

RADIO OBSERVATION DATA
AT SYOWA STATION, ANTARCTICA DURING 2004

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1. Introduction

The National Institute of Information and Communications Technology has been observing the absorption of cosmic radio noise with a standard relative ionospheric opacity meter (riometer) at 30 MHz at Syowa Station, Antarctica since February 1966. This report presents the data observed from January 1 through December 31, 2004. The combined data plots also contain geomagnetic field variation provided by the 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

Sachihito KAWANA
(National Institute of Information and Communications Technology)

4. Instrumentation

The riometer receiver has a center frequency of 30 MHz and a band width of 7.5 kHz and 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 signal from a reference noise diode, with power levels of 4000, 8000, 12000, 16000, and 20000 K, is inserted each day at 0800 of 45° eastern meridian time (EMT: UT + 3 hours). The output signal of riometer is converted analog to digital every second and stored in a digital storage system.

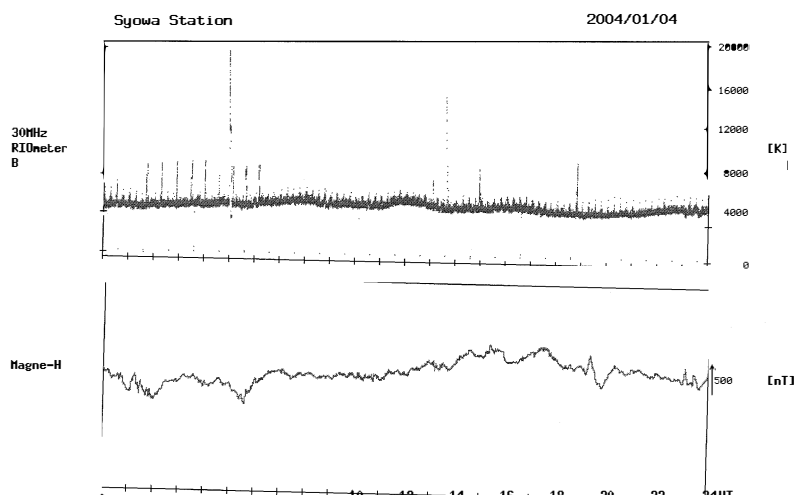
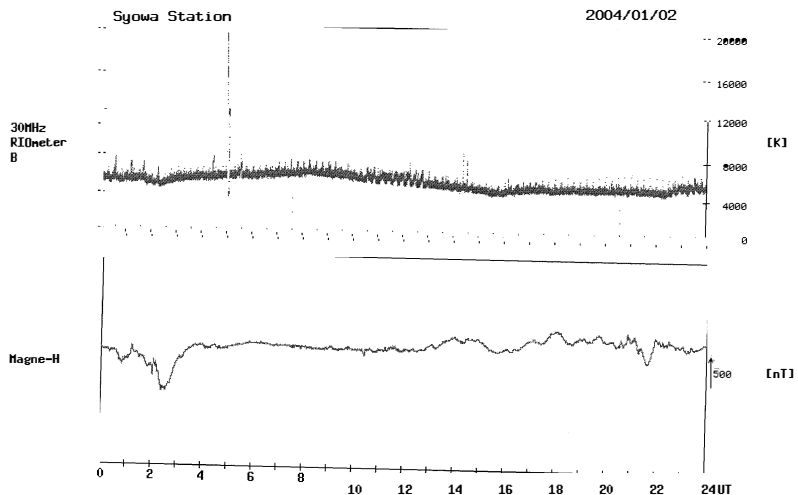
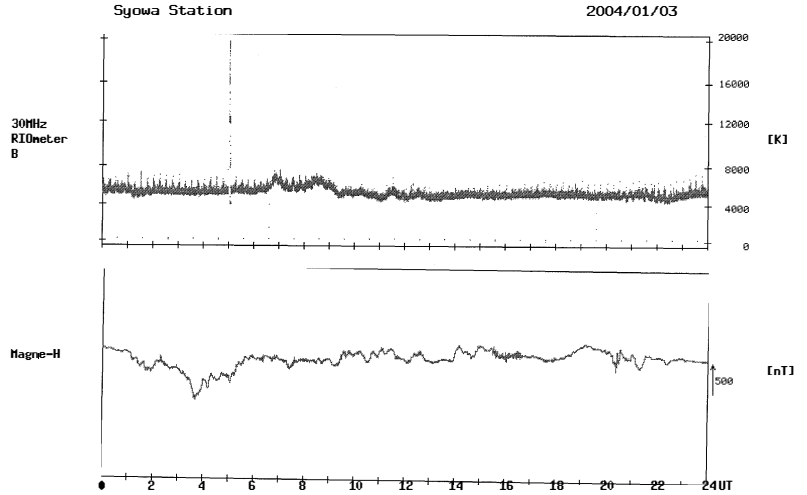
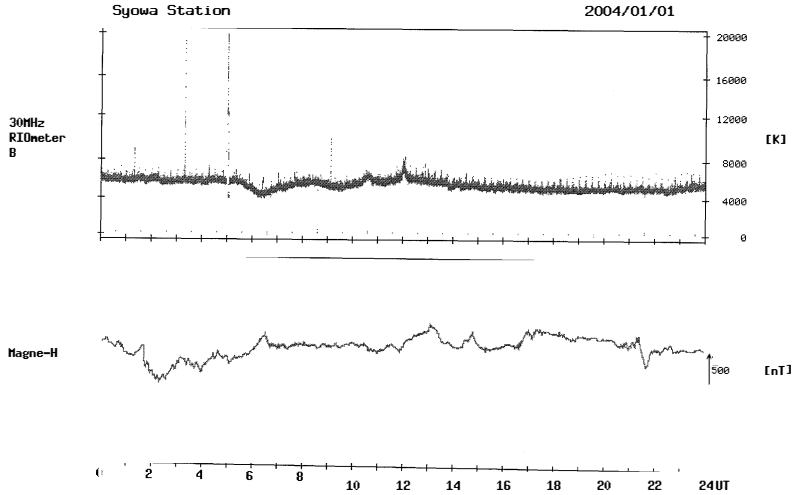
The cosmic noise power level shows a remarkable sidereal diurnal variation caused by the passage of the cosmic radio source across the zenith. Due to the earth's revolution, the time of the zenith passage of a particular cosmic radio source occurs approximately four minutes earlier each day and returns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

