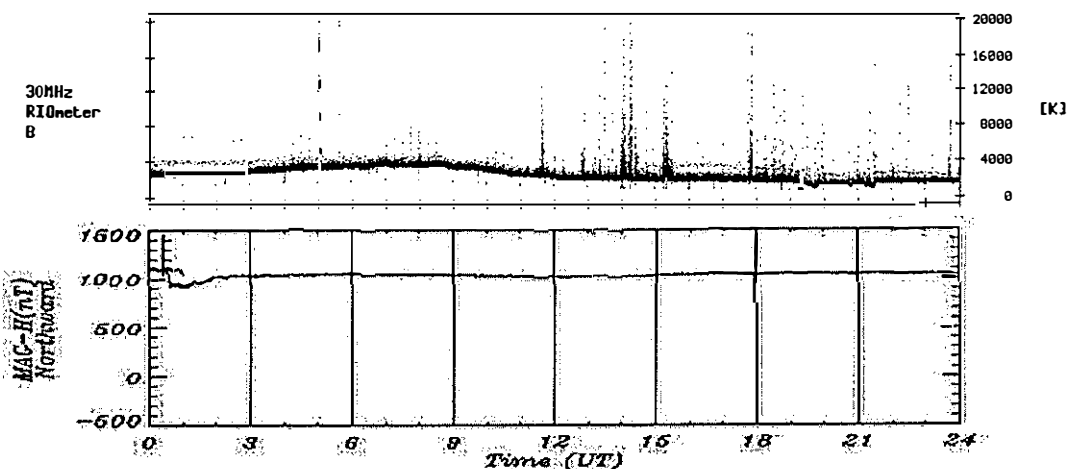
Syowa Station

2002/04/24



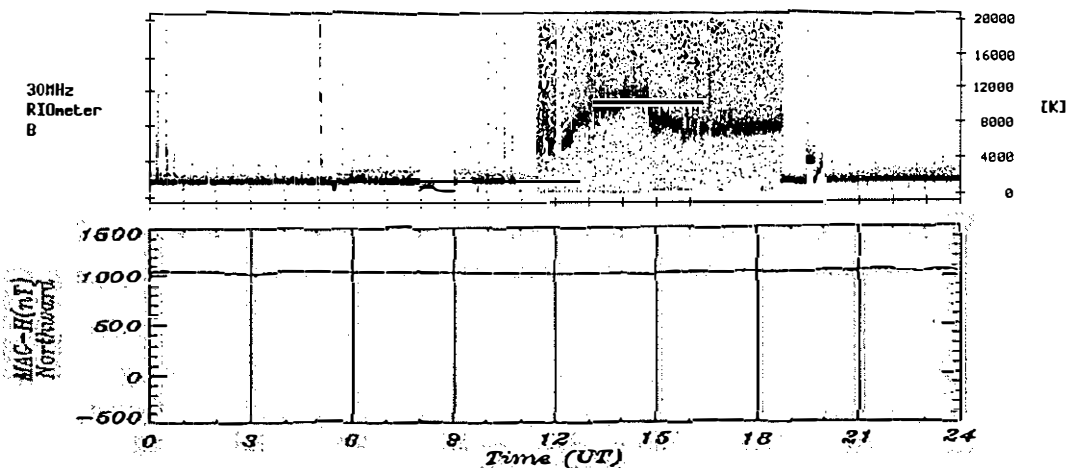
Syowa Station

2002/04/25



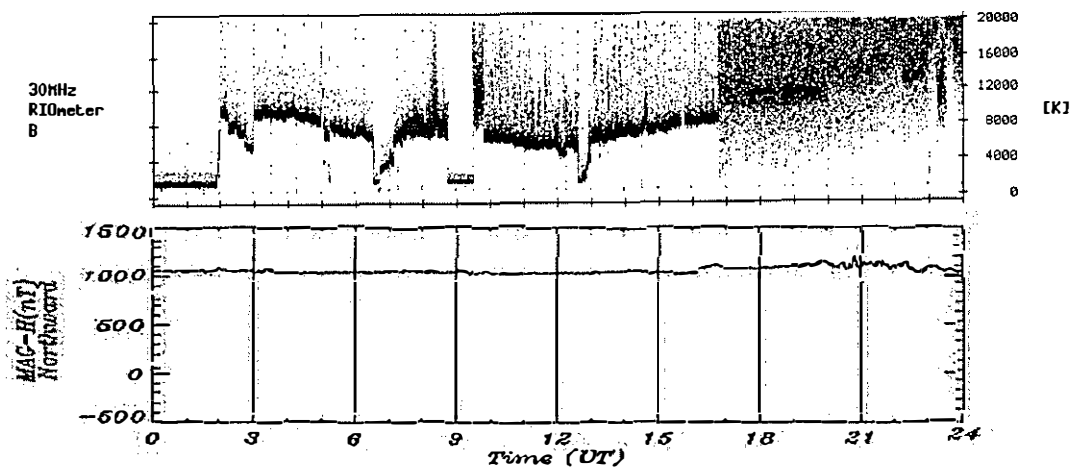
Syowa Station

2002/04/26



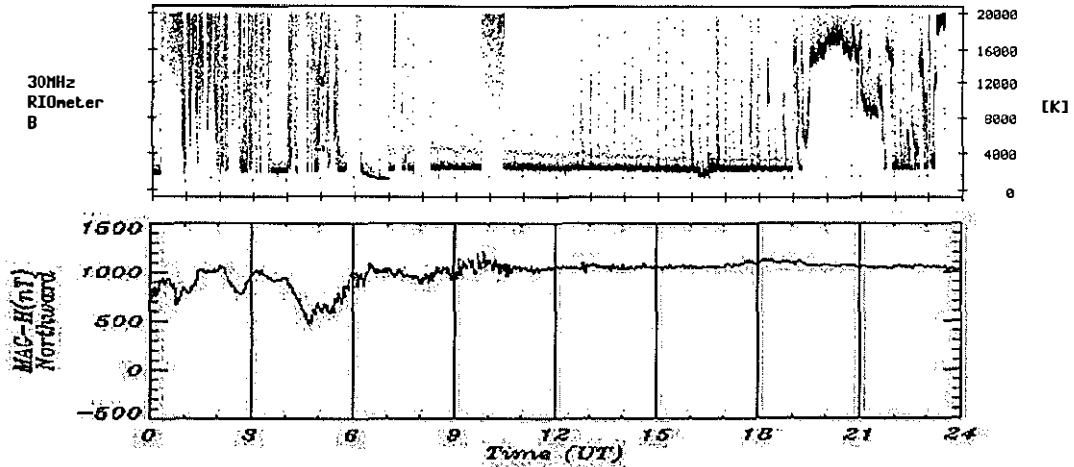
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2002/04/27



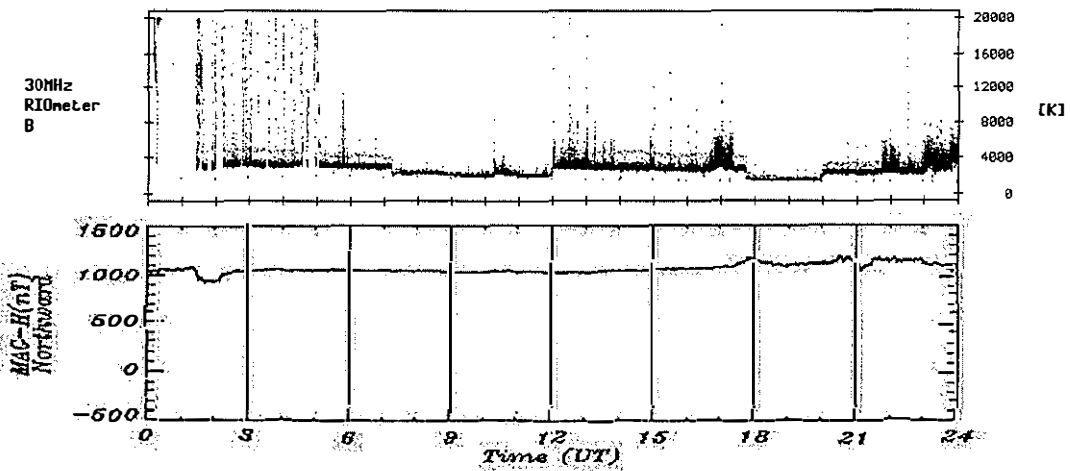
Syowa Station

2002/04/28



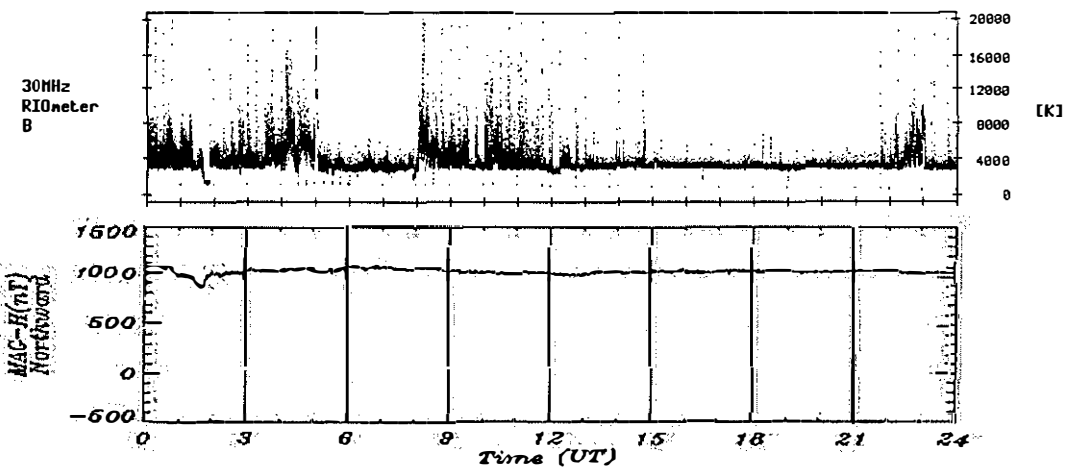
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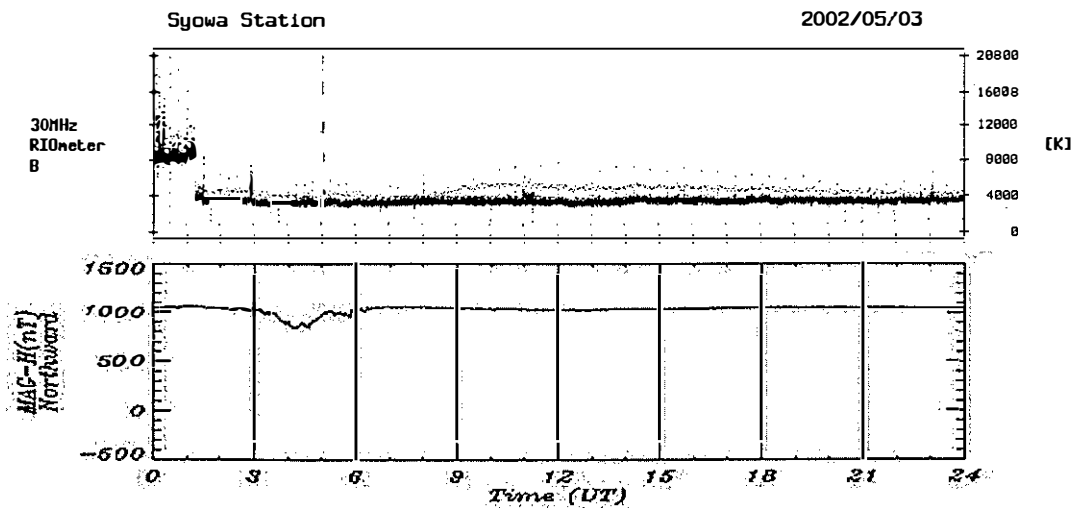
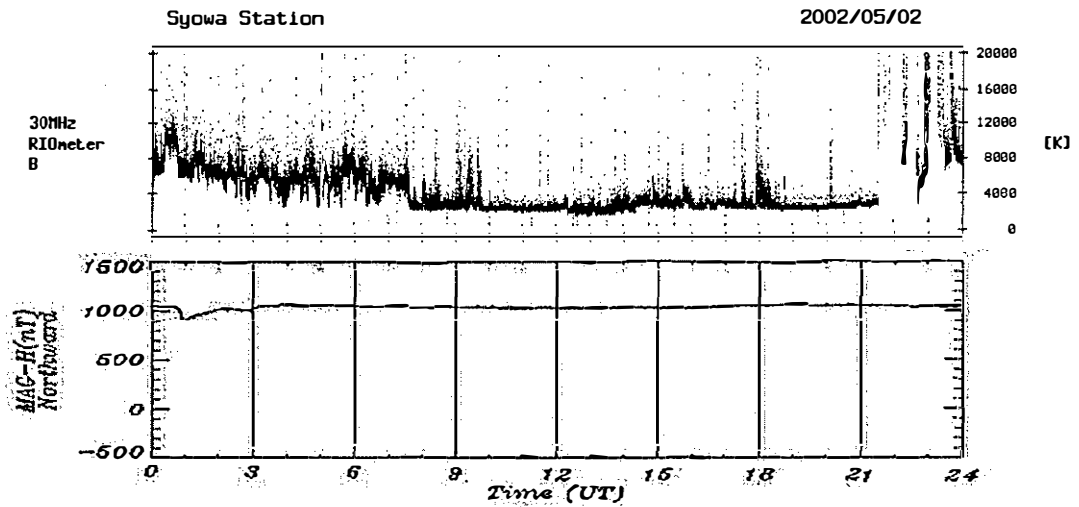
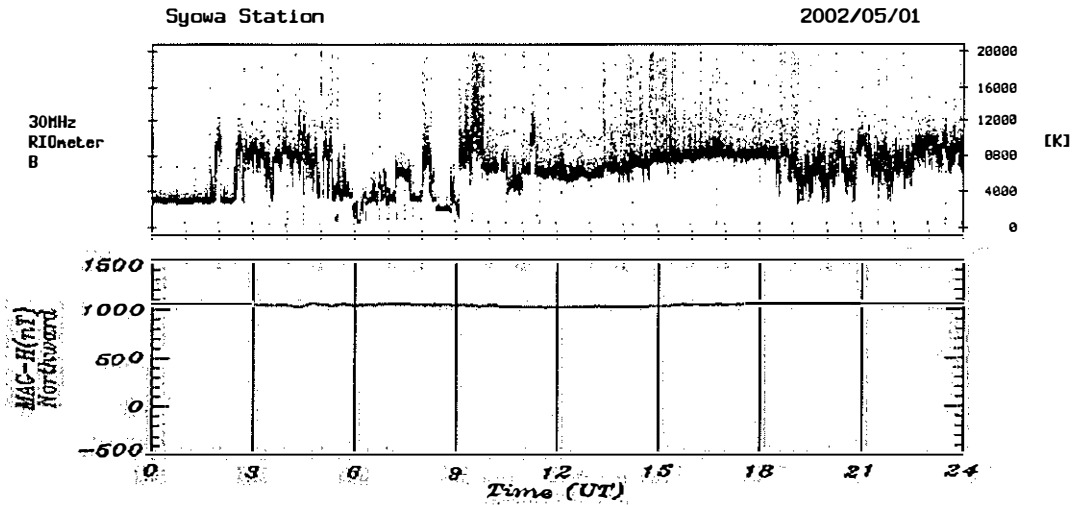
2002/04/29

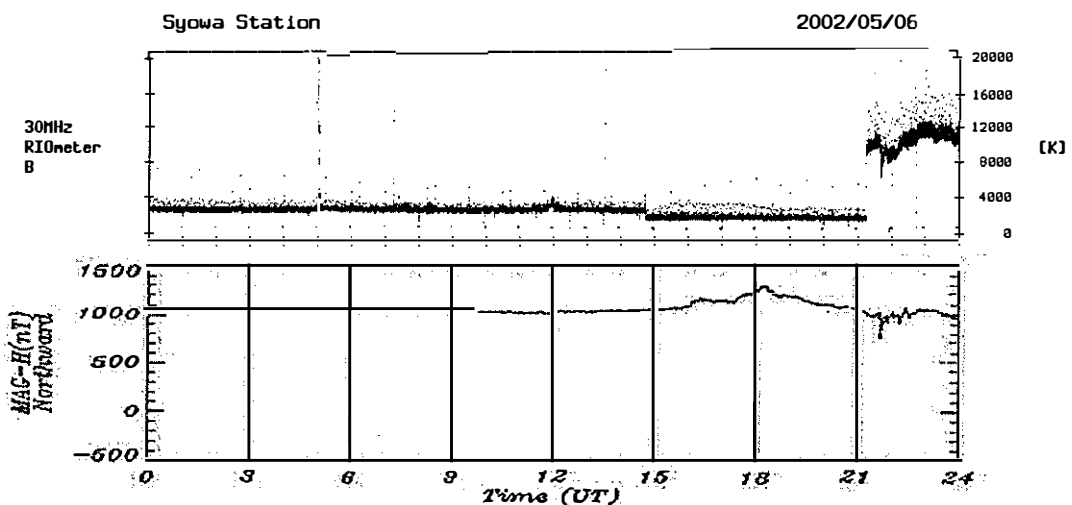
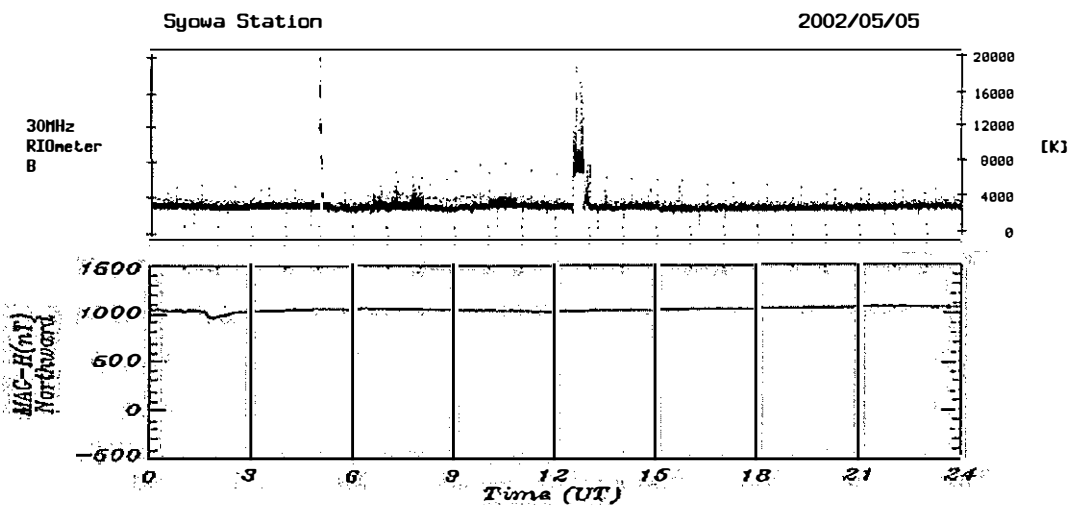
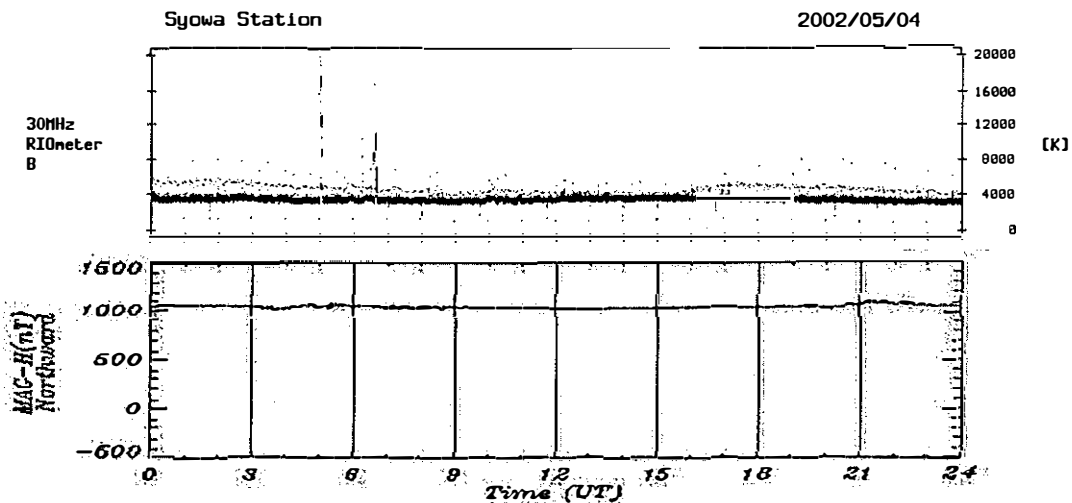


Syowa Station

2002/04/30

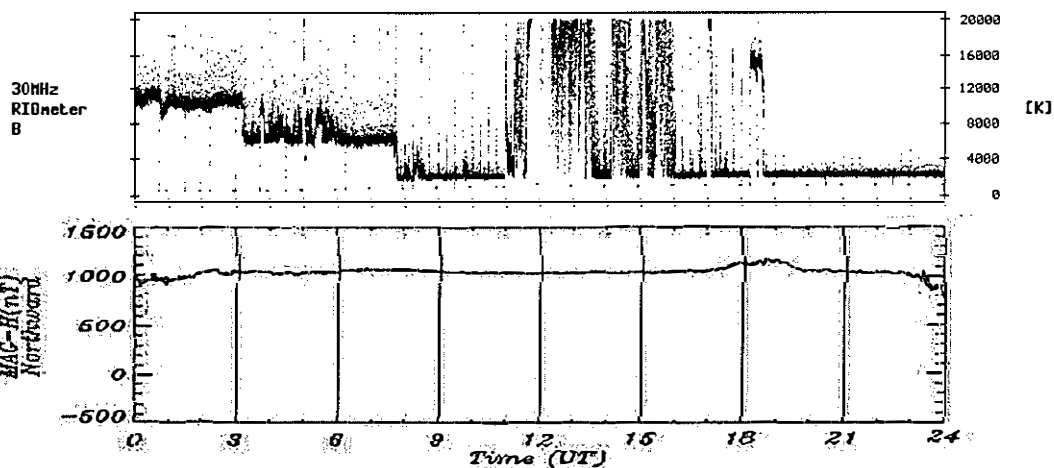






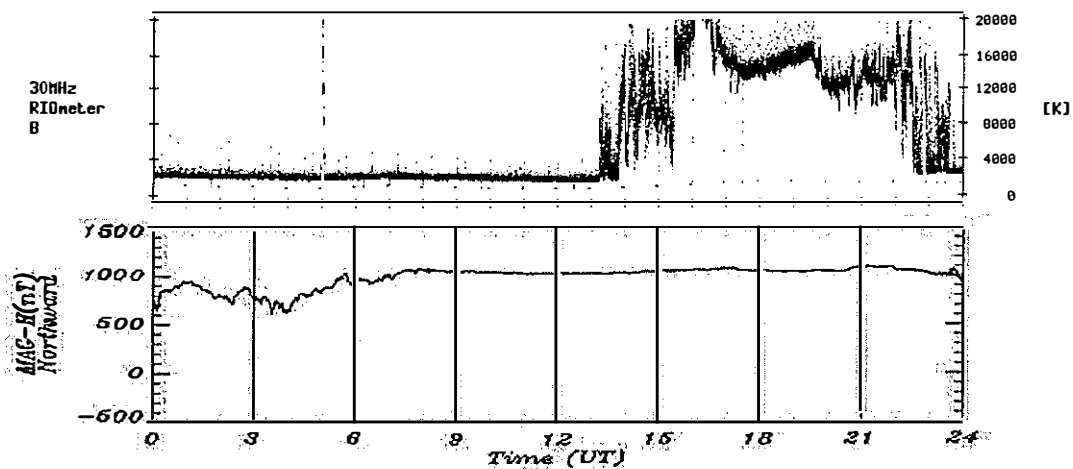
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2002/05/07



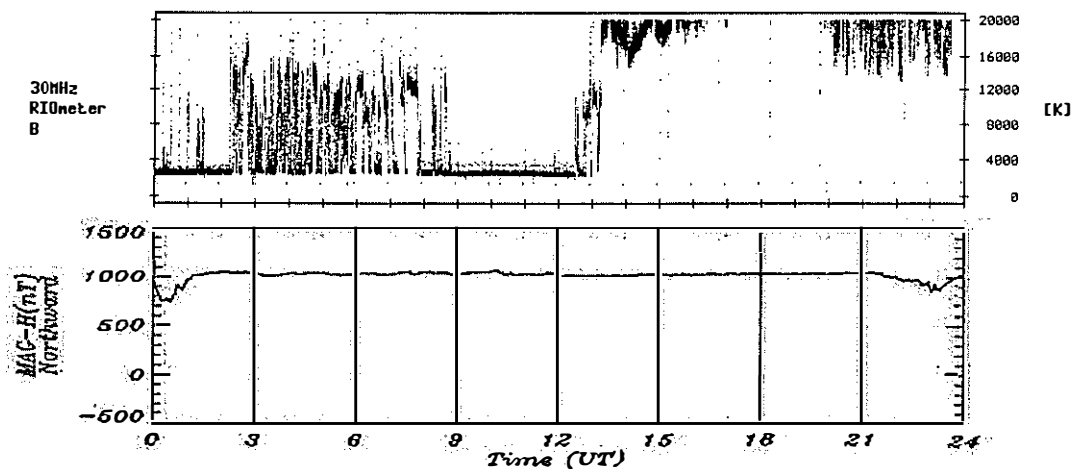
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2002/05/08



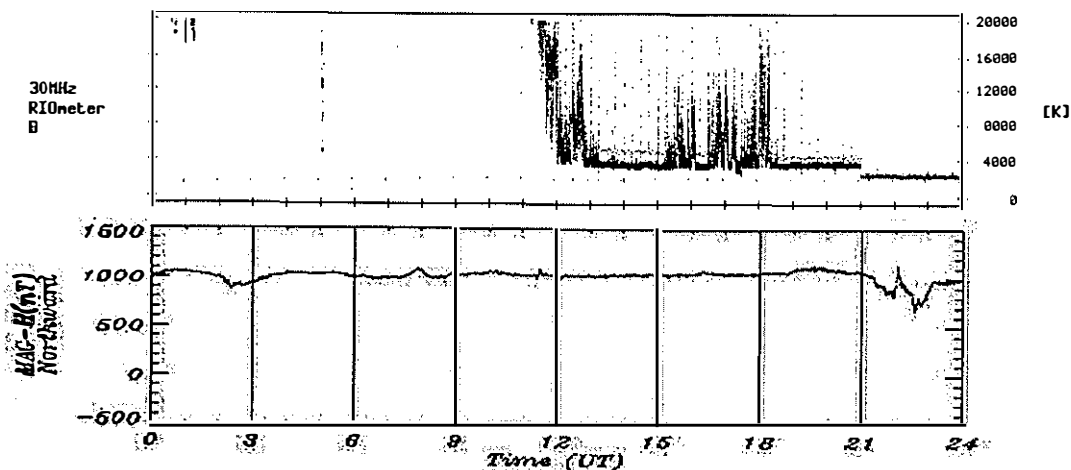
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2002/05/09



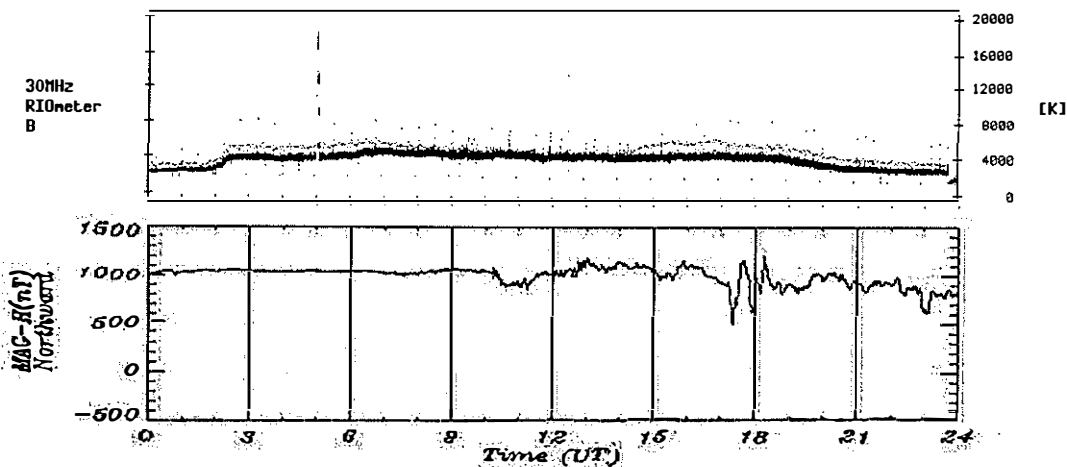
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2002/05/10



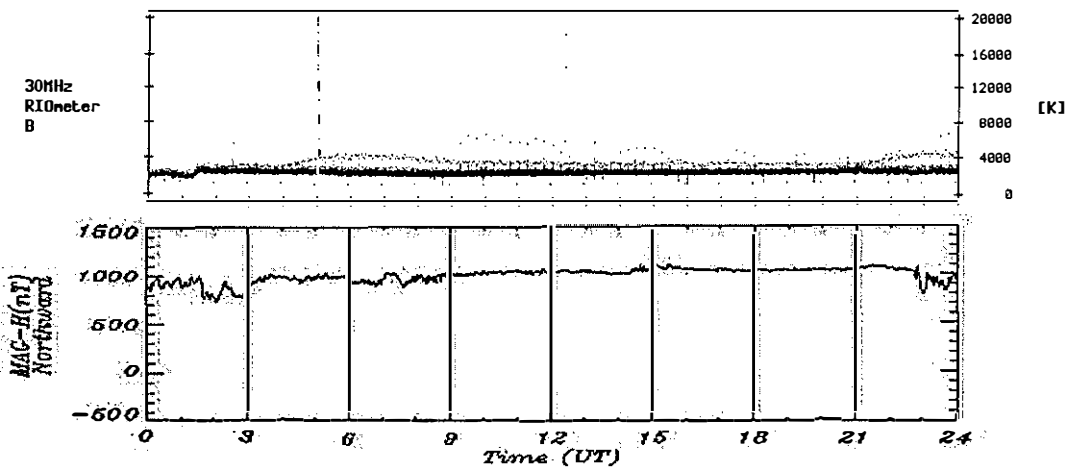
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2002/05/11



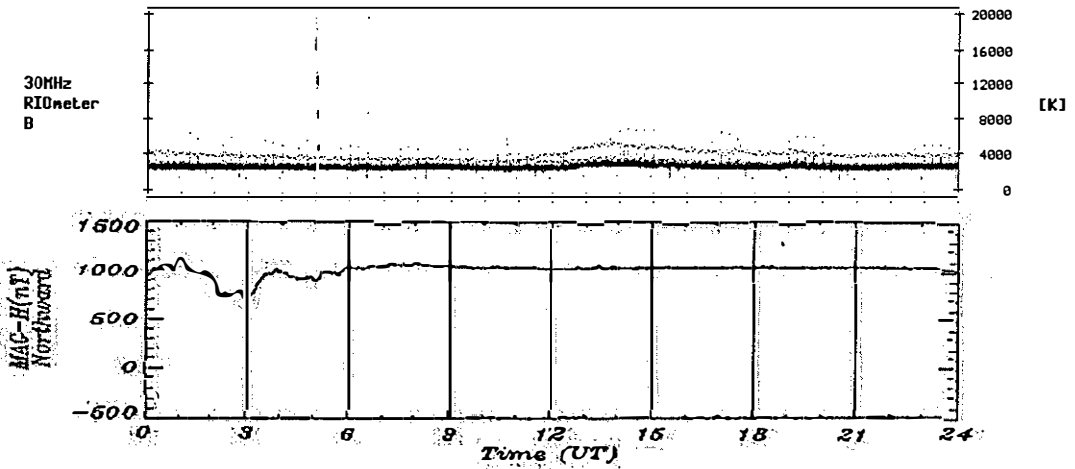
Syowa Station

2002/05/12



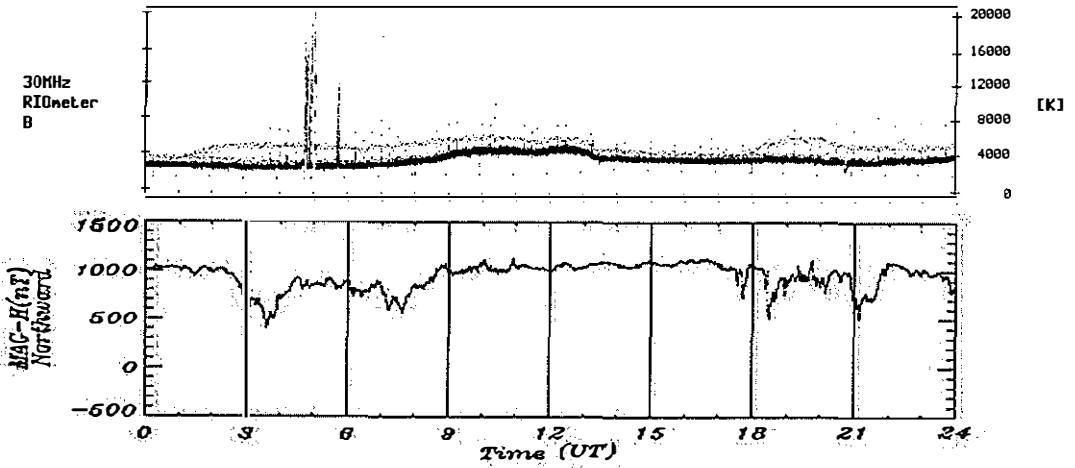
Syowa Station

2002/05/13



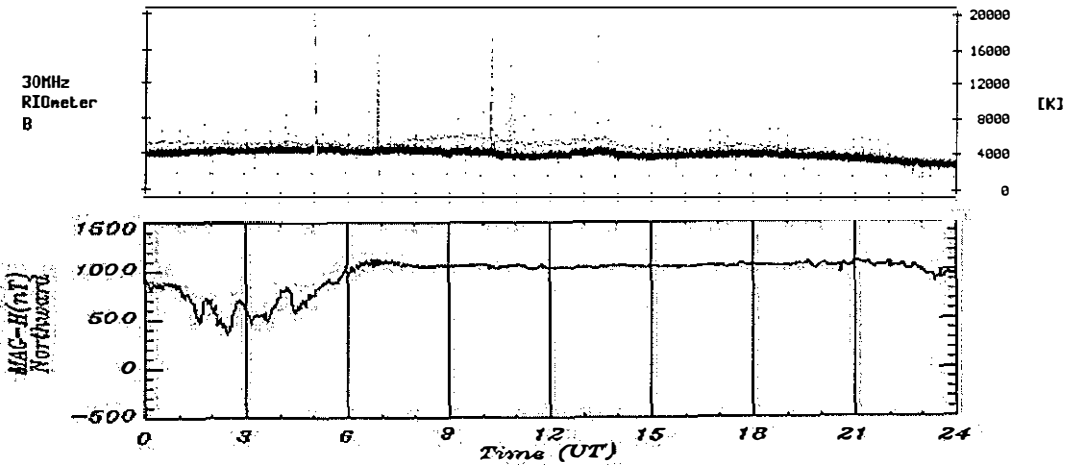
Syowa Station

2002/05/14



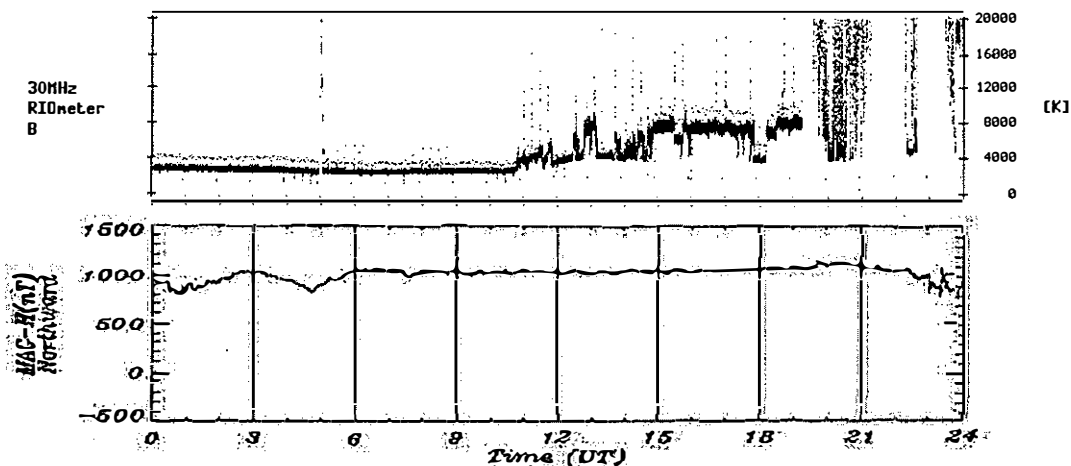
Syowa Station

2002/05/15



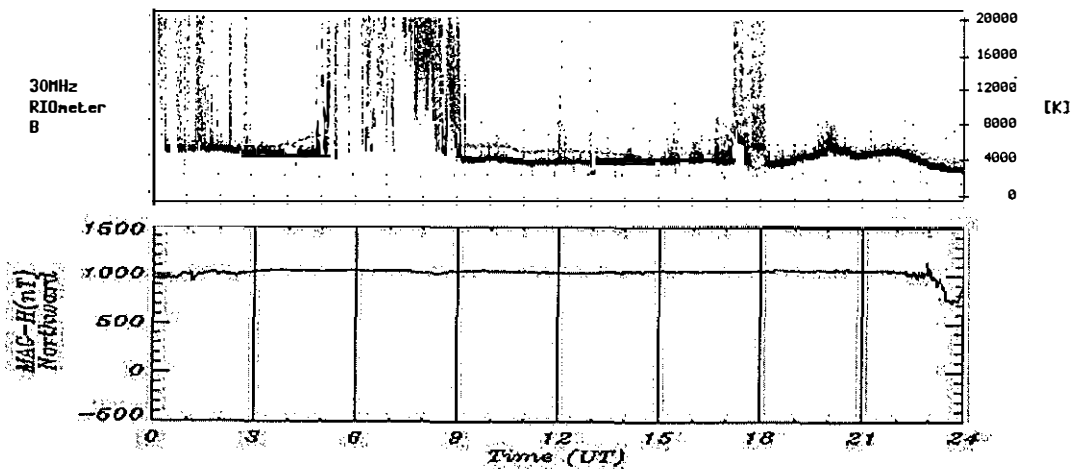
Syowa Station

2002/05/16



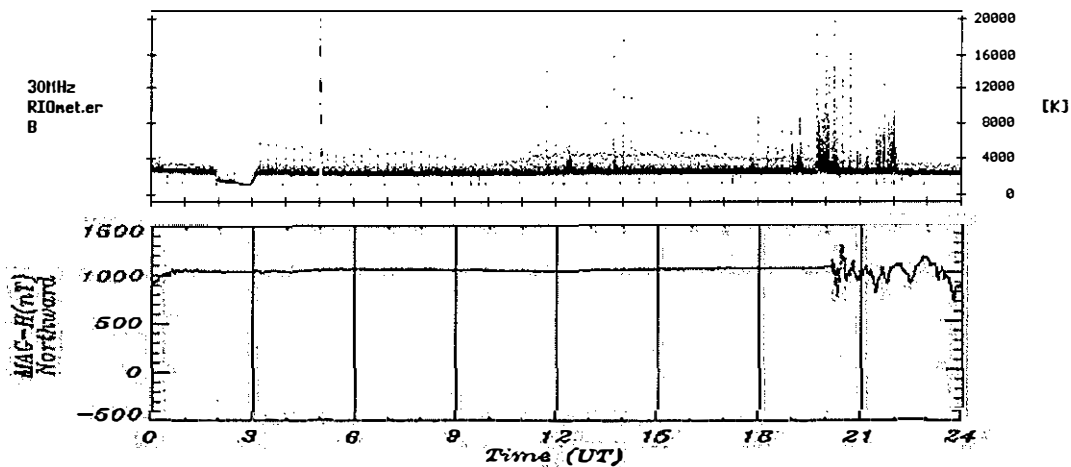
Syowa Station

2002/05/17



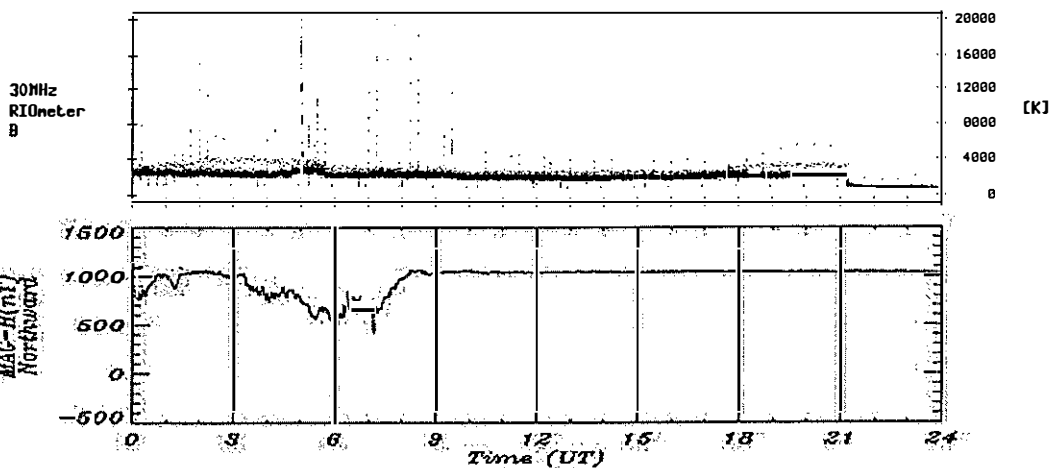
Syowa Station

2002/05/18



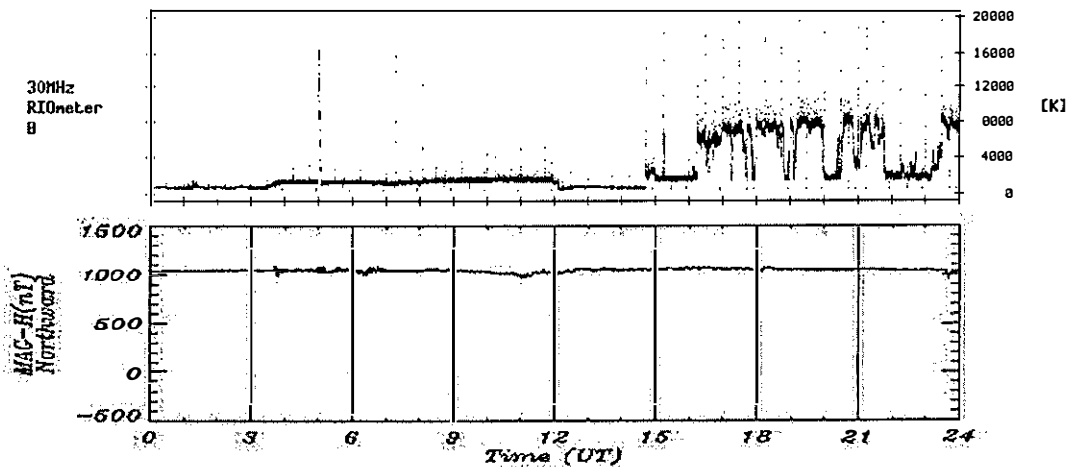
Syowa Station

2002/05/19



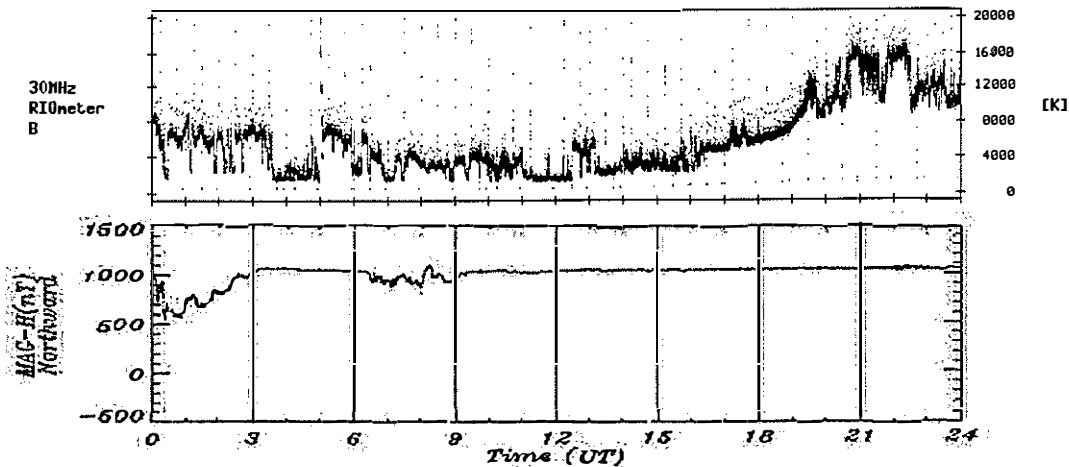
Syowa Station

2002/05/20



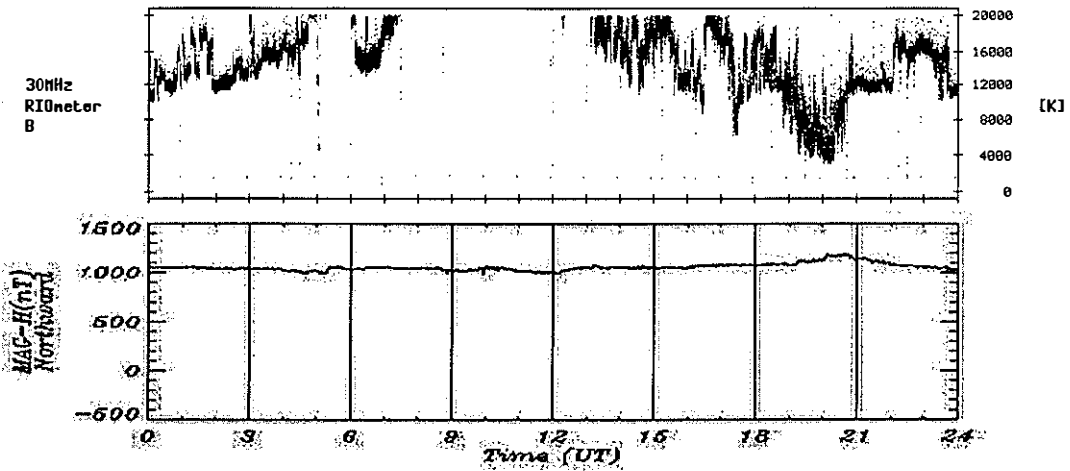
Syowa Station

2002/05/21



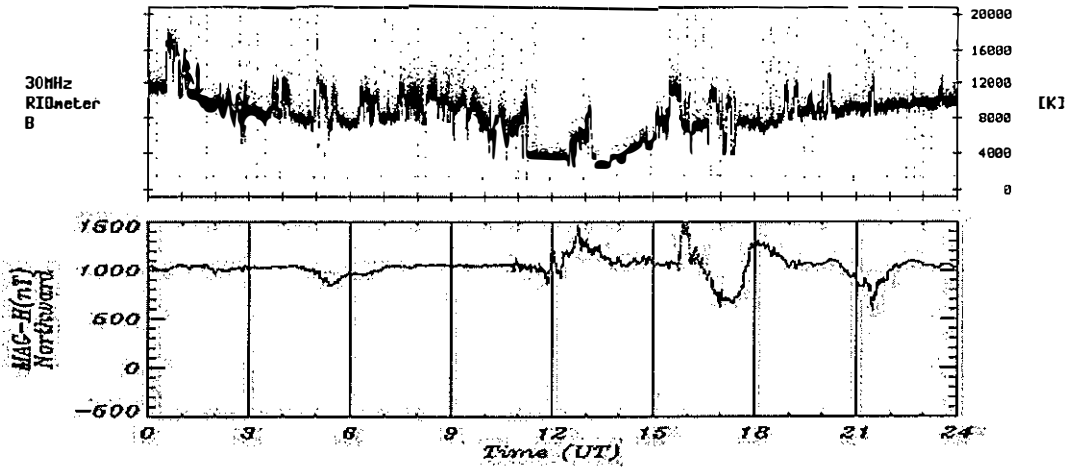
Syowa Station

2002/05/22



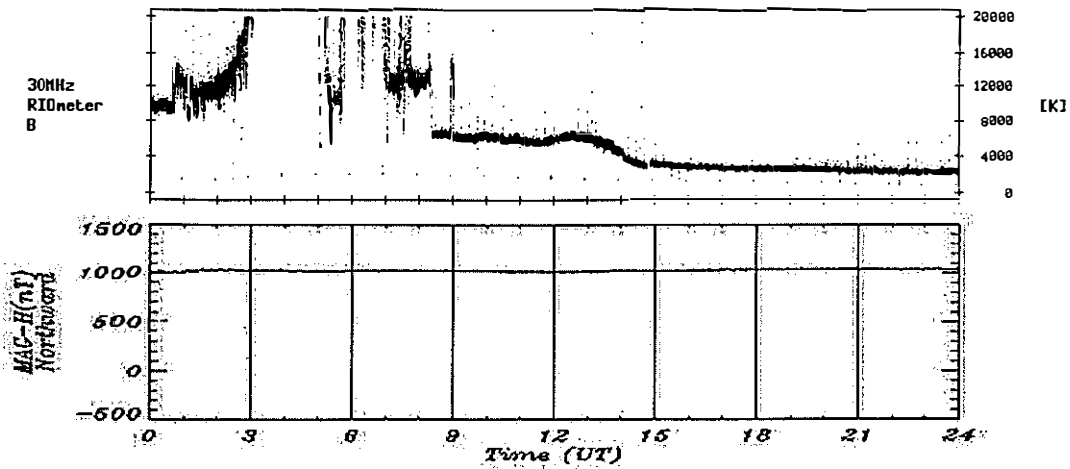
Syowa Station

2002/05/23



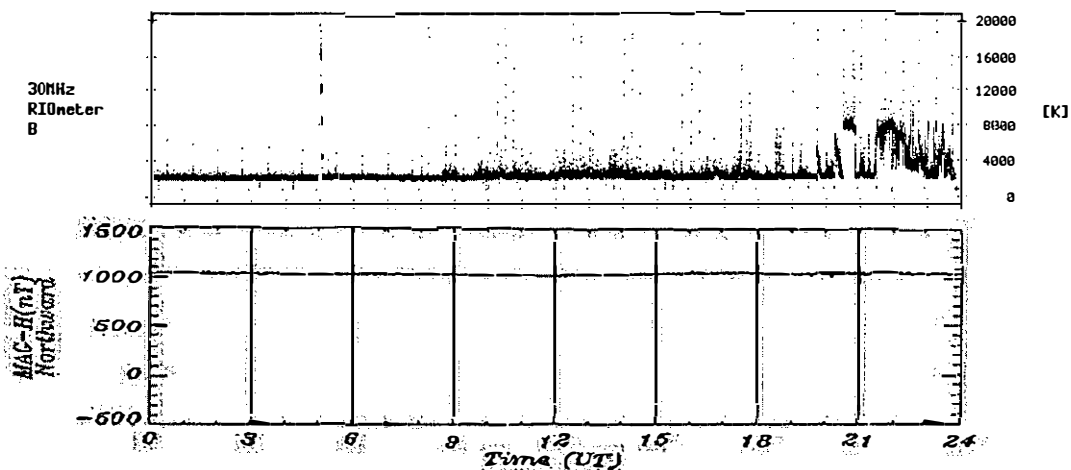
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2002/05/24