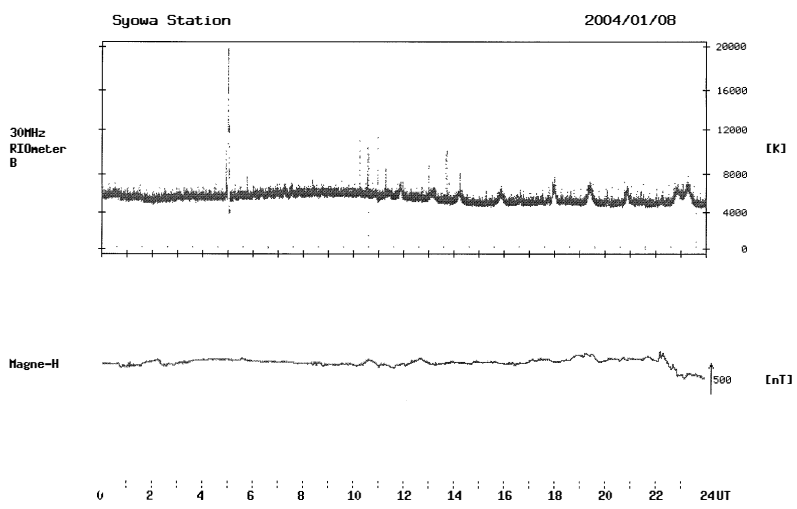
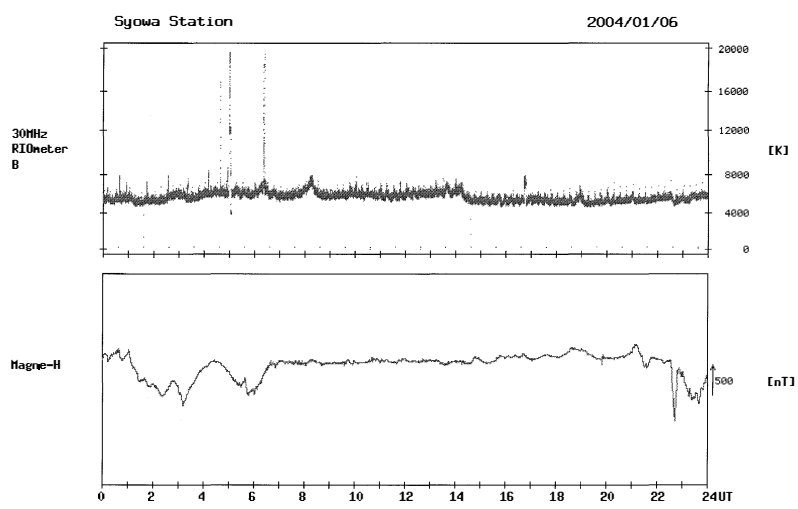
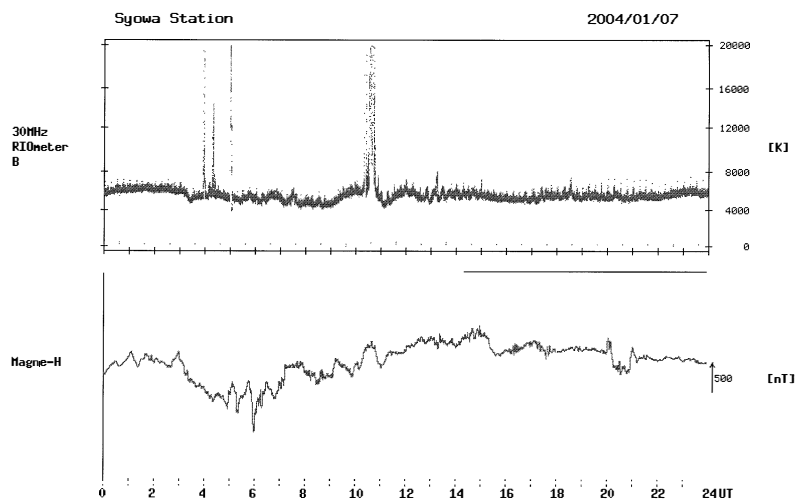
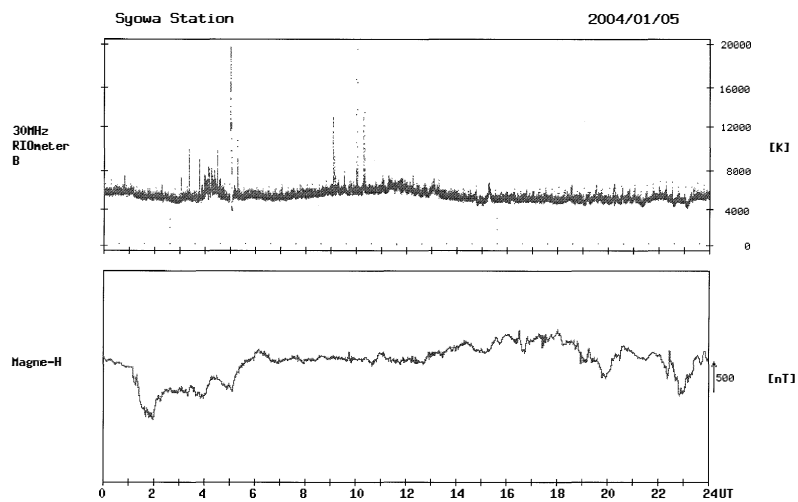
The ionospheric absorption in dB is obtained as follows:

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

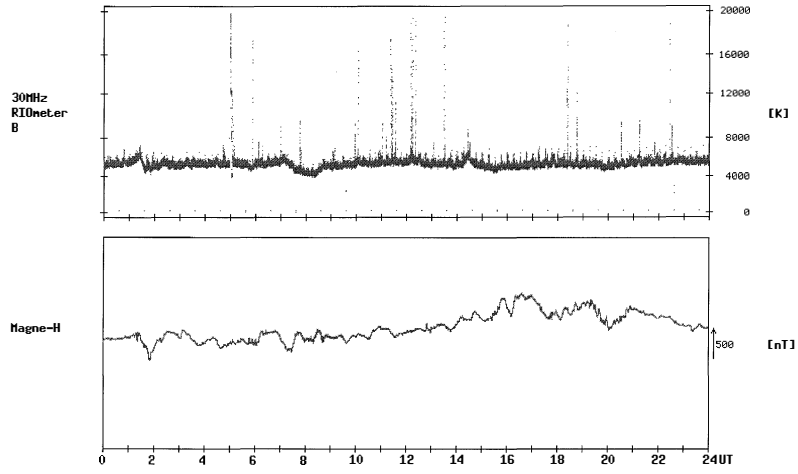
$$A = -10 \times \log\left(\frac{T_1}{T_0}\right).$$

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

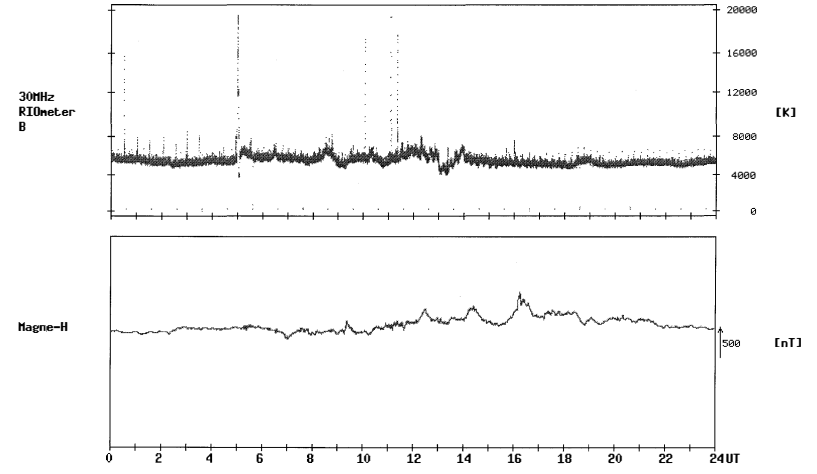




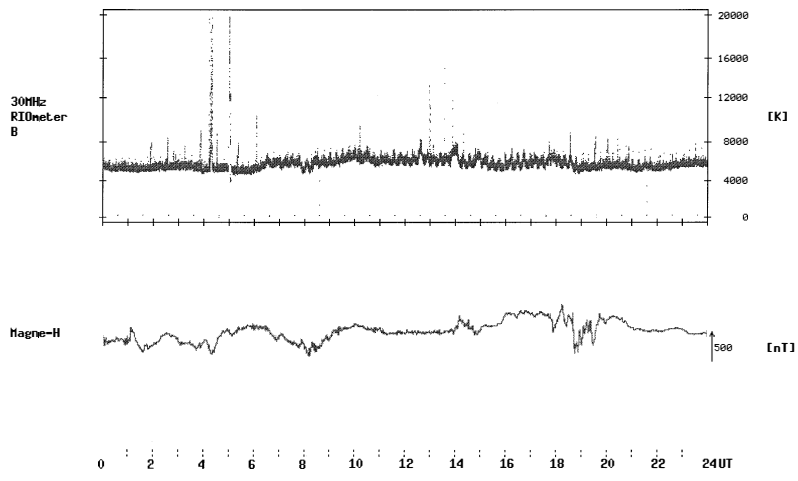
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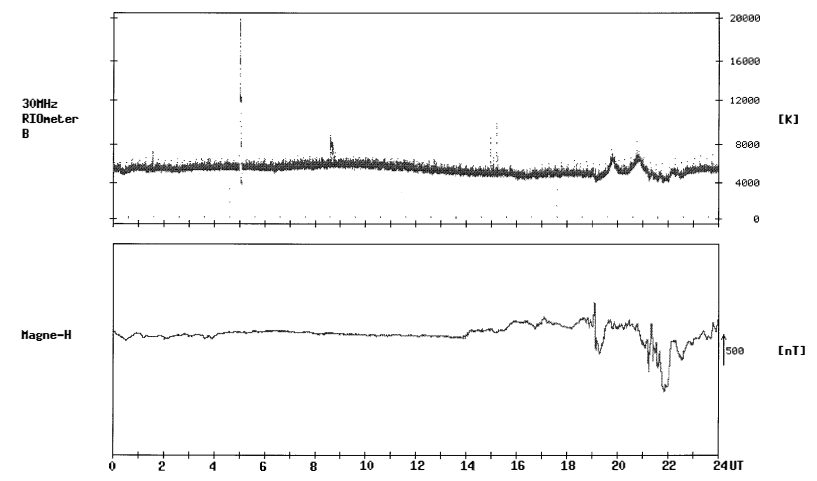
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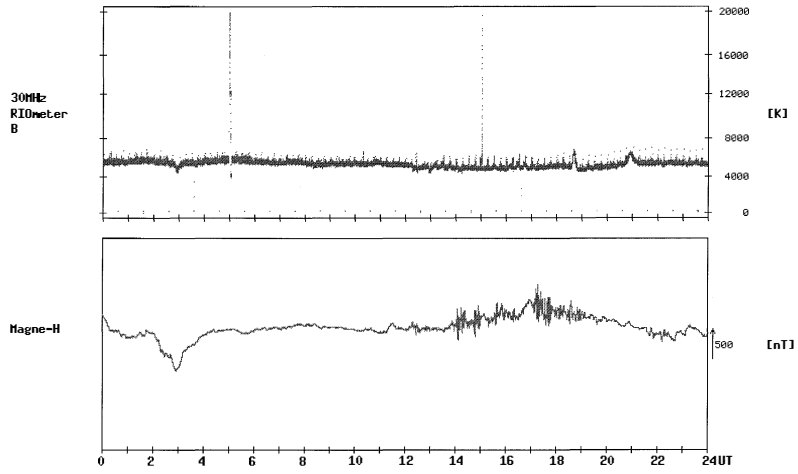
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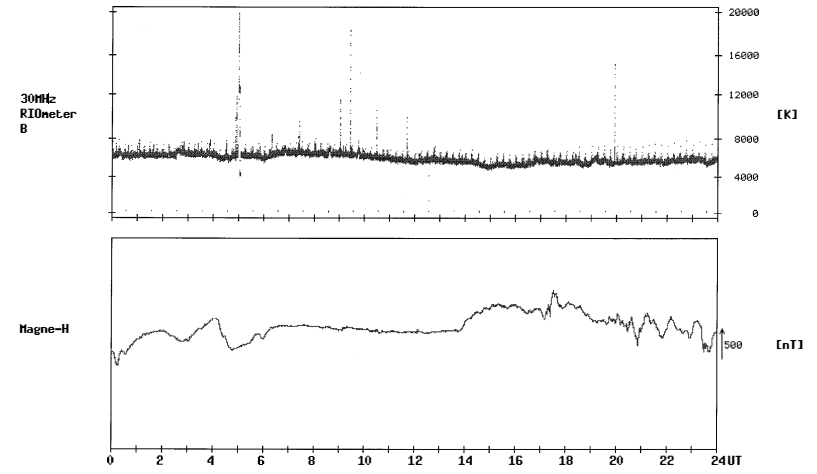