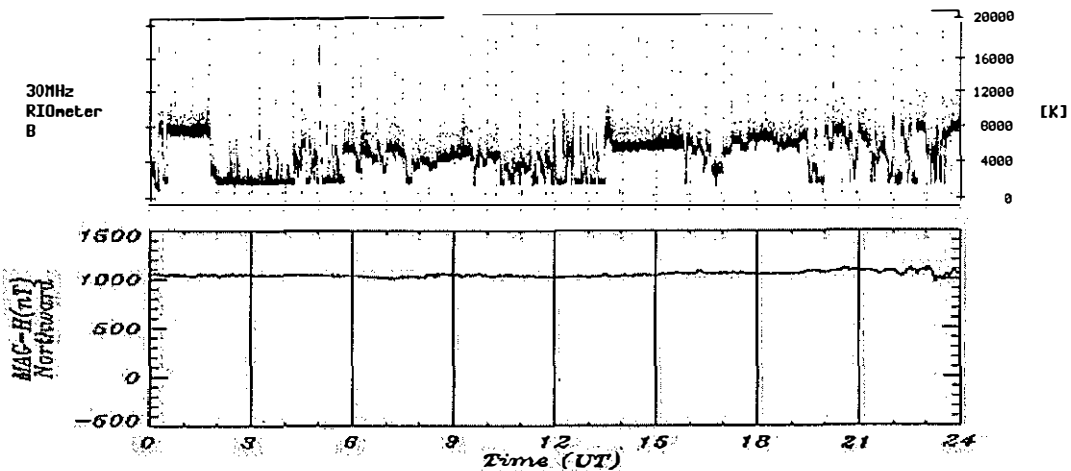
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2002/05/25



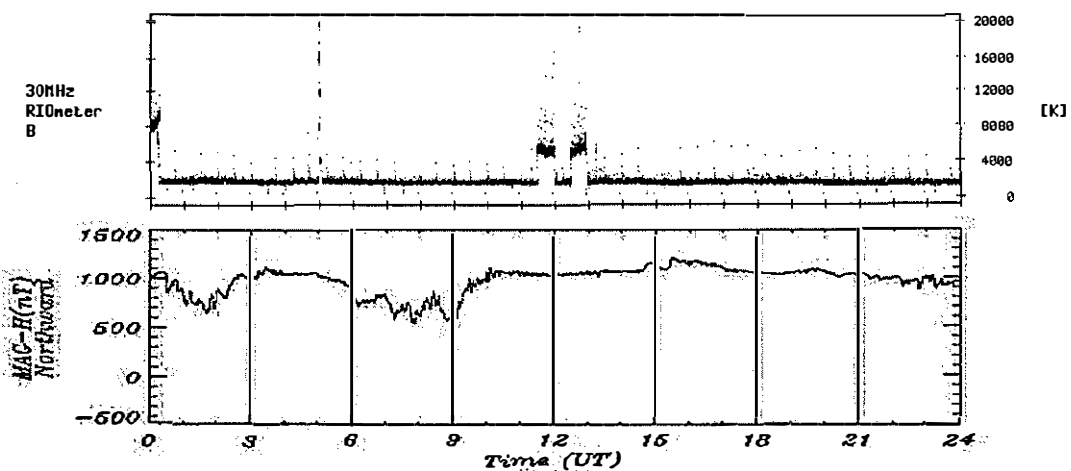
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2002/05/26



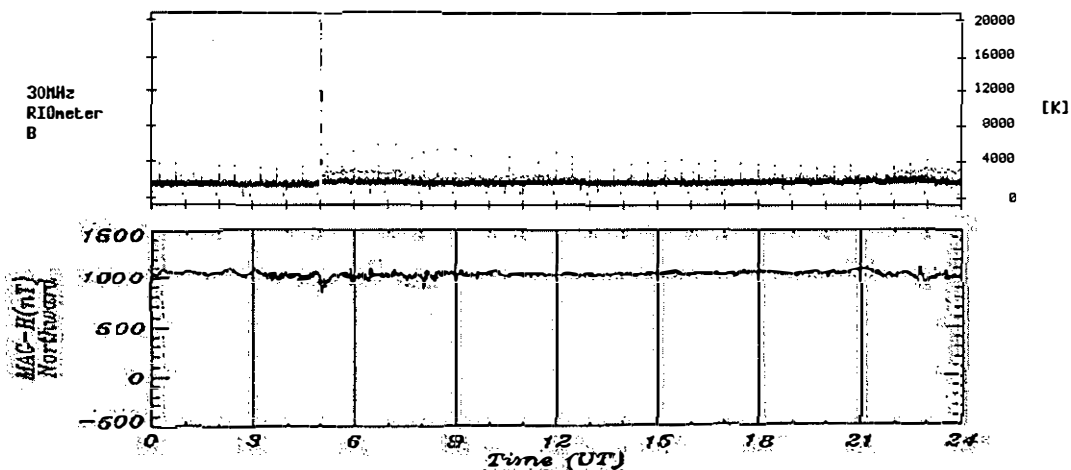
Syowa Station

2002/05/27



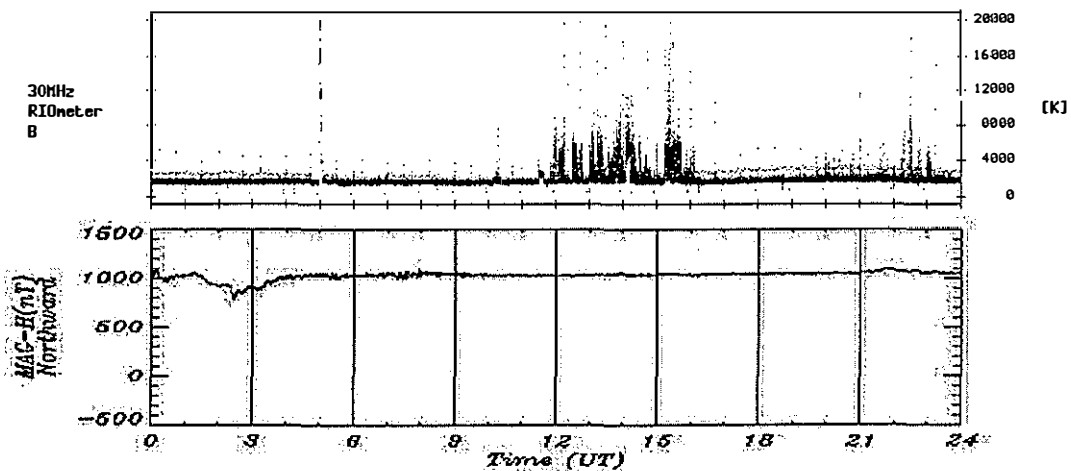
Syowa Station

2002/05/28



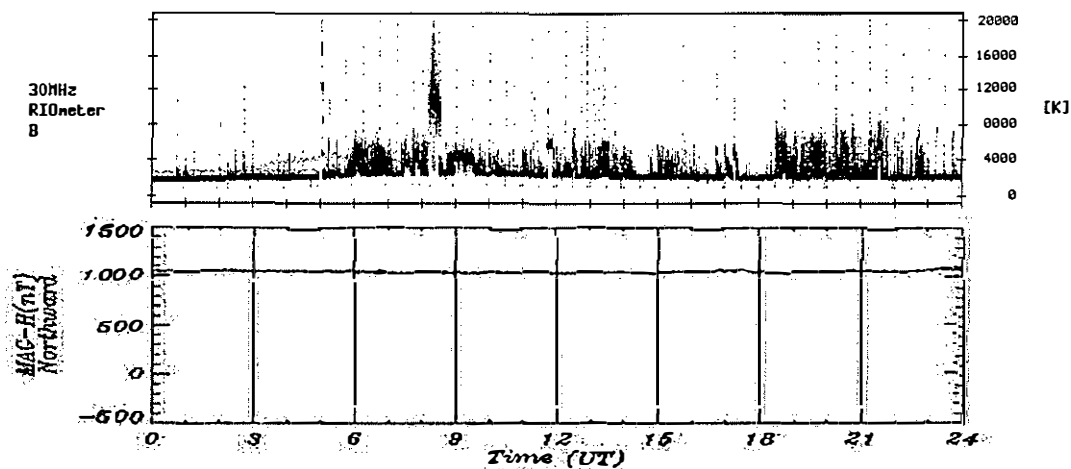
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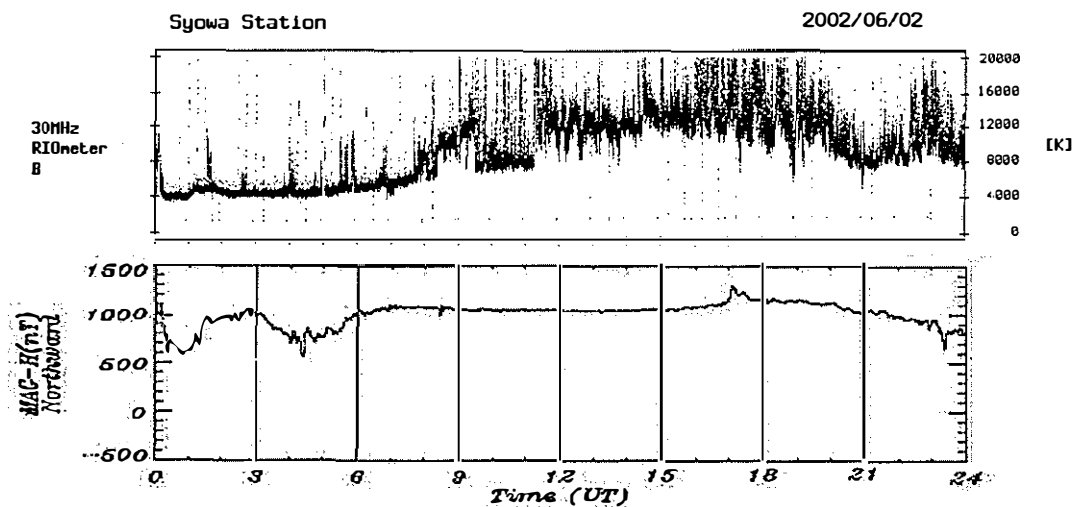
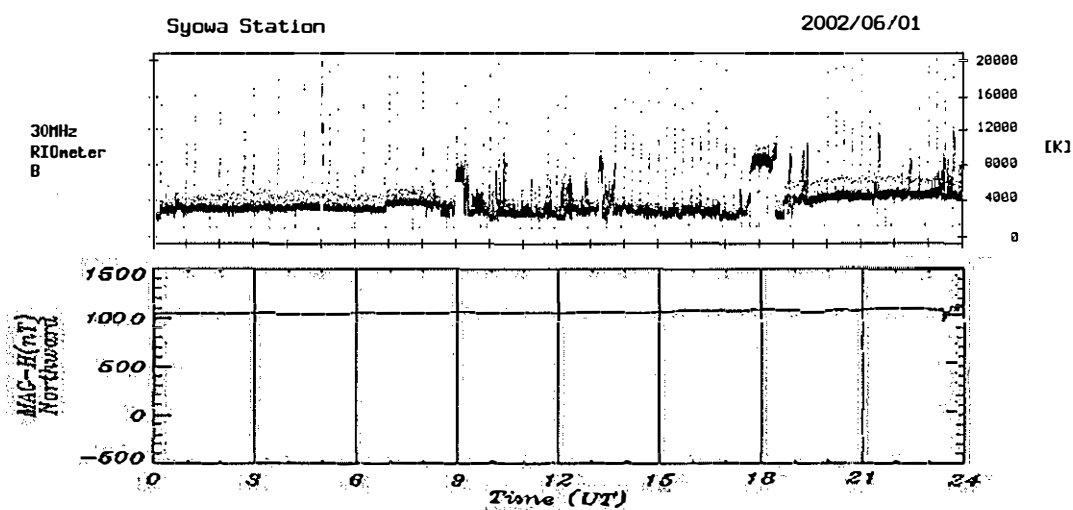
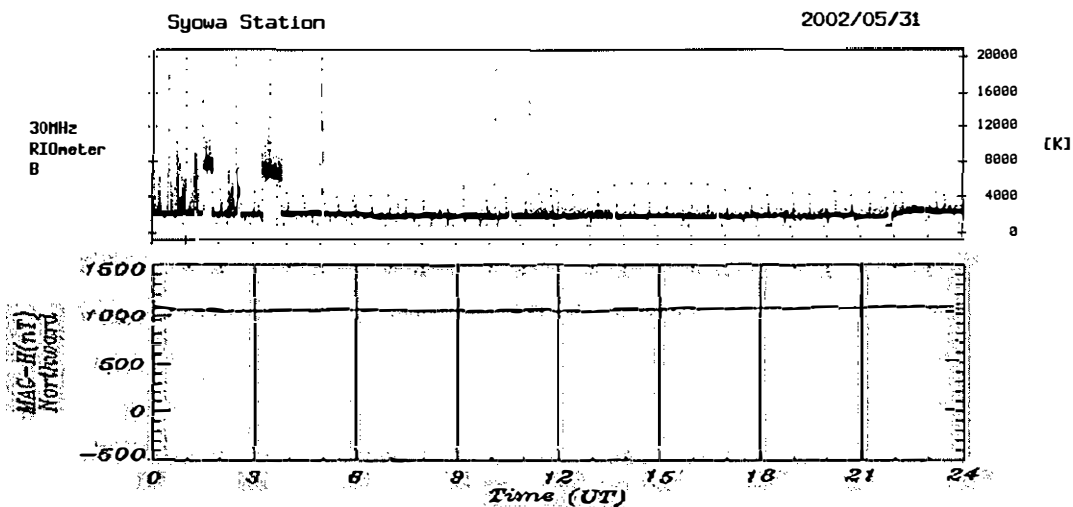
2002/05/29



Syowa Station

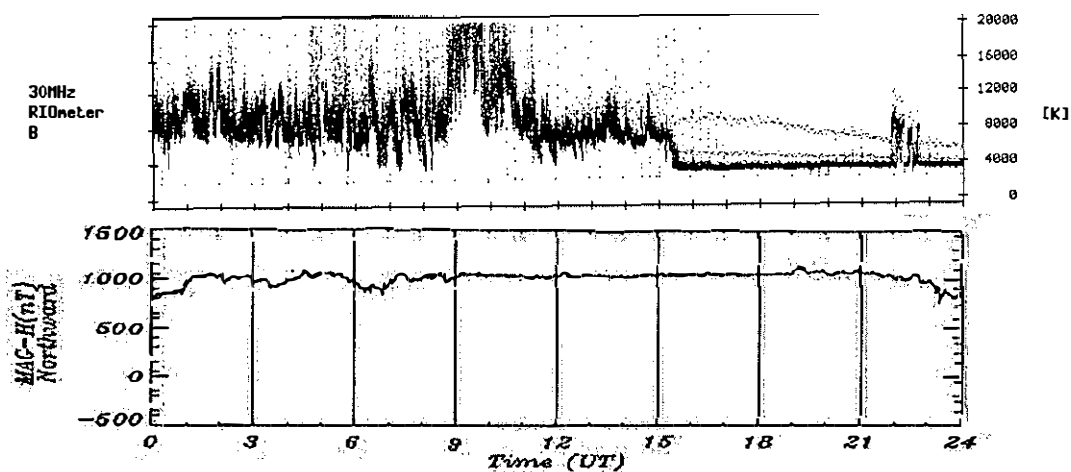
2002/05/30





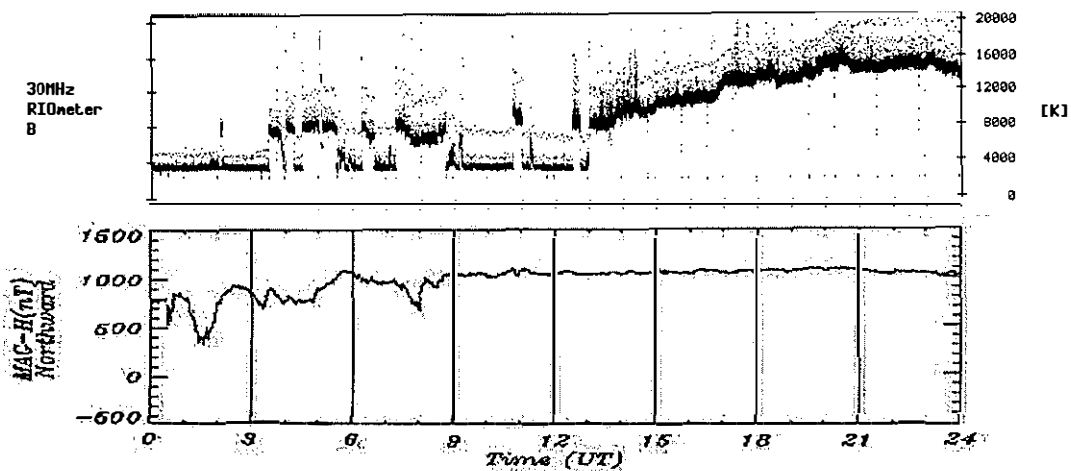
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2002/06/03



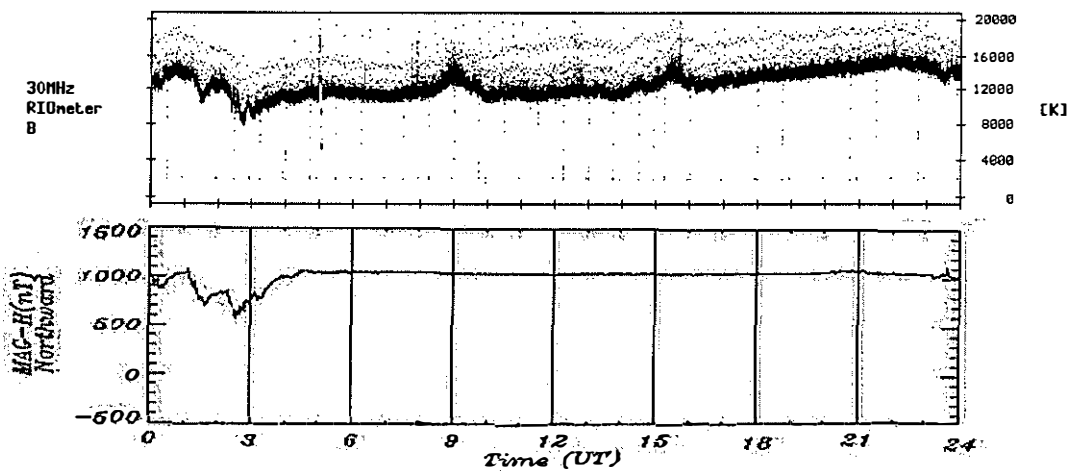
Syowa Station

2002/06/04



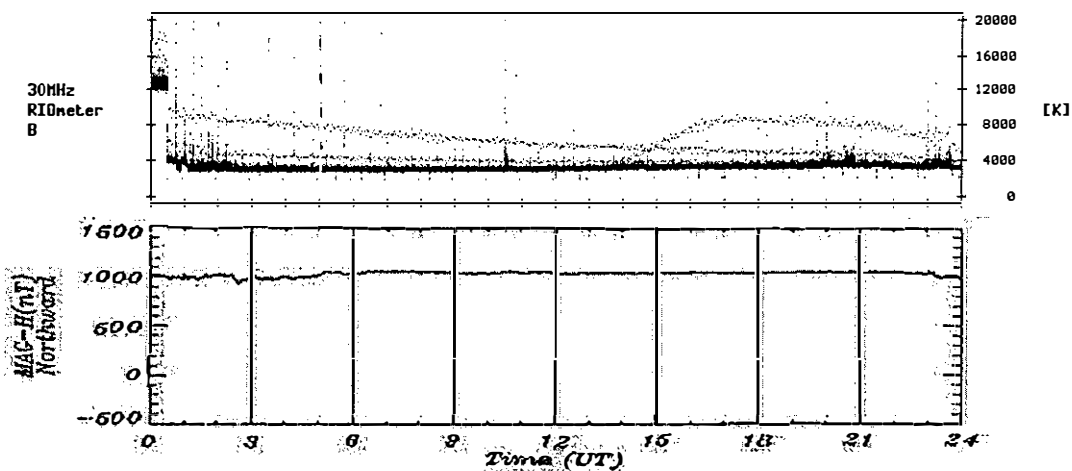
Syowa Station

2002/06/05



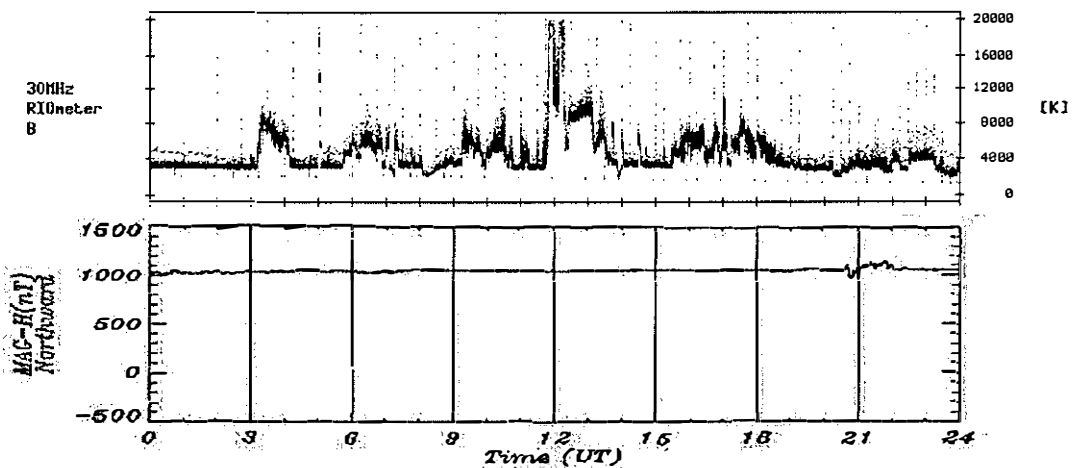
Syowa Station

2002/06/06



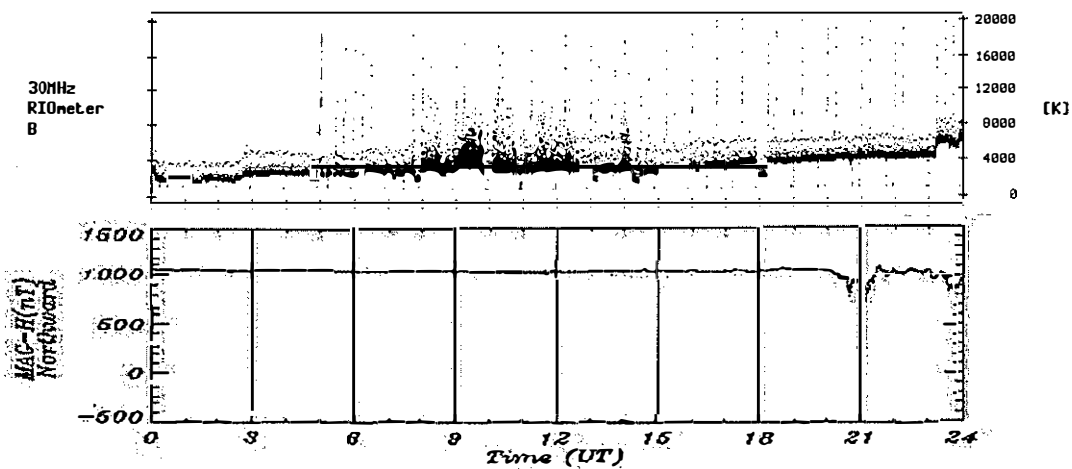
Syowa Station

2002/06/07



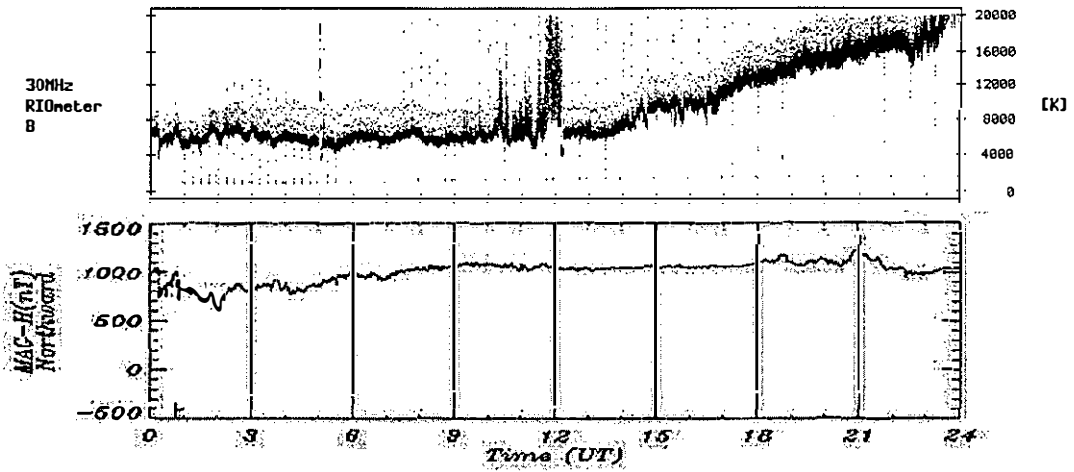
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2002/06/08



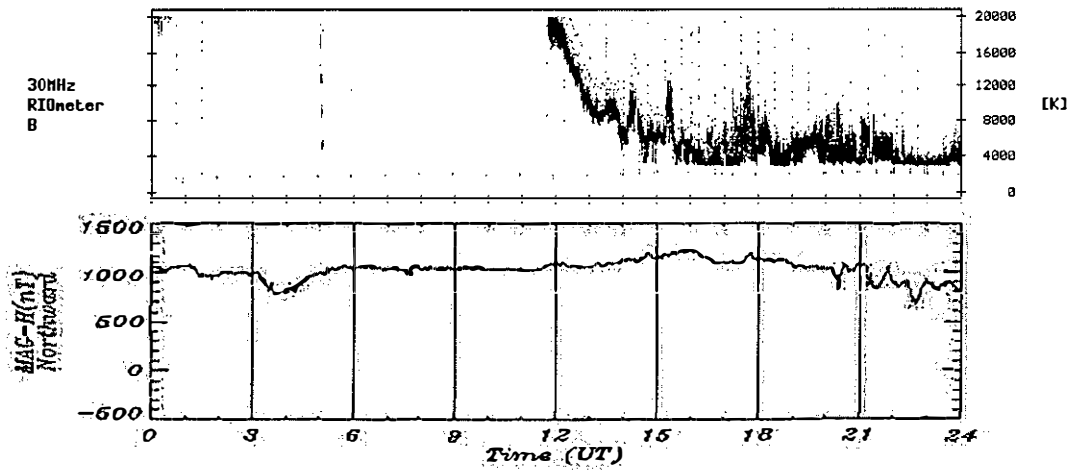
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2002/06/09



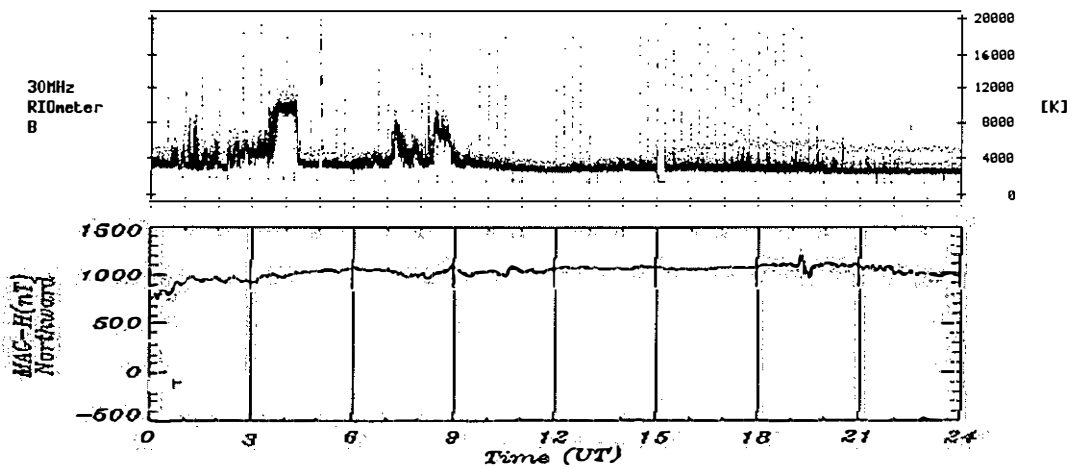
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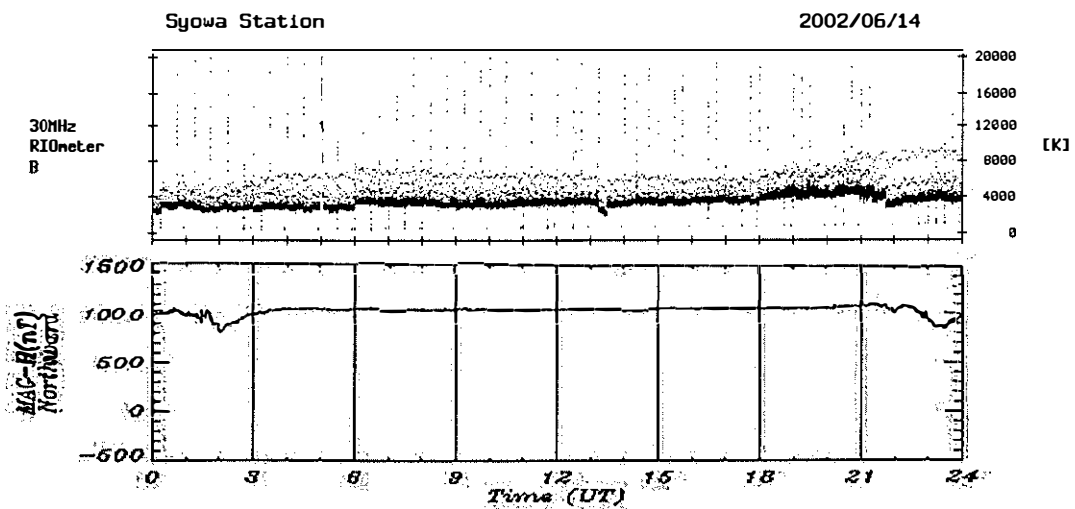
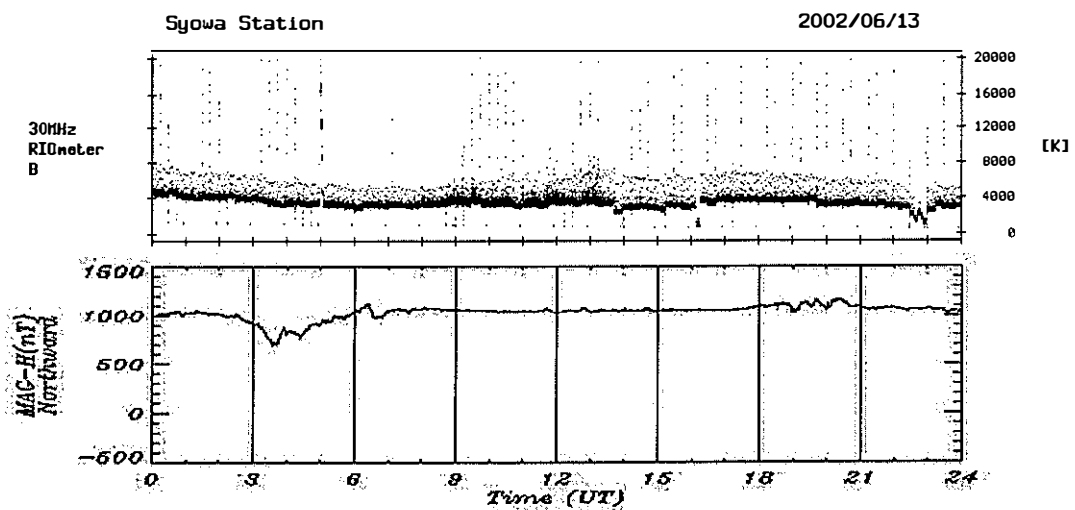
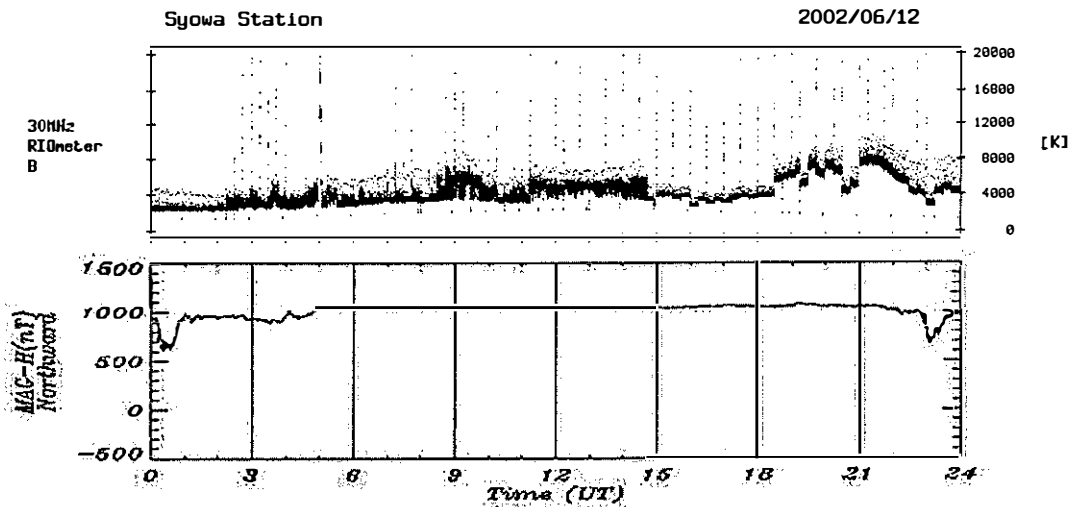
2002/06/10



Syowa Station

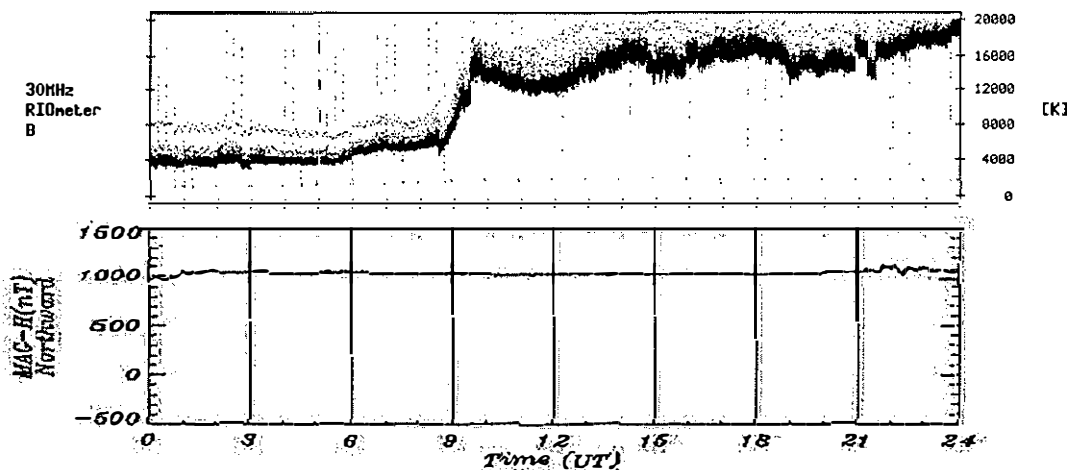
2002/06/11





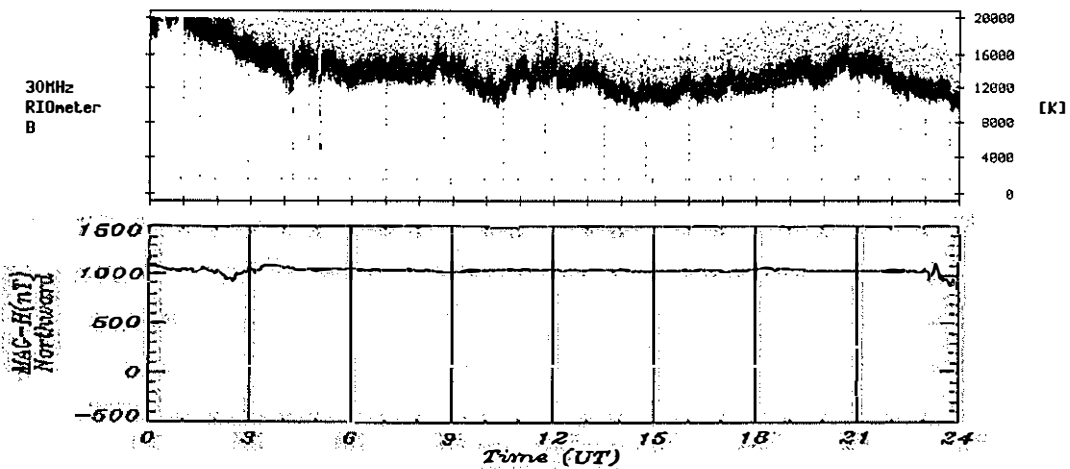
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2002/06/15



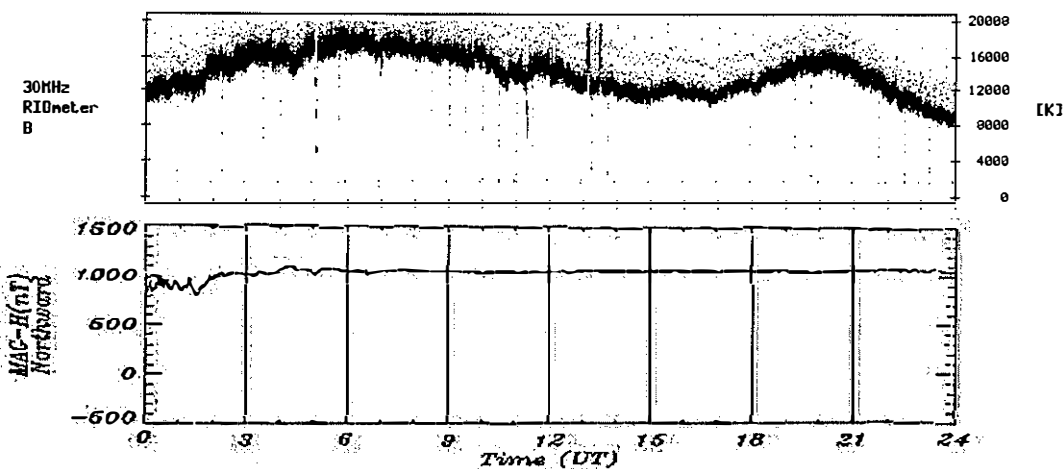
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2002/06/16



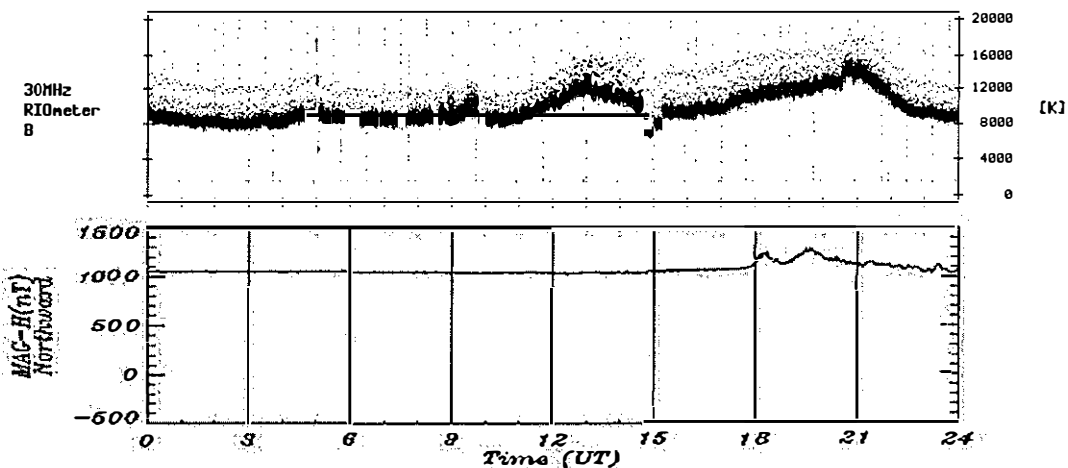
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2002/06/17



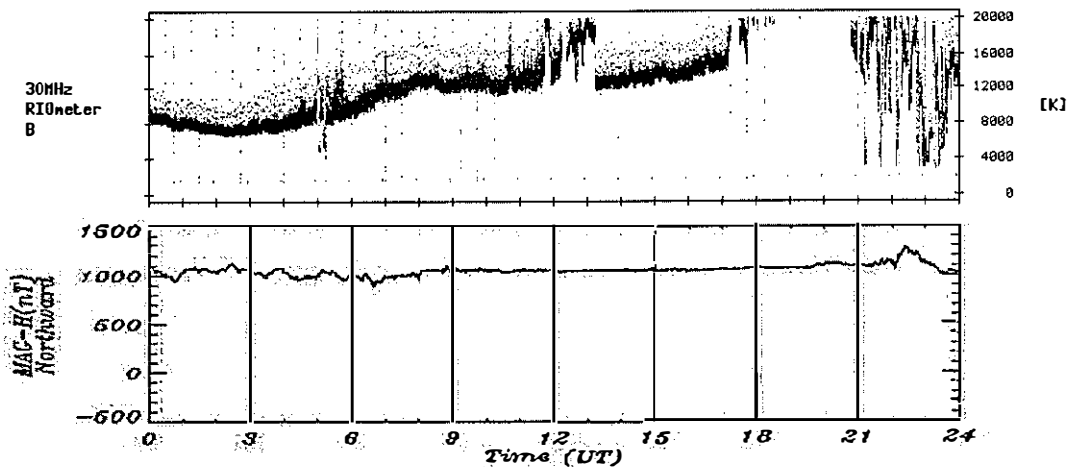
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2002/06/18



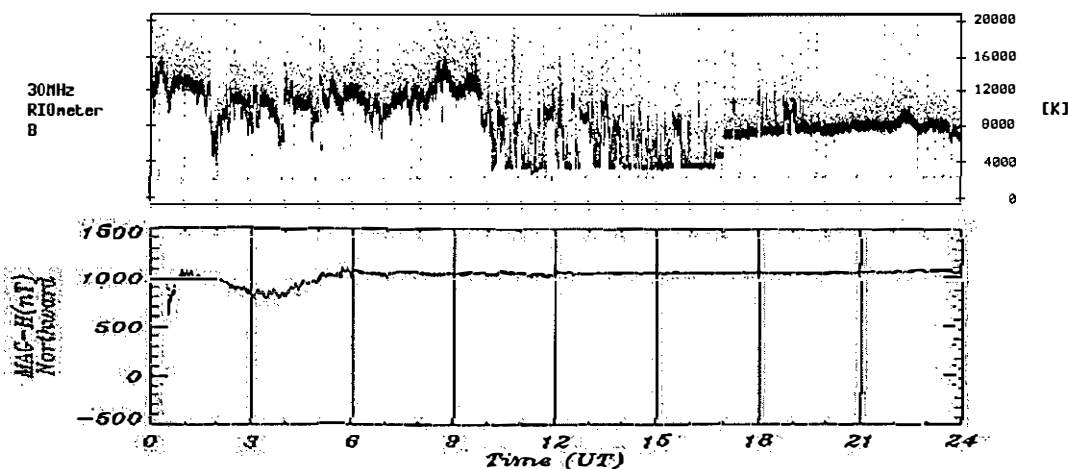
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2002/06/19