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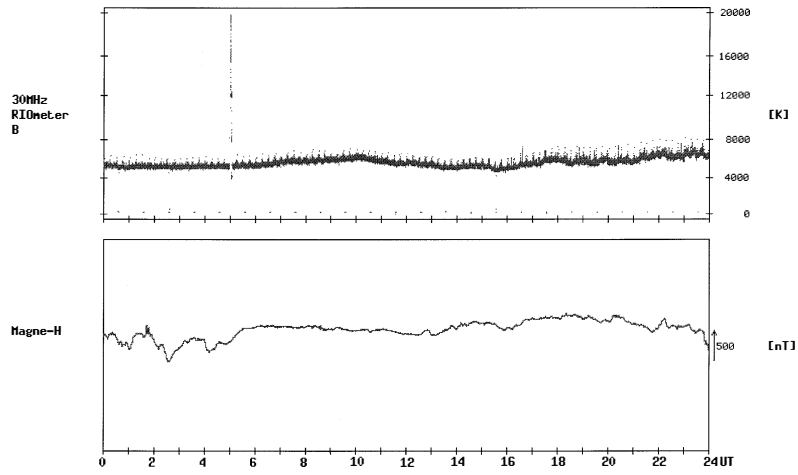
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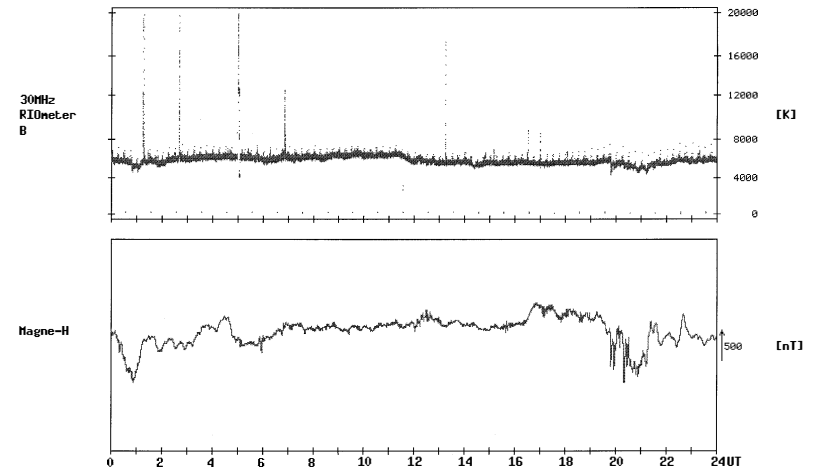
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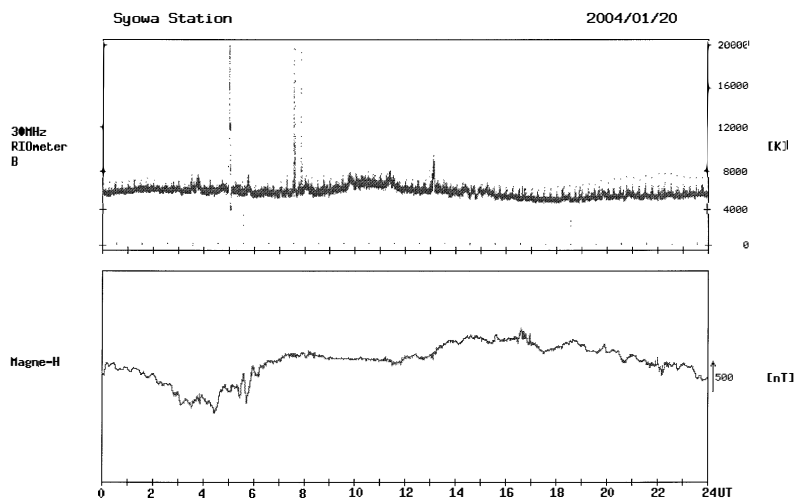
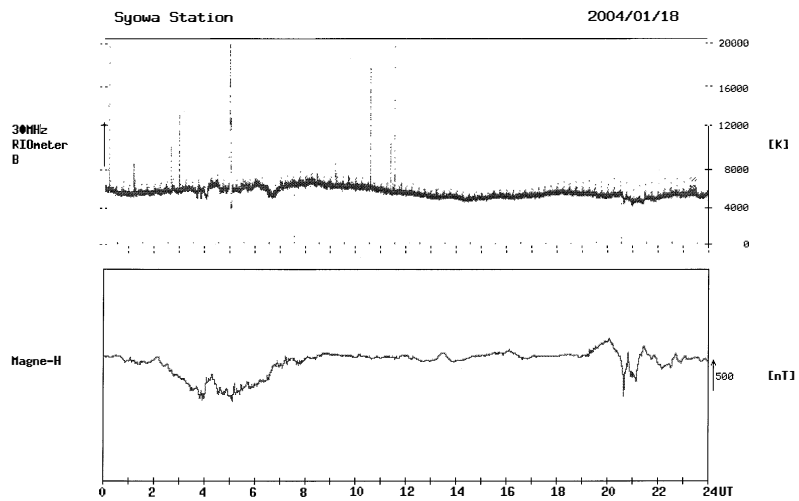
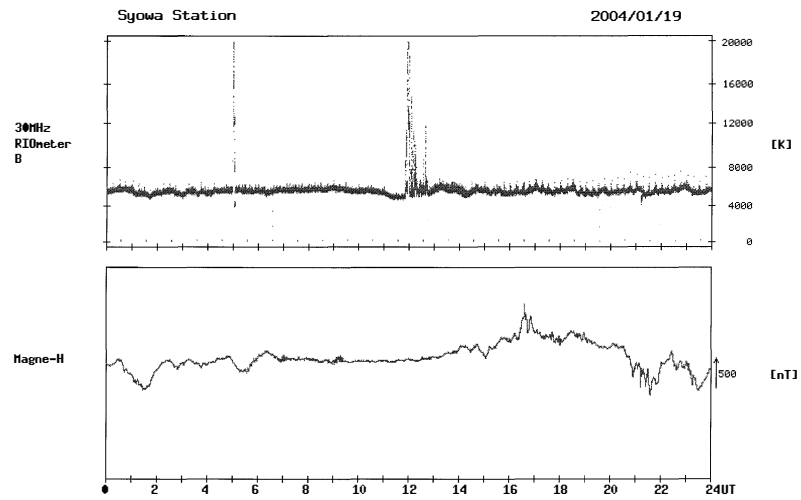
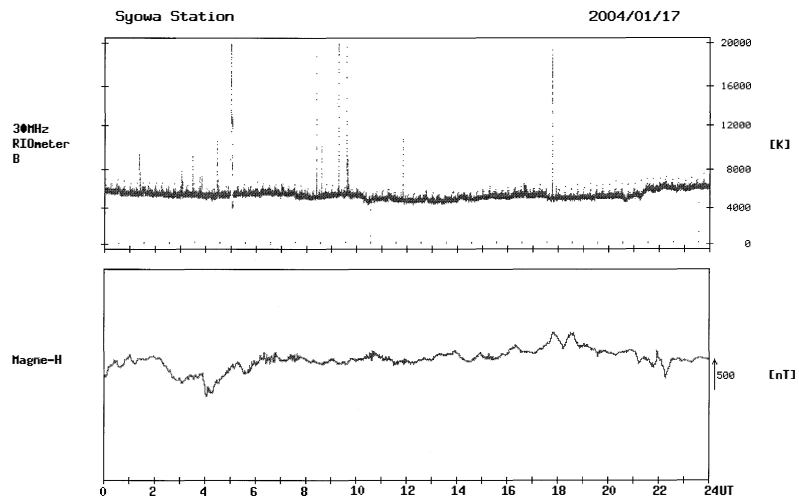


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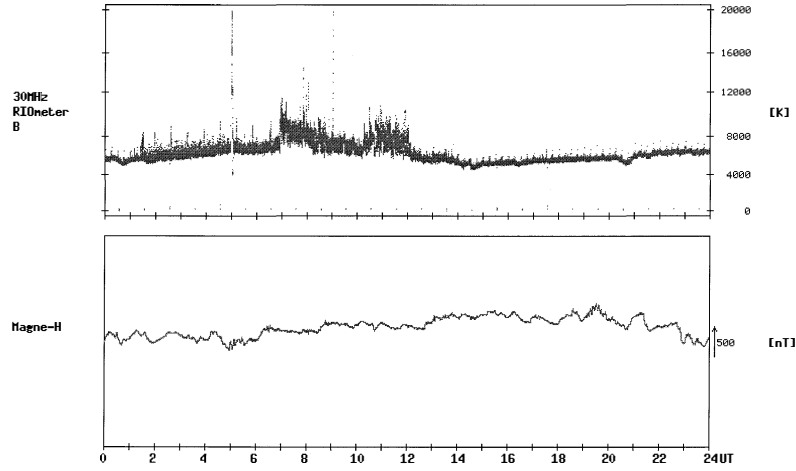


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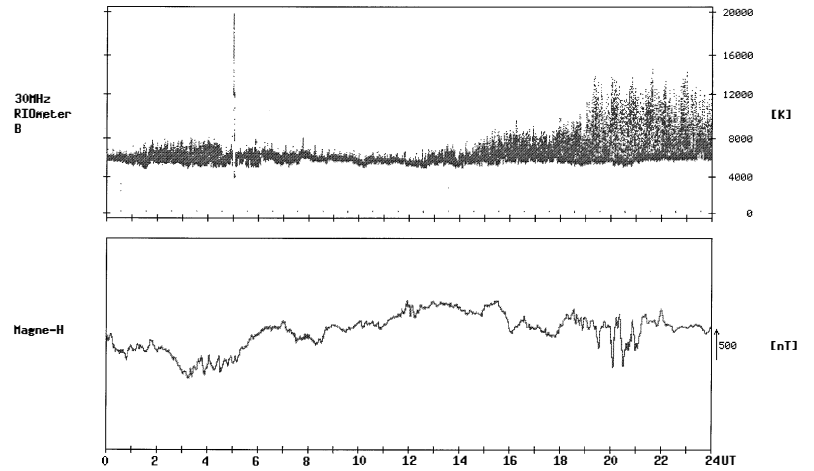