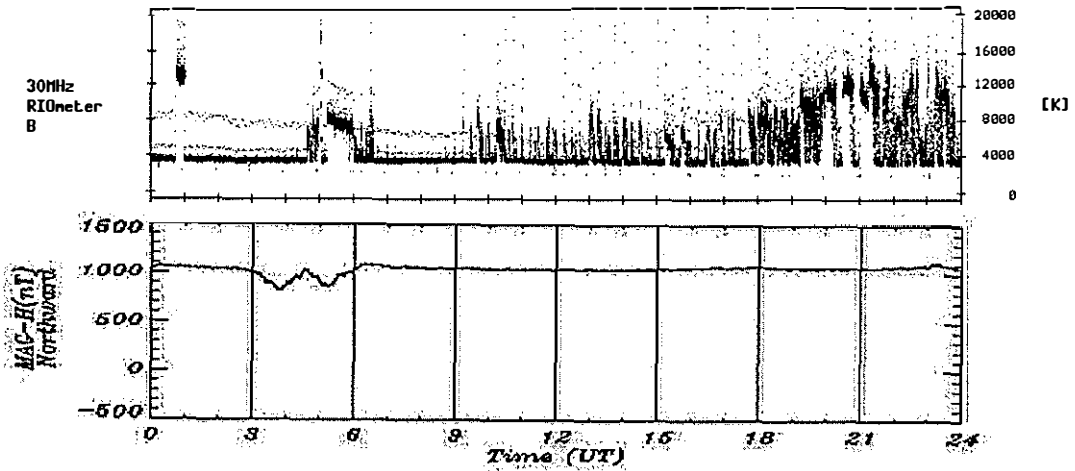
Syowa Station

2002/06/20



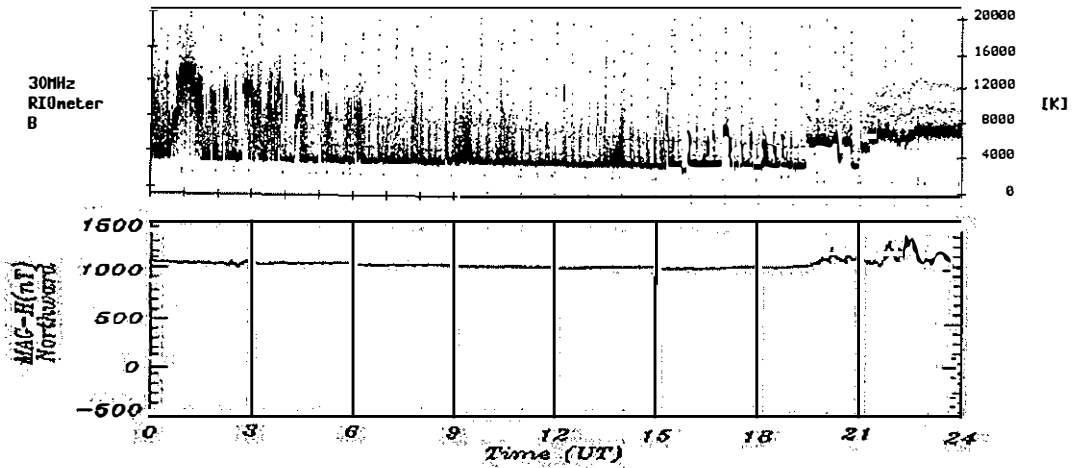
Syowa Station

2002/06/21



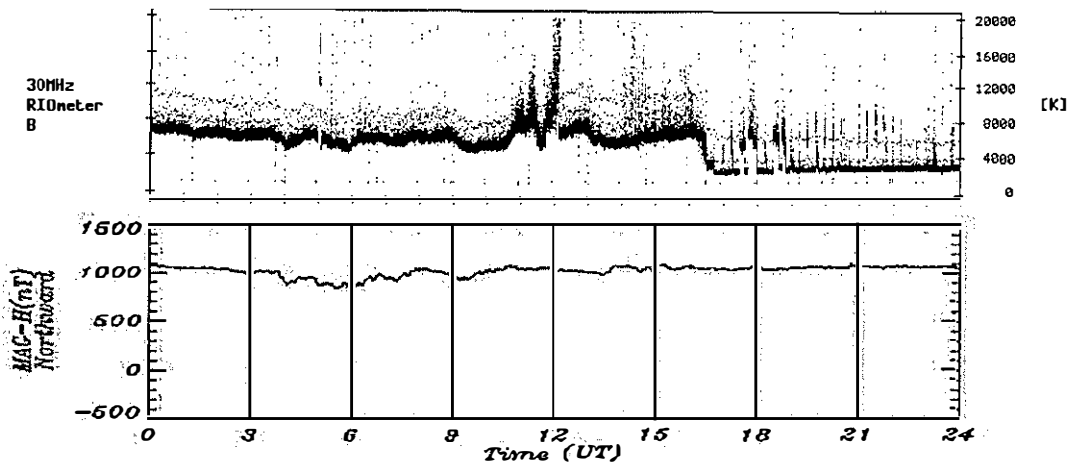
Syowa Station

2002/06/22



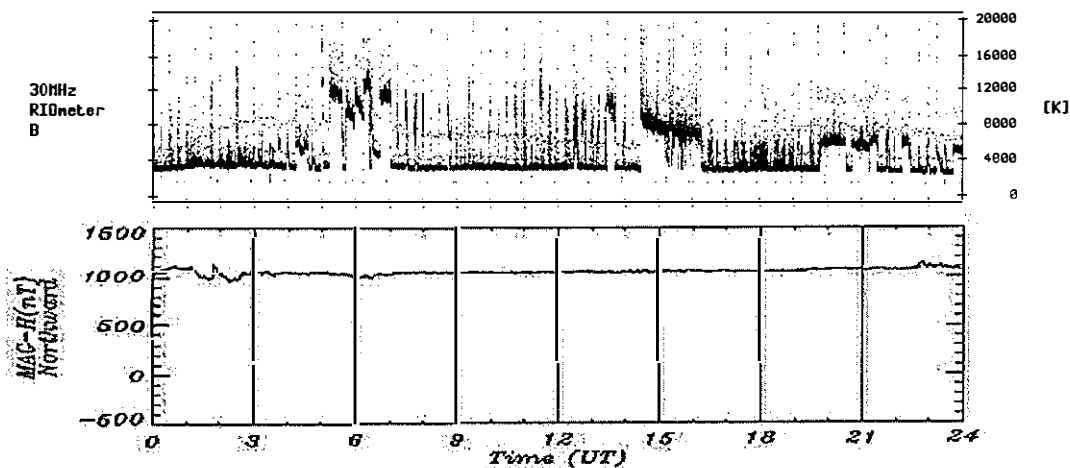
Syowa Station

2002/06/23



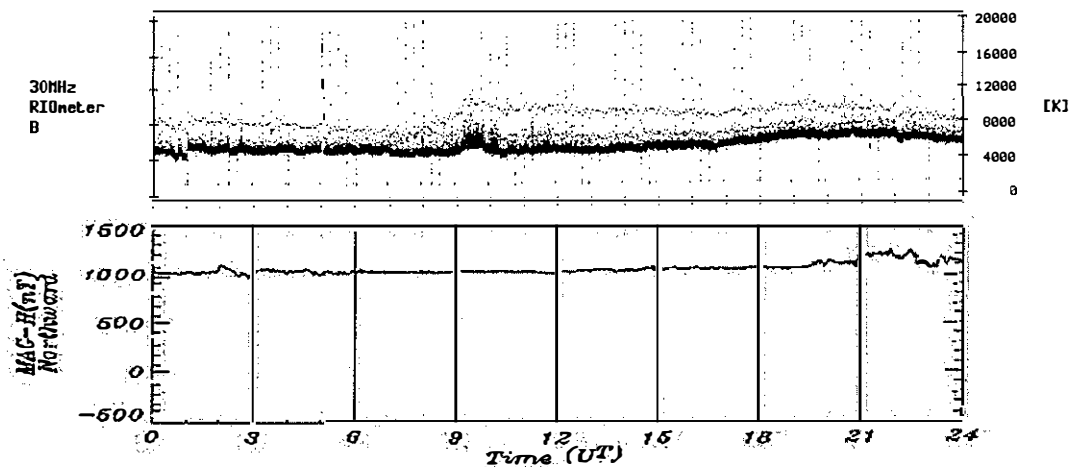
Syowa Station

2002/06/24



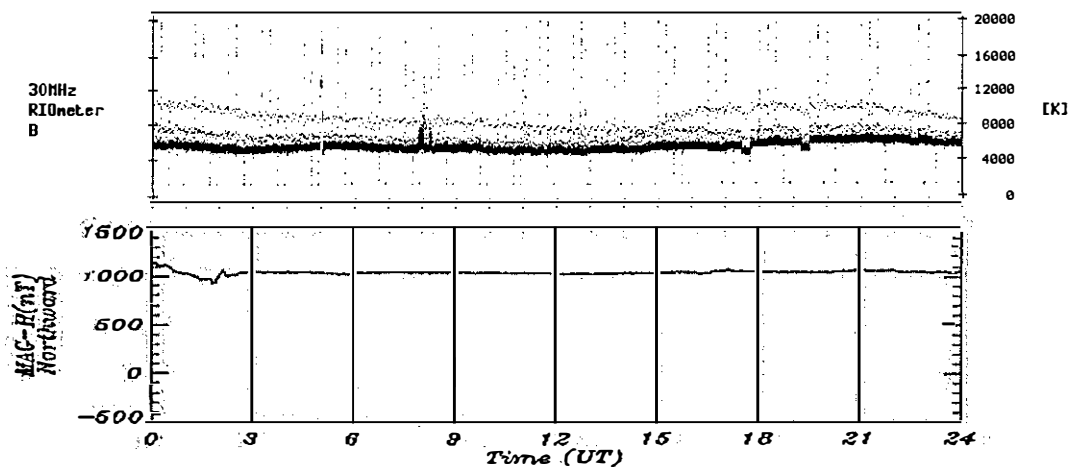
Syowa Station

2002/06/25



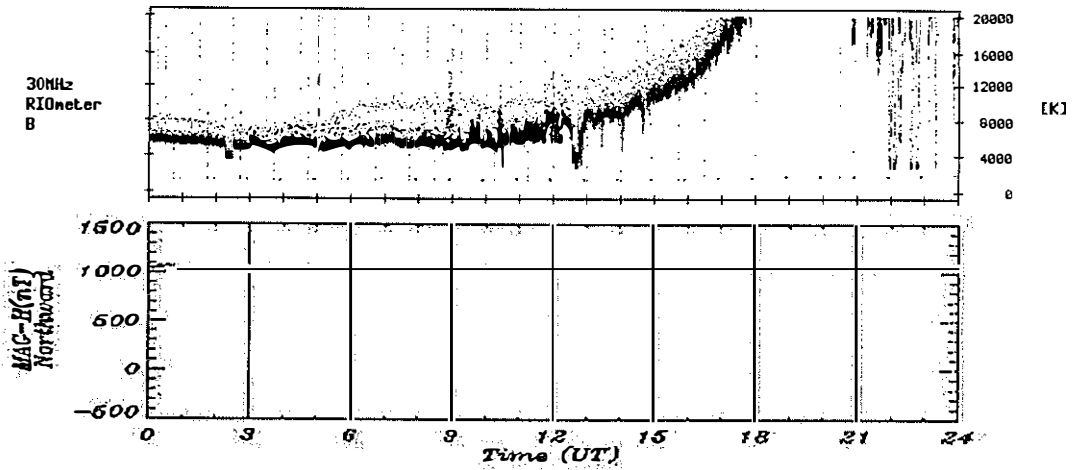
Syowa Station

2002/06/26



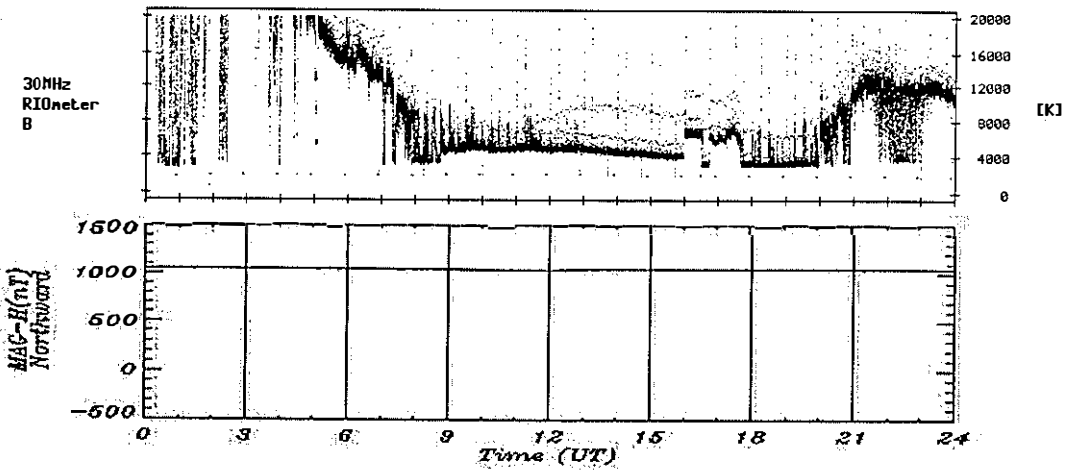
Syowa Station

2002/06/27



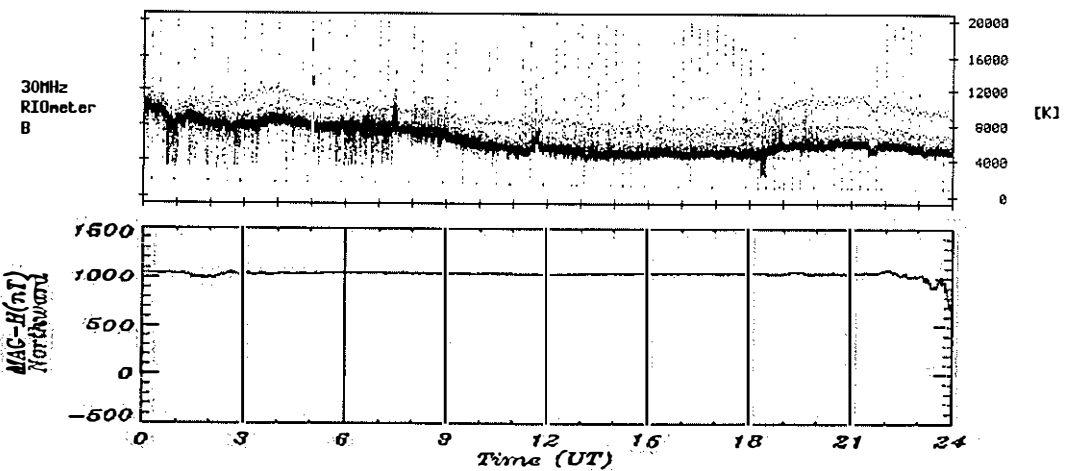
Syowa Station

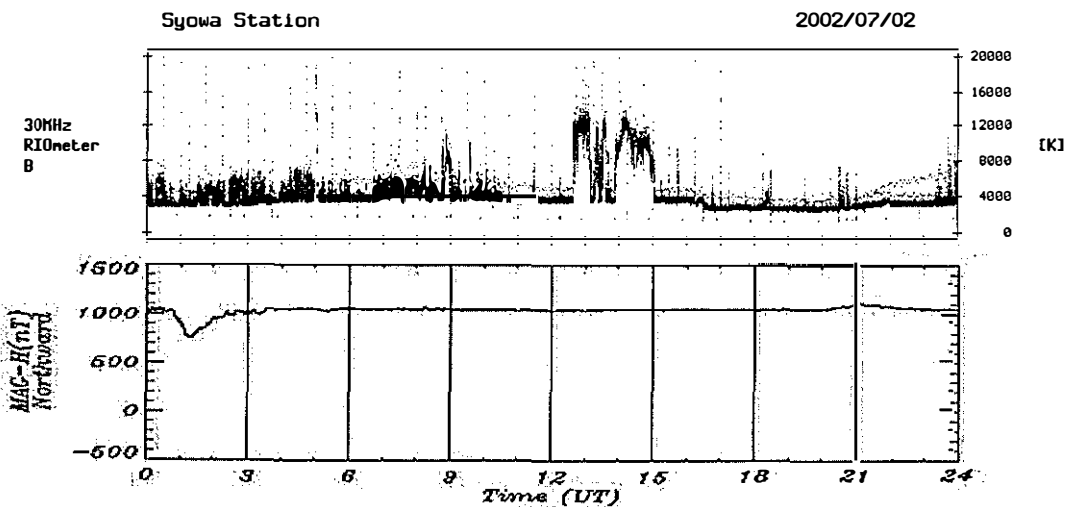
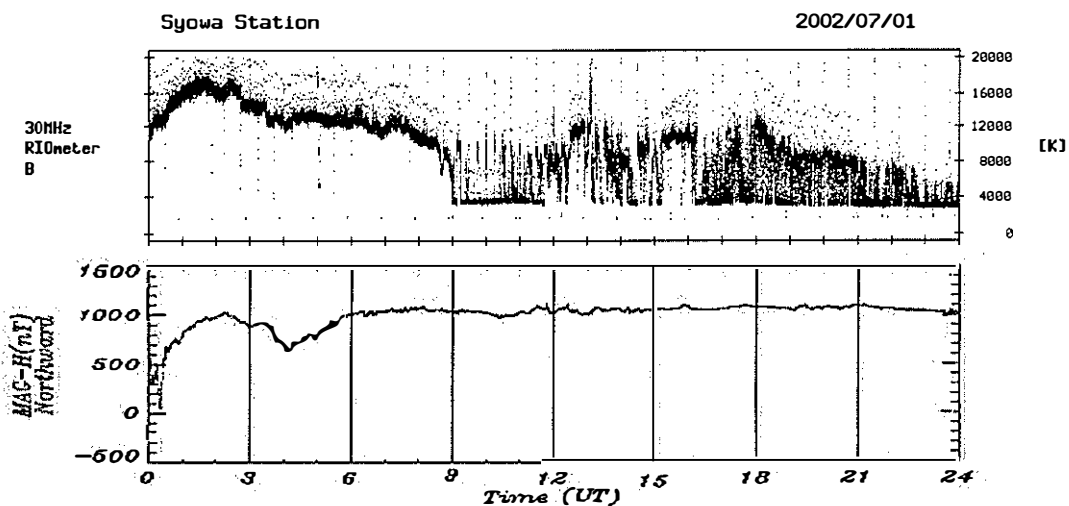
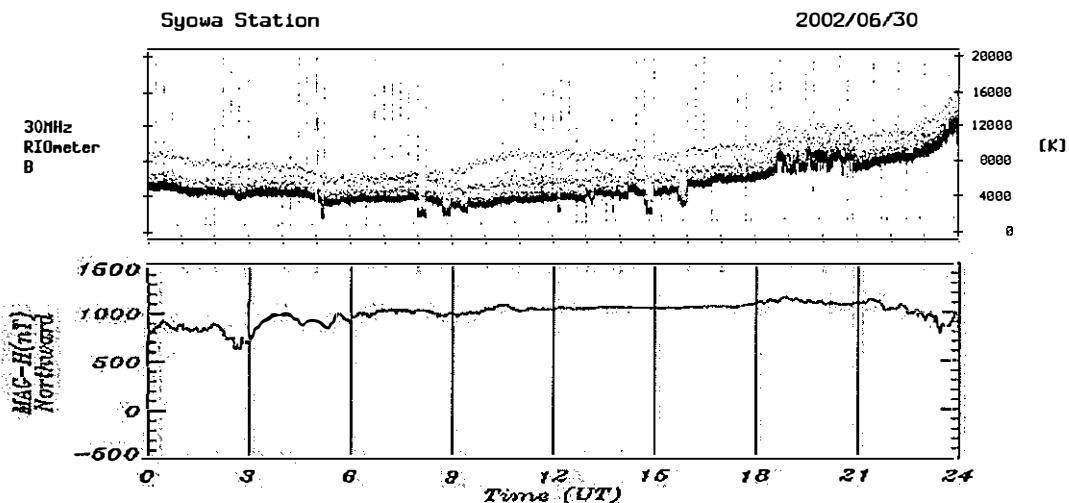
2002/06/28

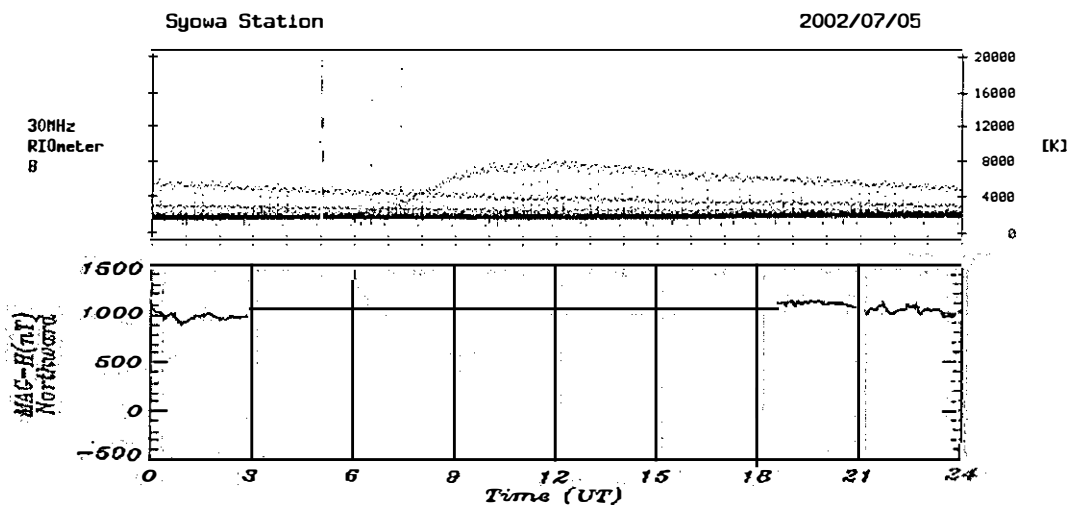
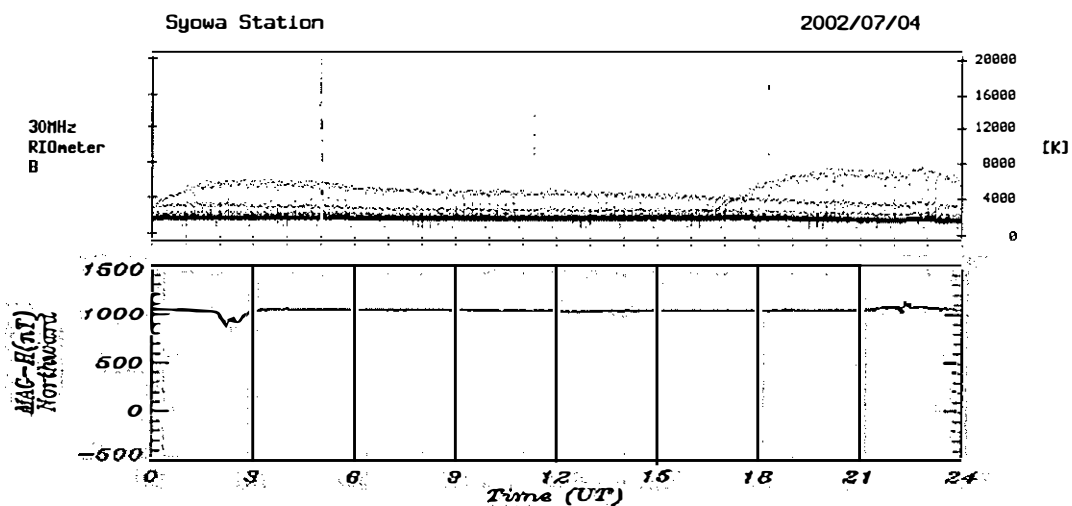
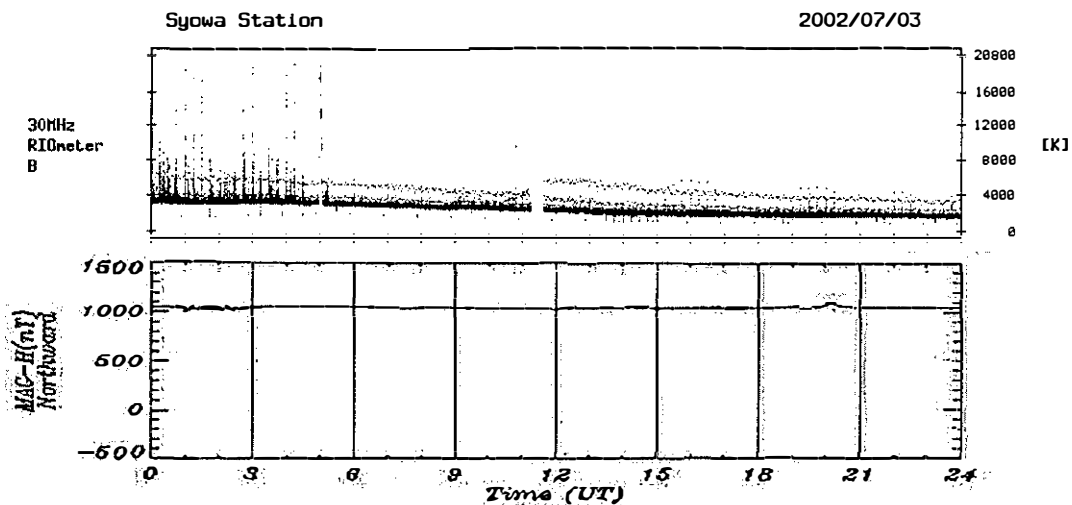


Syowa Station

2002/06/29

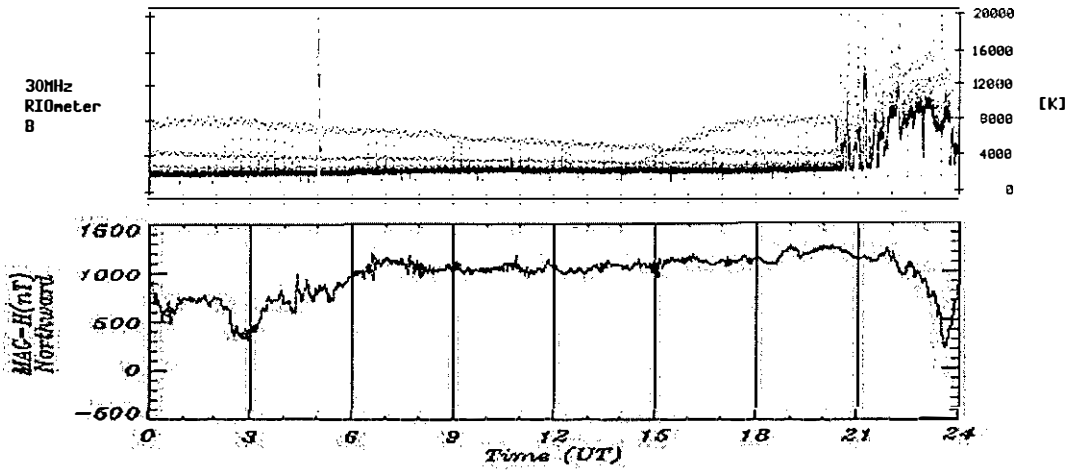






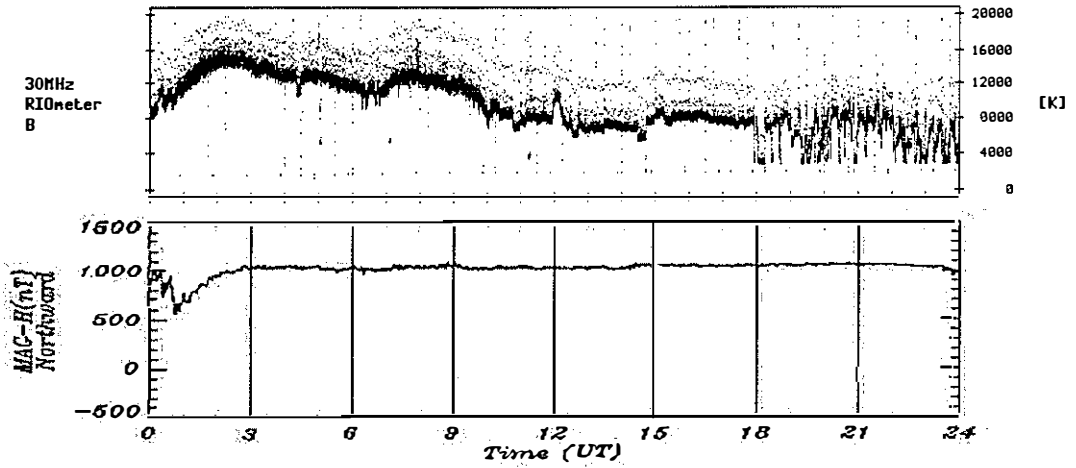
Syowa Station

2002/07/06



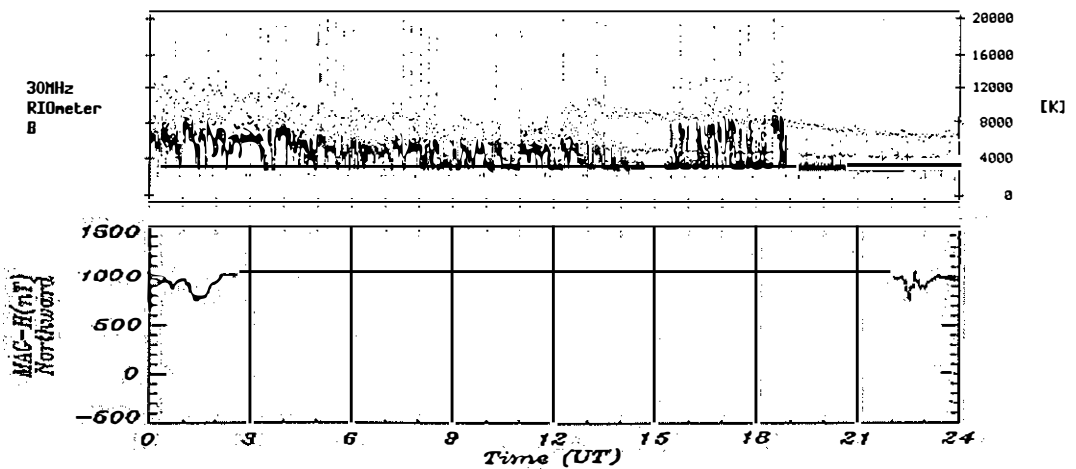
Syowa Station

2002/07/07



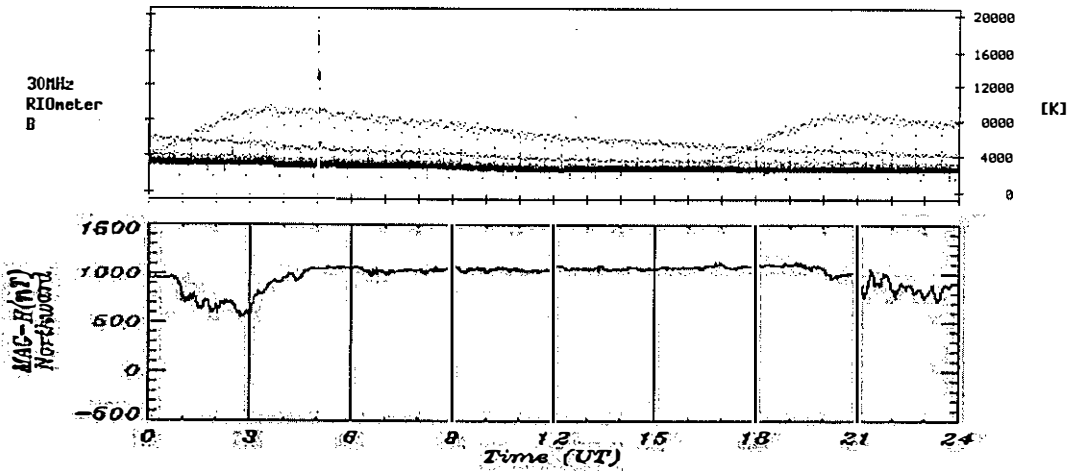
Syowa Station

2002/07/08



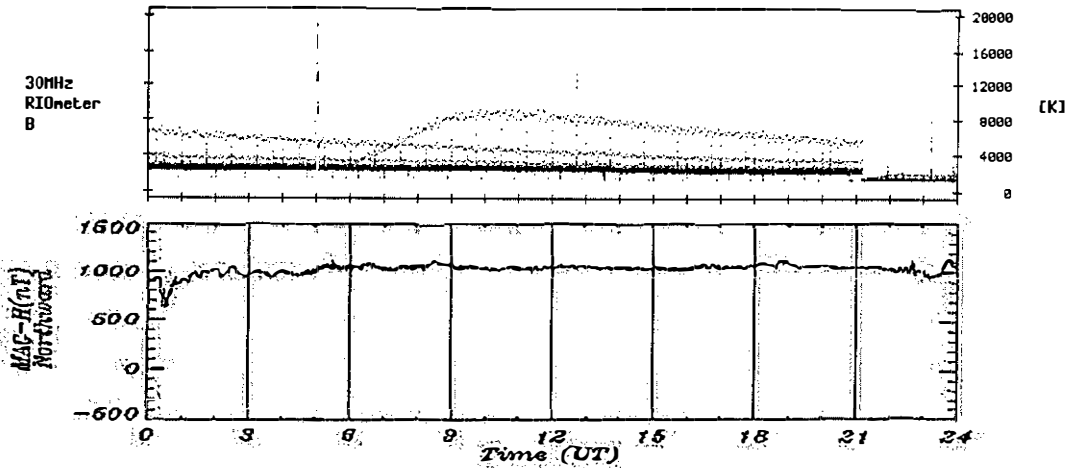
Syowa Station

2002/07/09



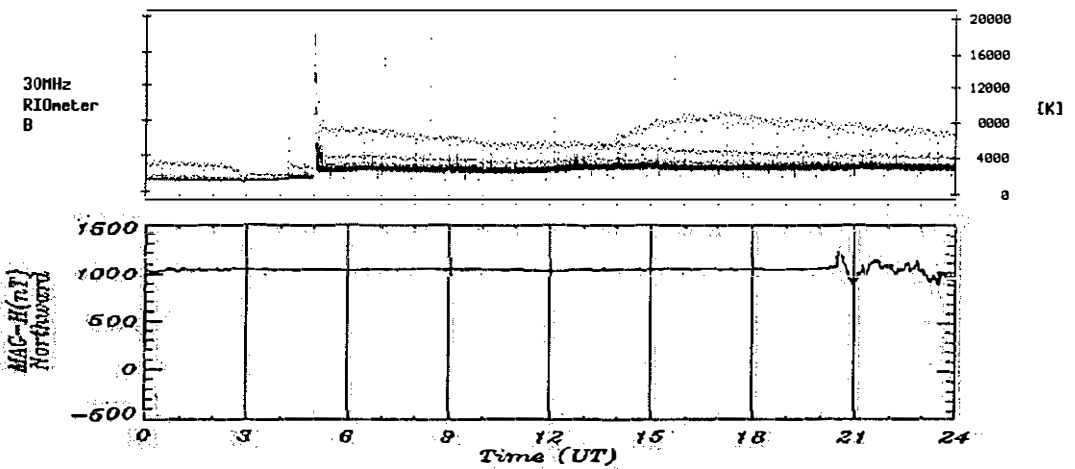
Syowa Station

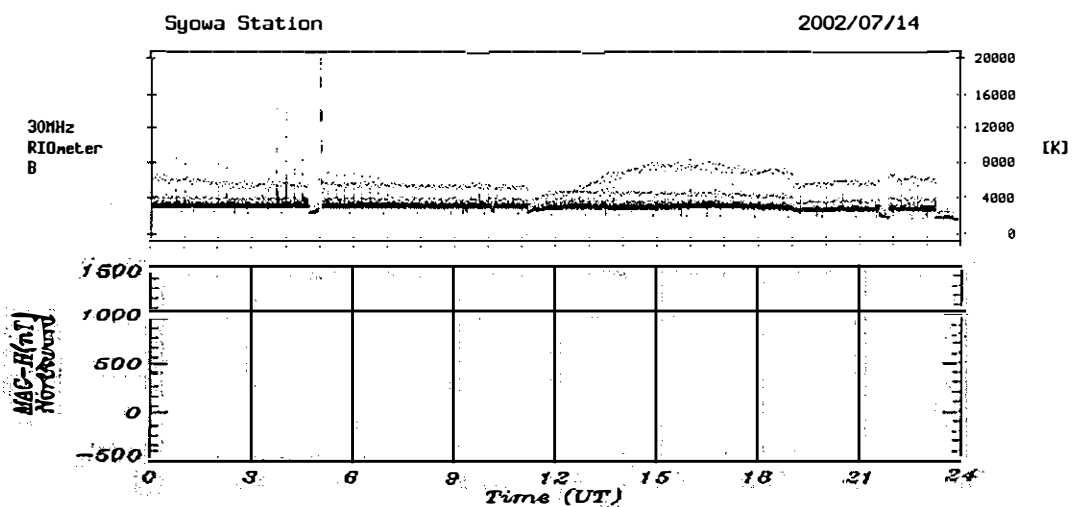
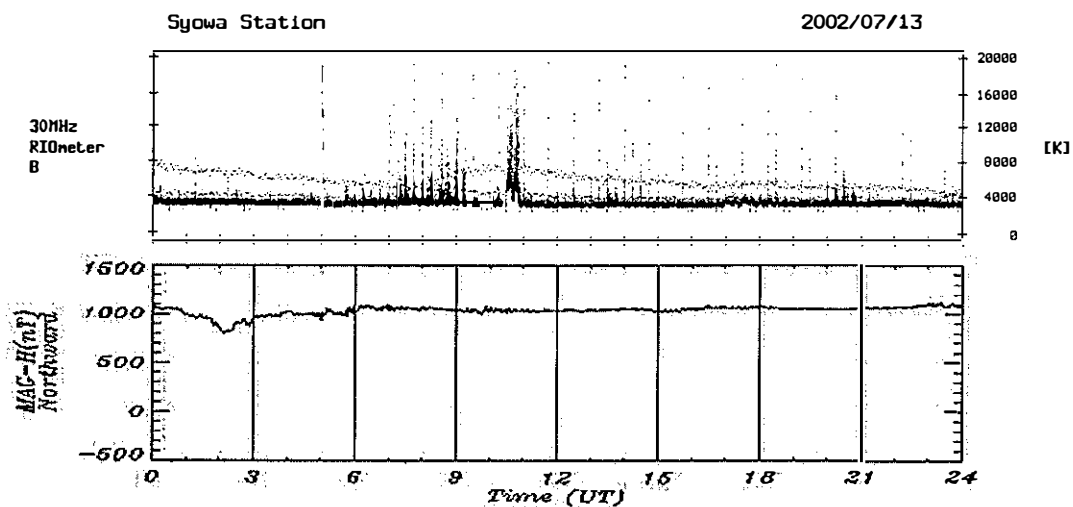
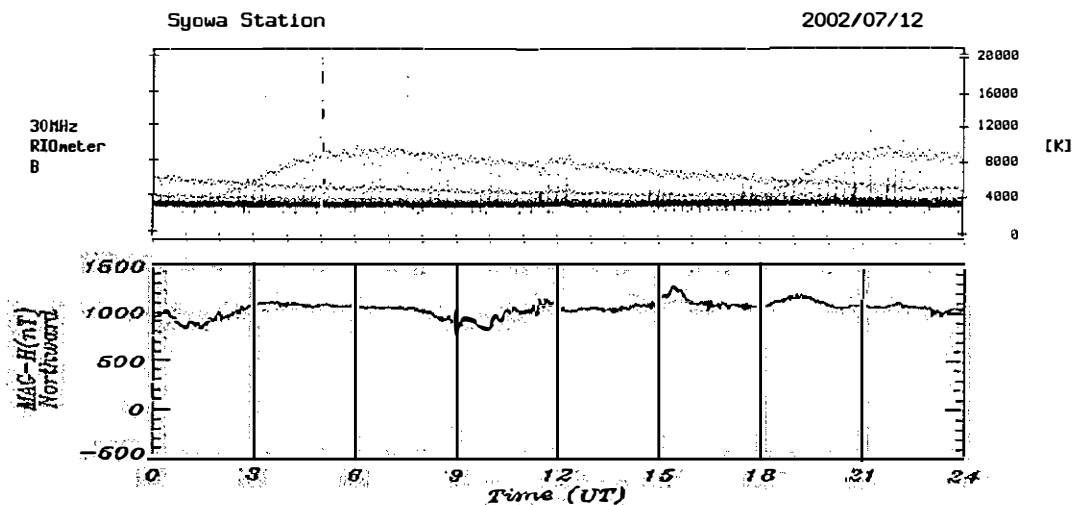
2002/07/10



Syowa Station

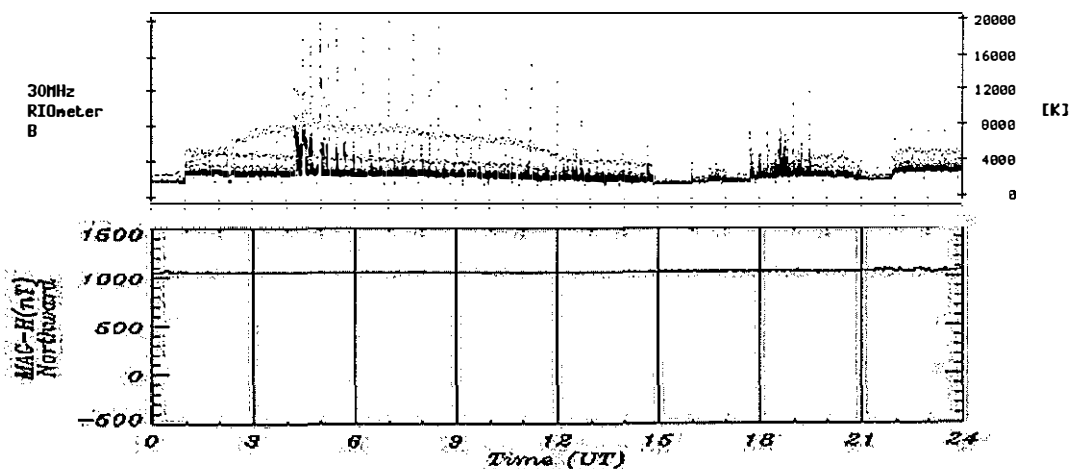
2002/07/11





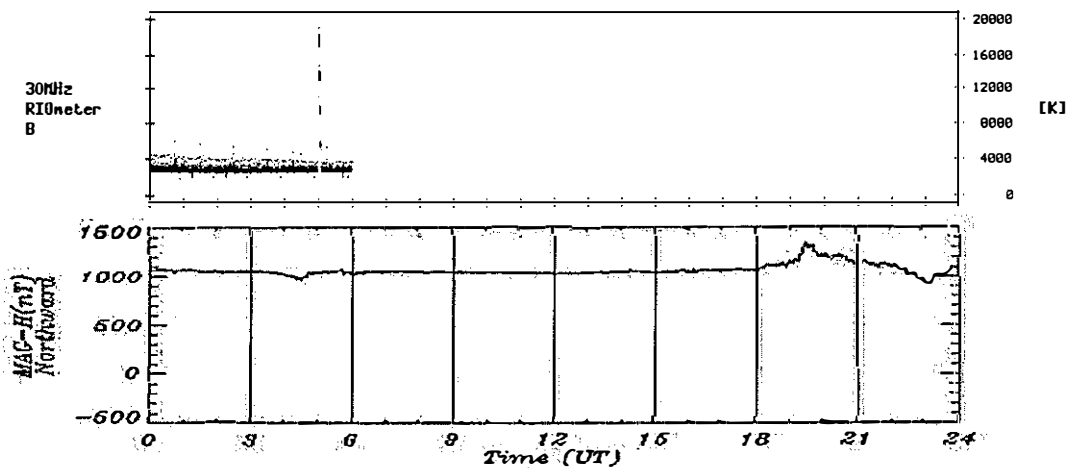
Syowa Station

2002/07/15



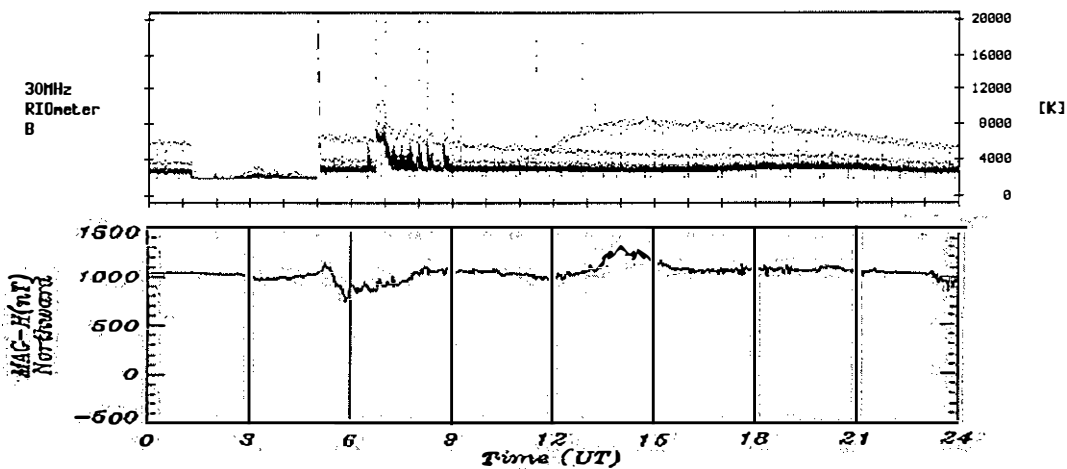
Syowa Station

2002/07/16



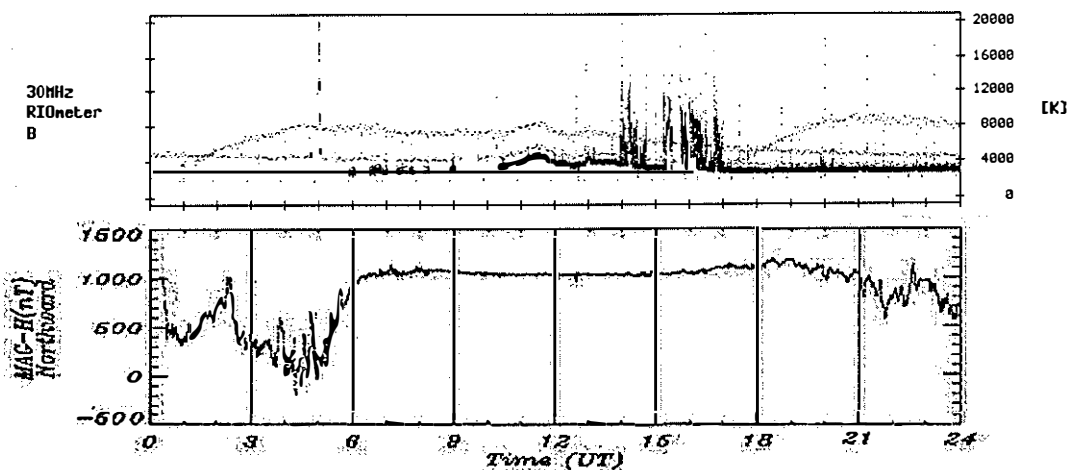
Syowa Station

2002/08/01



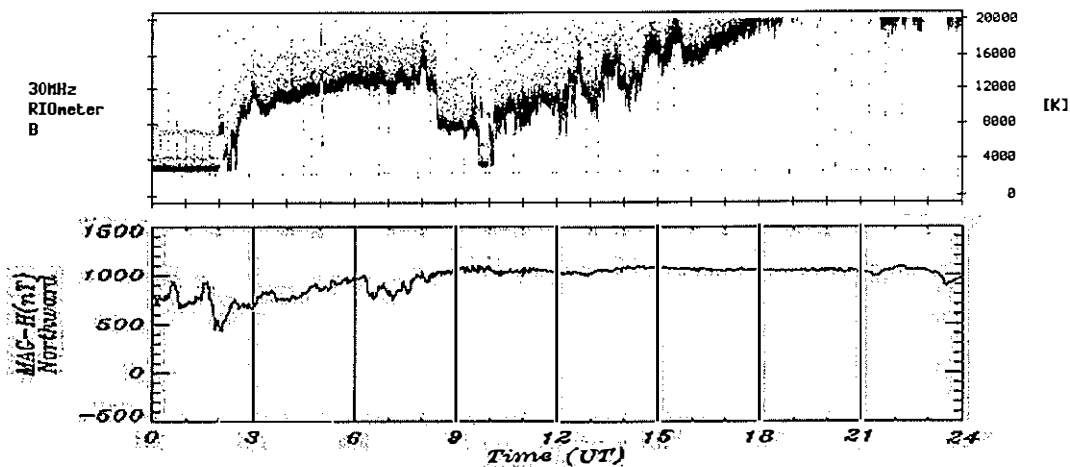
Syowa Station

2002/08/02



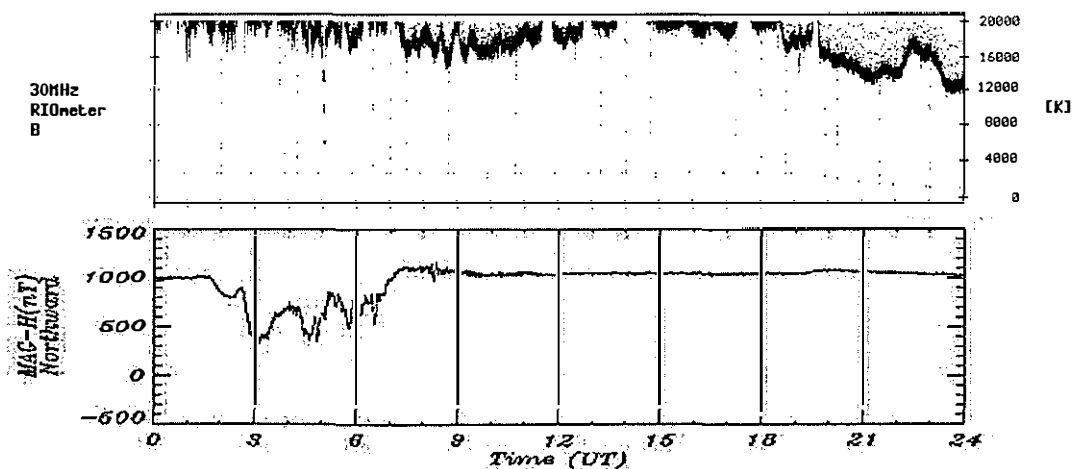
Syowa Station

2002/08/03



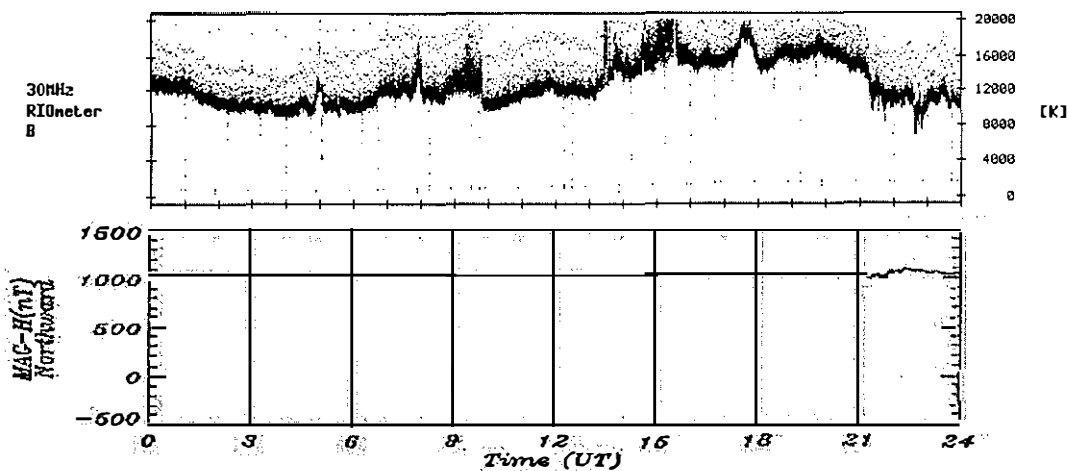
Syowa Station

2002/08/04



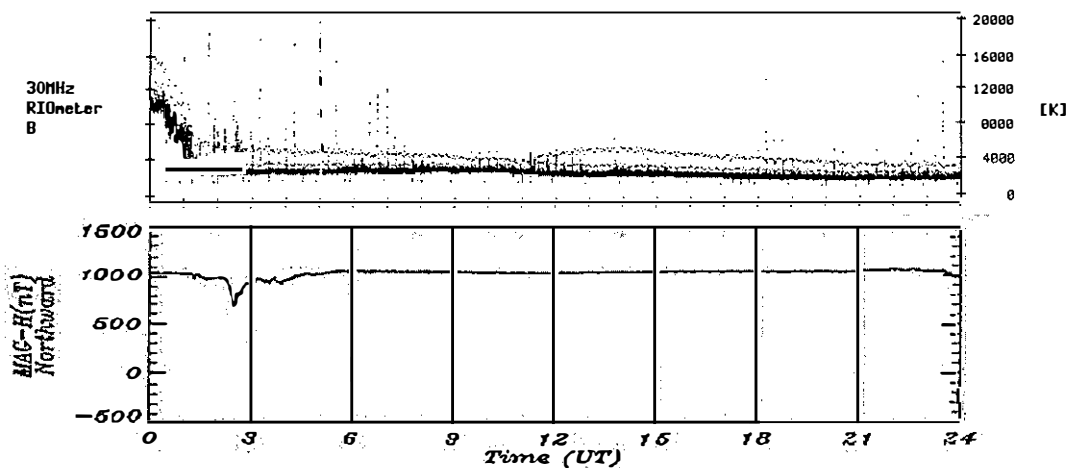
Syowa Station

2002/08/05



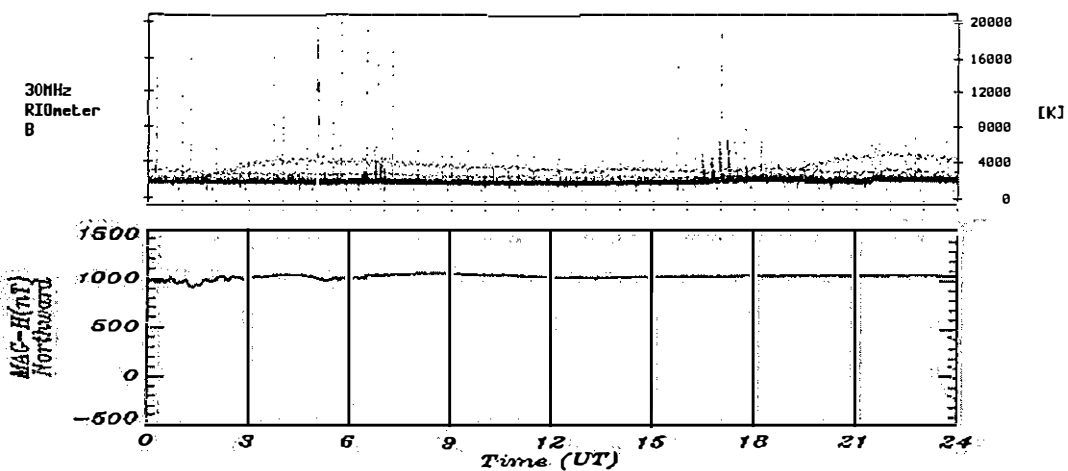
Syowa Station

2002/08/06



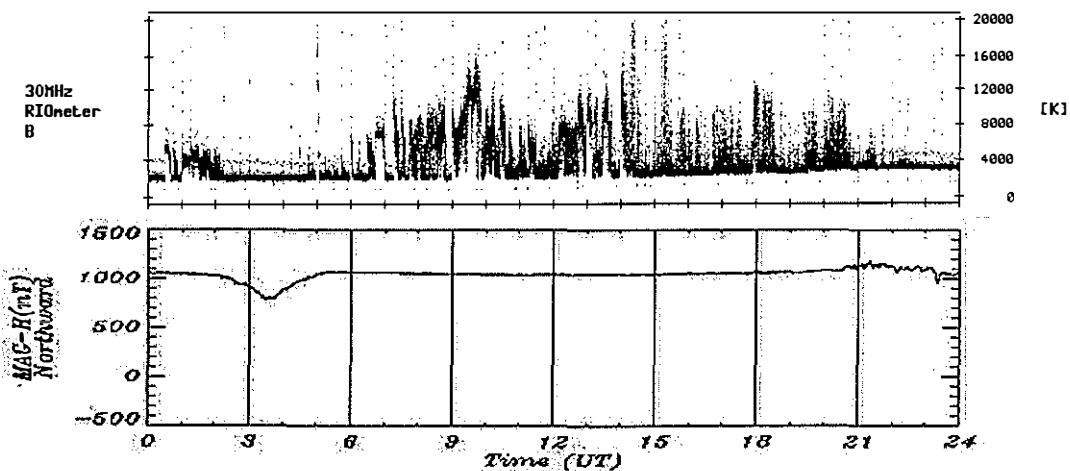
Syowa Station

2002/08/07



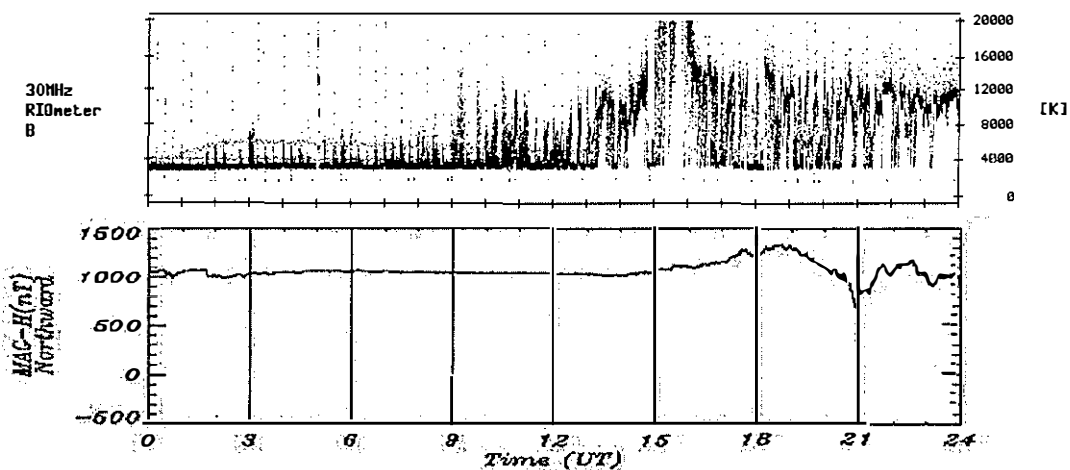
Syowa Station

2002/08/08



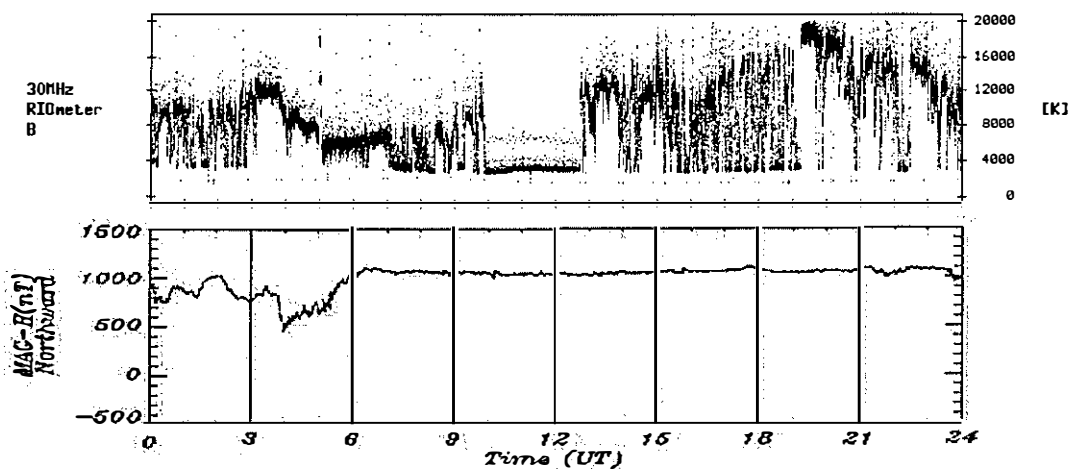
Syowa Station

2002/08/09



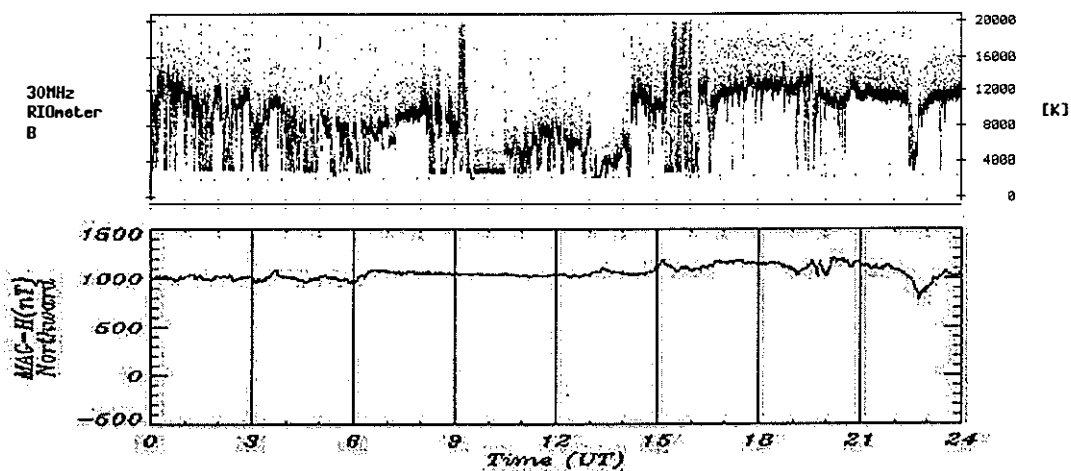
Syowa Station

2002/08/10



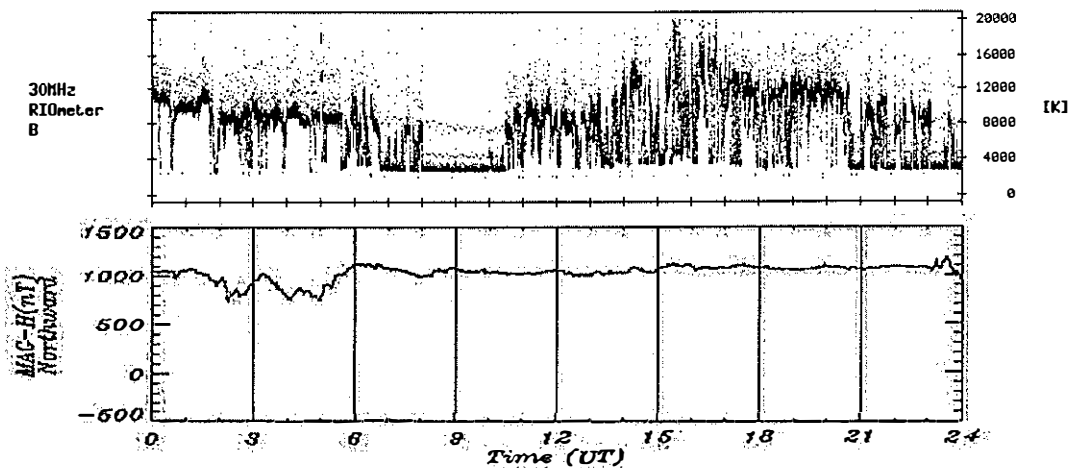
Syowa Station

2002/08/11



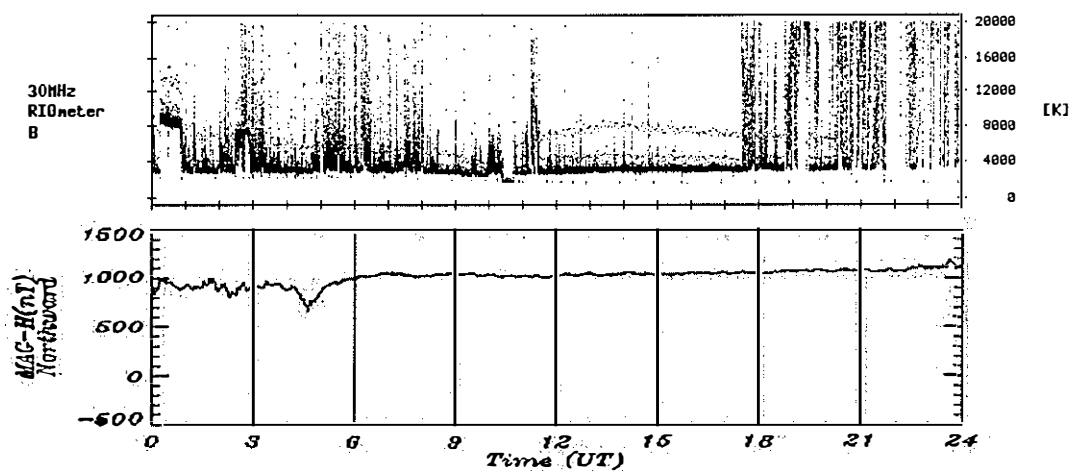
Syowa Station

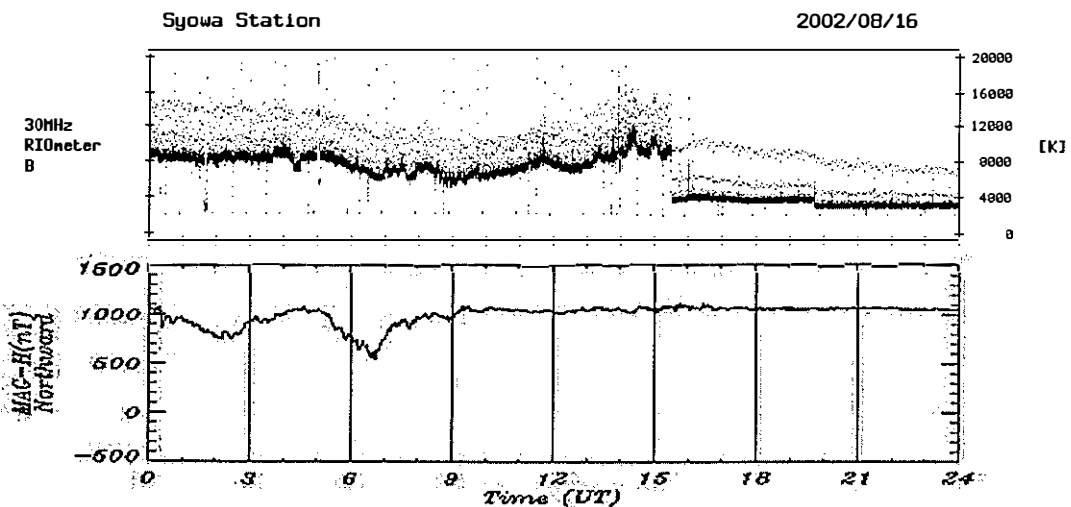
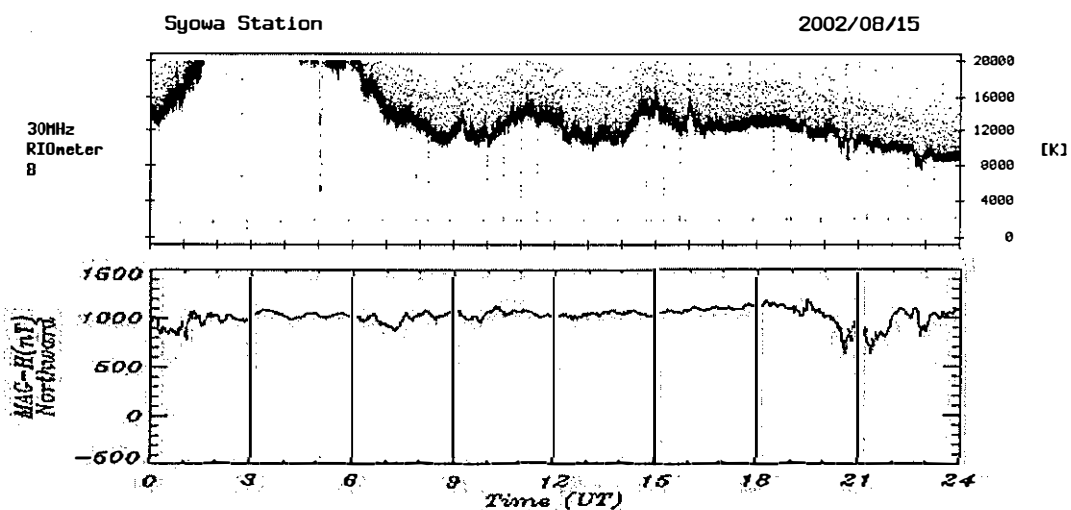
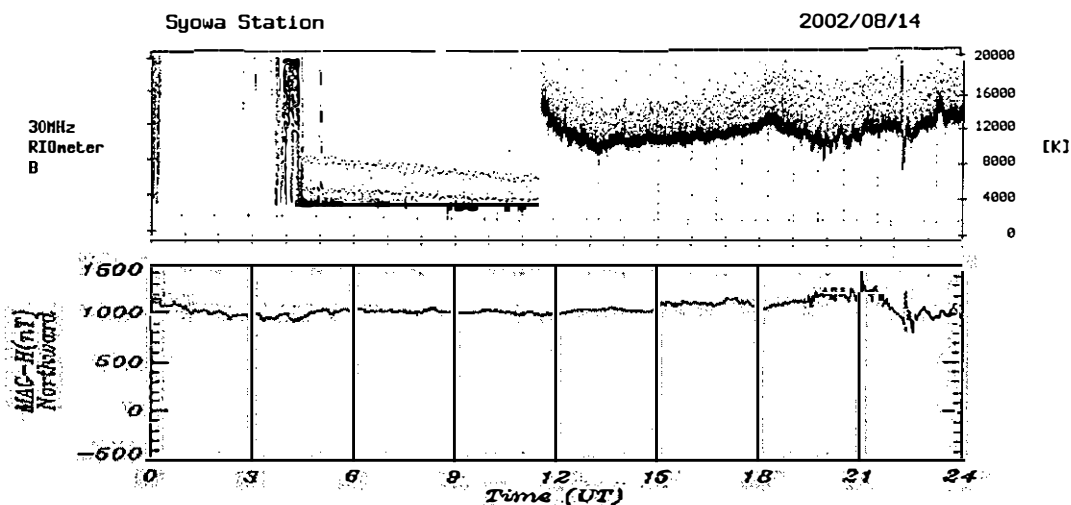
2002/08/12