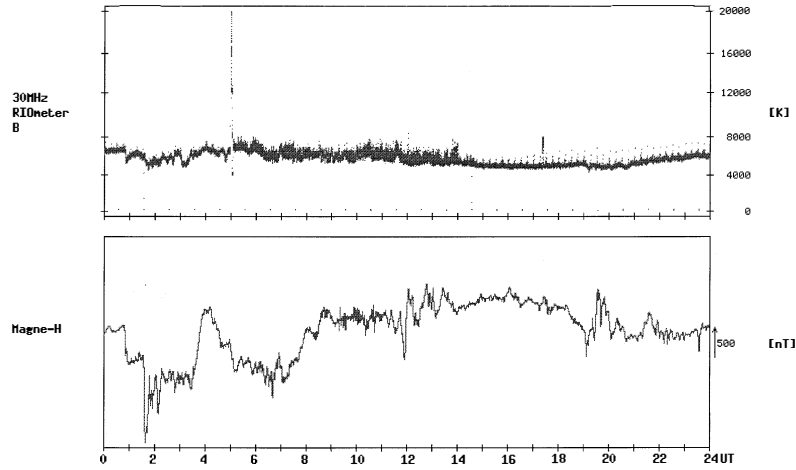
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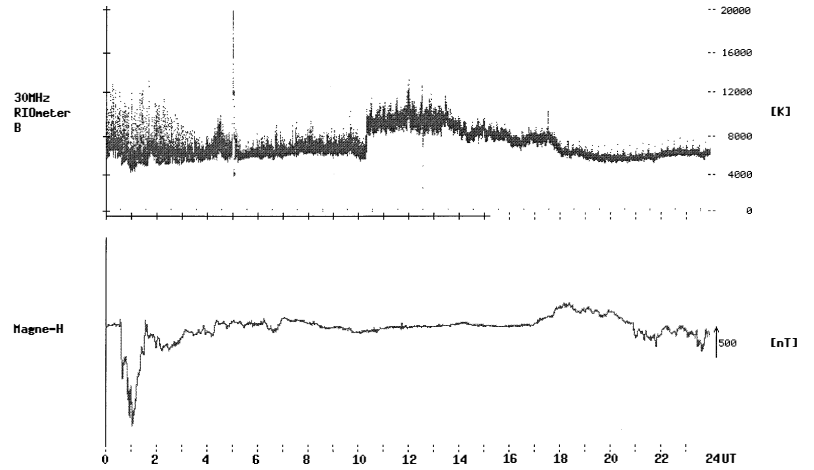
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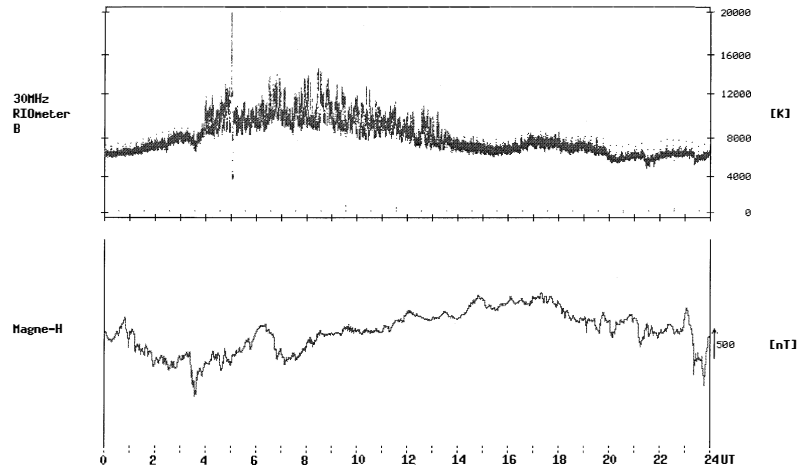
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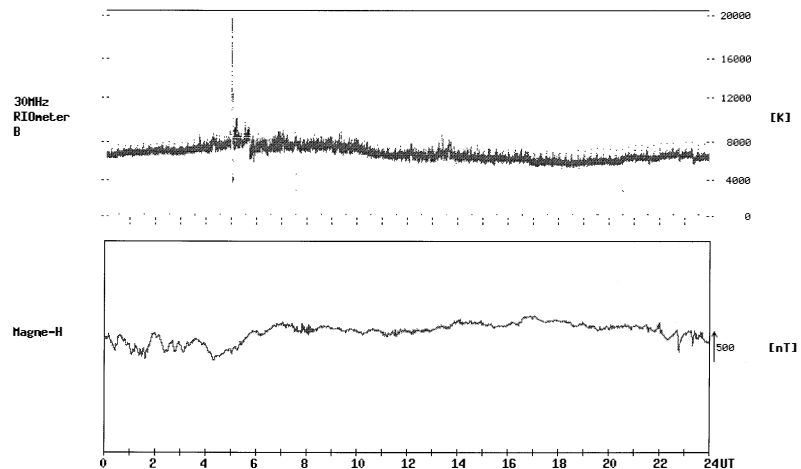
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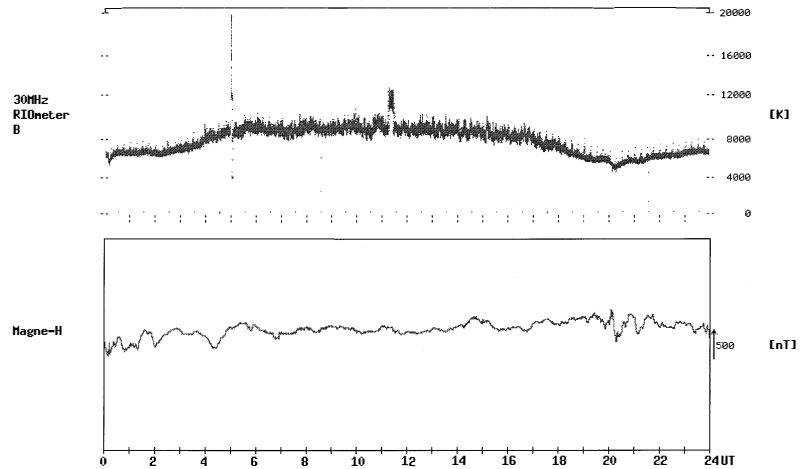
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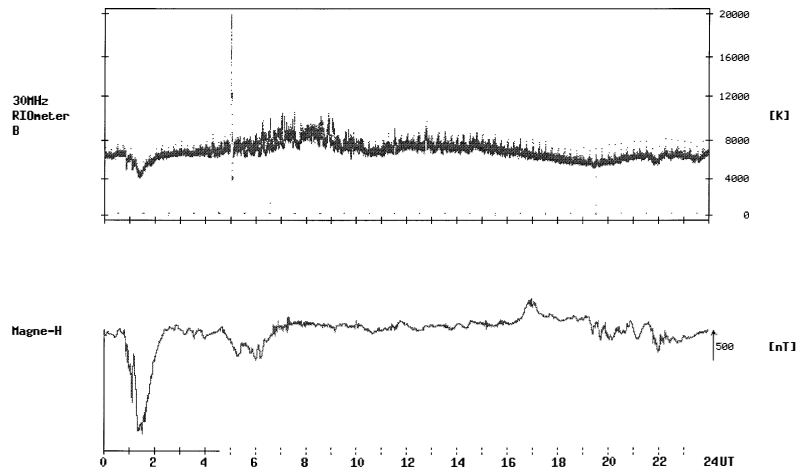
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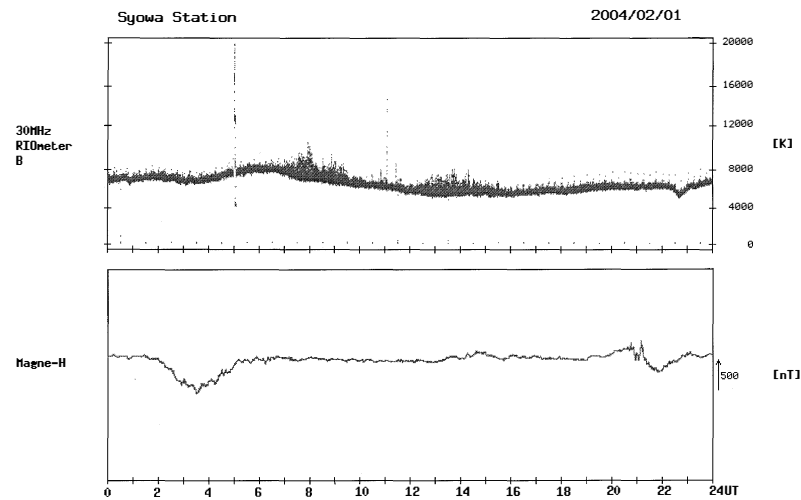
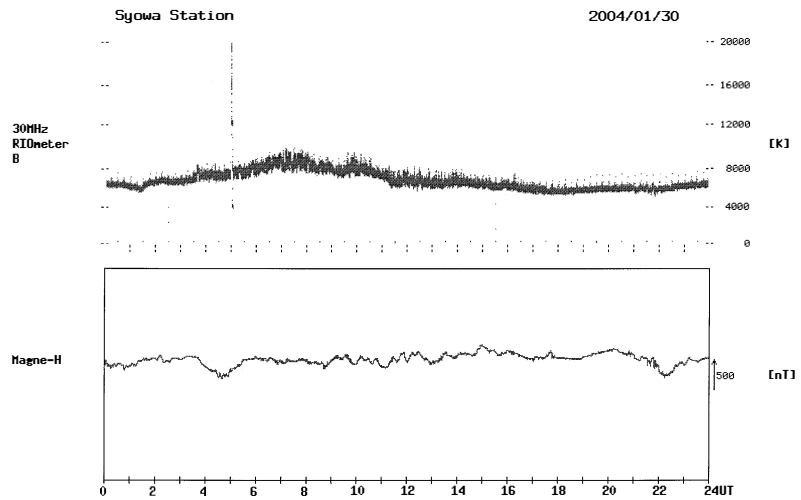
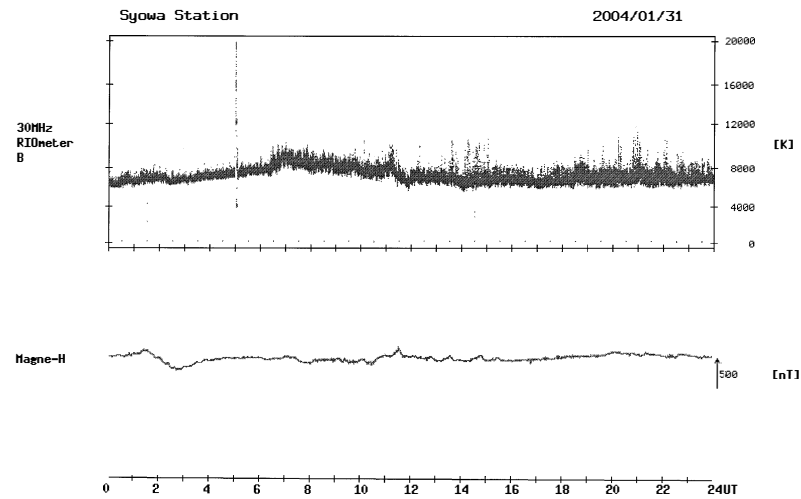
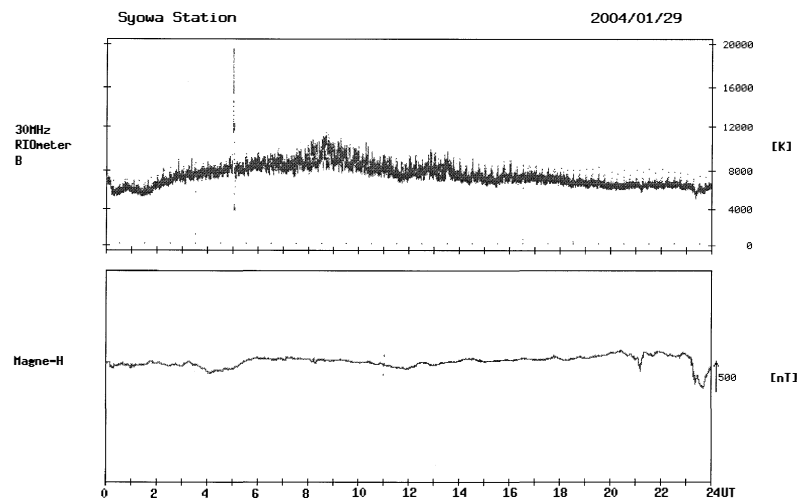