Syowa Station

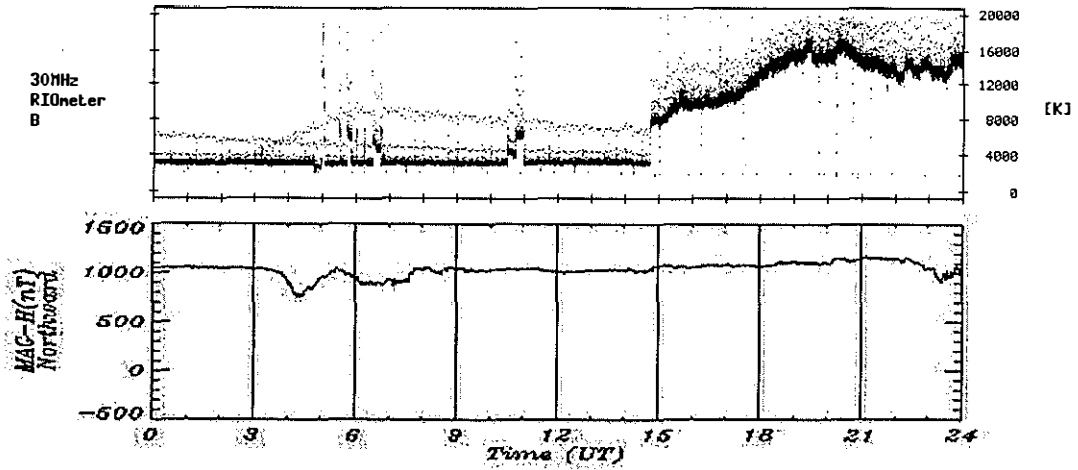
2002/08/13





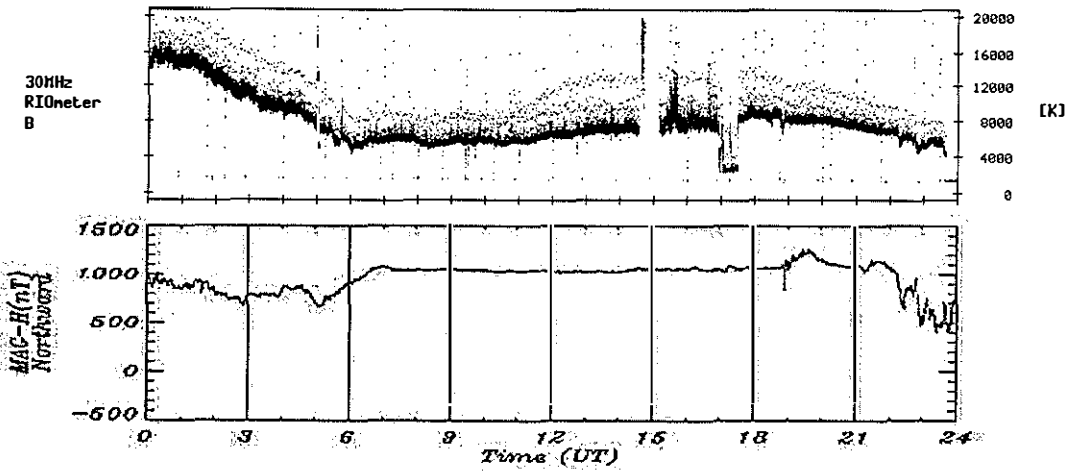
Syowa Station

2002/08/17



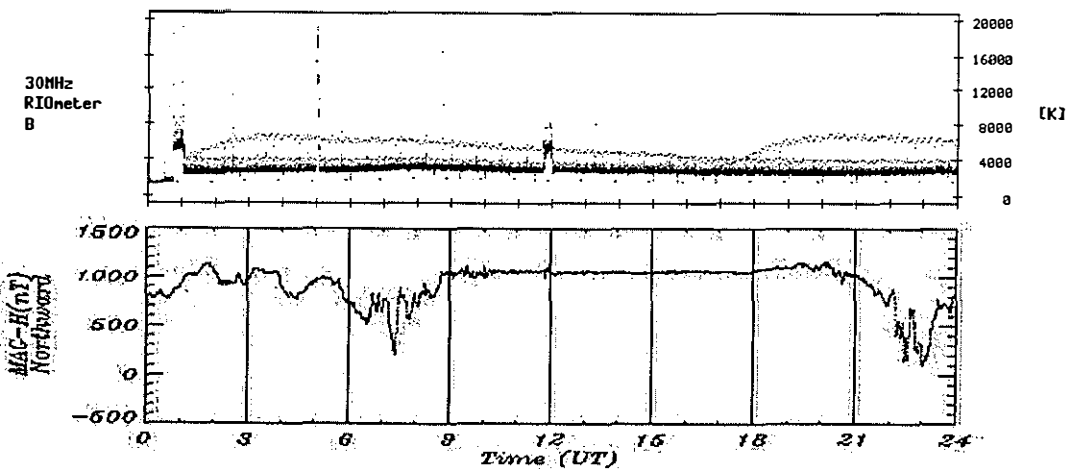
Syowa Station

2002/08/18



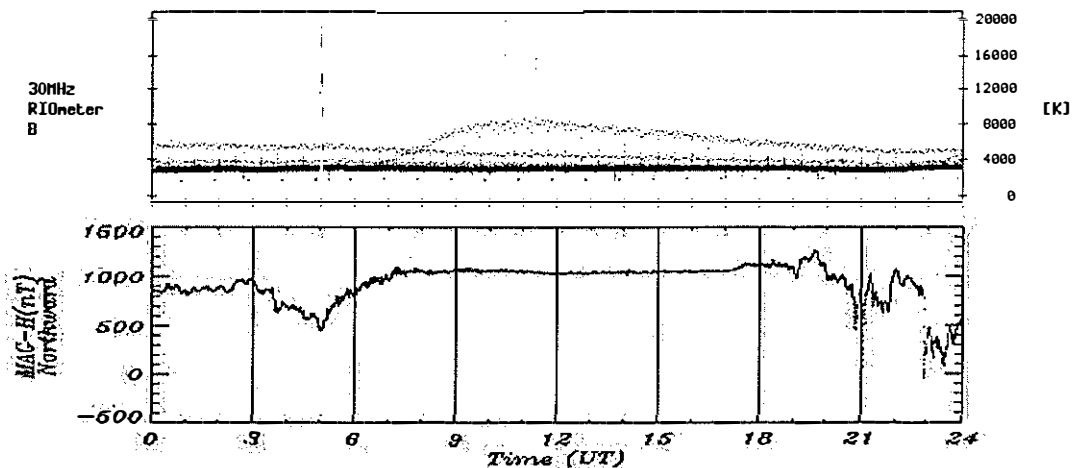
Syowa Station

2002/08/19



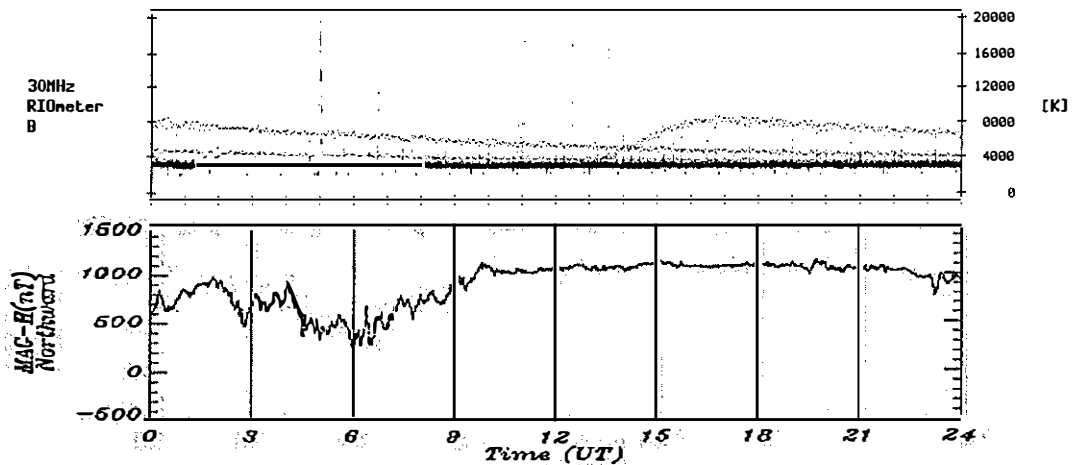
Syowa Station

2002/08/20



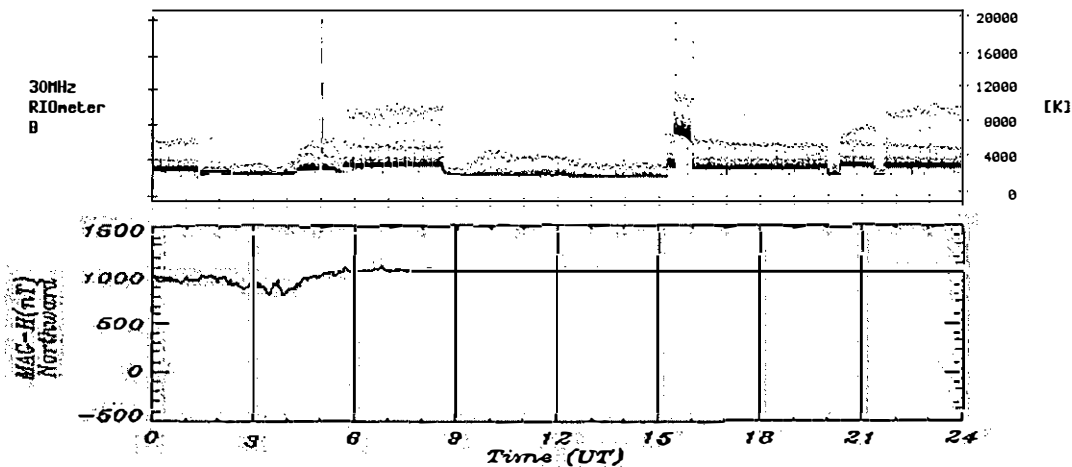
Syowa Station

2002/08/21



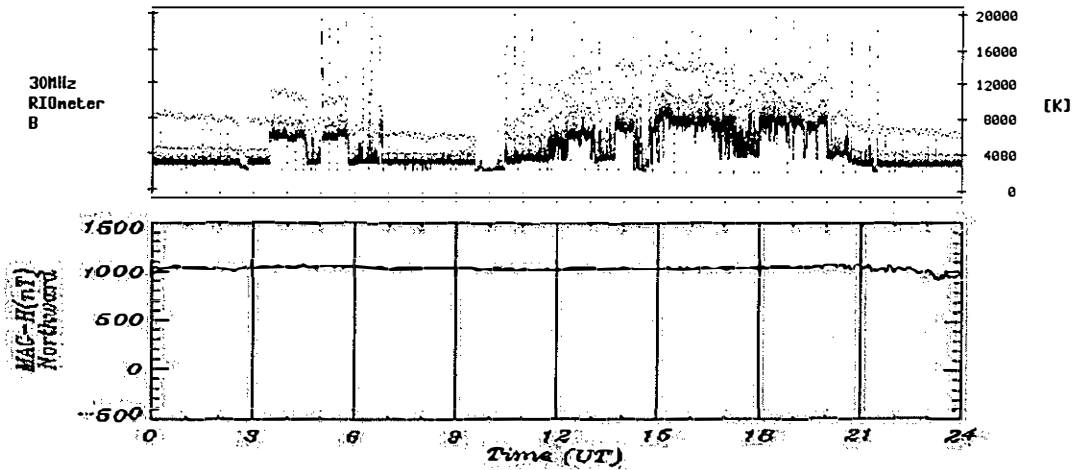
Syowa Station

2002/08/22



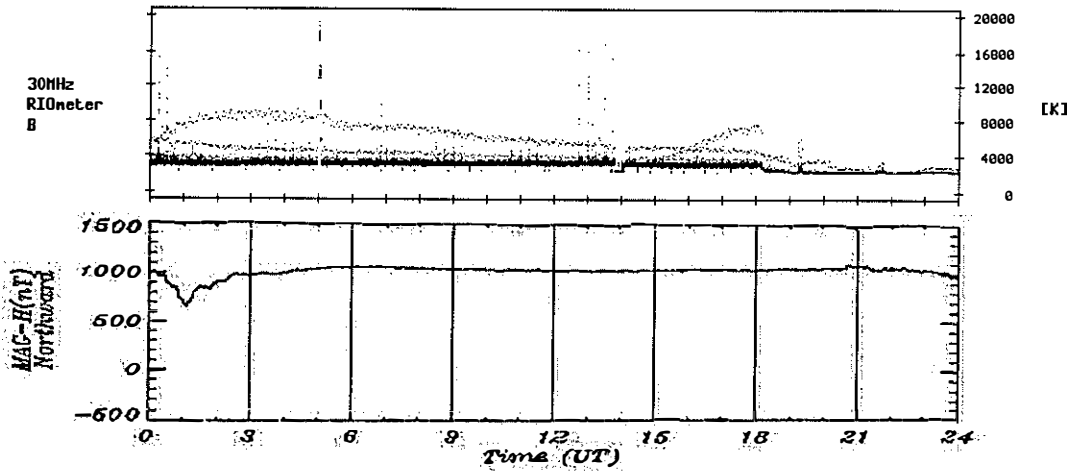
Syowa Station

2002/08/23



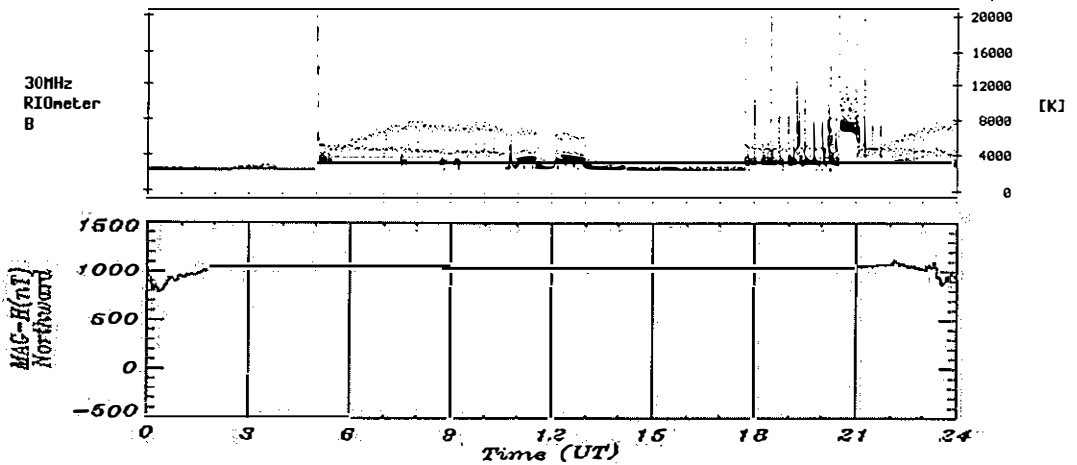
Syowa Station

2002/08/24



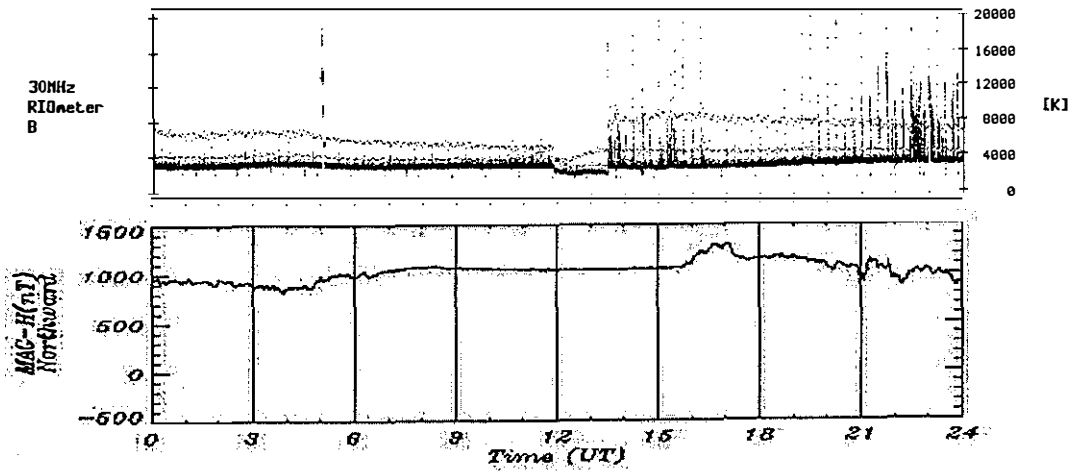
Syowa Station

2002/08/25



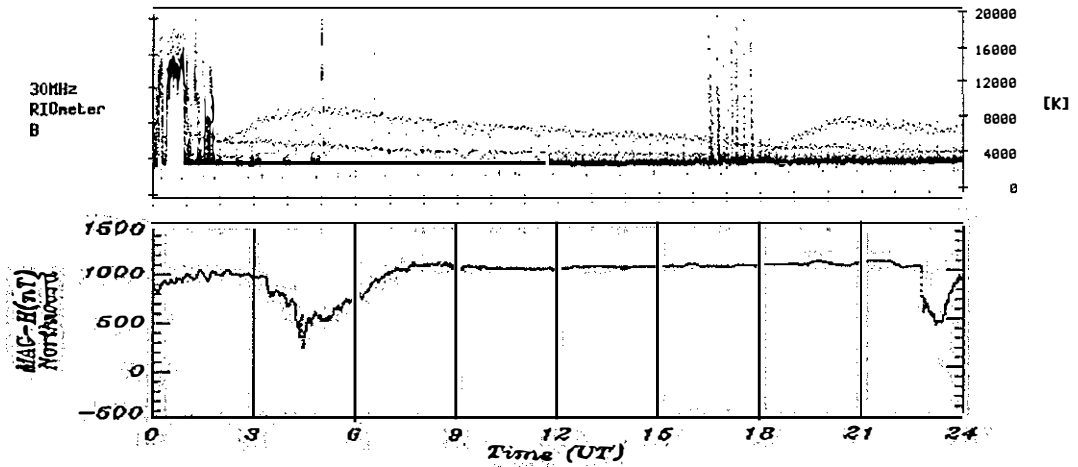
Syowa Station

2002/08/26



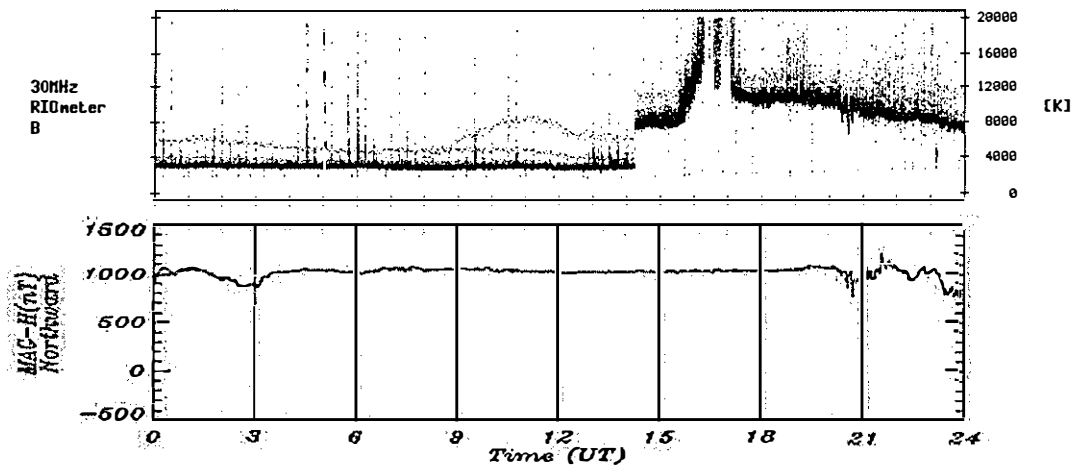
Syowa Station

2002/08/27



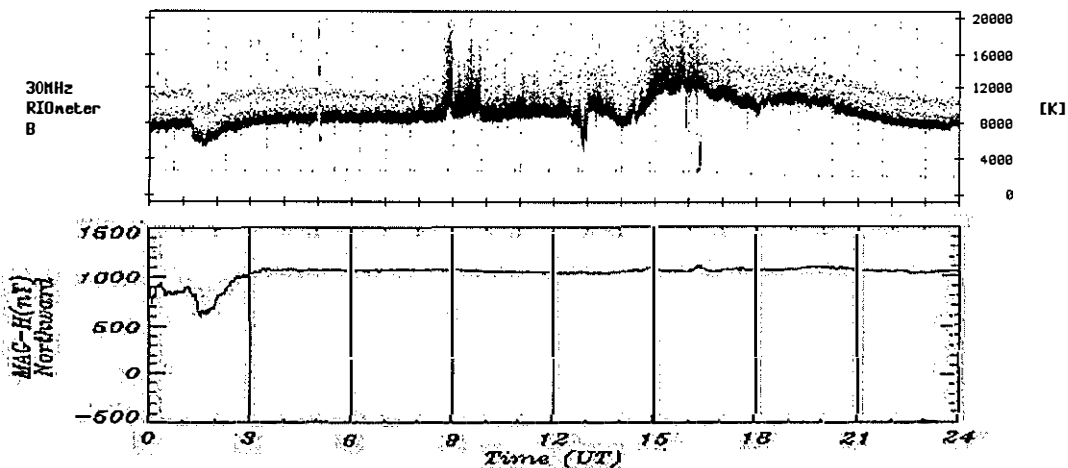
Syowa Station

2002/08/28



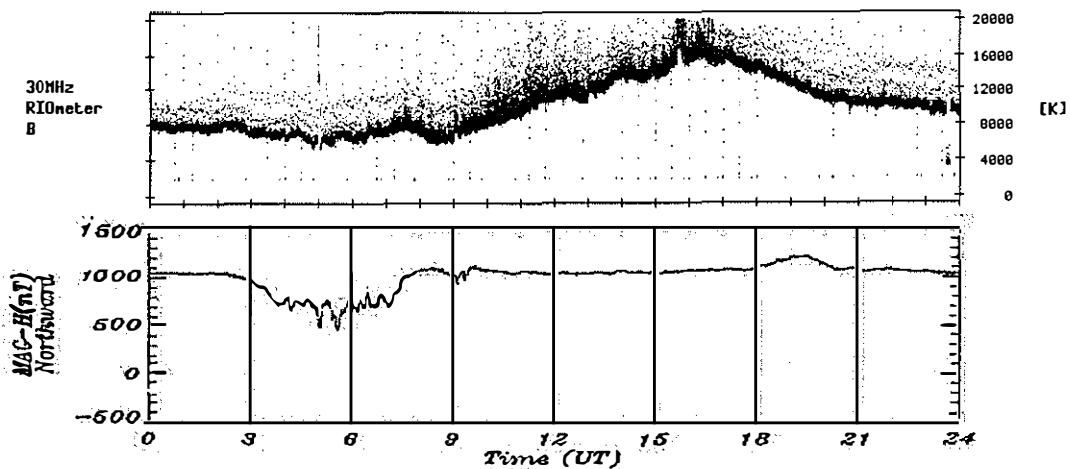
Syowa Station

2002/08/29



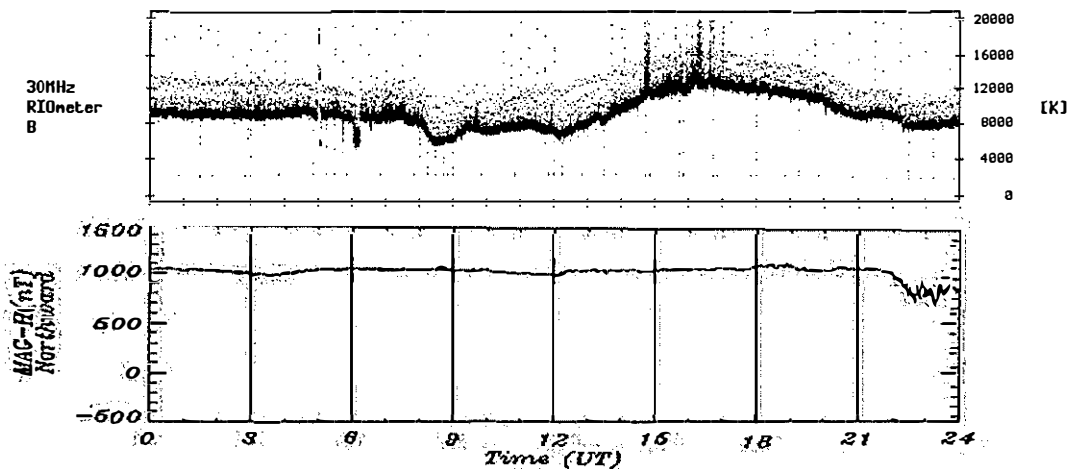
Syowa Station

2002/08/30



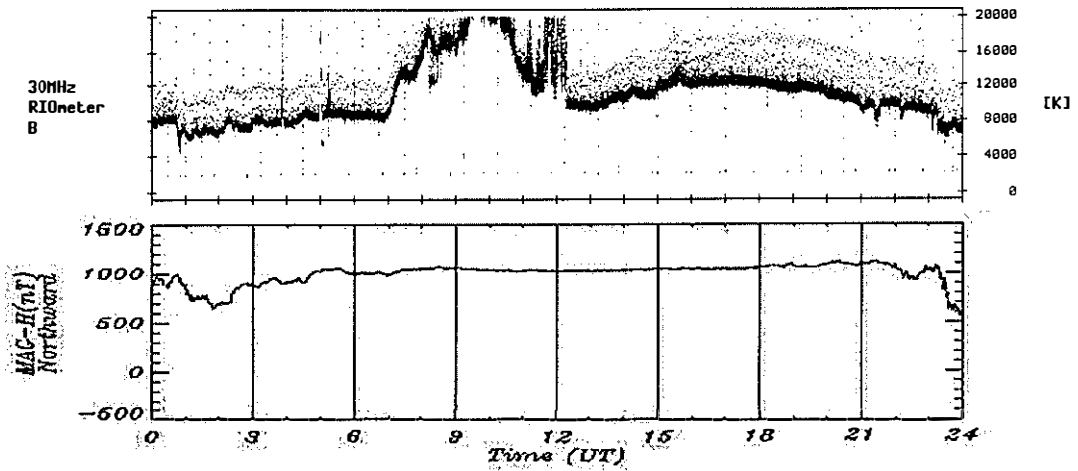
Syowa Station

2002/08/31



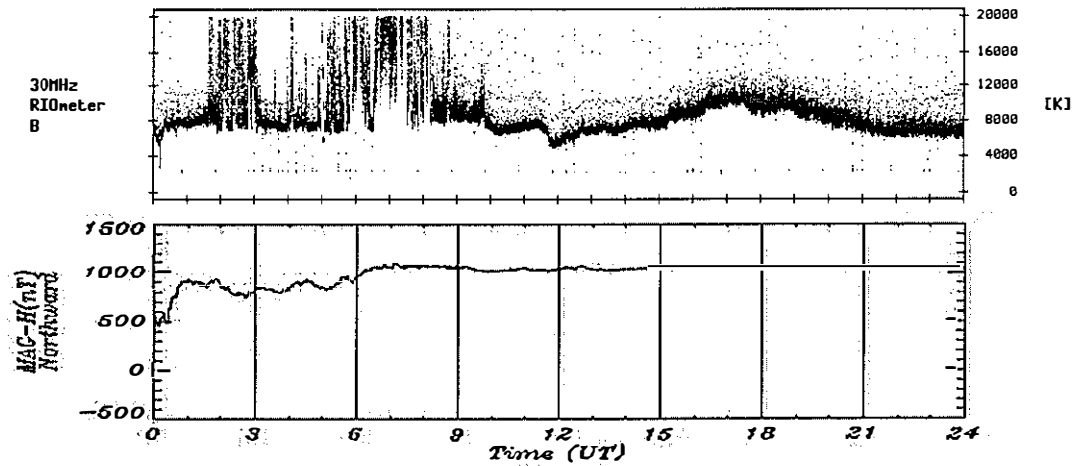
Syowa Station

2002/09/01



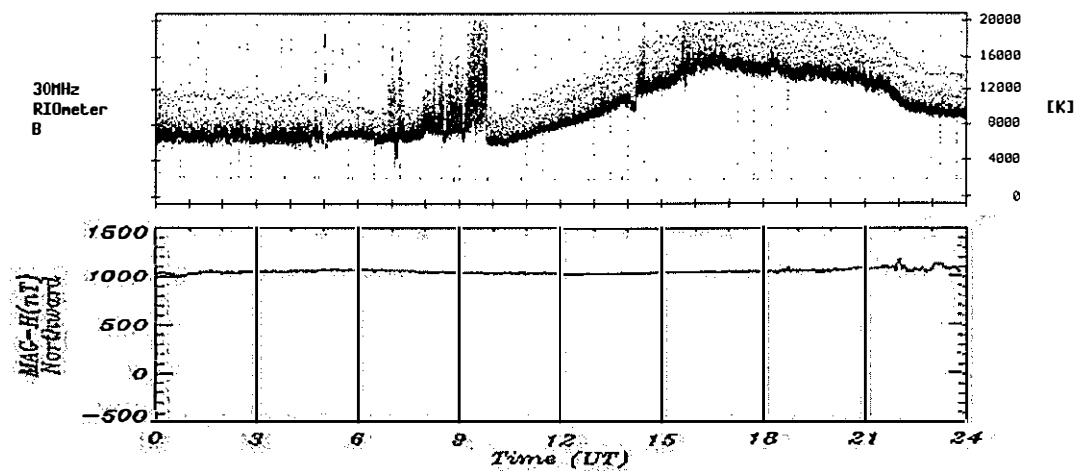
Syowa Station

2002/09/02



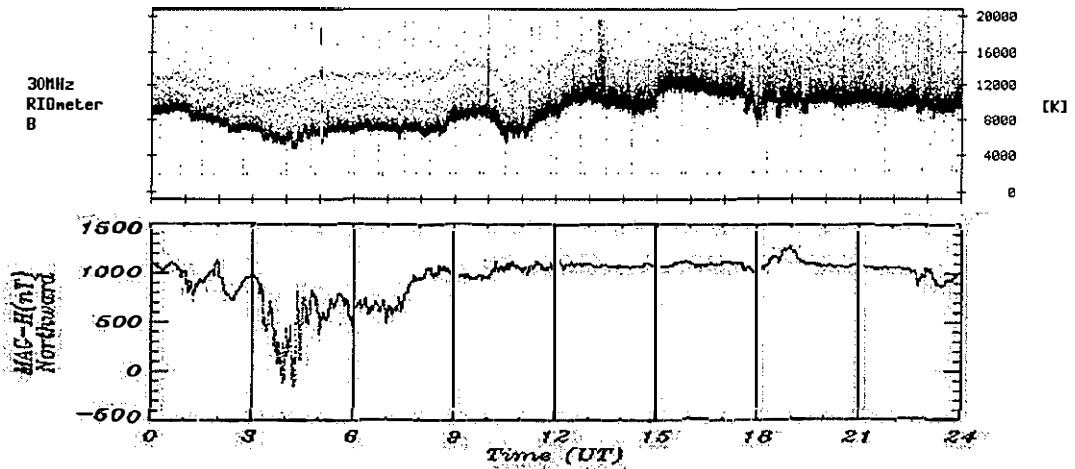
Syowa Station

2002/09/03



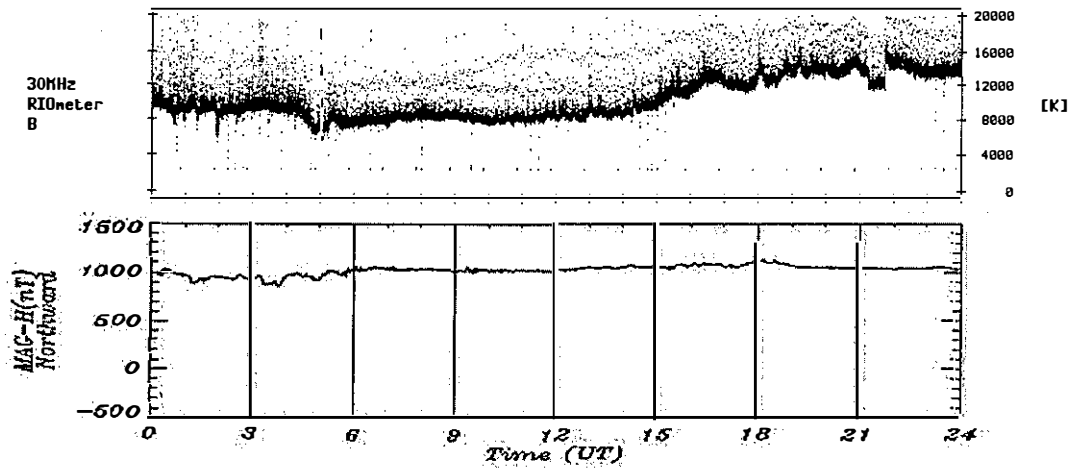
Syowa Station

2002/09/04



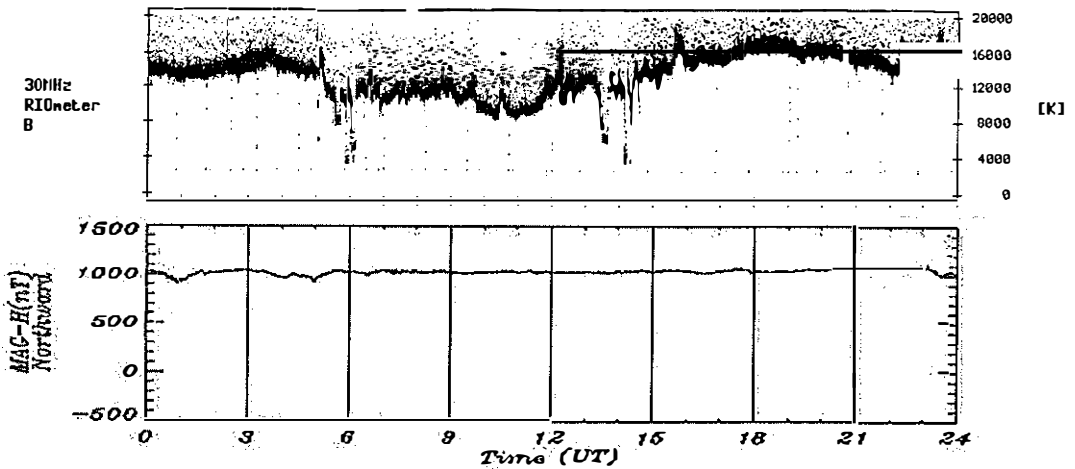
Syowa Station

2002/09/05



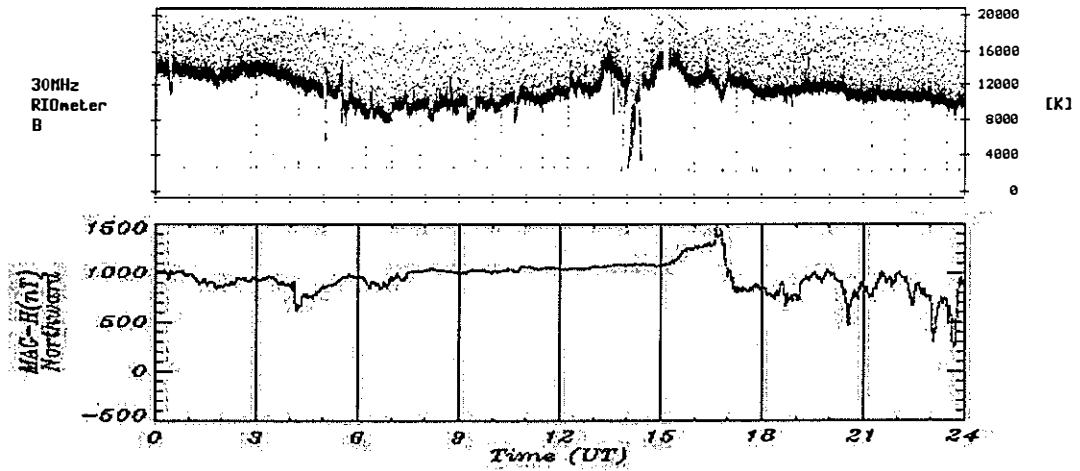
Syowa Station

2002/09/06



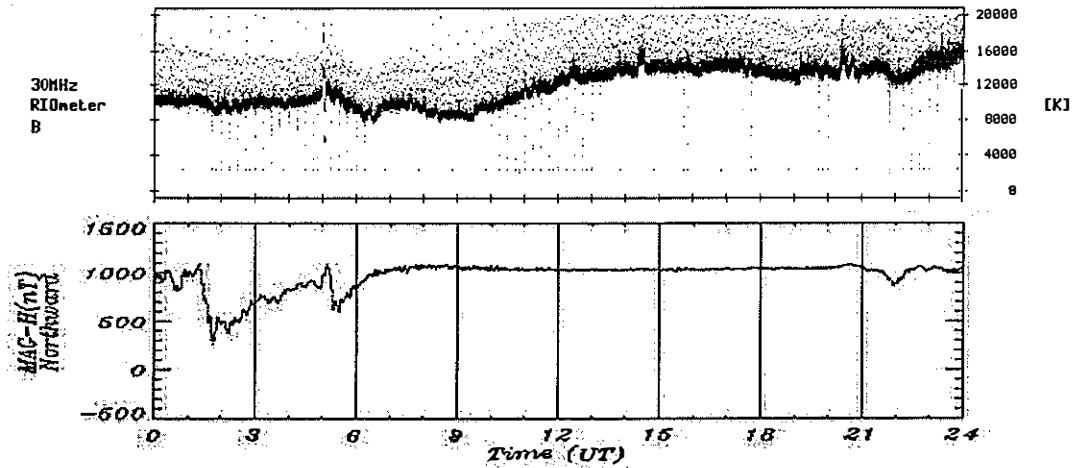
Syowa Station

2002/09/07



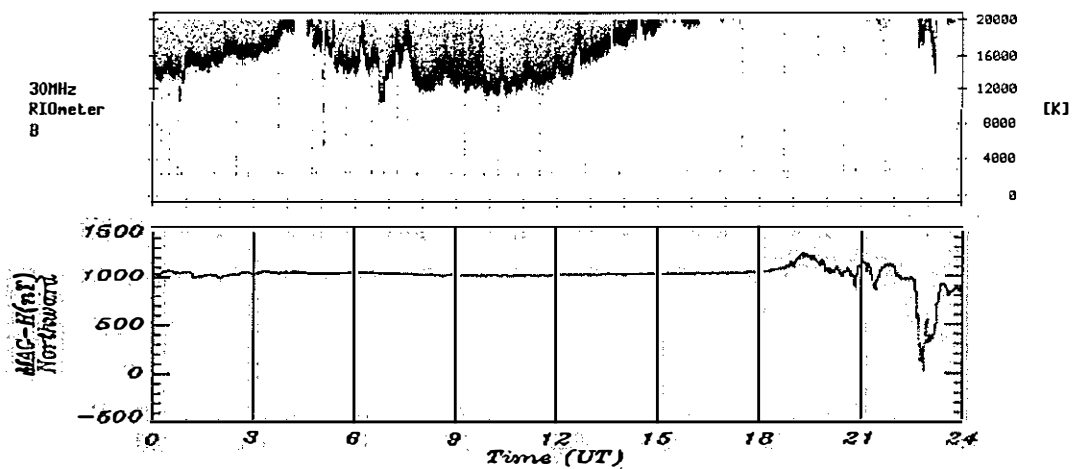
Syowa Station

2002/09/08



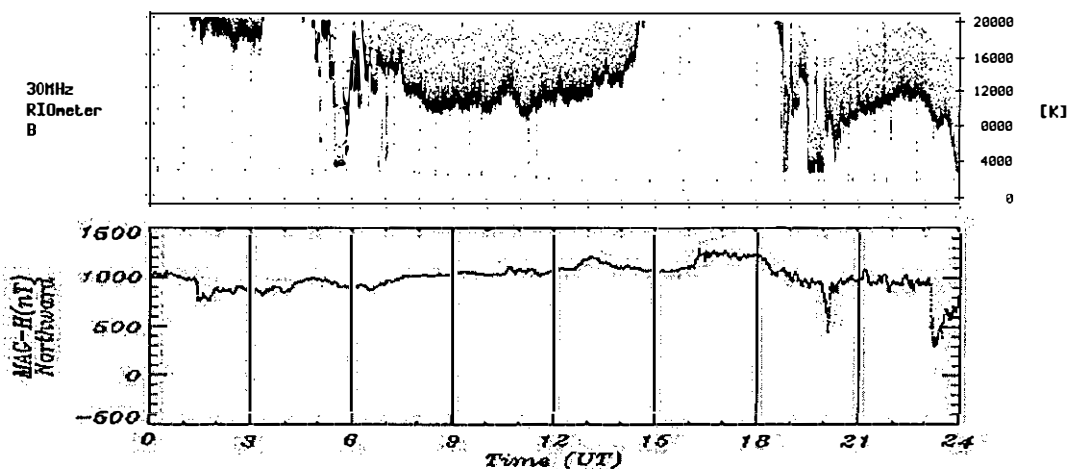
Syowa Station

2002/09/09



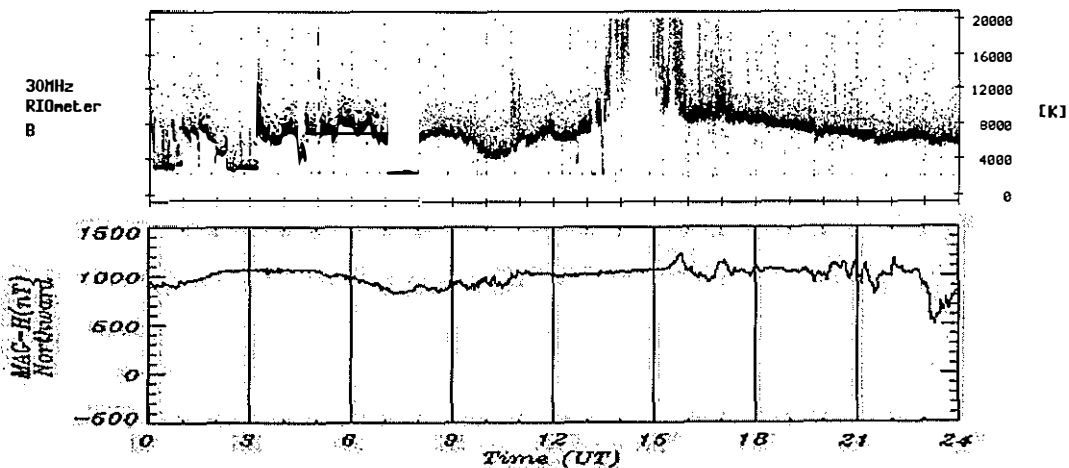
Syowa Station

2002/09/10



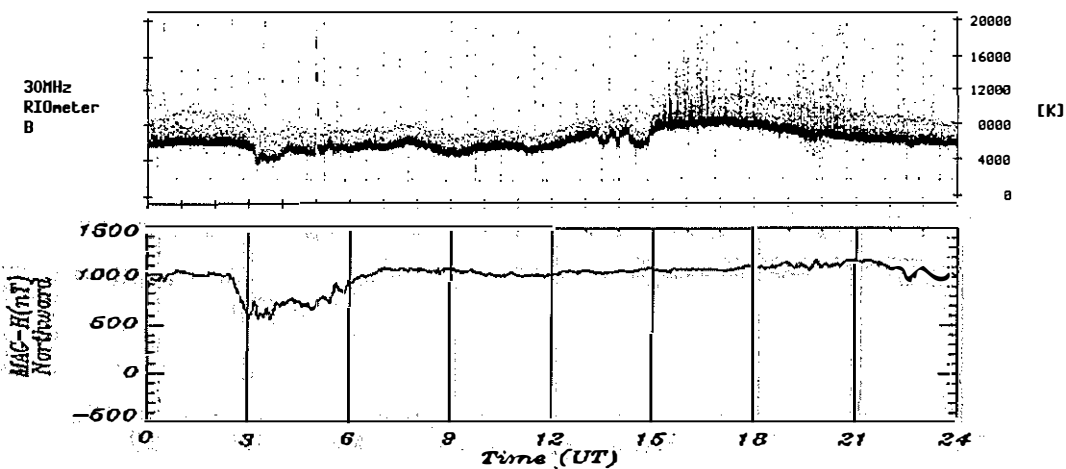
Syowa Station

2002/09/11



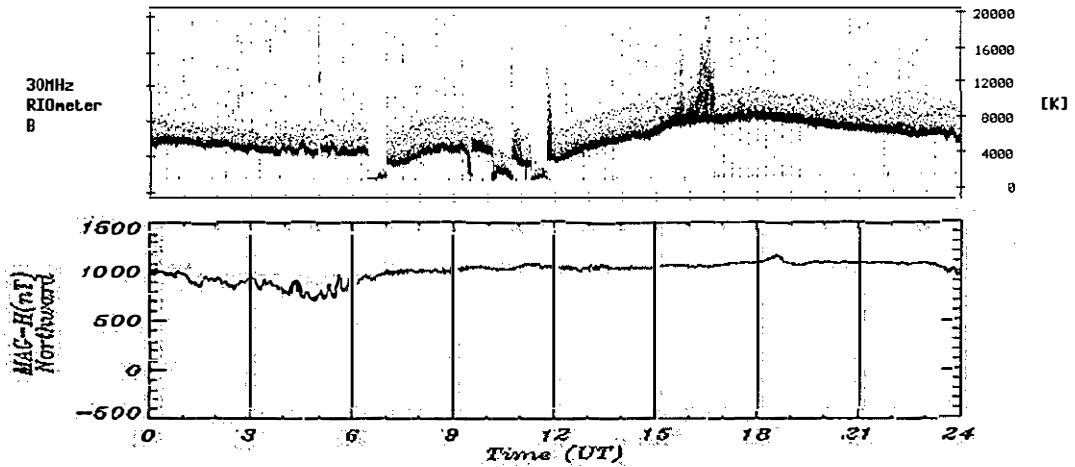
Syowa Station

2002/09/12



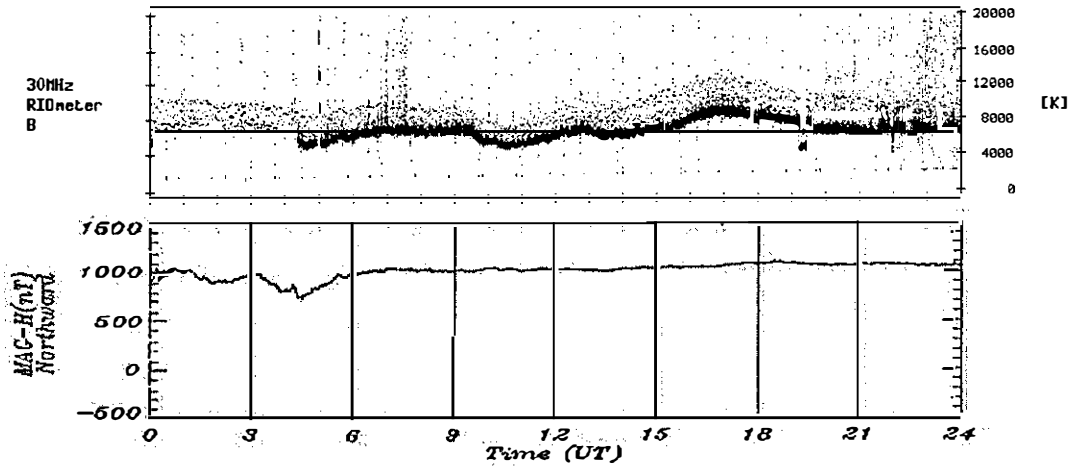
Syowa Station

2002/09/13



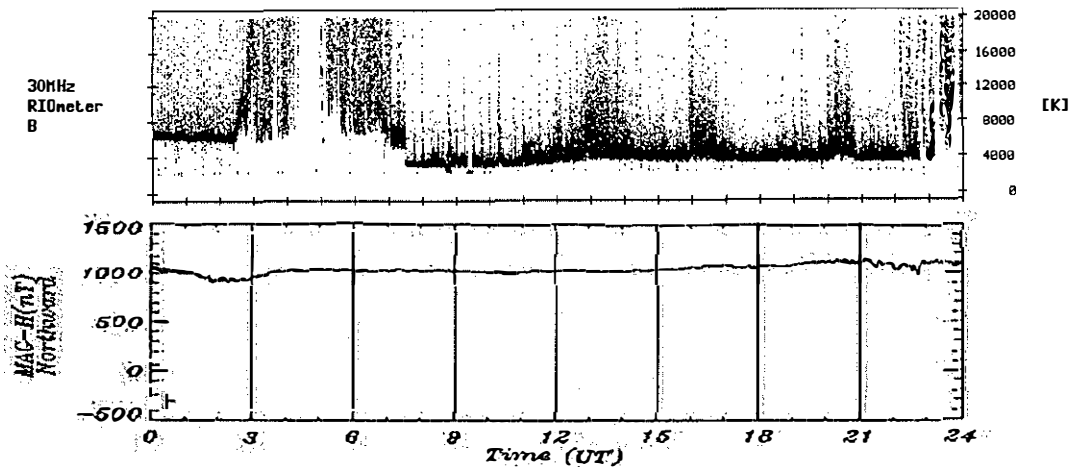
Syowa Station

2002/09/14



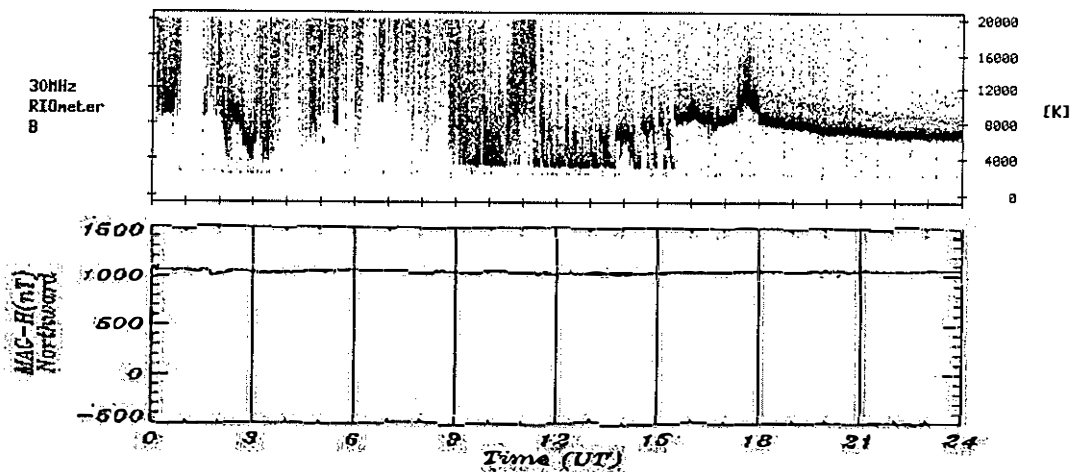
Syowa Station

2002/09/15



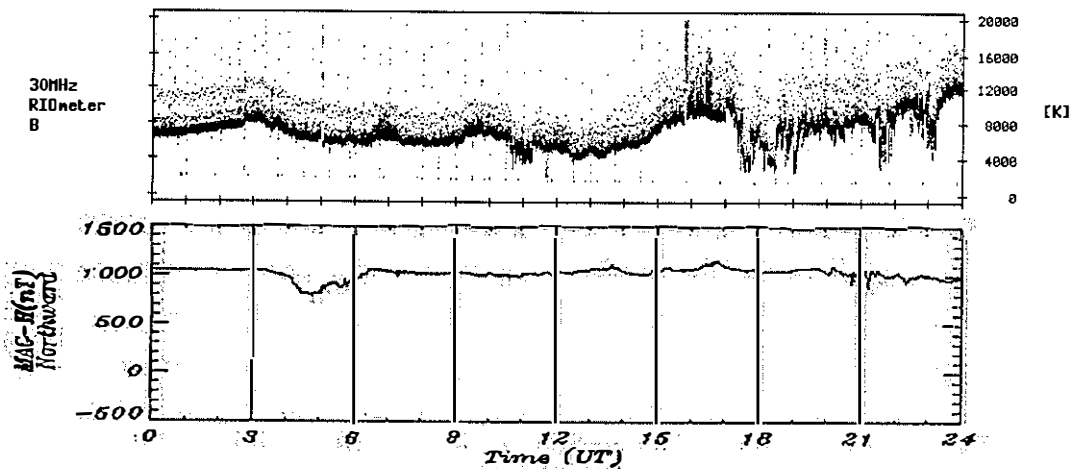
Syowa Station

2002/09/16



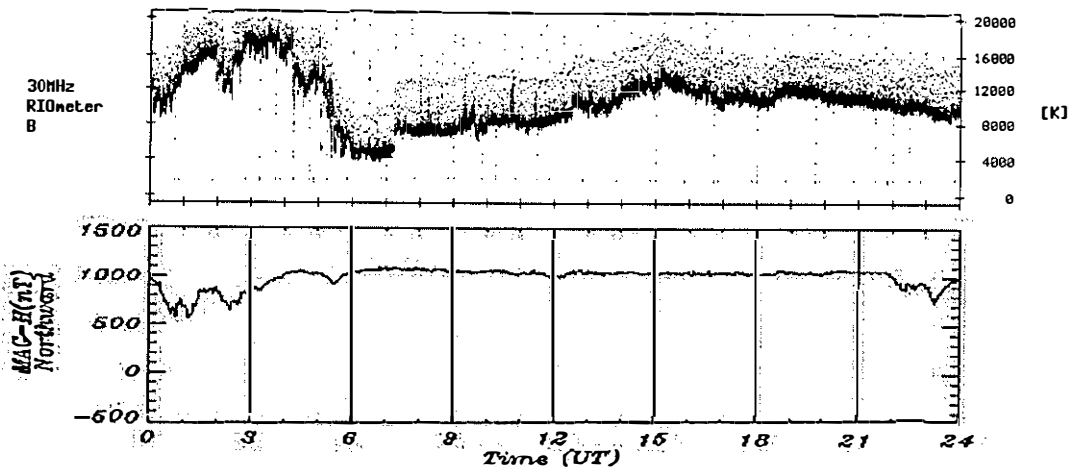
Syowa Station

2002/09/17



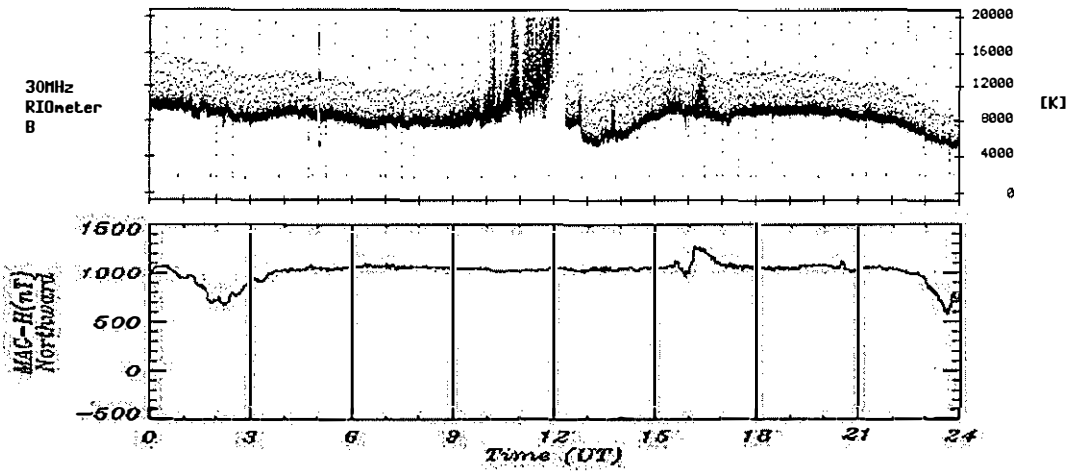
Syowa Station

2002/09/18



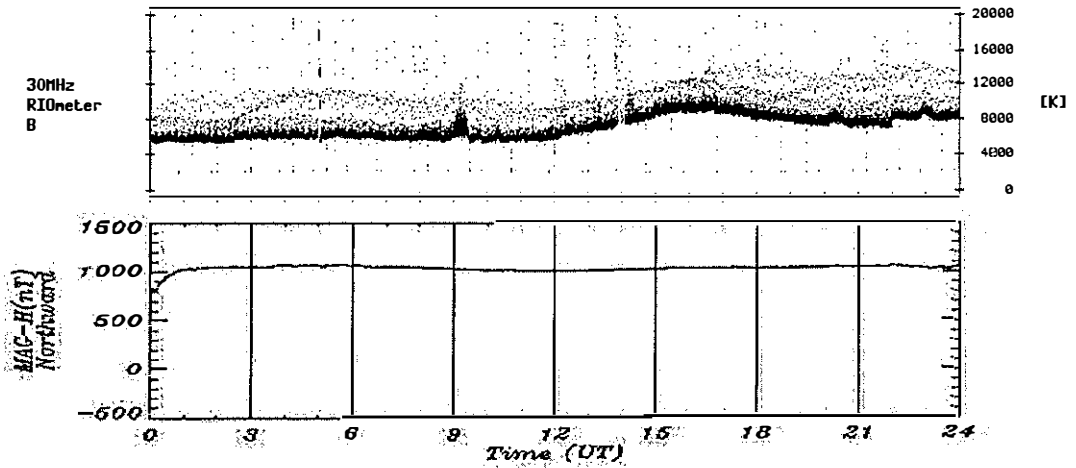
Syowa Station

2002/09/19



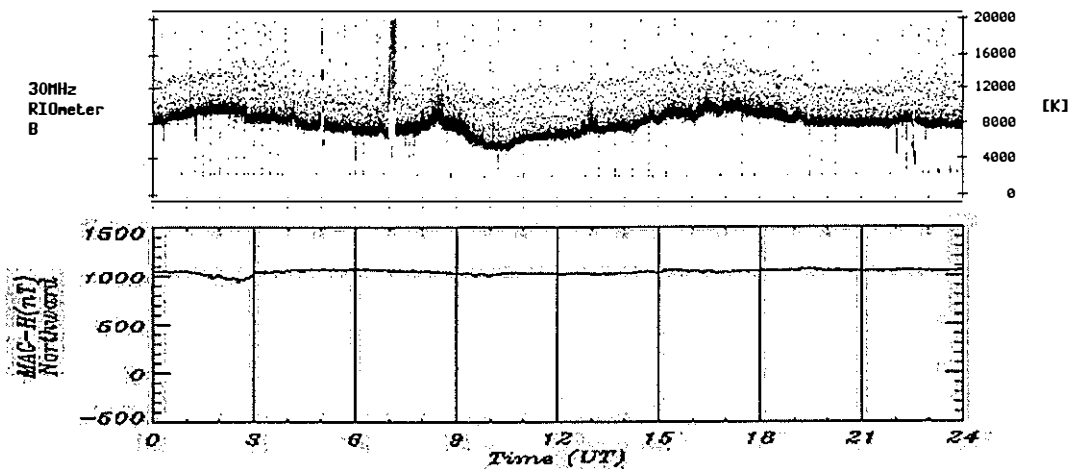
Syowa Station

2002/09/20



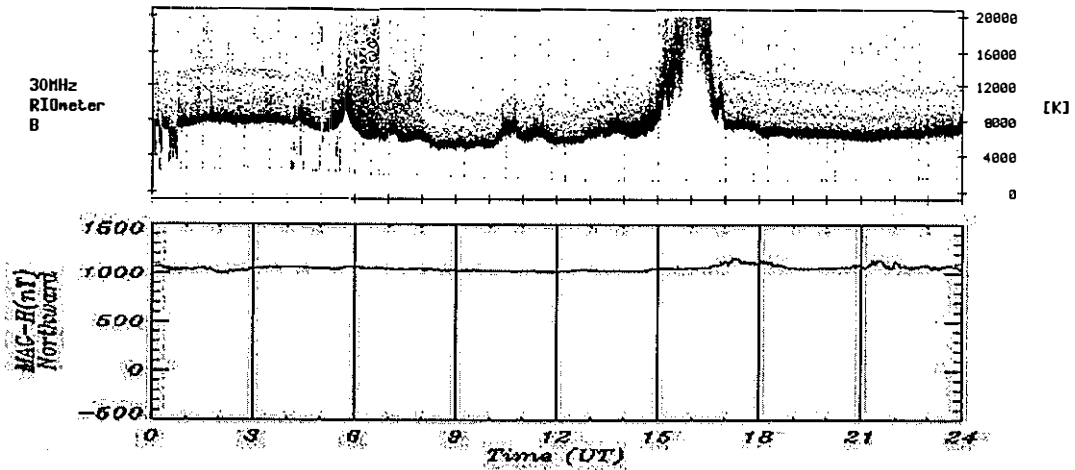
Syowa Station

2002/09/21



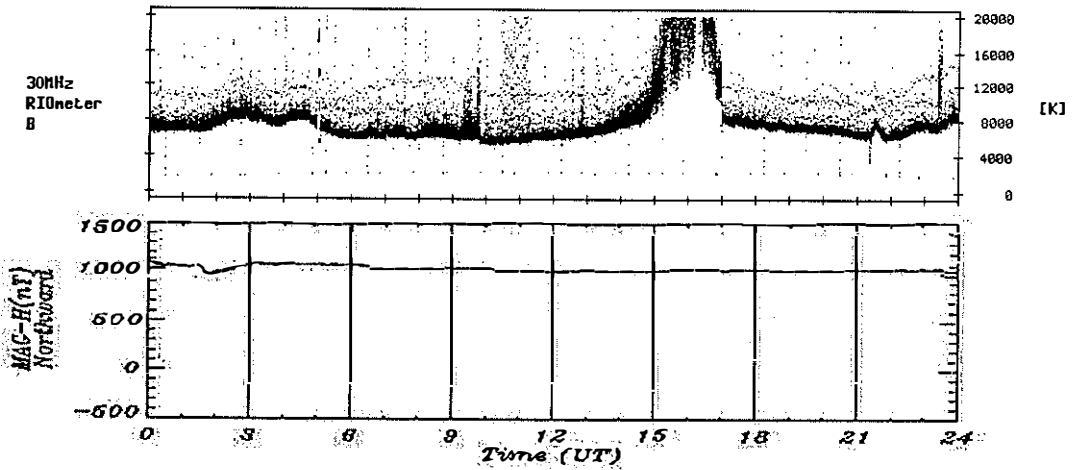
Syowa Station

2002/09/22



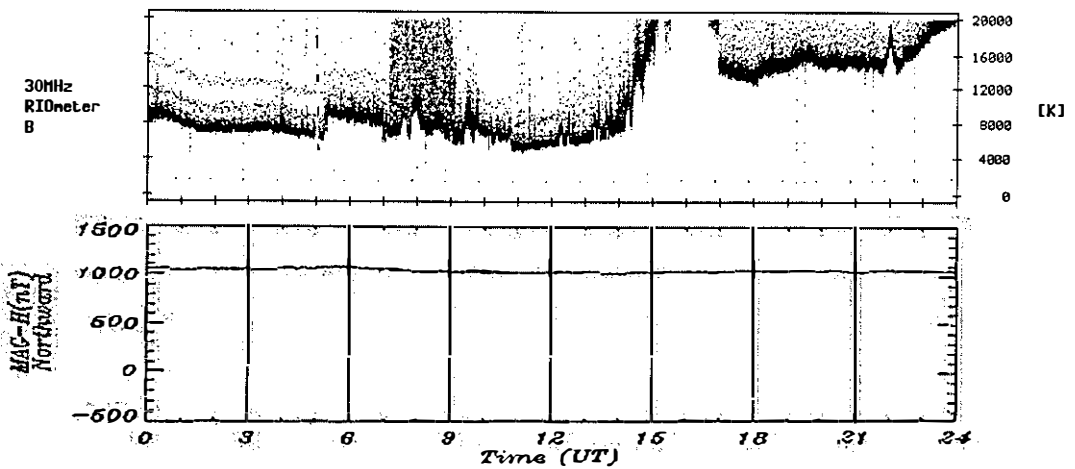
Syowa Station

2002/09/23



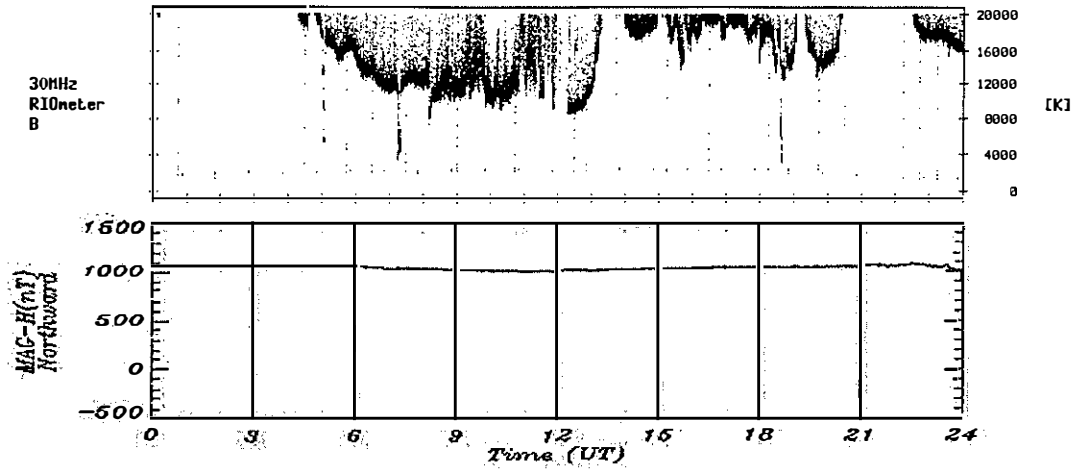
Syowa Station

2002/09/24



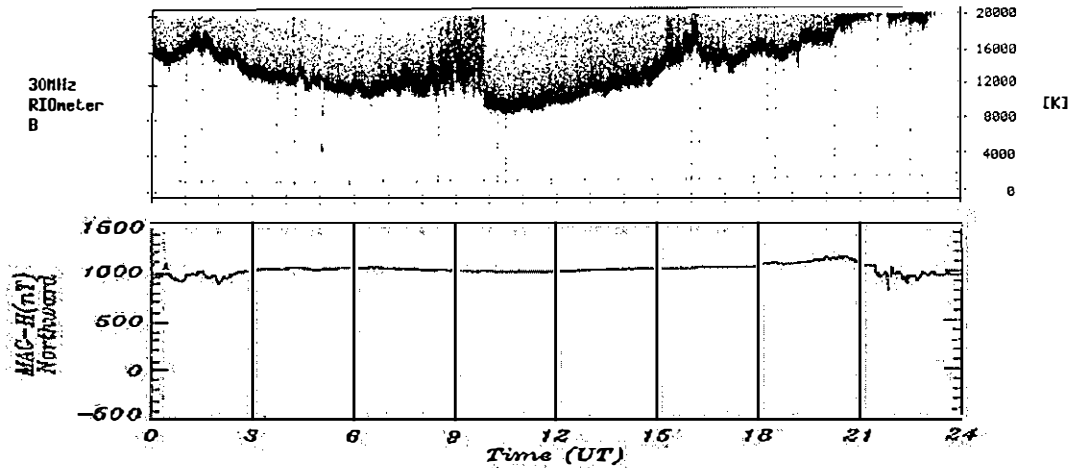
Syowa Station

2002/09/25



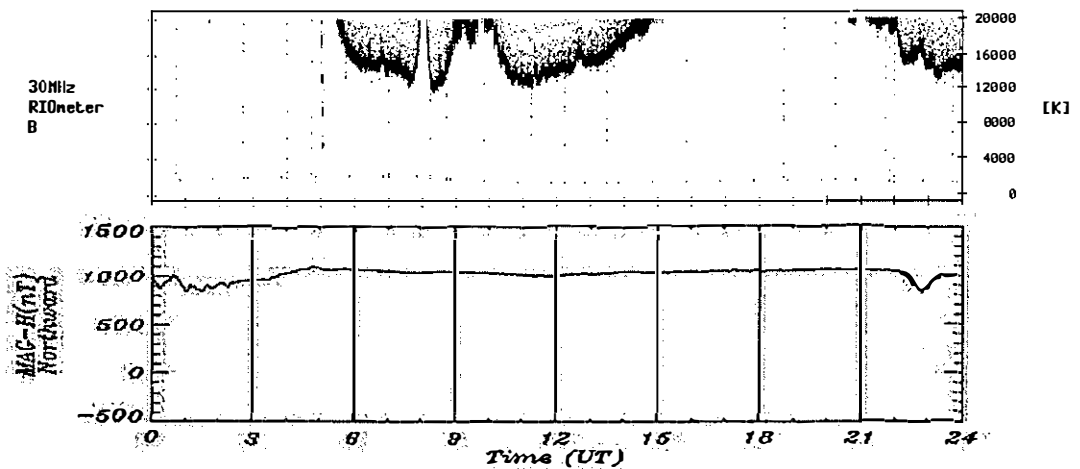
Syowa Station

2002/09/26



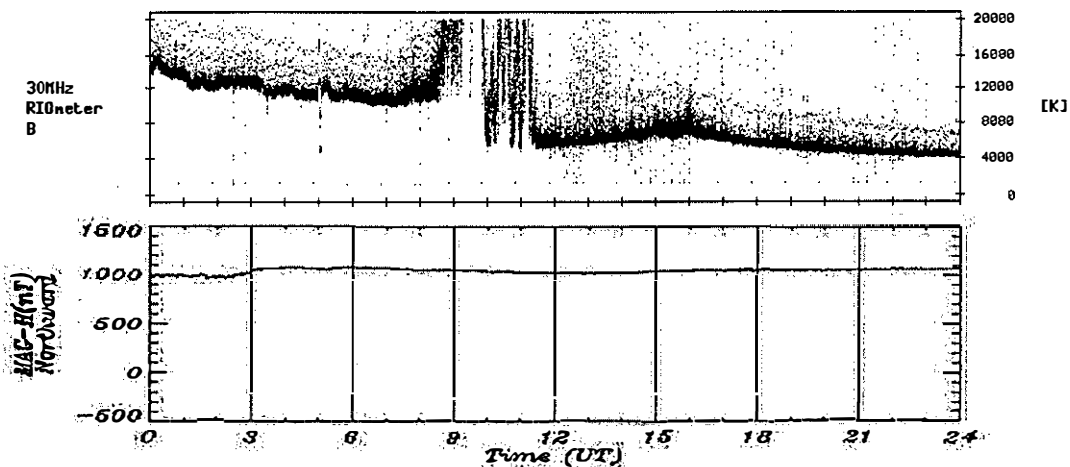
Syowa Station

2002/09/27



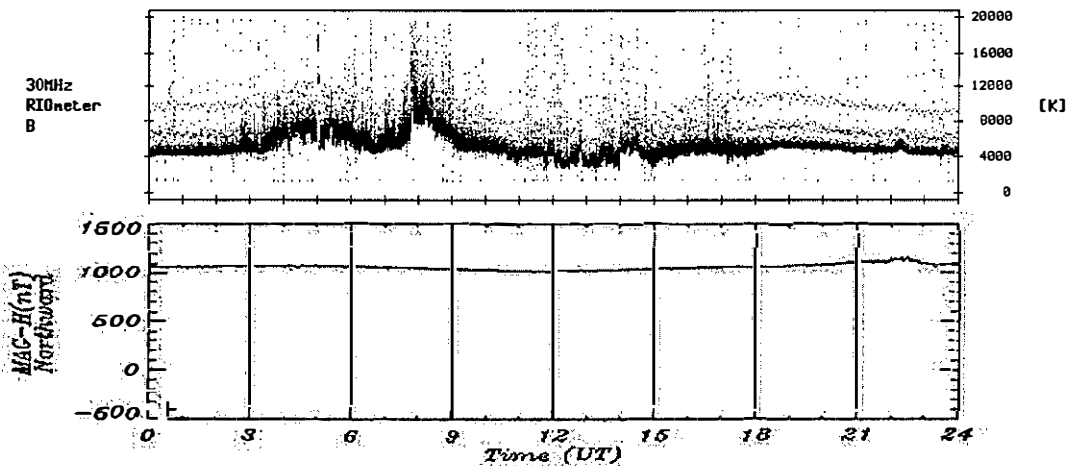
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2002/09/28



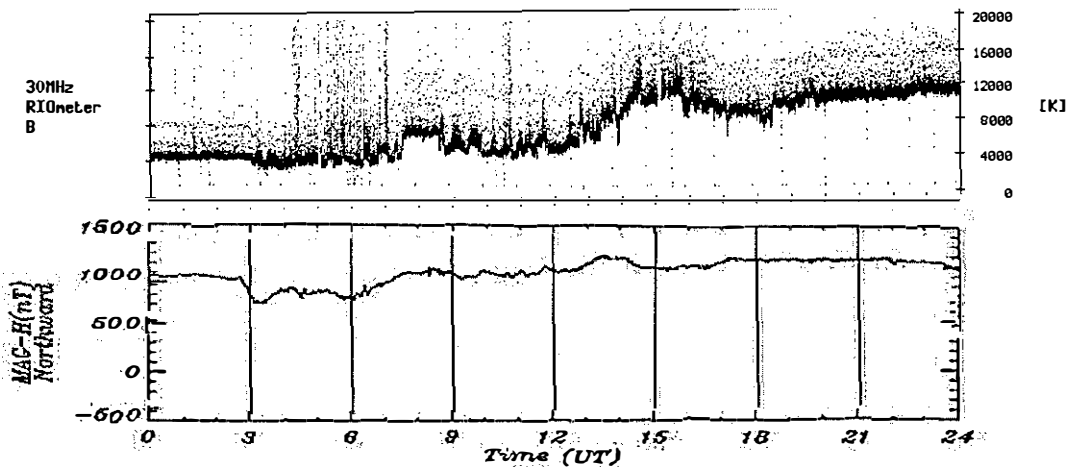
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2002/09/29



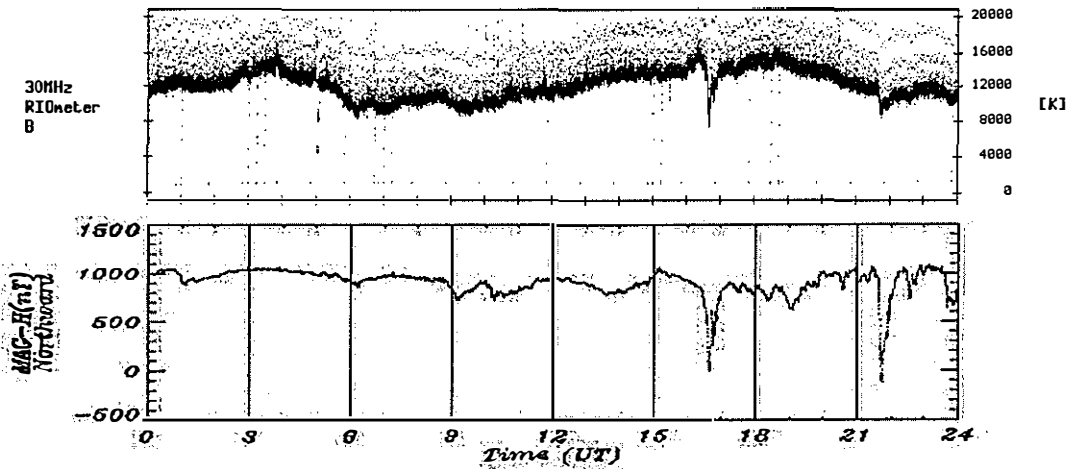
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2002/09/30