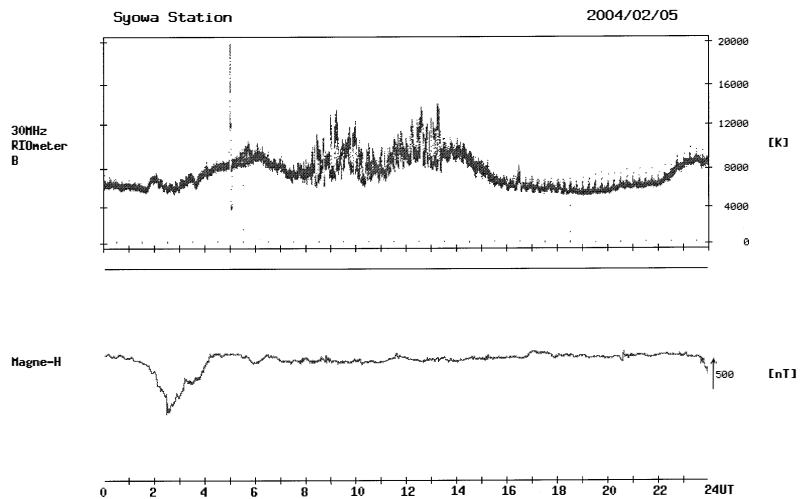
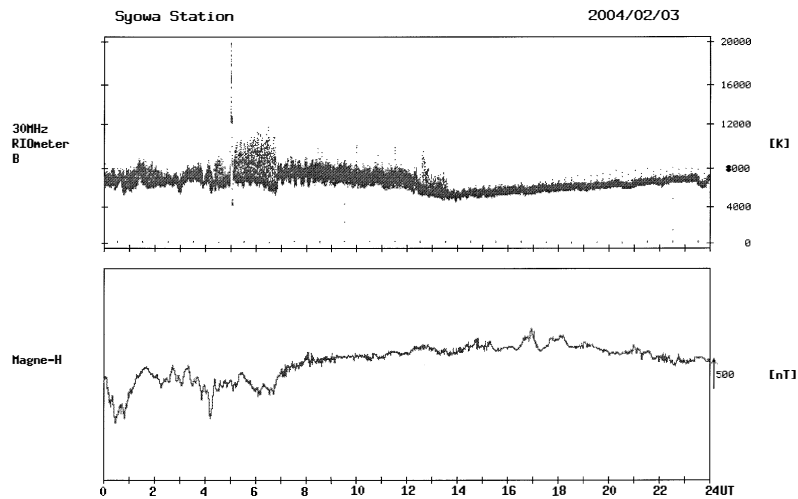
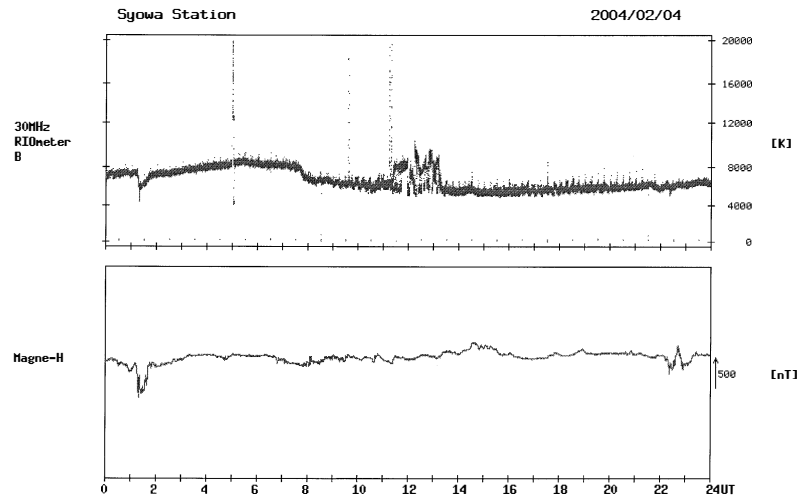
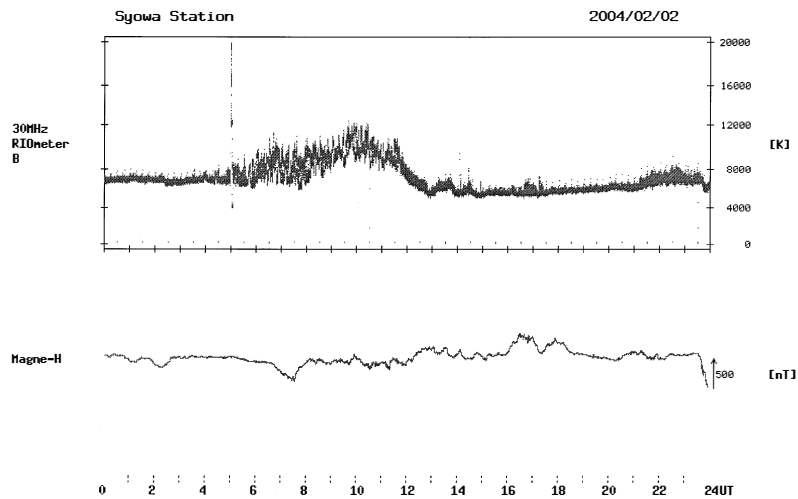
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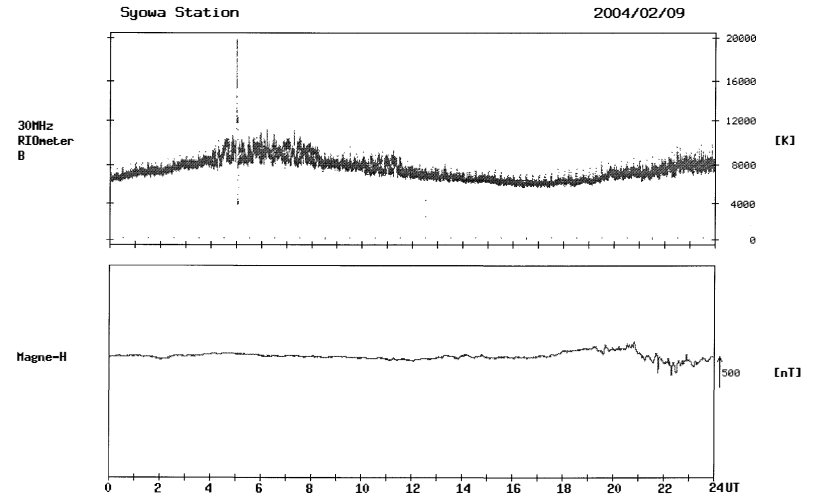