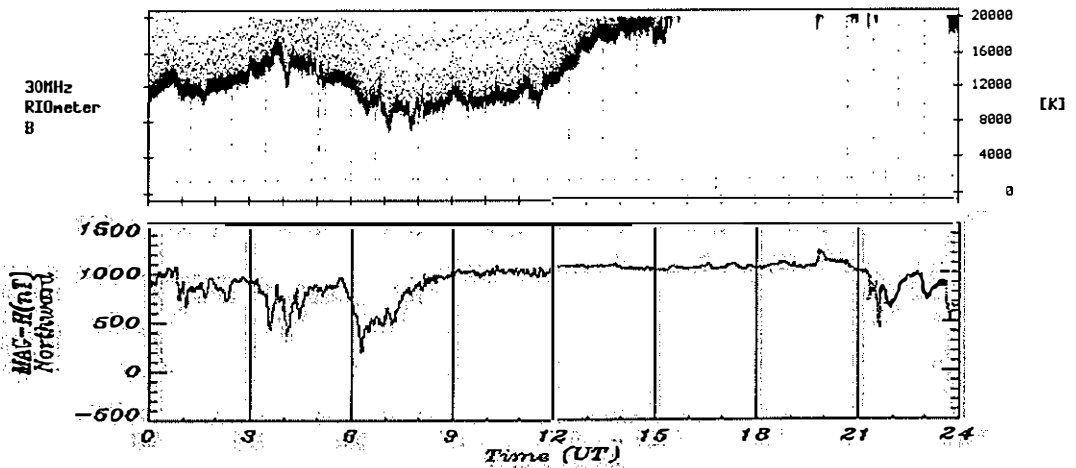
Syowa Station

2002/10/01



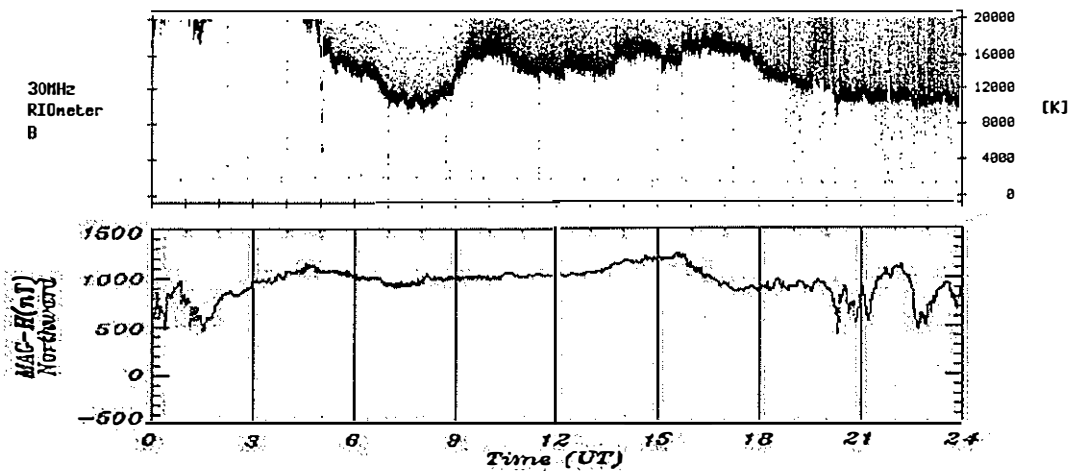
Syowa Station

2002/10/02



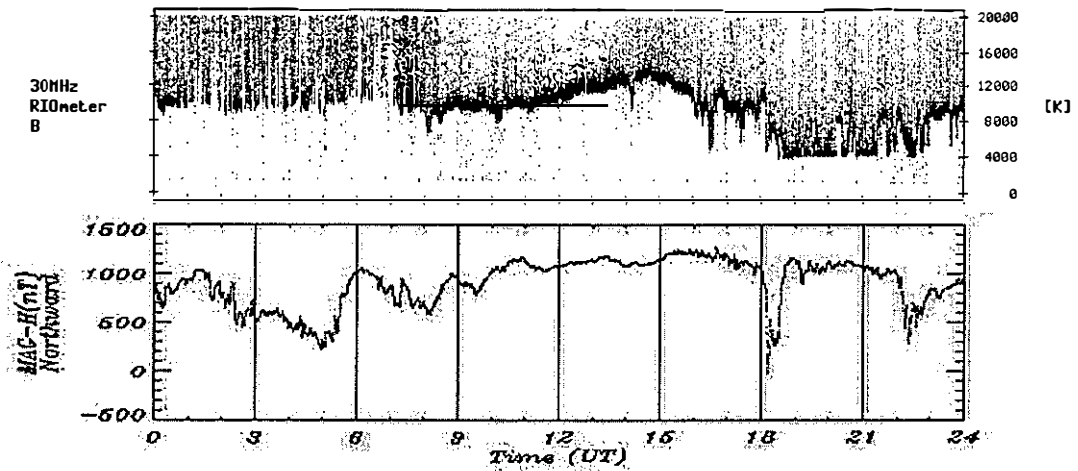
Syowa Station

2002/10/03



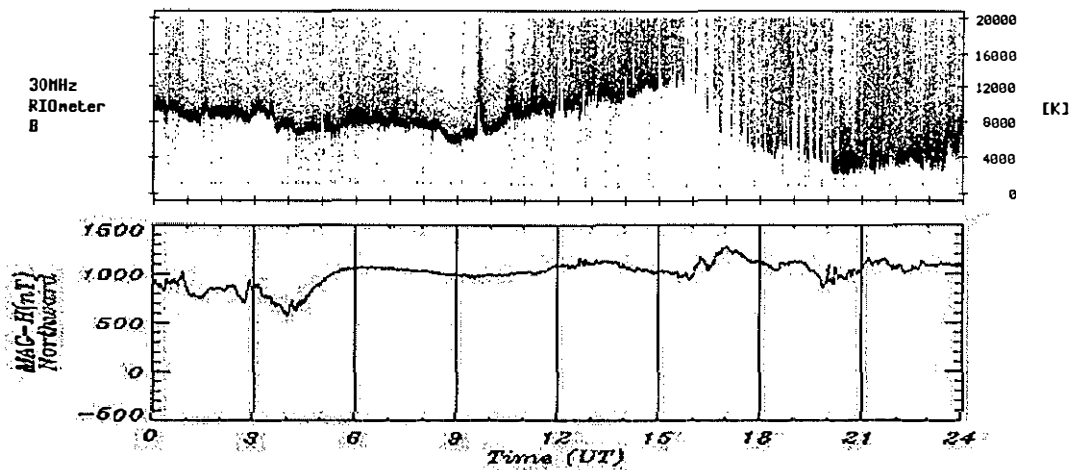
Syowa Station

2002/10/04



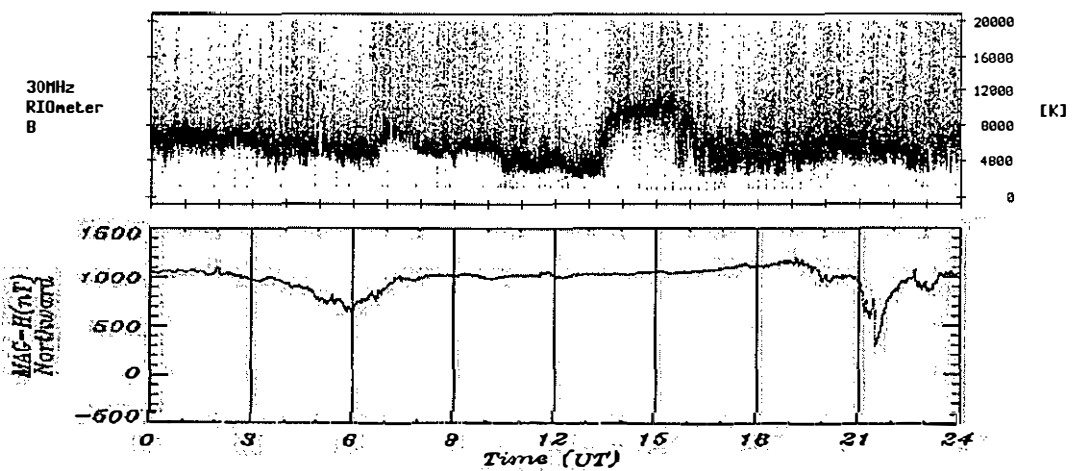
Syowa Station

2002/10/05



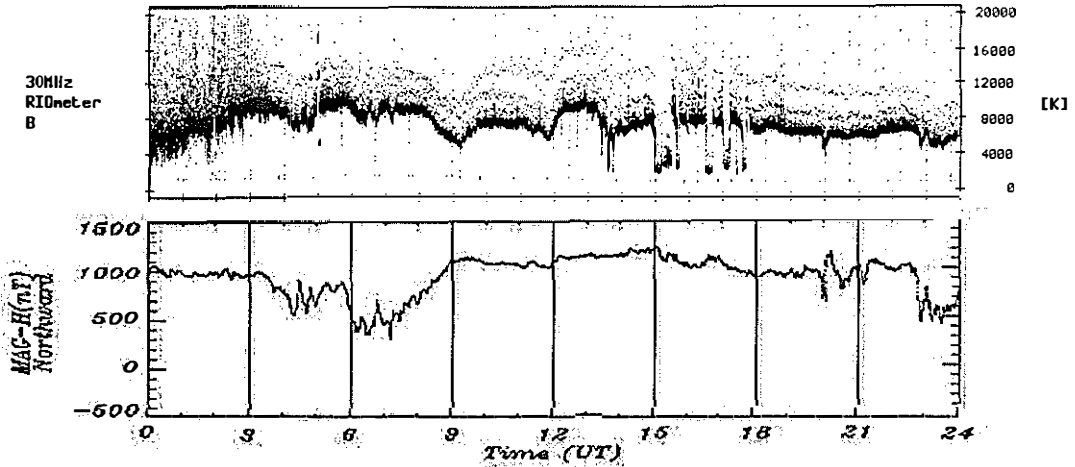
Syowa Station

2002/10/06



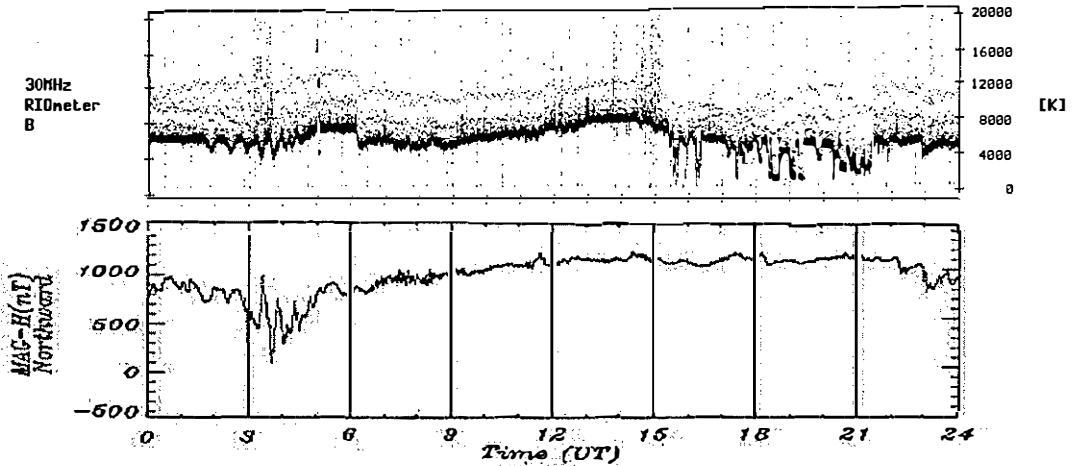
Syowa Station

2002/10/07



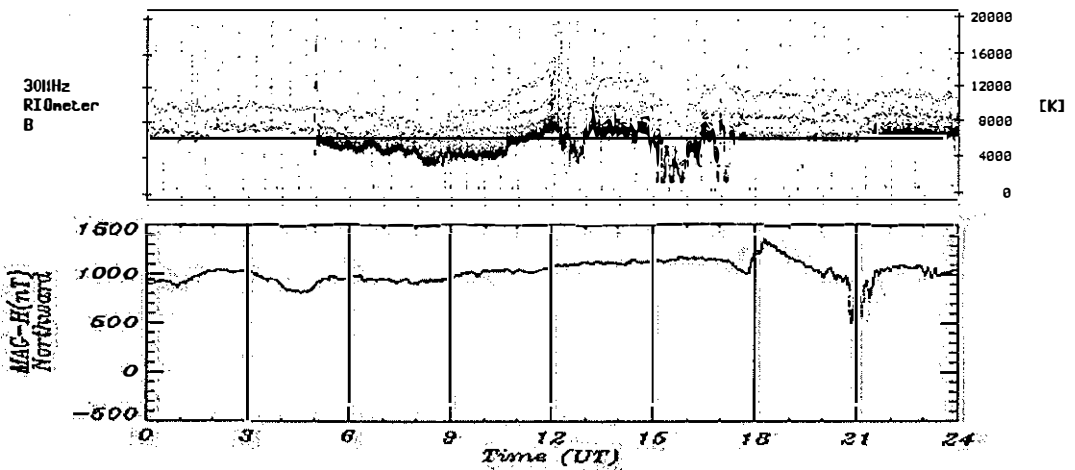
Syowa Station

2002/10/08



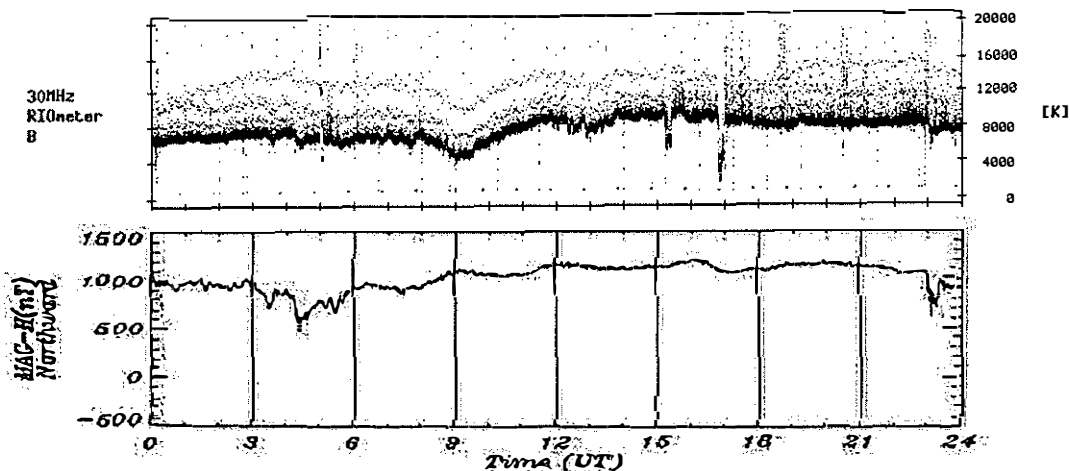
Syowa Station

2002/10/09



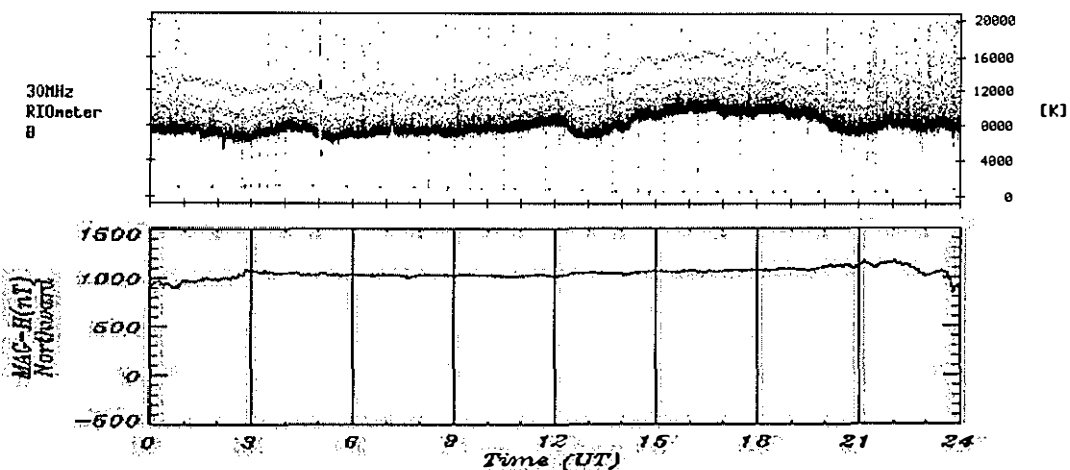
Syowa Station

2002/10/10



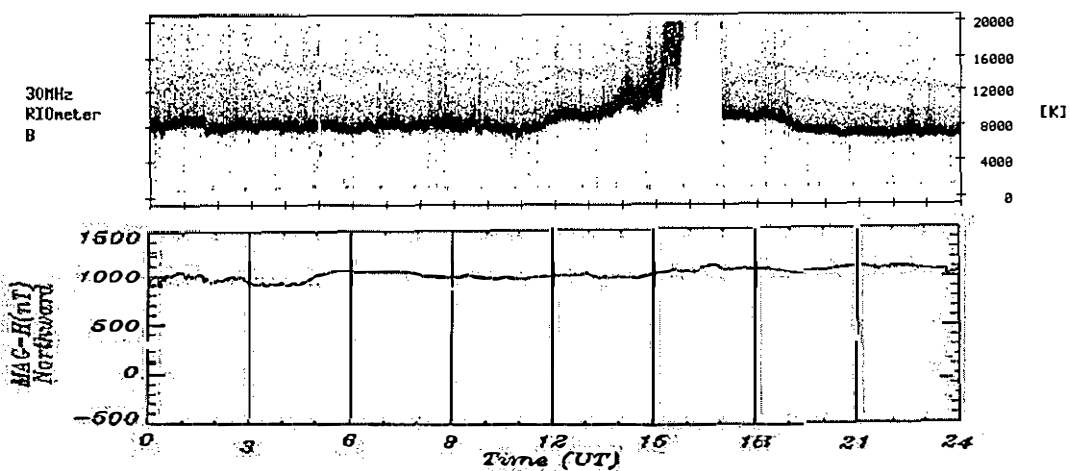
Syowa Station

2002/10/11



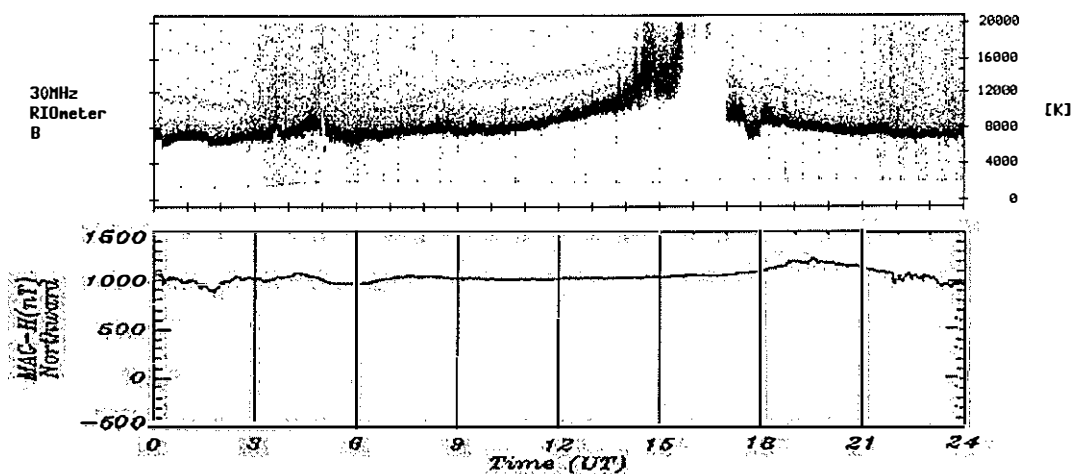
Syowa Station

2002/10/12



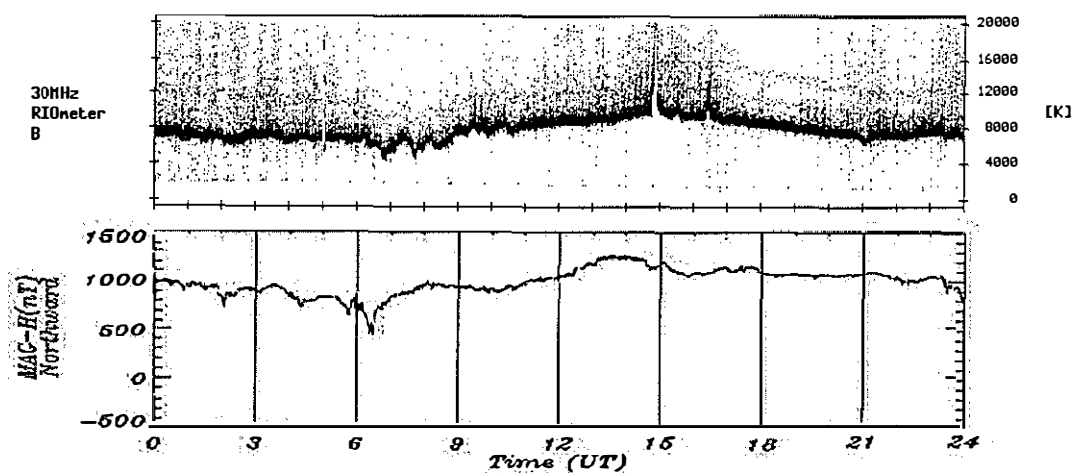
Syowa Station

2002/10/13



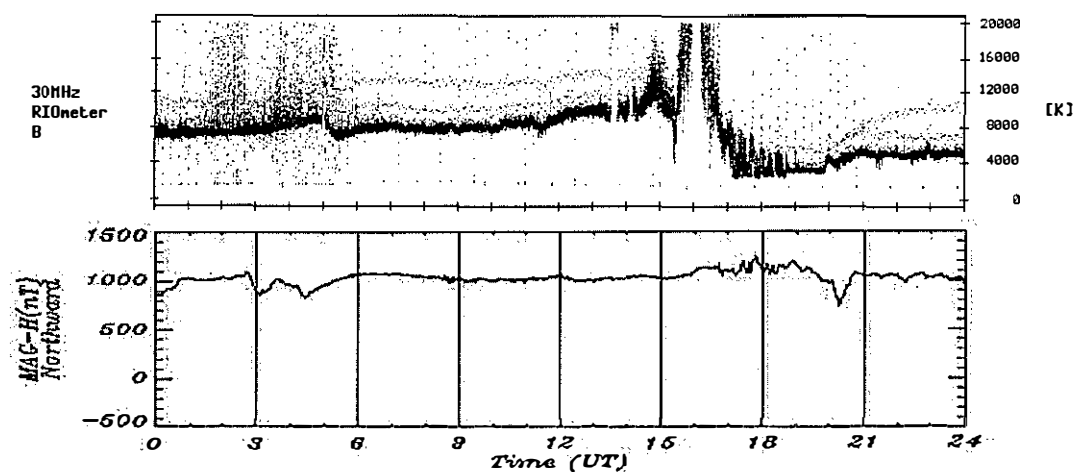
Syowa Station

2002/10/14



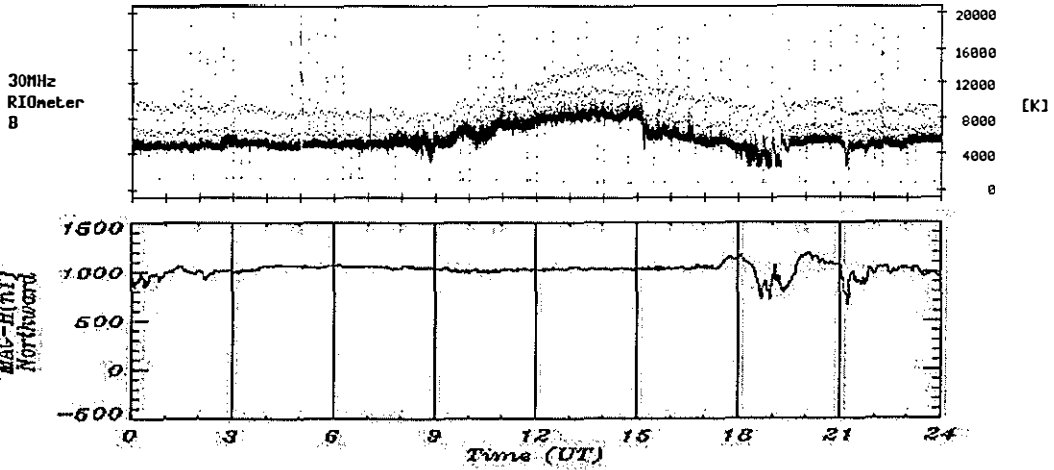
Syowa Station

2002/10/15



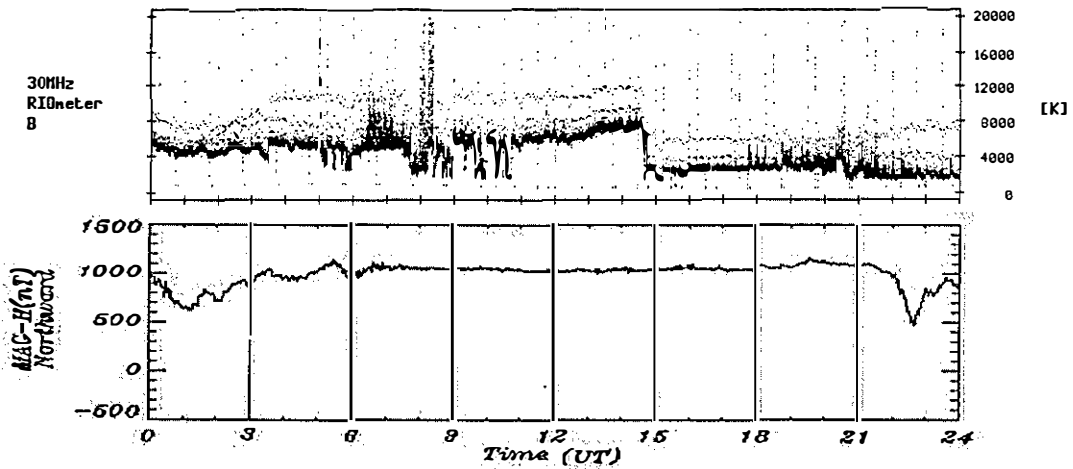
Syowa Station

2002/10/16



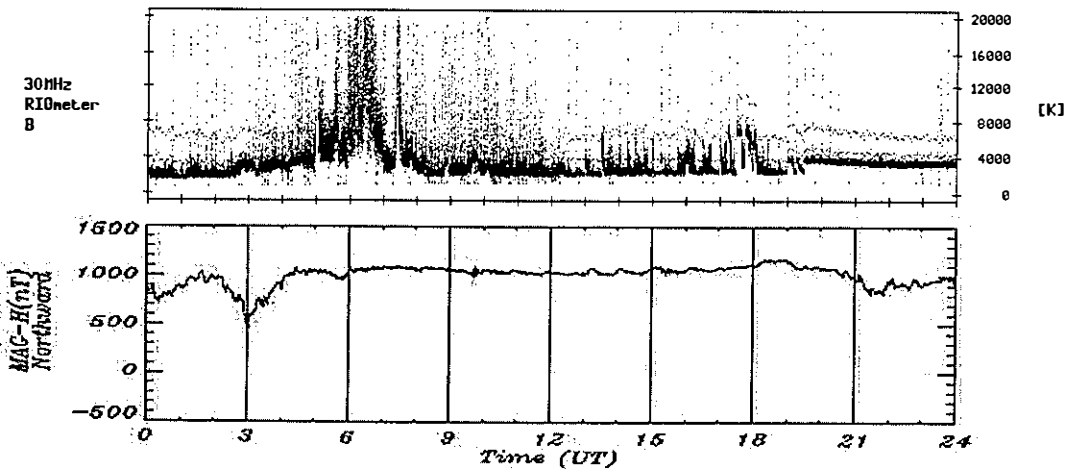
Syowa Station

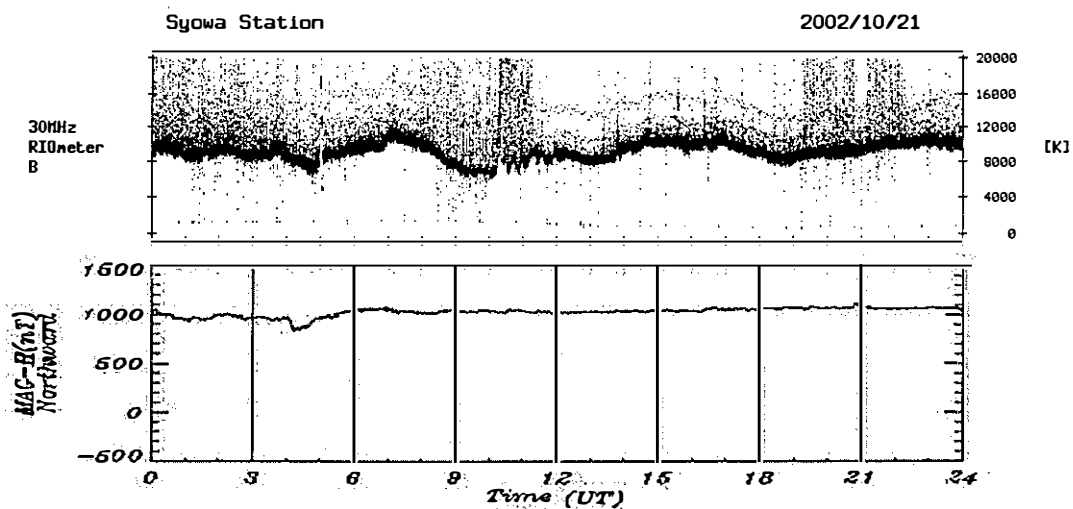
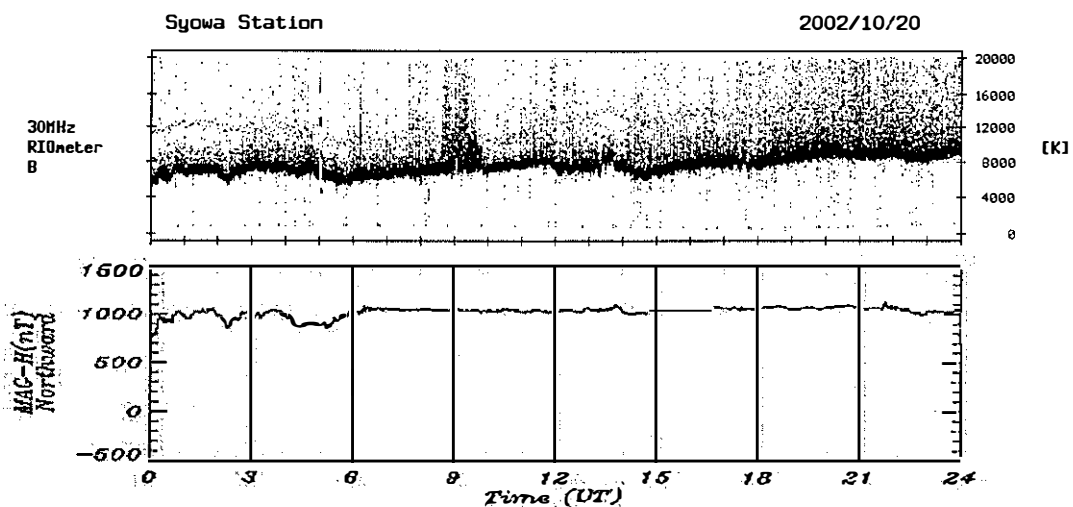
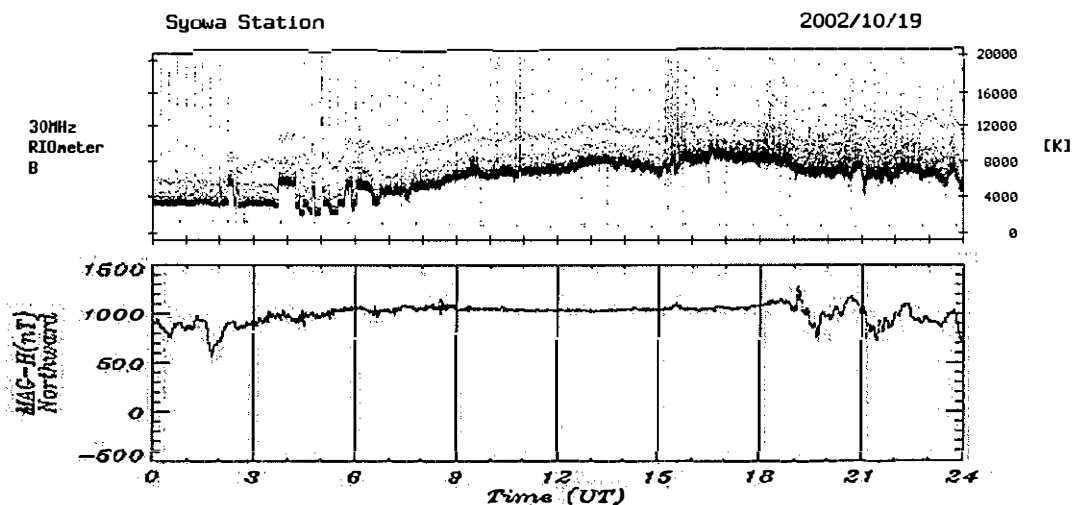
2002/10/17



Syowa Station

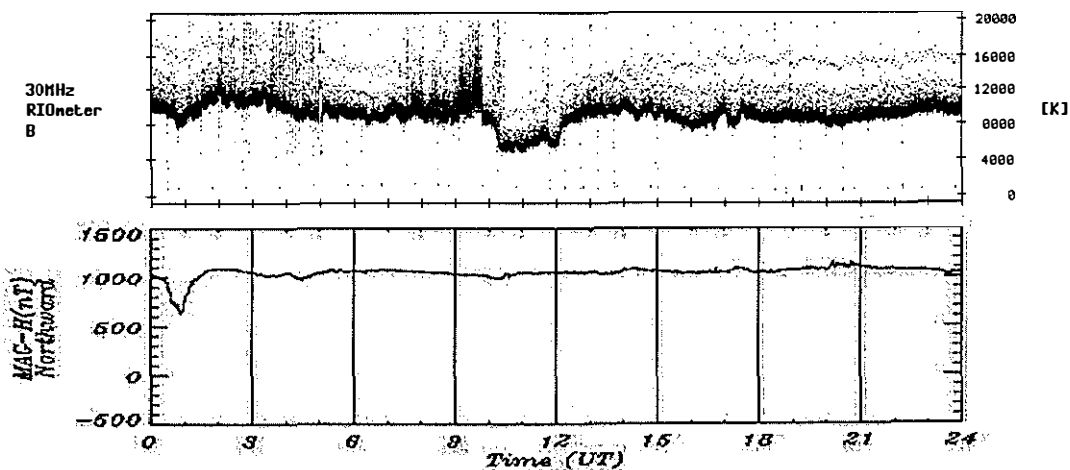
2002/10/18





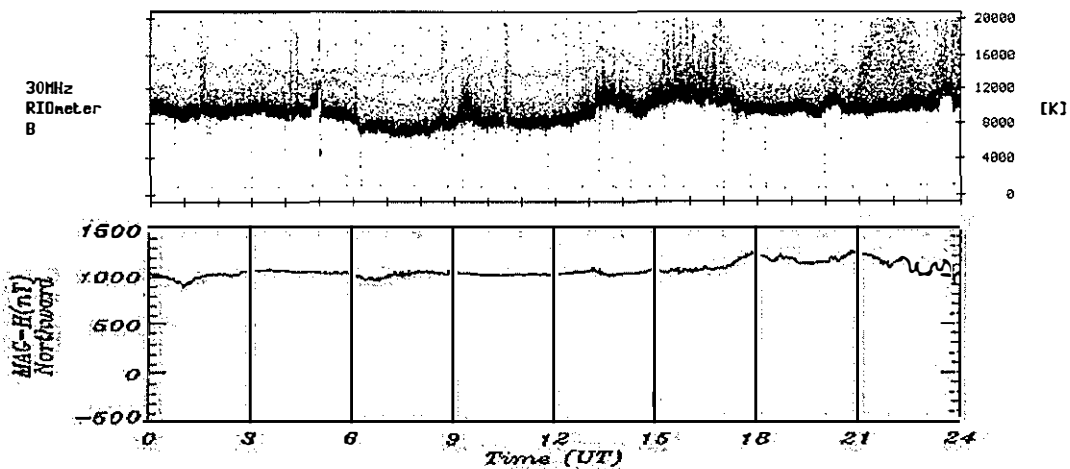
Syowa Station

2002/10/22



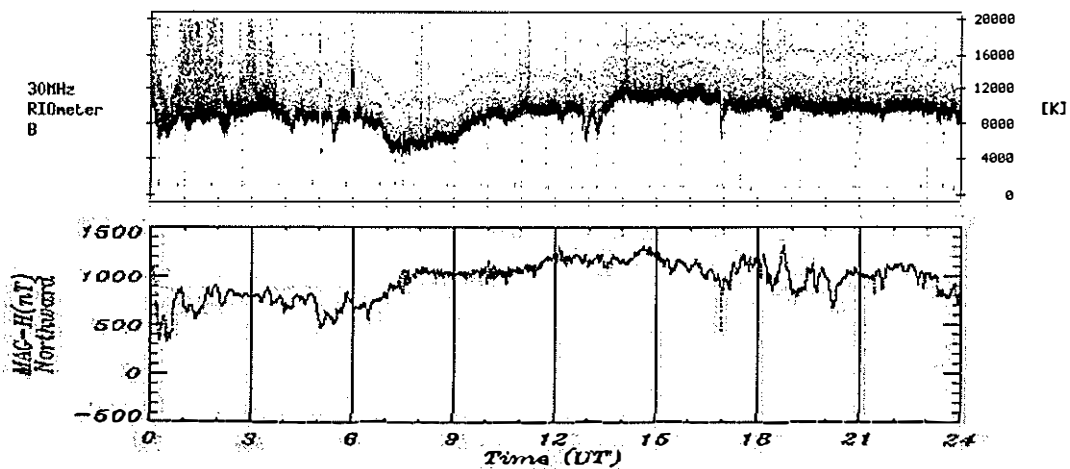
Syowa Station

2002/10/23



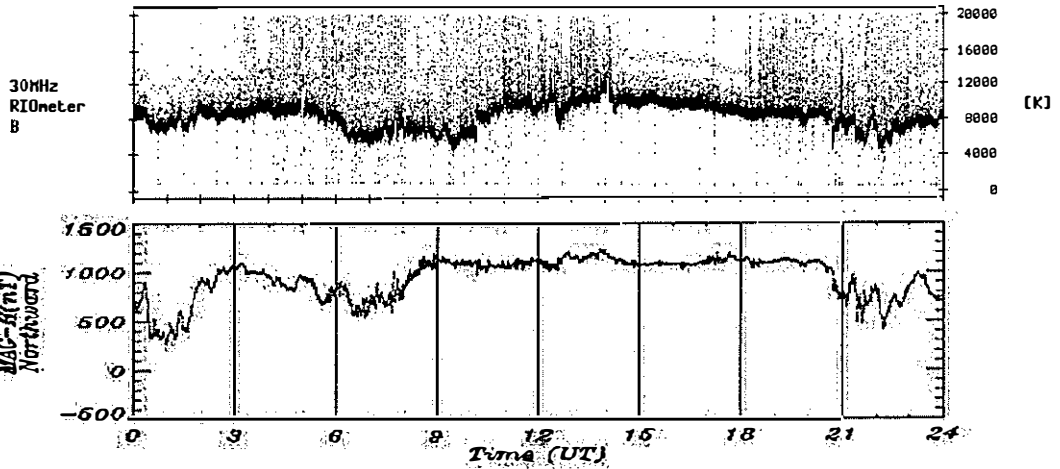
Syowa Station

2002/10/24



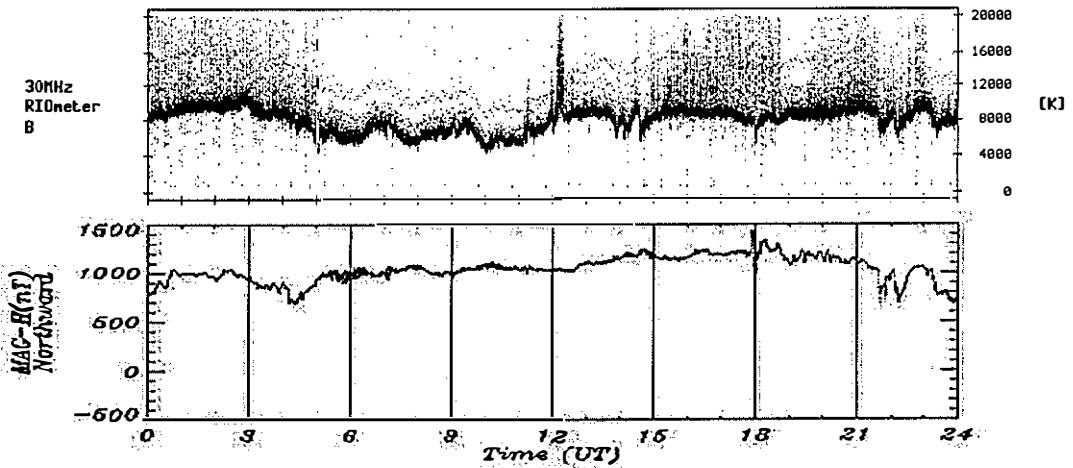
Syowa Station

2002/10/25



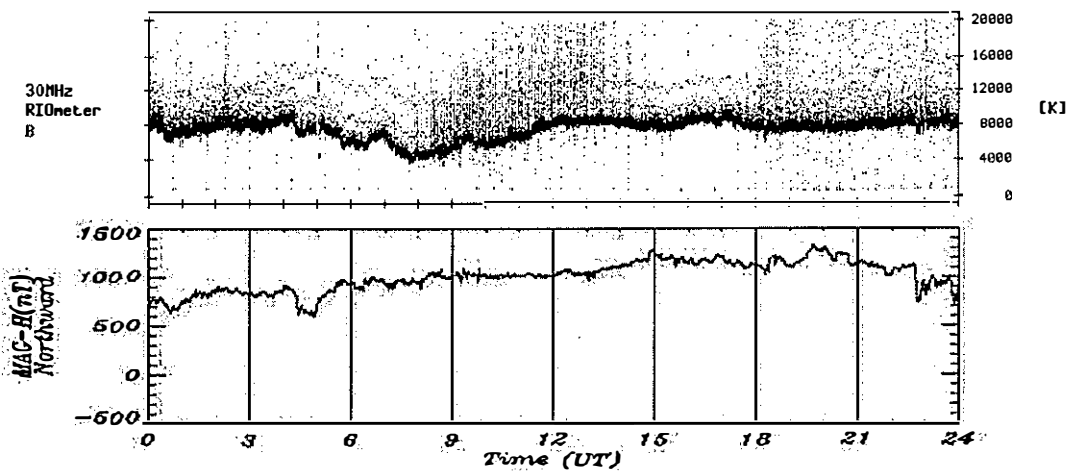
Syowa Station

2002/10/26



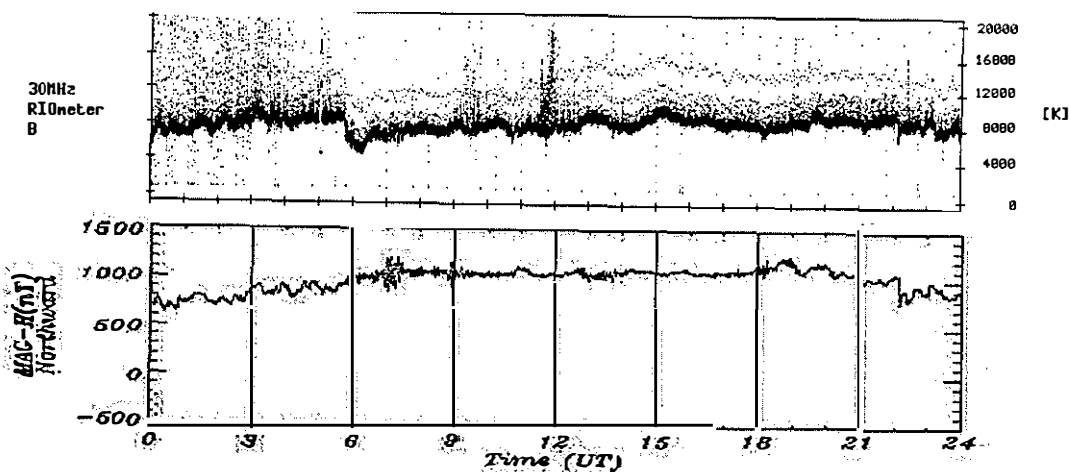
Syowa Station

2002/10/27



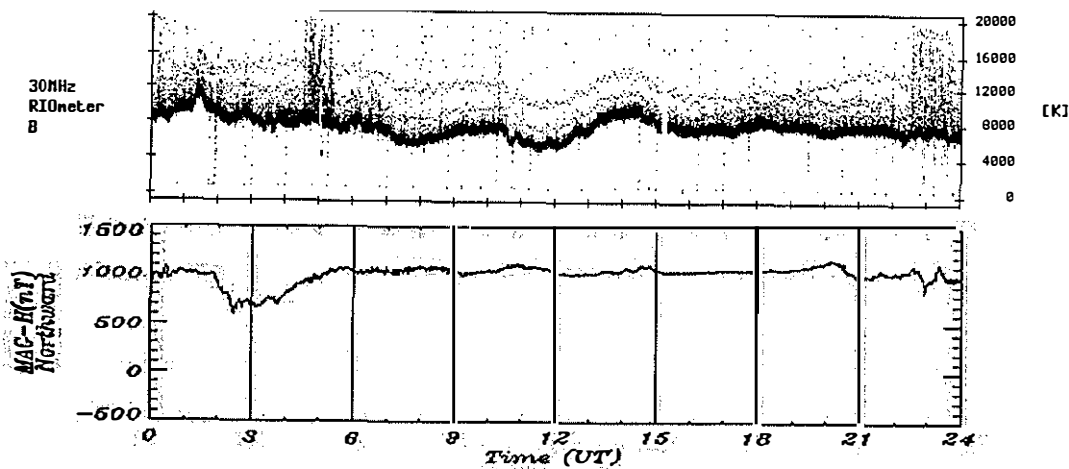
Syowa Station

2002/10/28



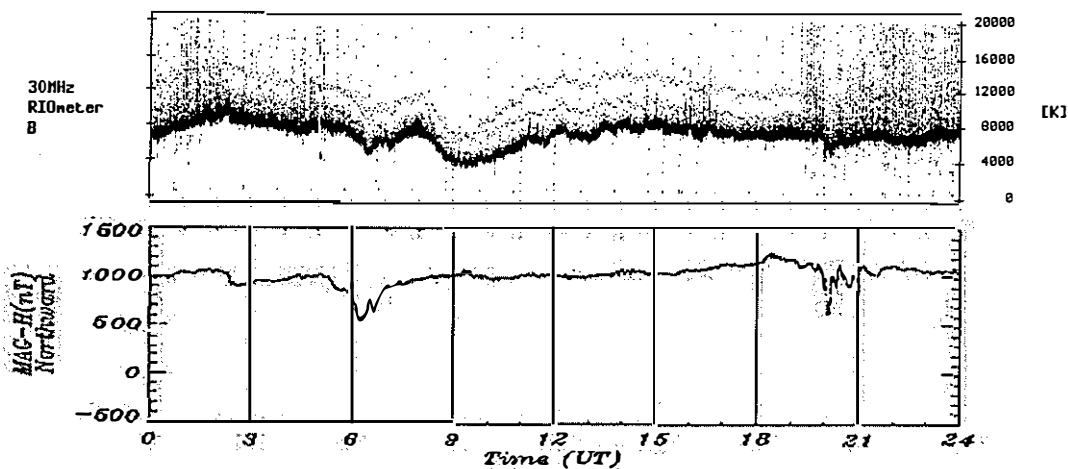
Syowa Station

2002/10/29



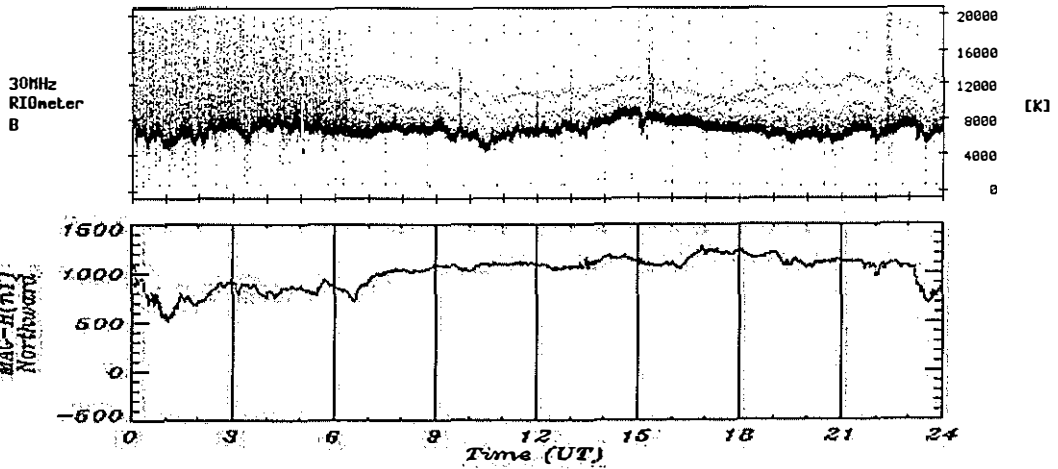
Syowa Station

2002/10/30



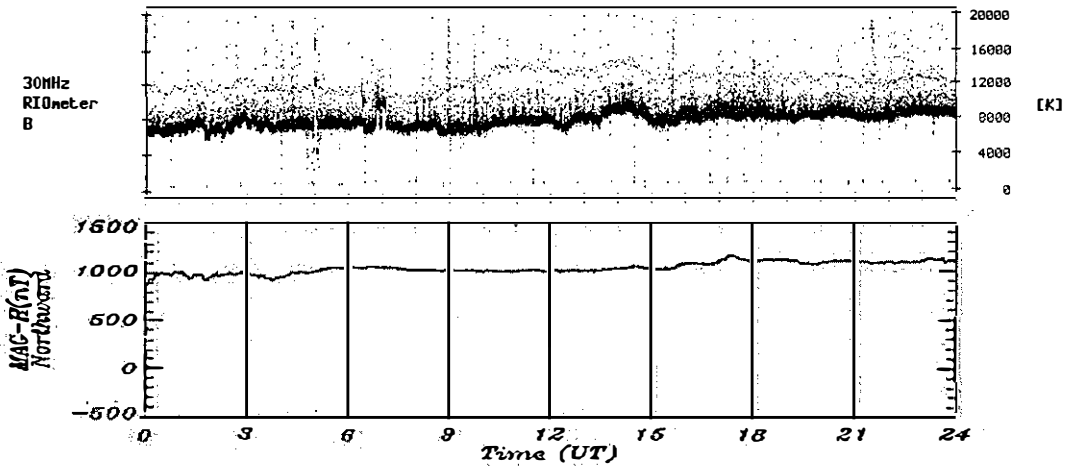
Syowa Station

2002/10/31



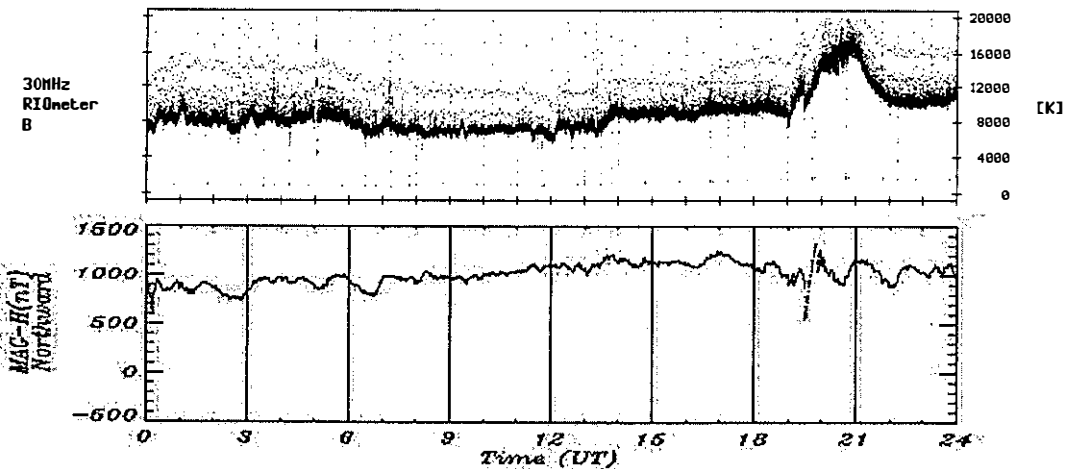
Syowa Station

2002/11/01



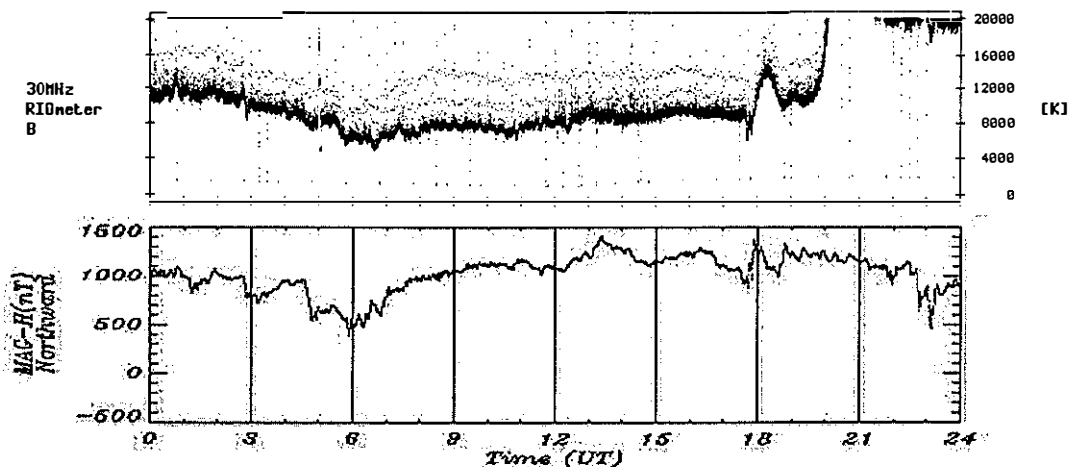
Syowa Station

2002/11/02



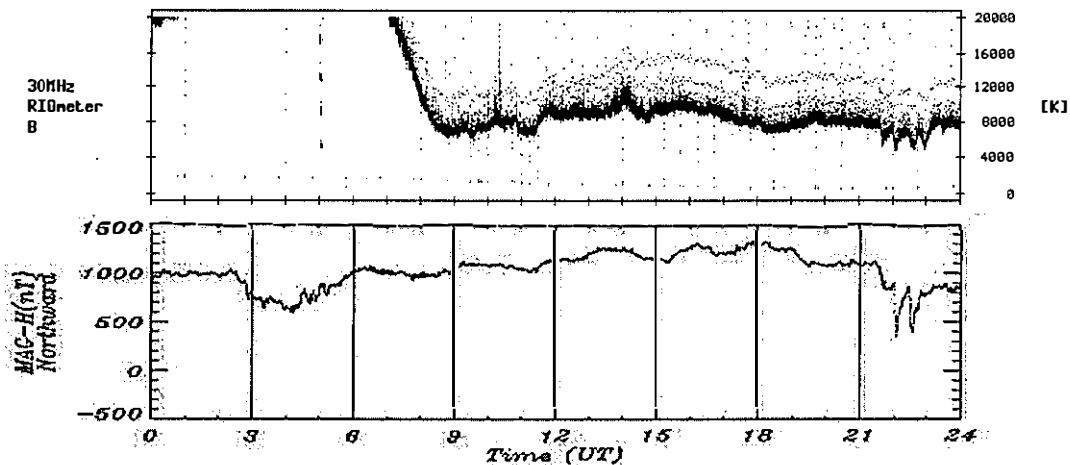
Syowa Station

2002/11/03



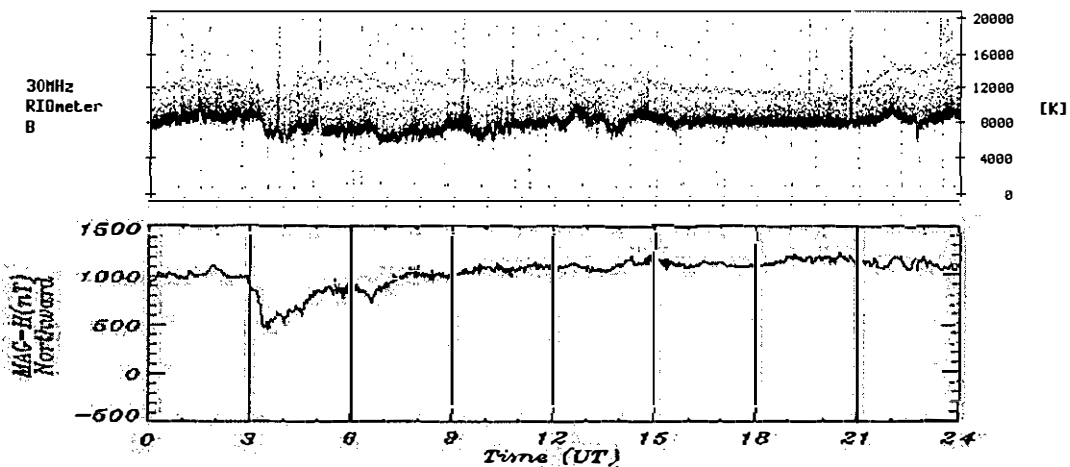
Syowa Station

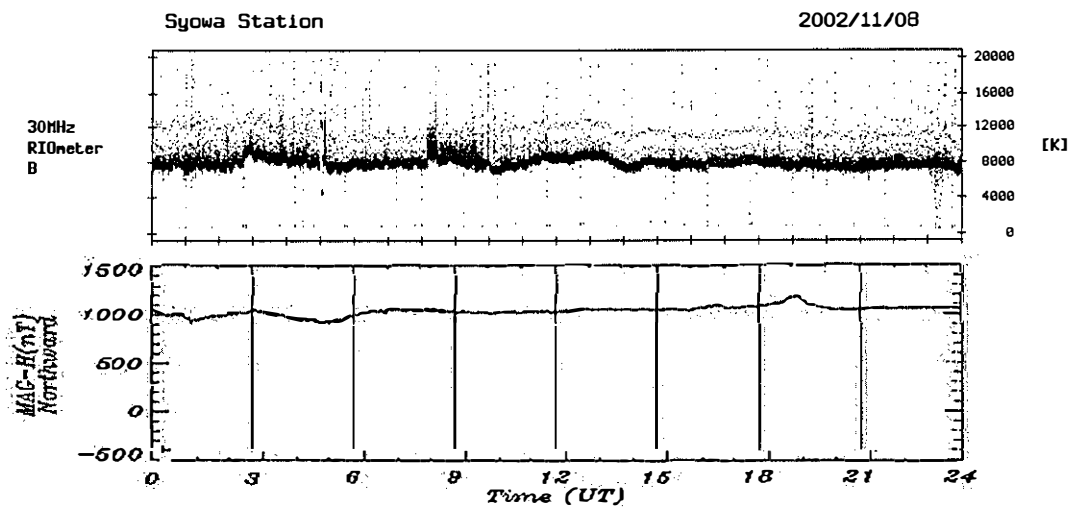
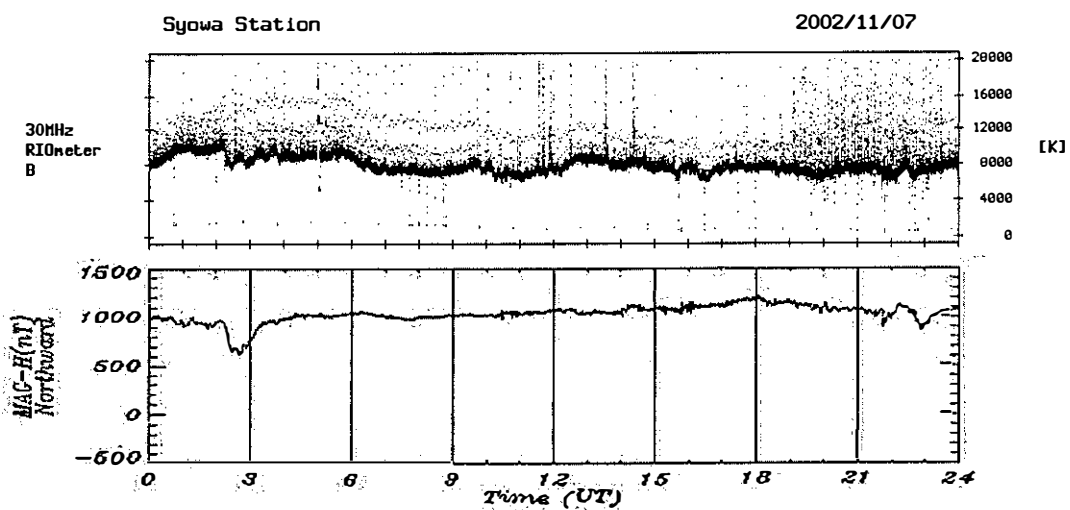
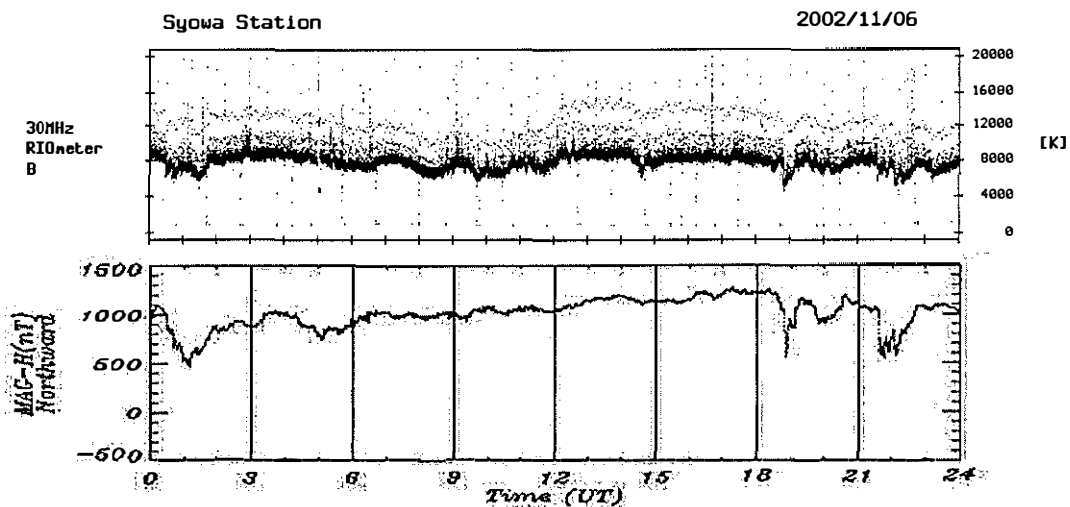
2002/11/04



Syowa Station

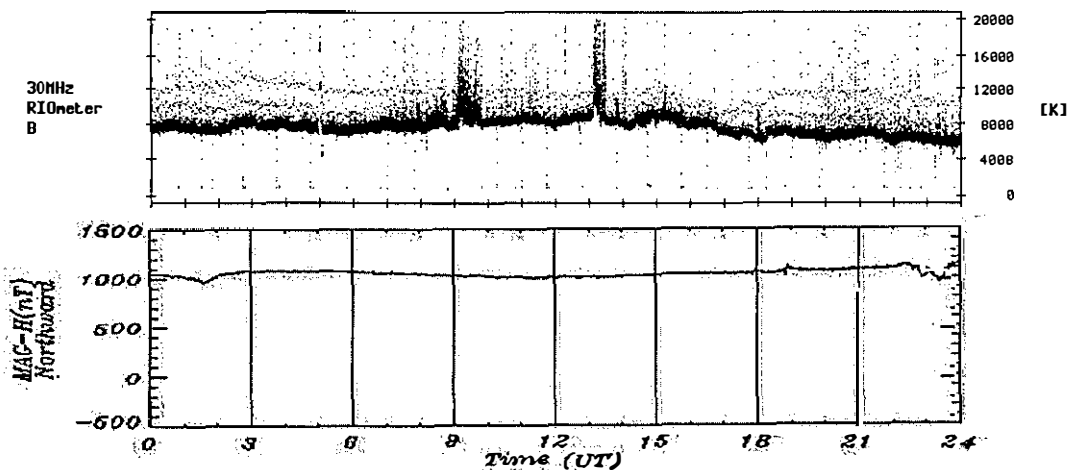
2002/11/05





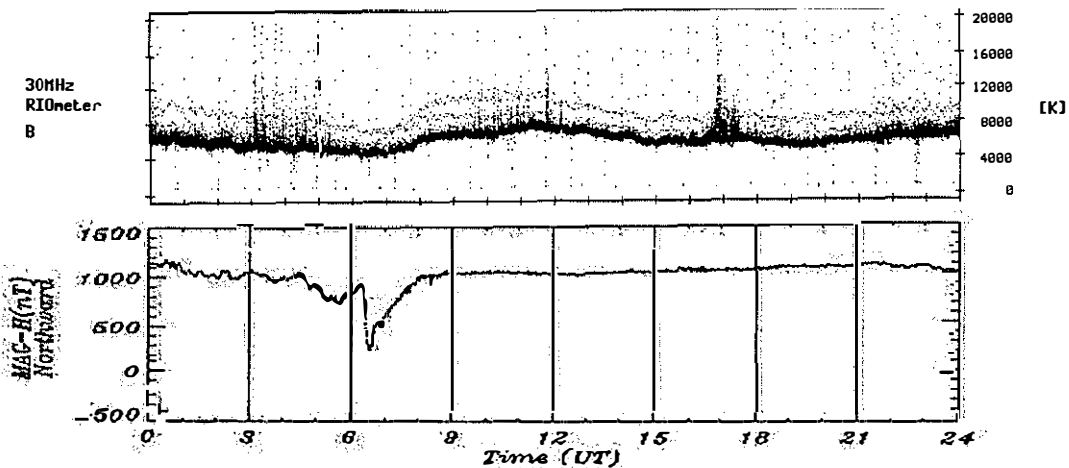
Syowa Station

2002/11/09



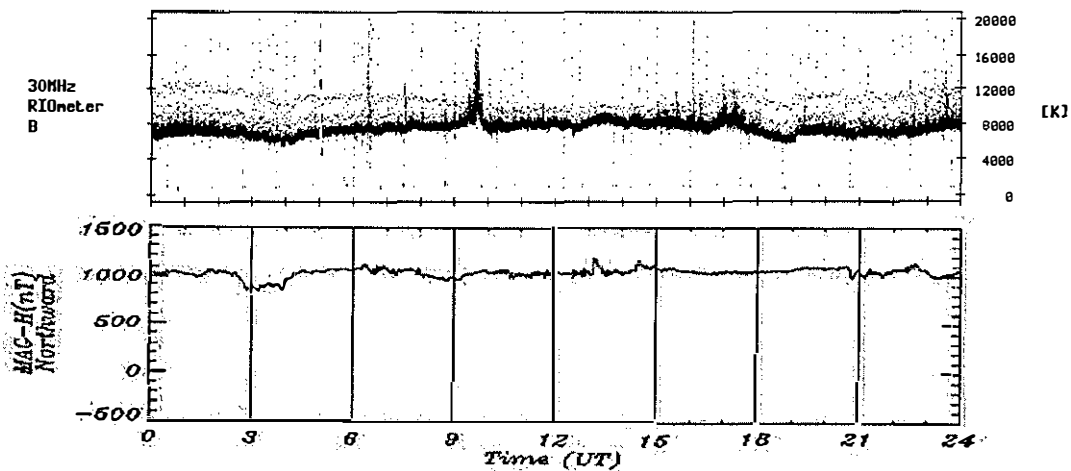
Syowa Station

2002/11/10



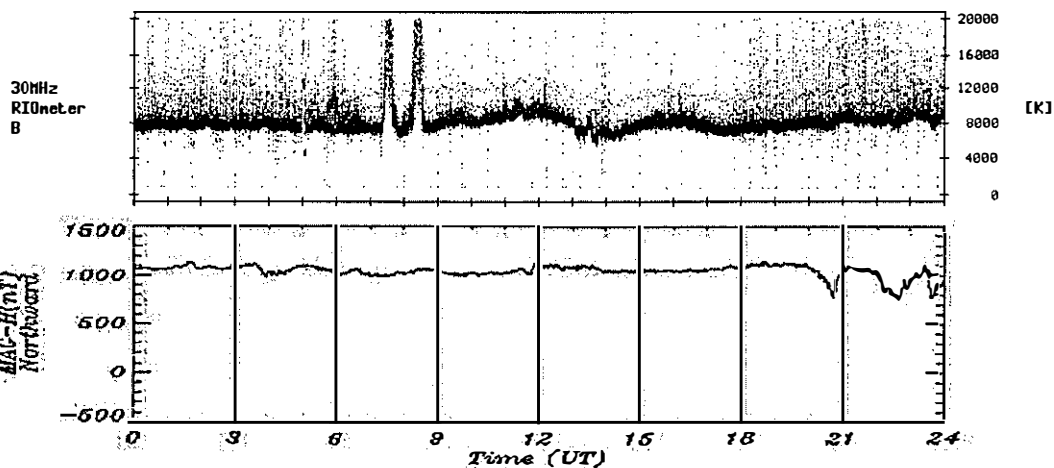
Syowa Station

2002/11/11



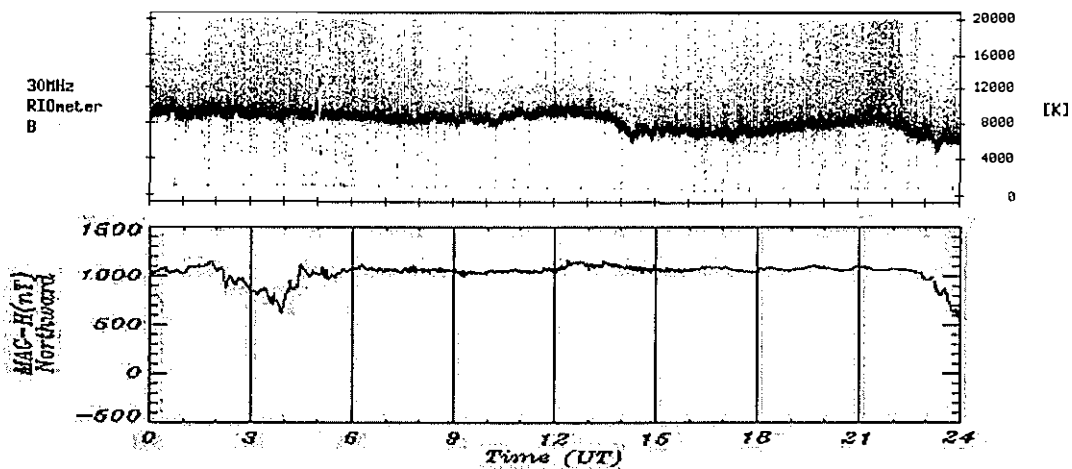
Syowa Station

2002/11/12



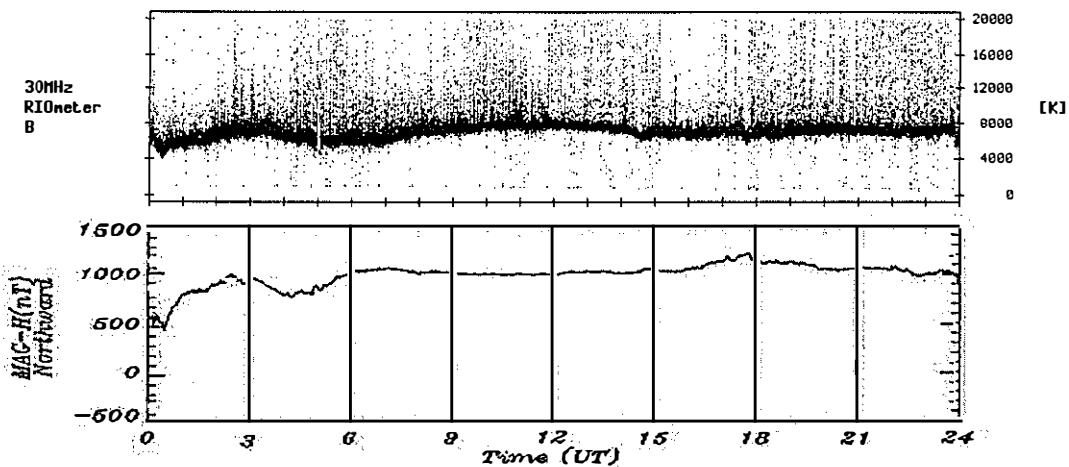
Syowa Station

2002/11/13



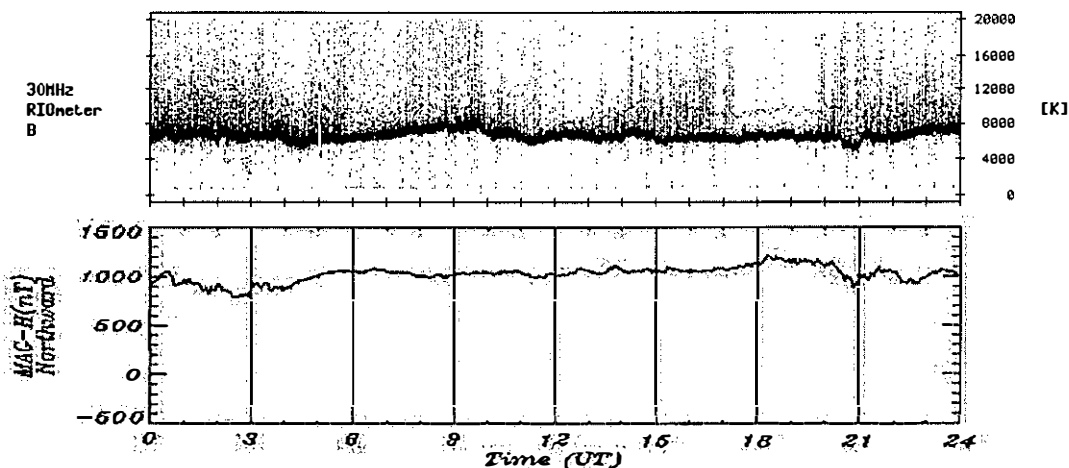
Syowa Station

2002/11/14



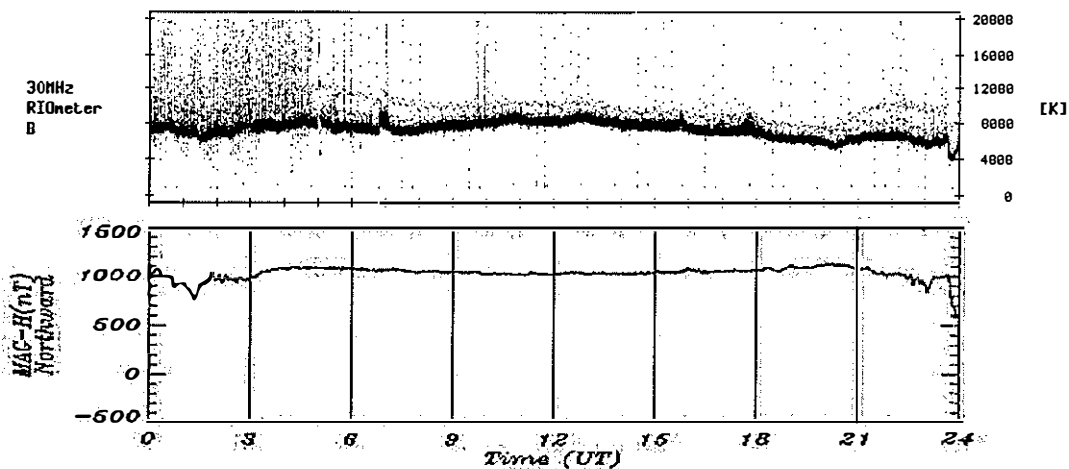
Syowa Station

2002/11/15



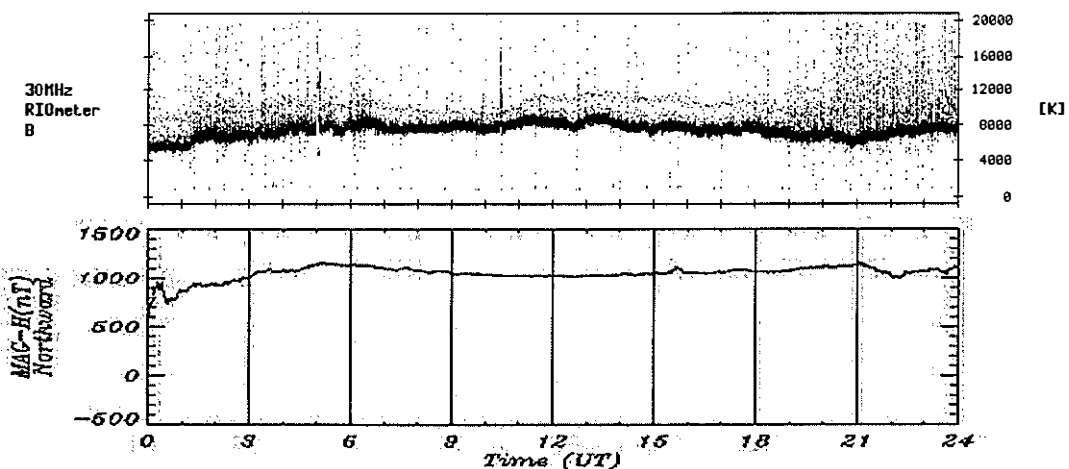
Syowa Station

2002/11/16



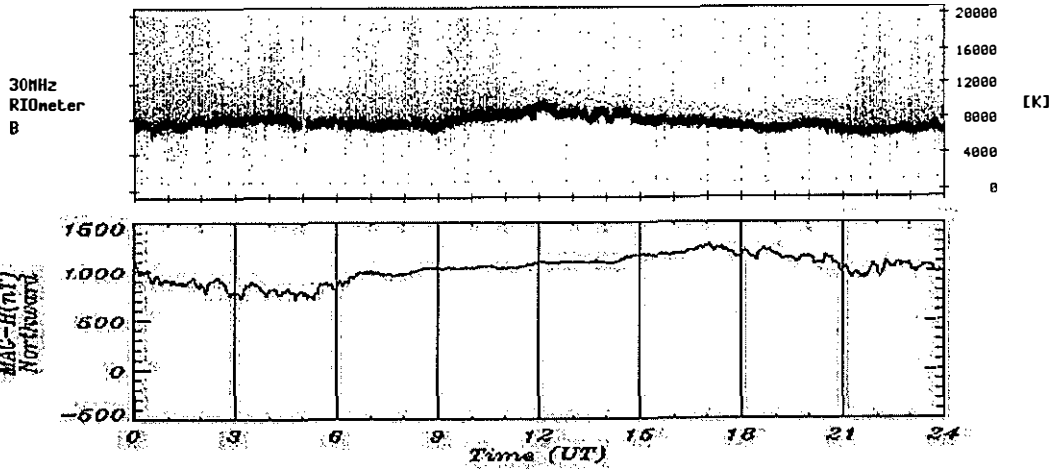
Syowa Station

2002/11/17



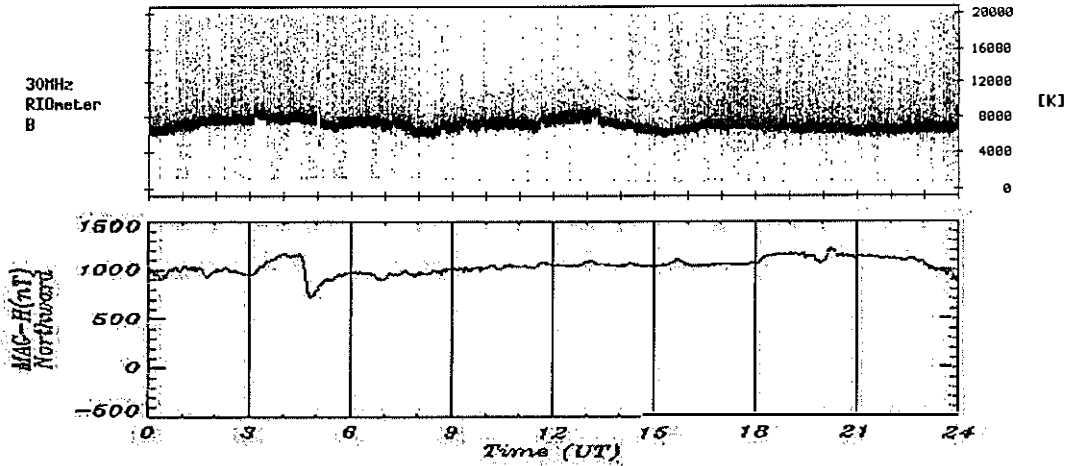
Syowa Station

2002/11/18



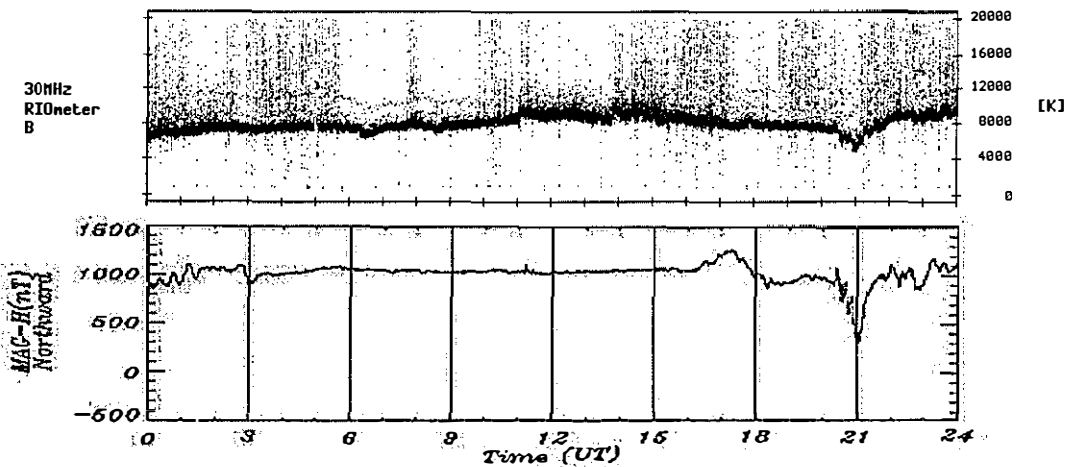
Syowa Station

2002/11/19



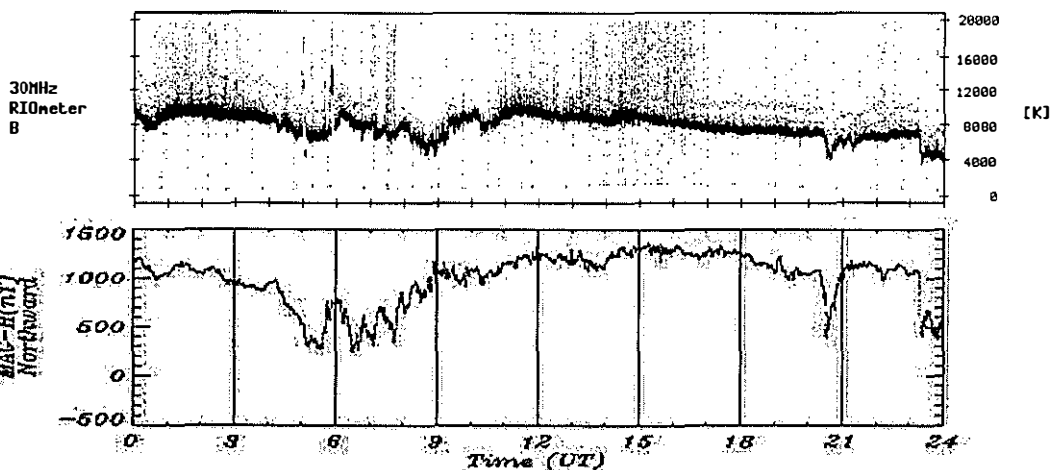
Syowa Station

2002/11/20



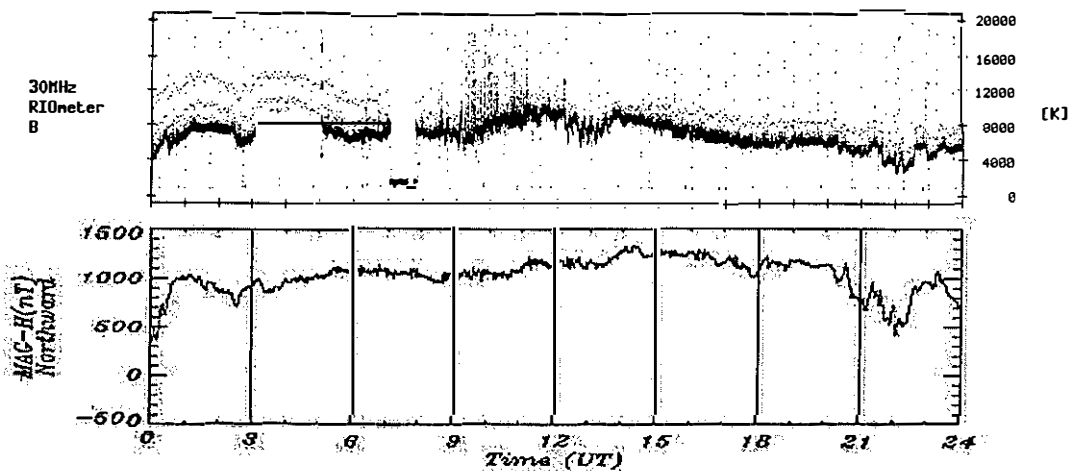
Syowa Station

2002/11/21



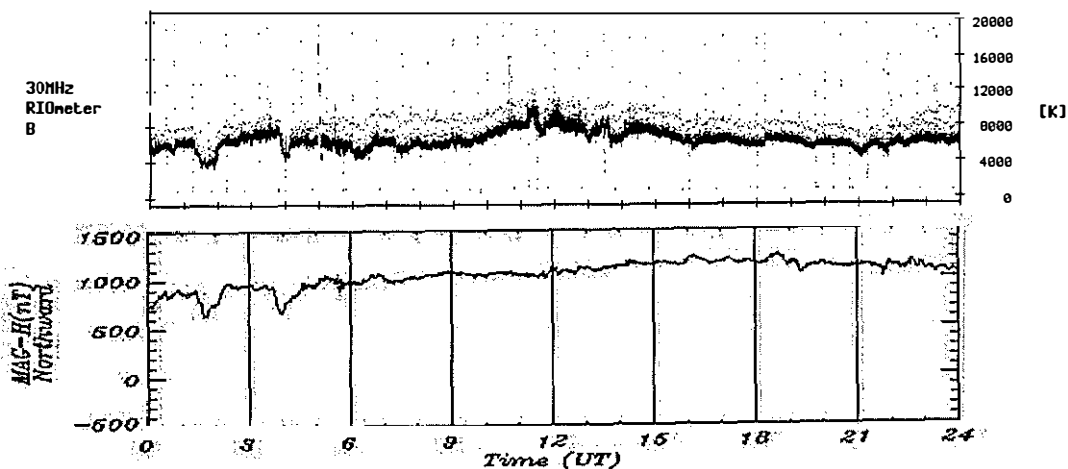
Syowa Station

2002/11/22



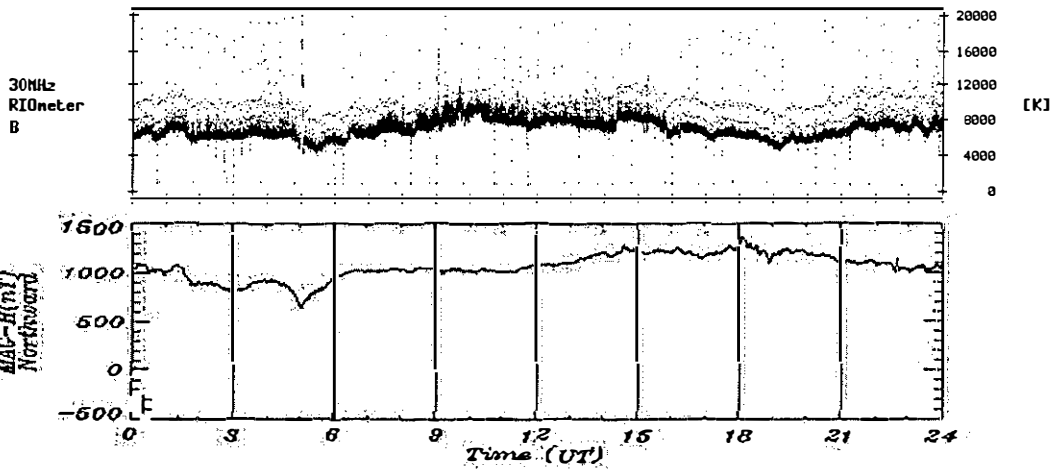
Syowa Station

2002/11/23



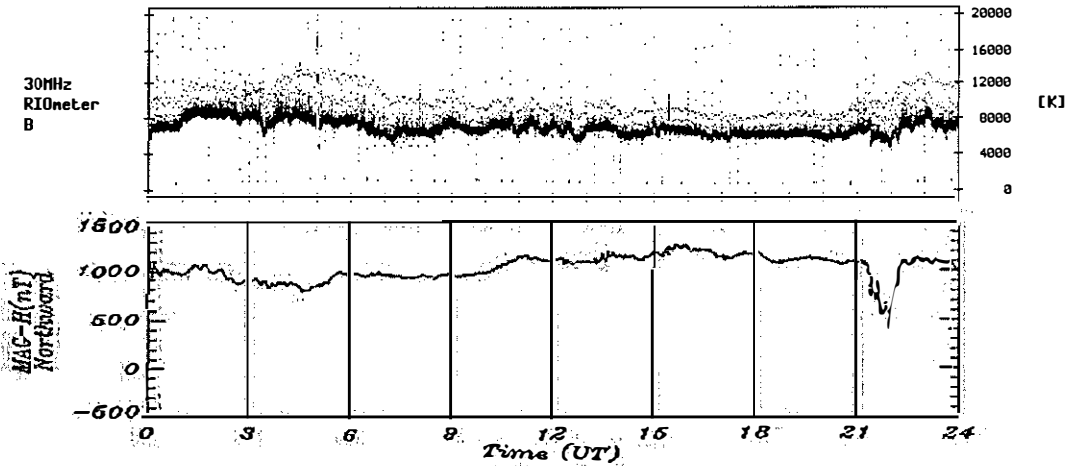
Syowa Station

2002/11/24



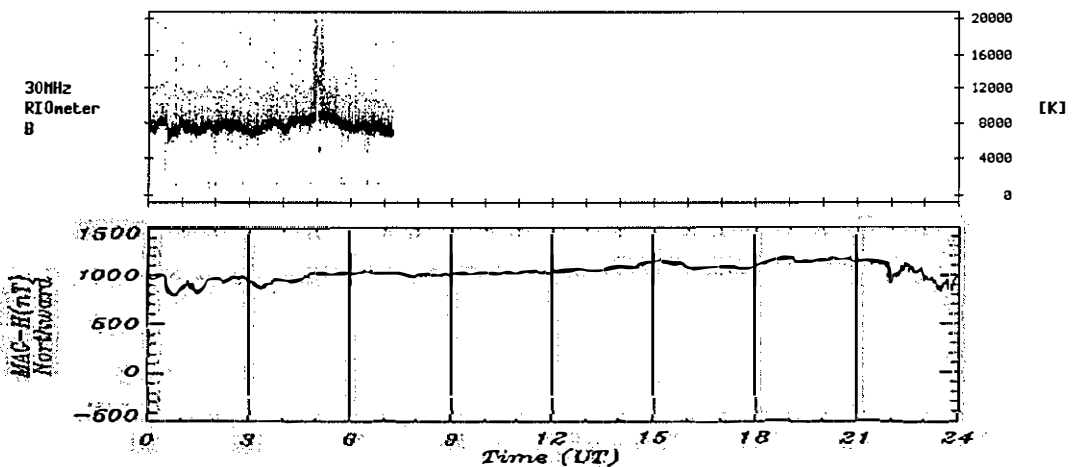
Syowa Station

2002/11/25



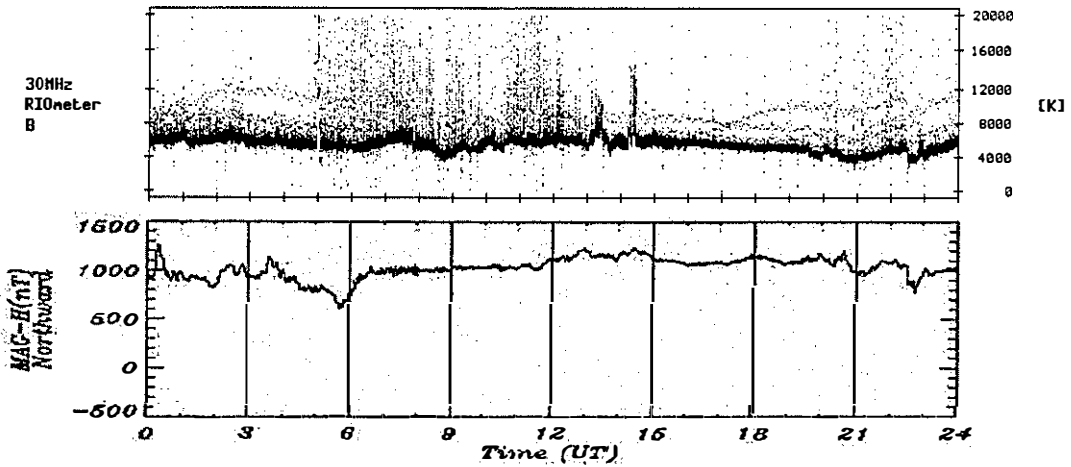
Syowa Station

2002/11/26



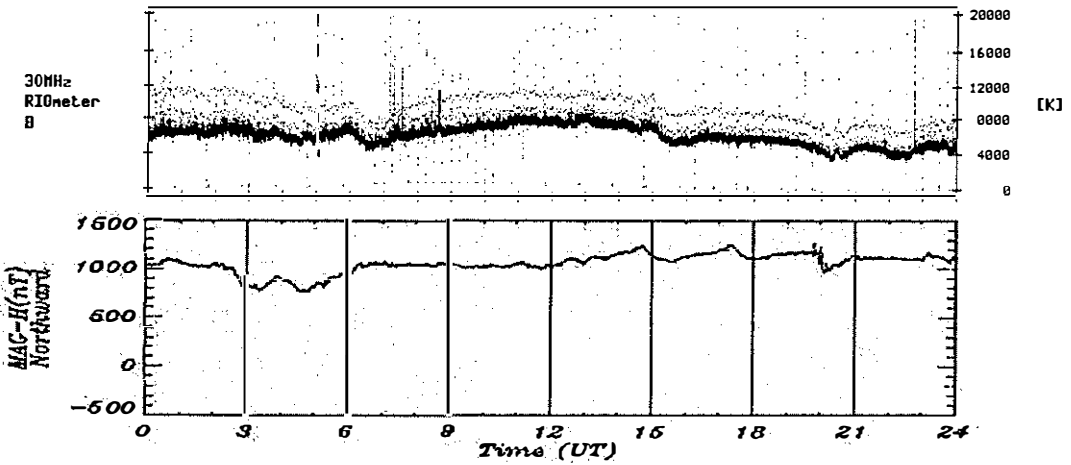
Syowa Station

2002/11/27



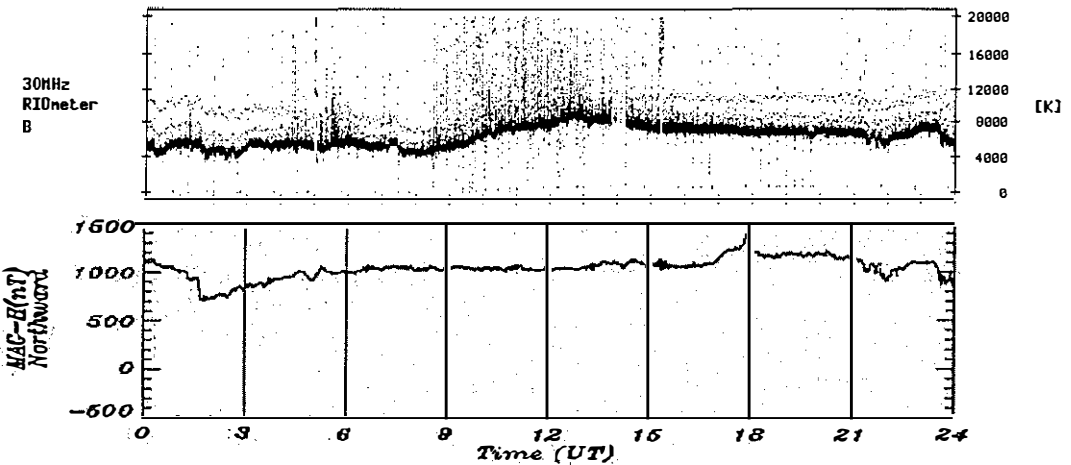
Syowa Station

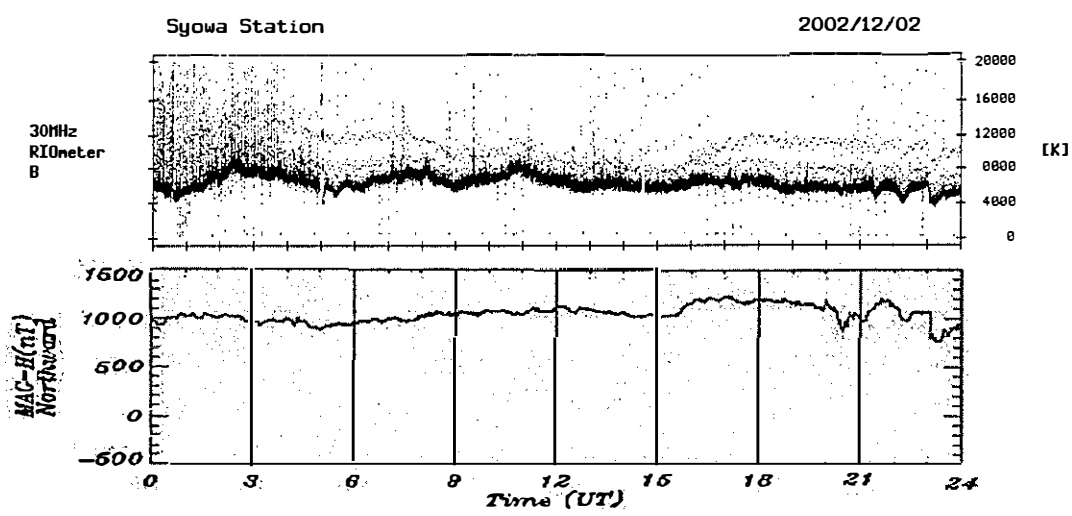
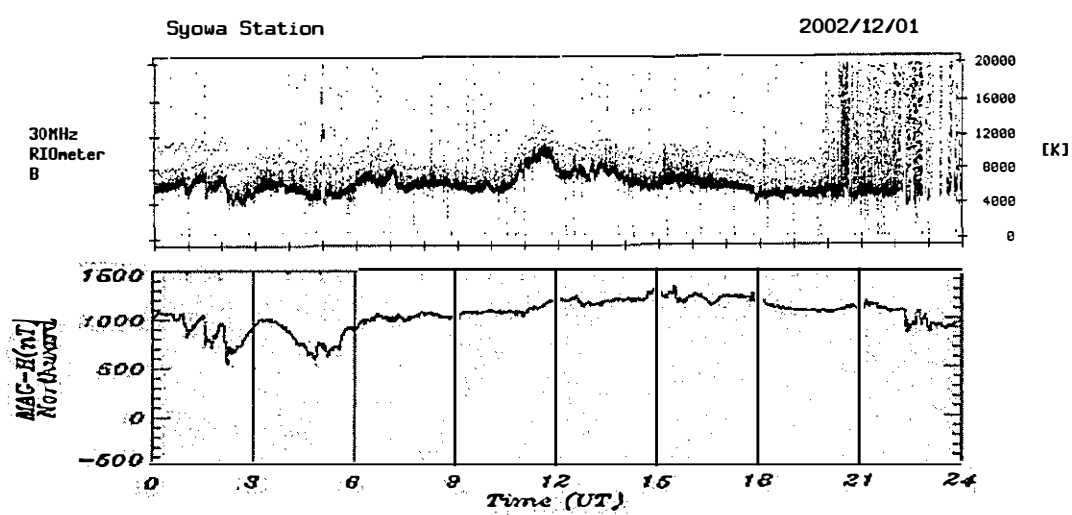
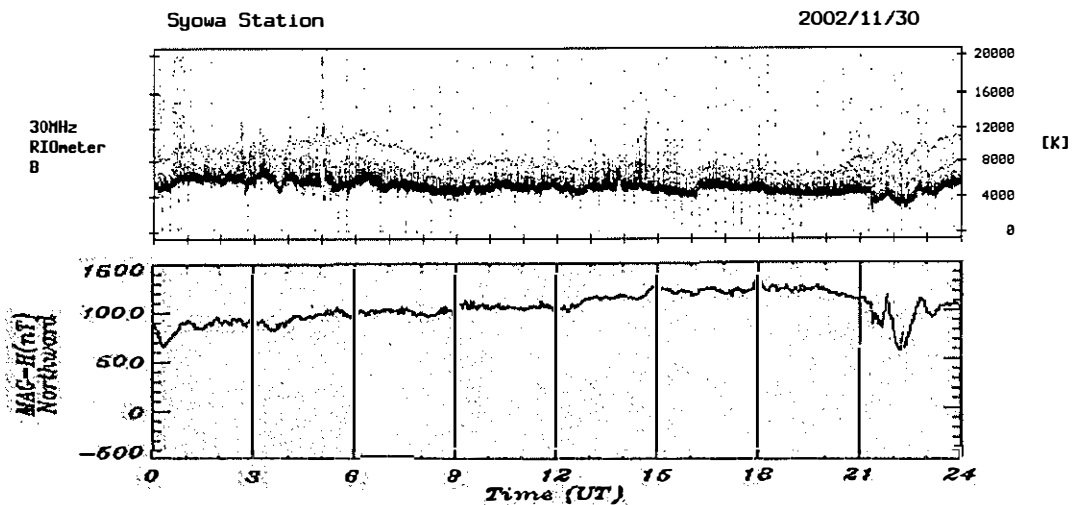
2002/11/28



Syowa Station

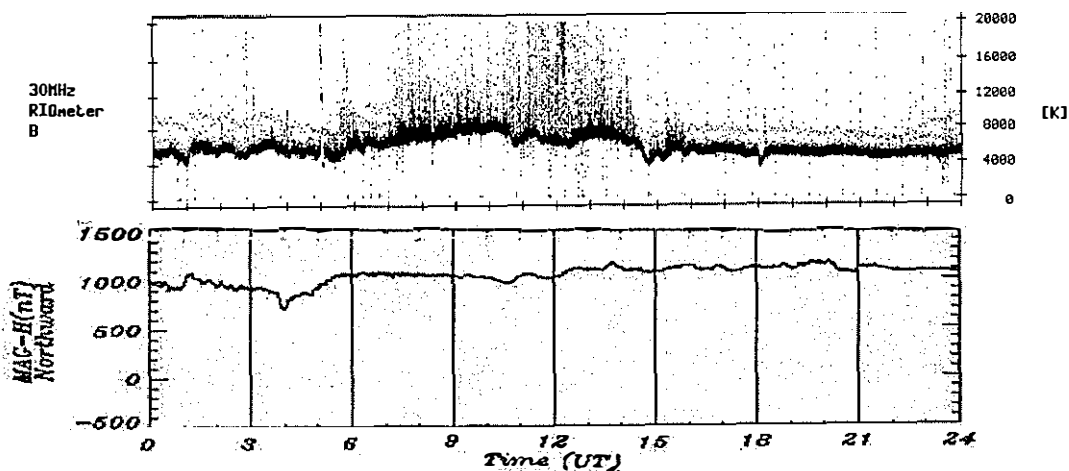
2002/11/29





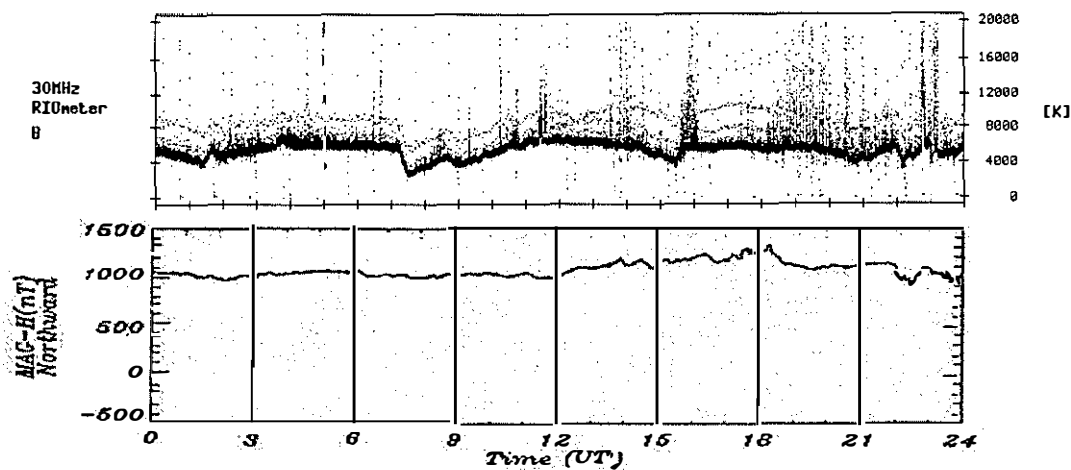
Syowa Station

2002/12/03



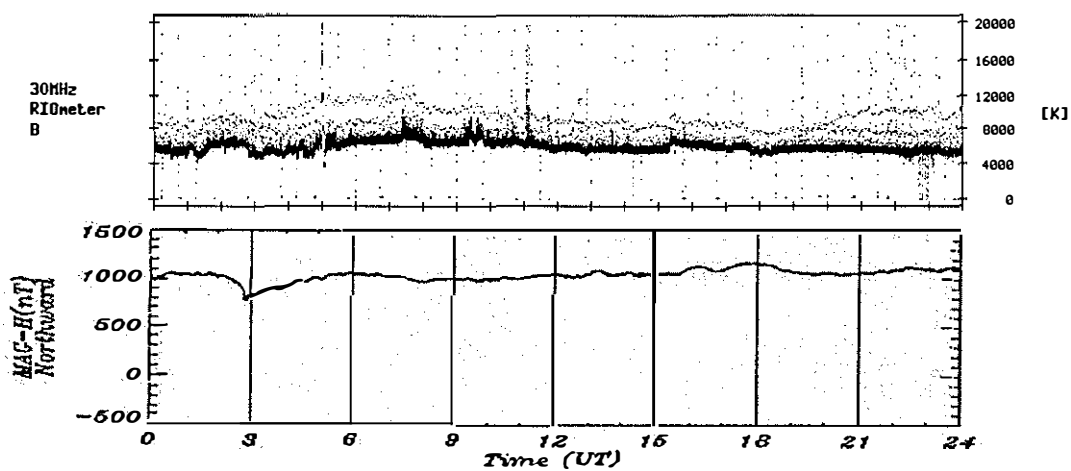
Syowa Station

2002/12/04



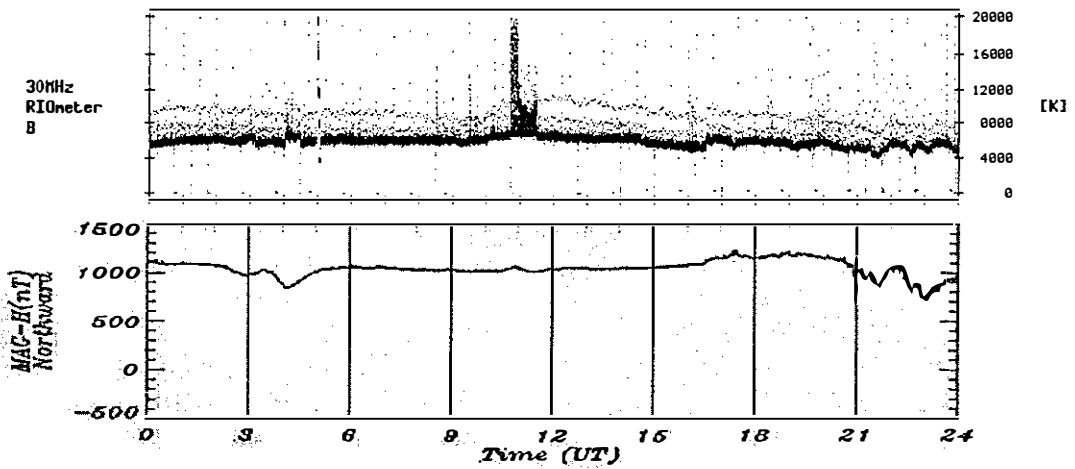
Syowa Station

2002/12/05



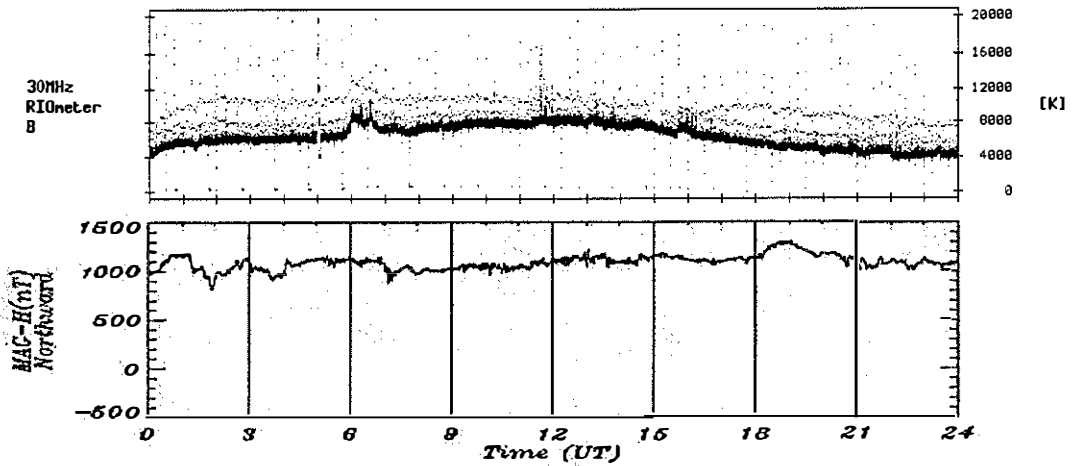
Syowa Station

2002/12/06



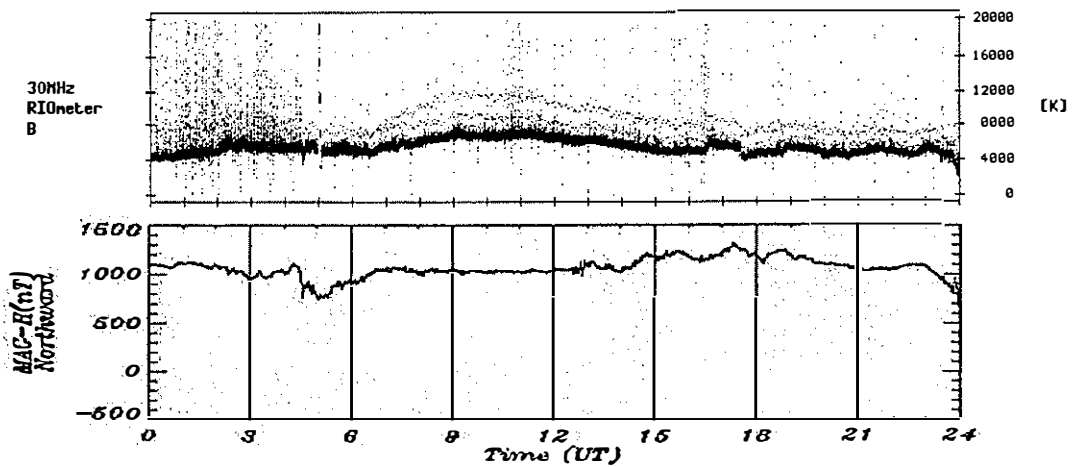
Syowa Station

2002/12/07



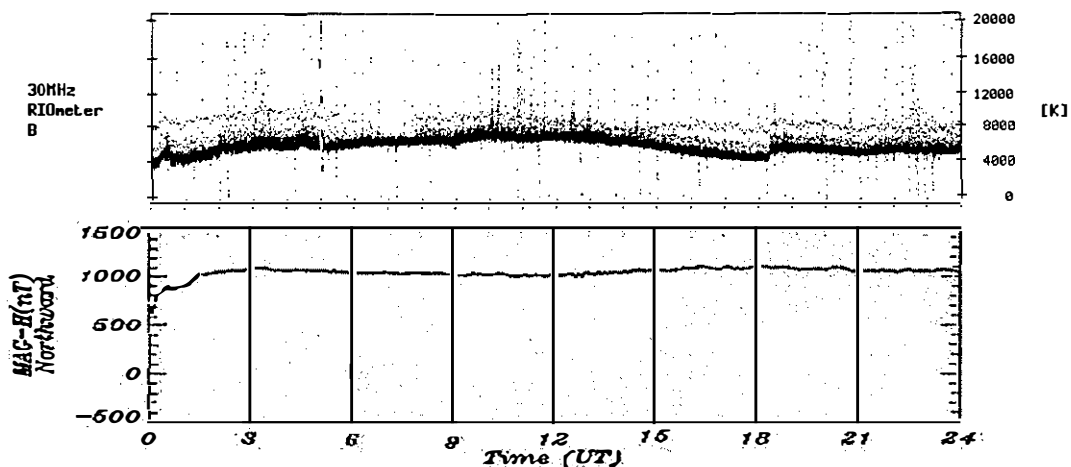
Syowa Station

2002/12/08



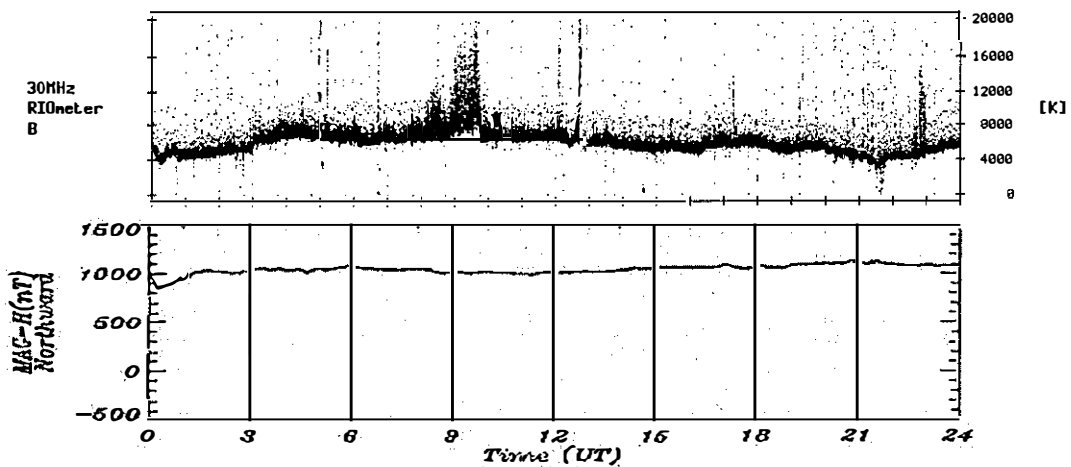
Syowa Station

2002/12/09



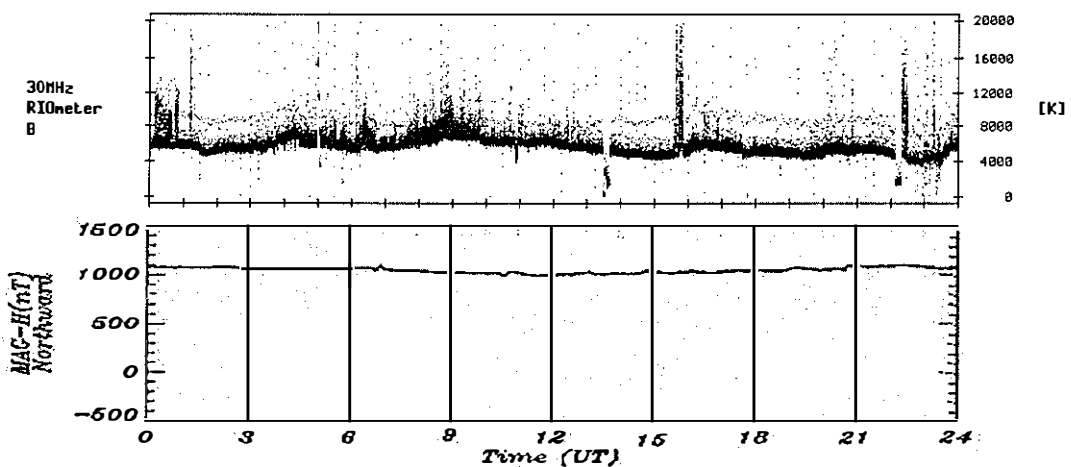
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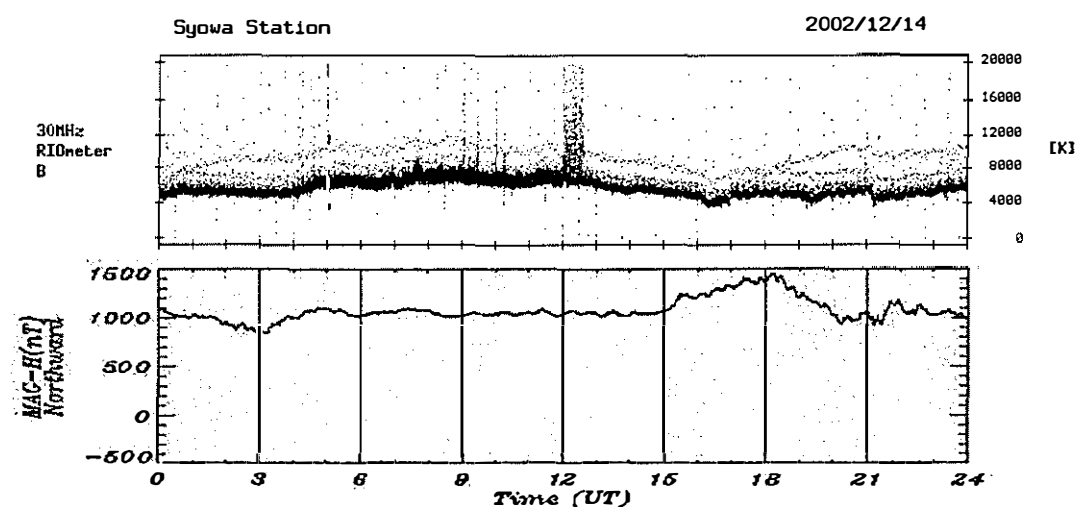
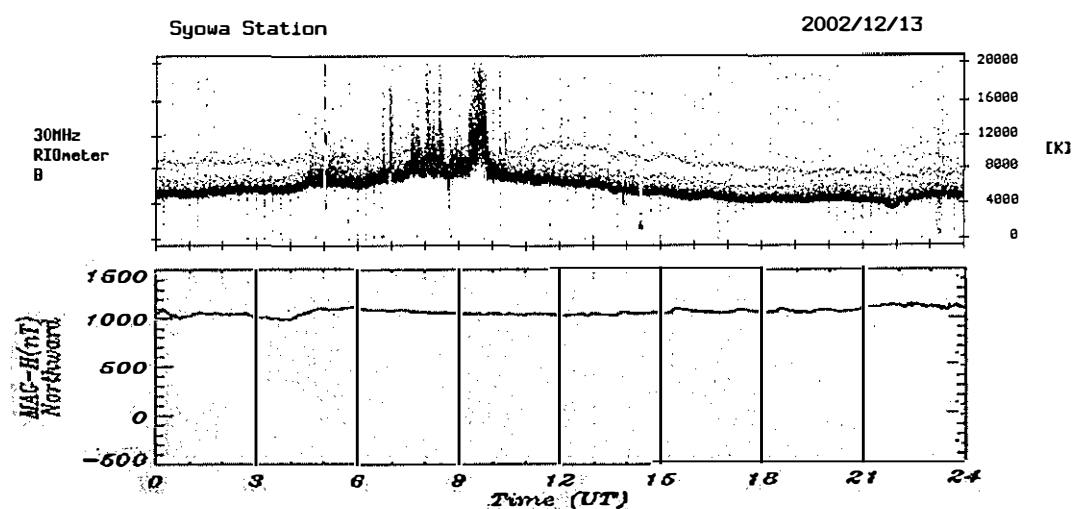
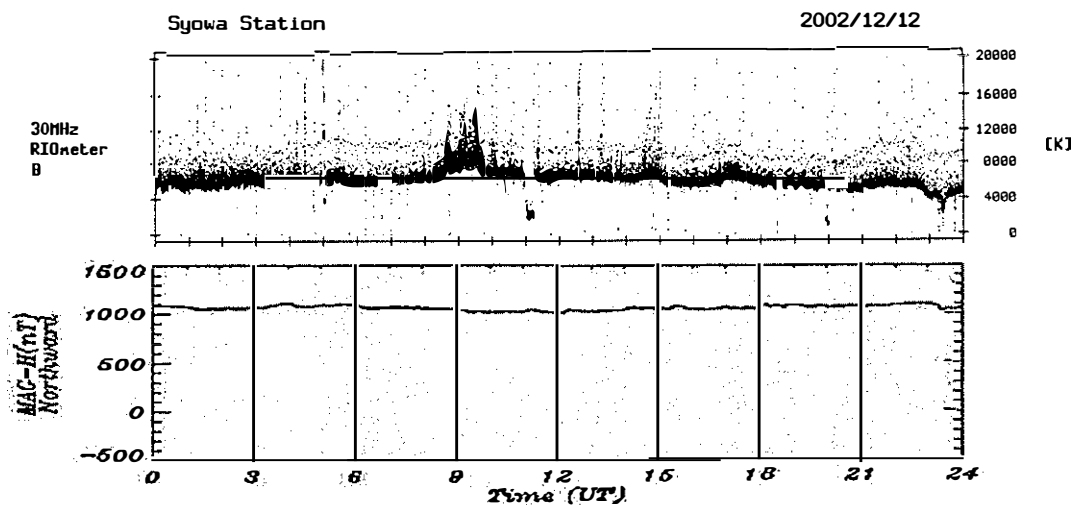
2002/12/10



Syowa Station

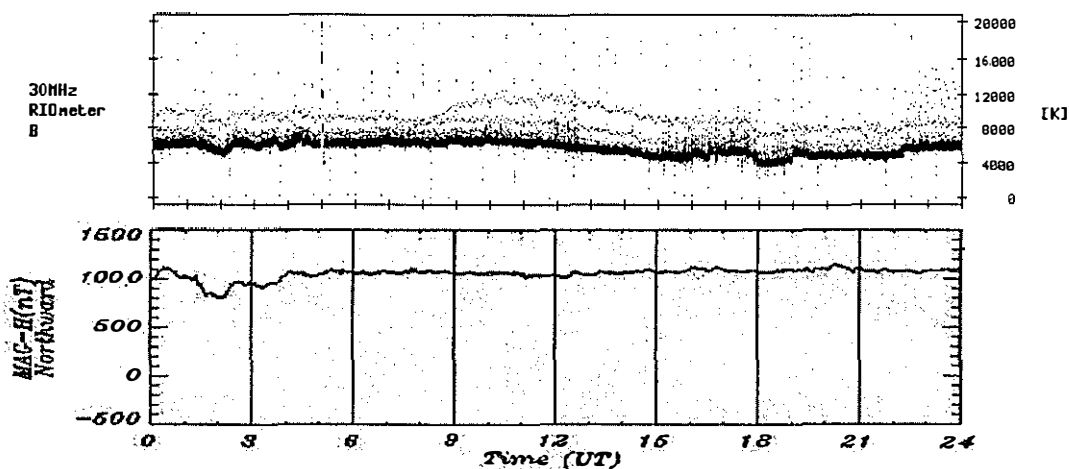
2002/12/11





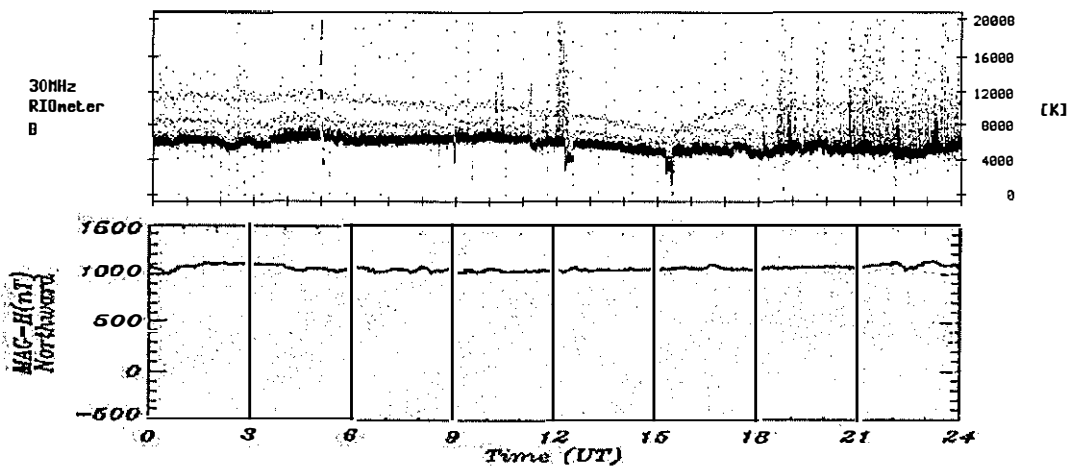
Syowa Station

2002/12/15



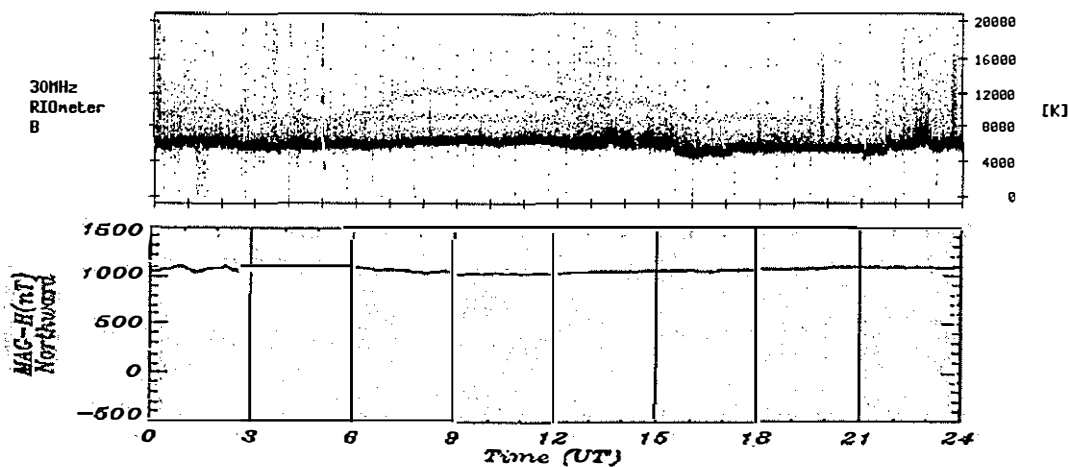
Syowa Station

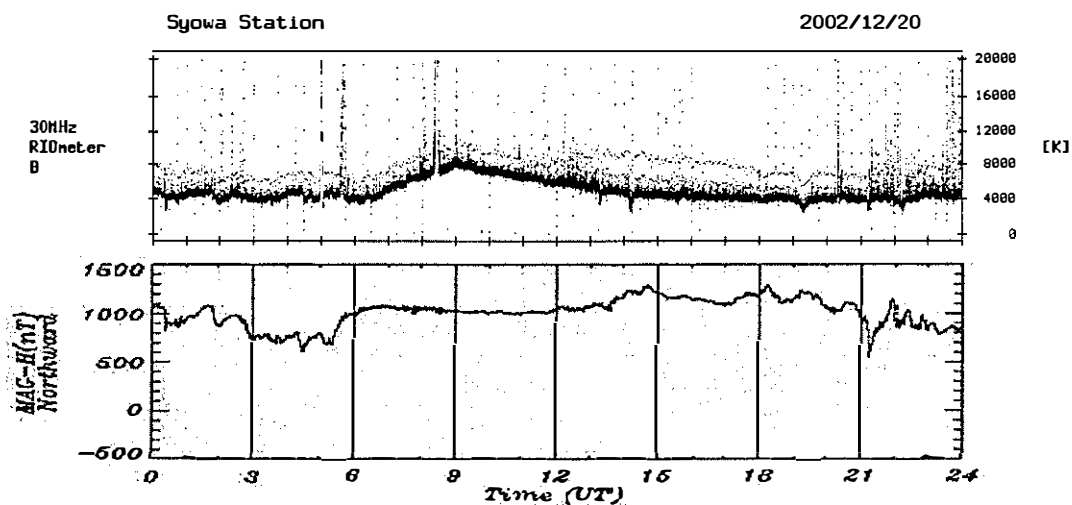
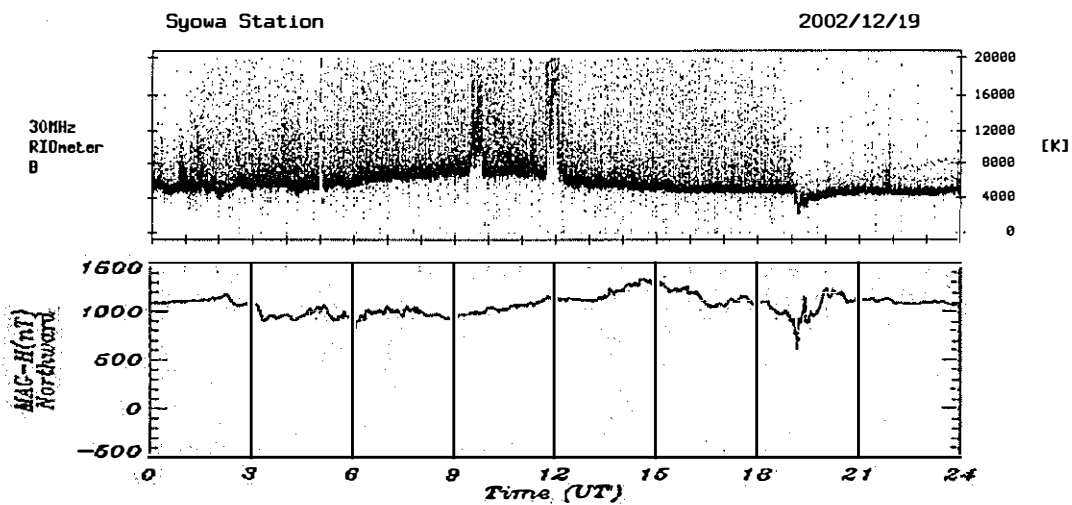
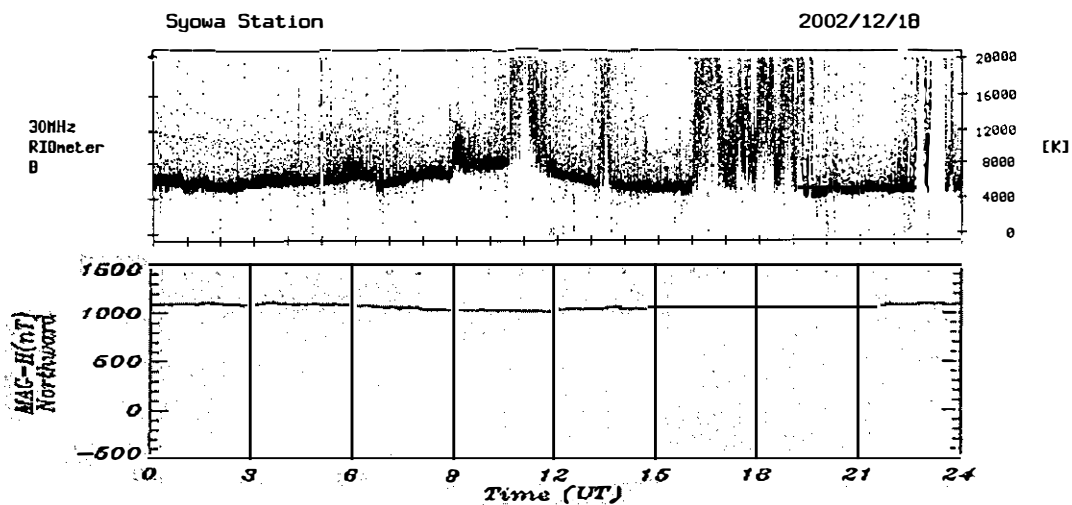
2002/12/16



Syowa Station

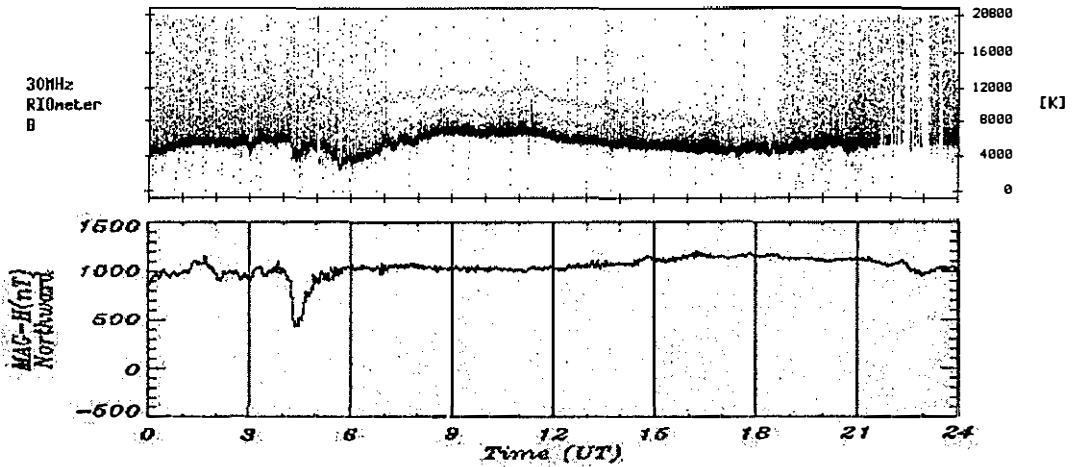
2002/12/17





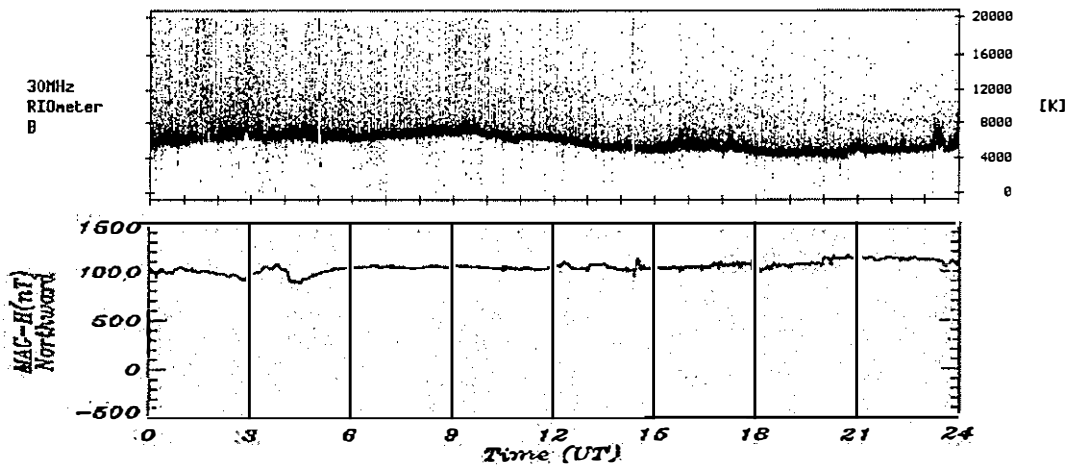
Syowa Station

2002/12/21



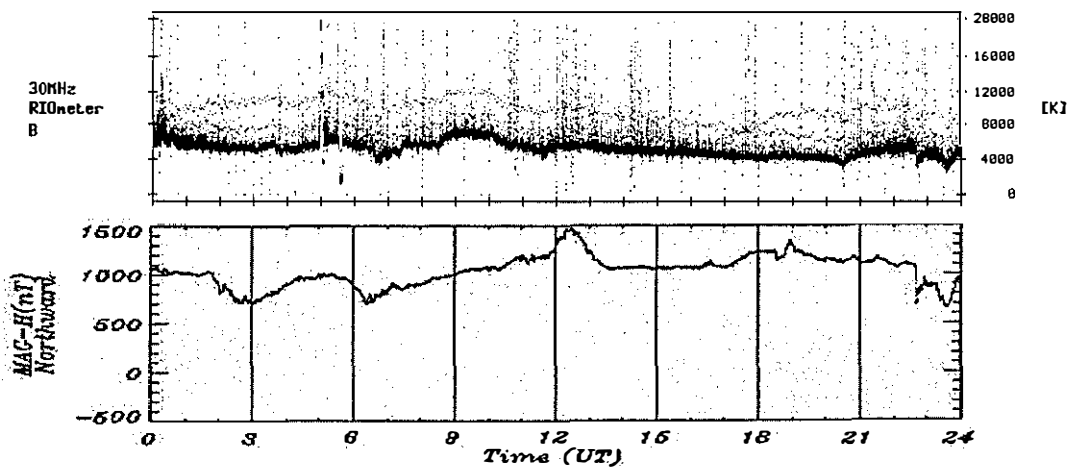
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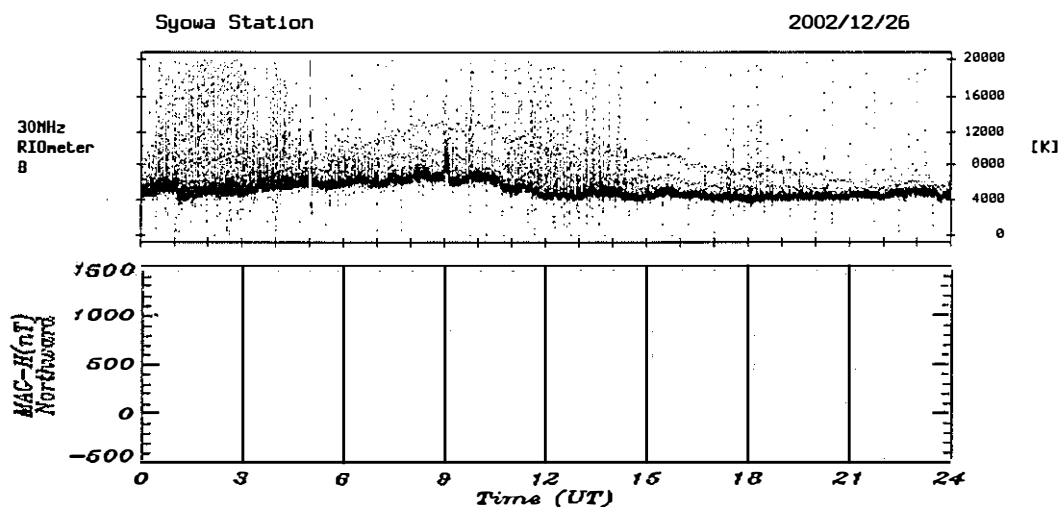
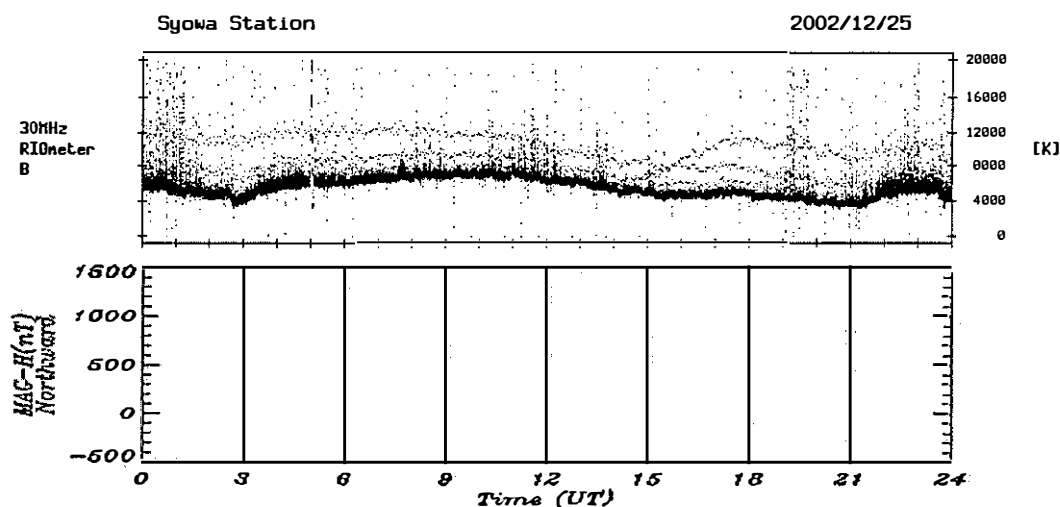
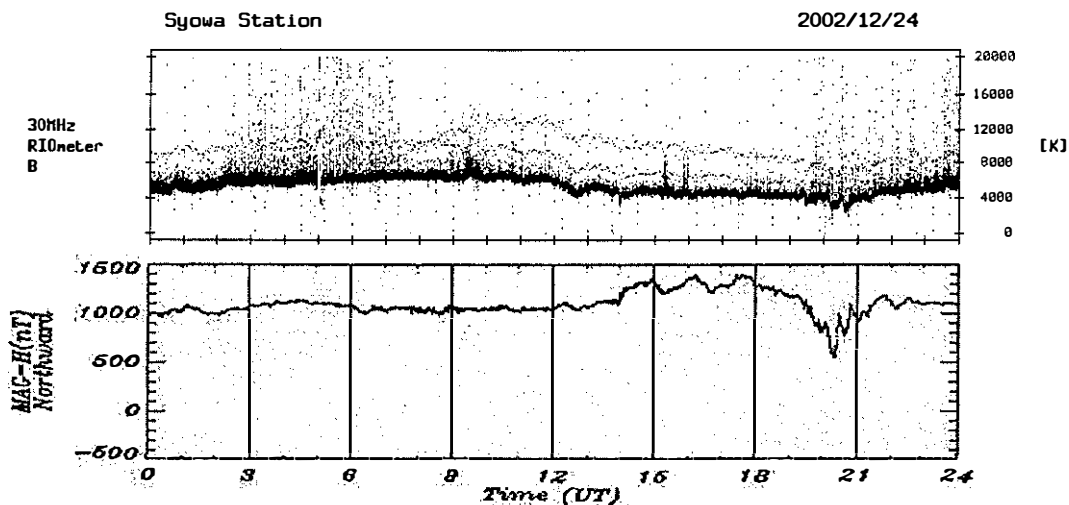
2002/12/22



Syowa Station

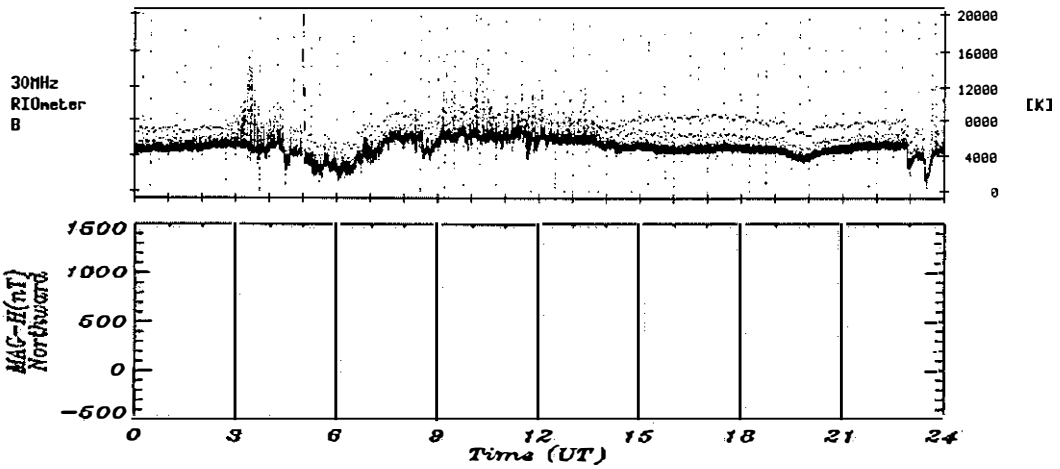
2002/12/23





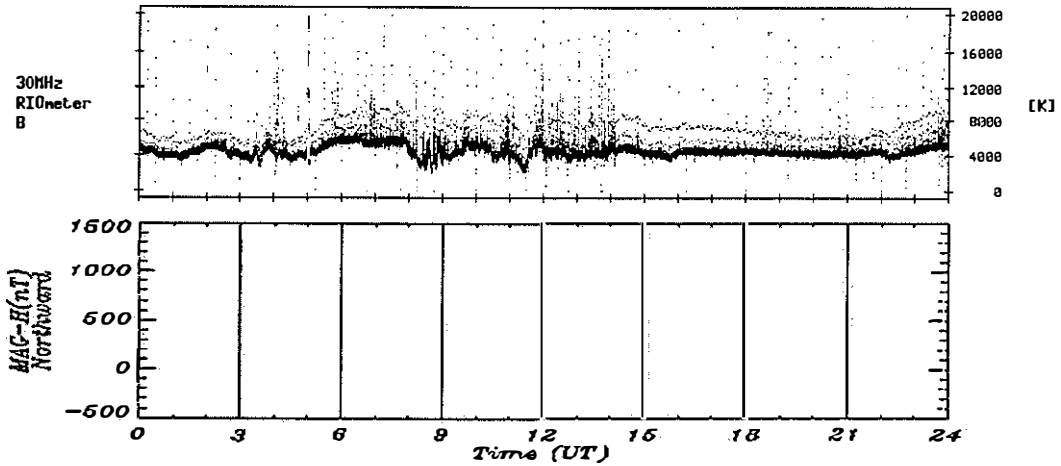
Syowa Station

2002/12/27



Syowa Station

2002/12/28



Syowa Station

2002/12/29