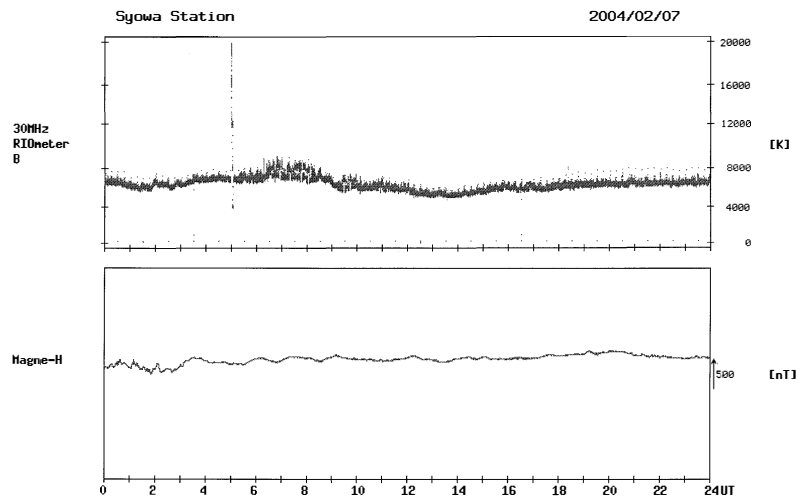
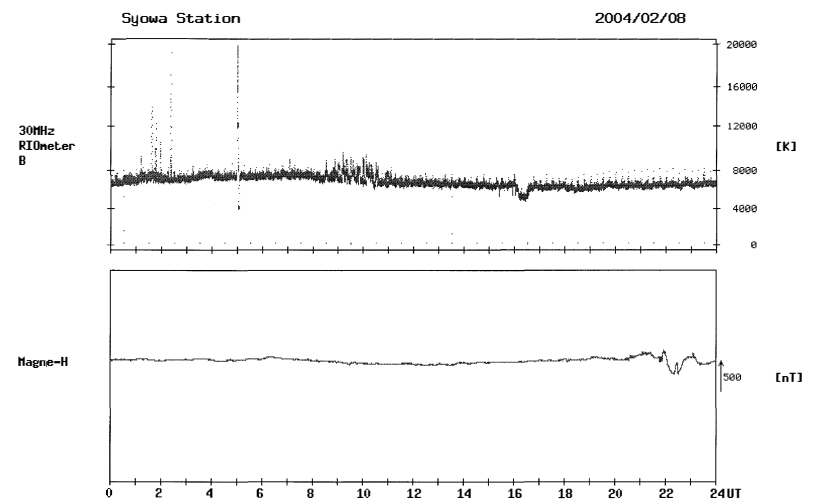
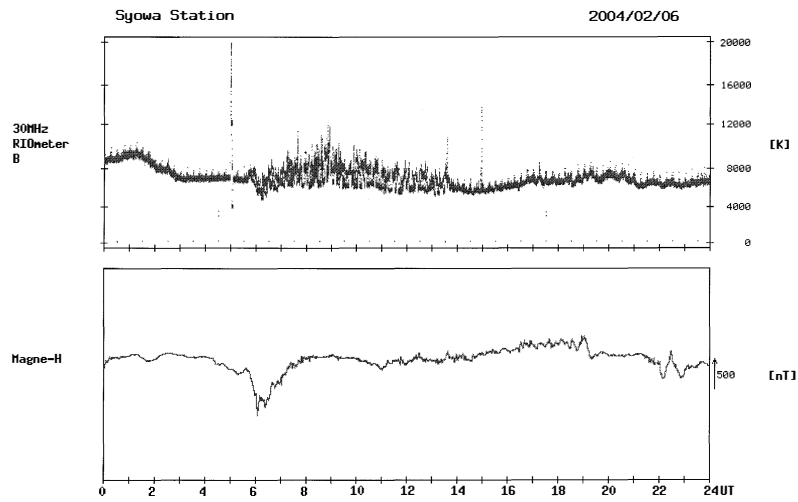
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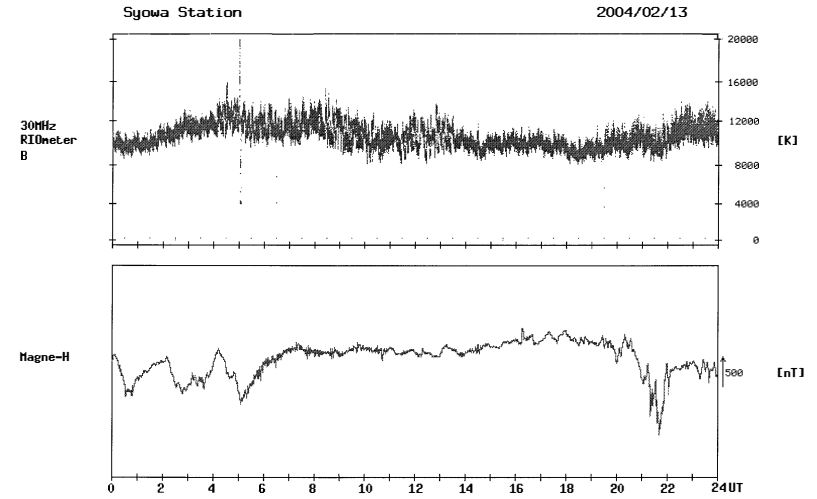
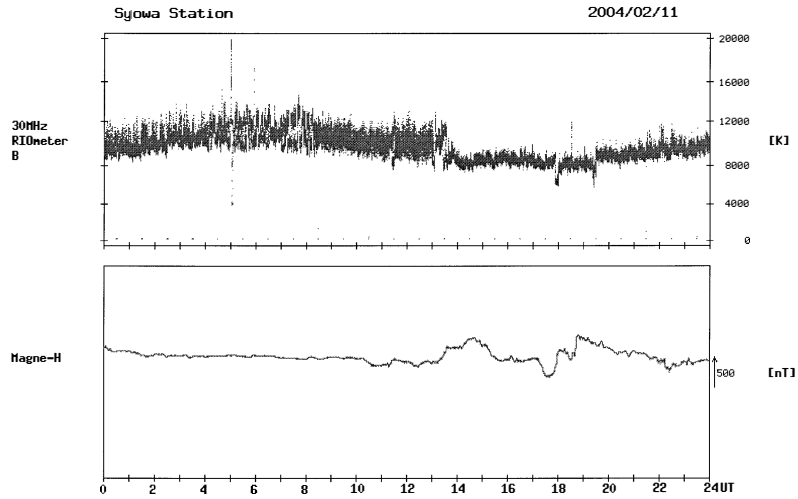
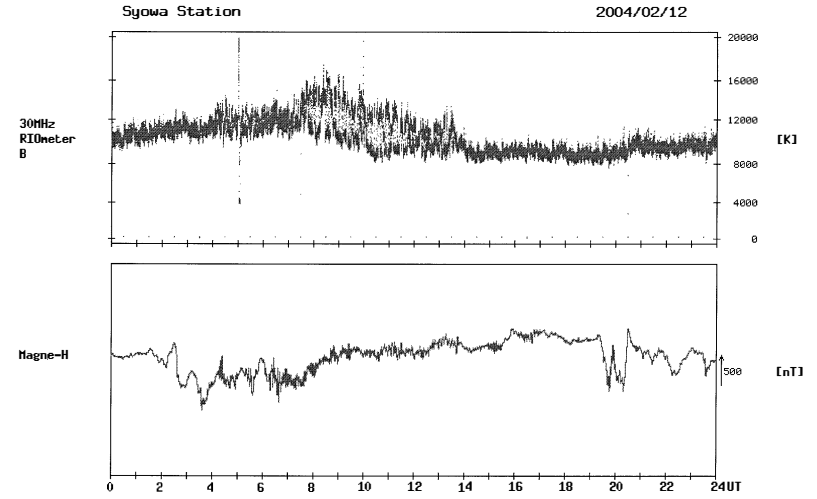
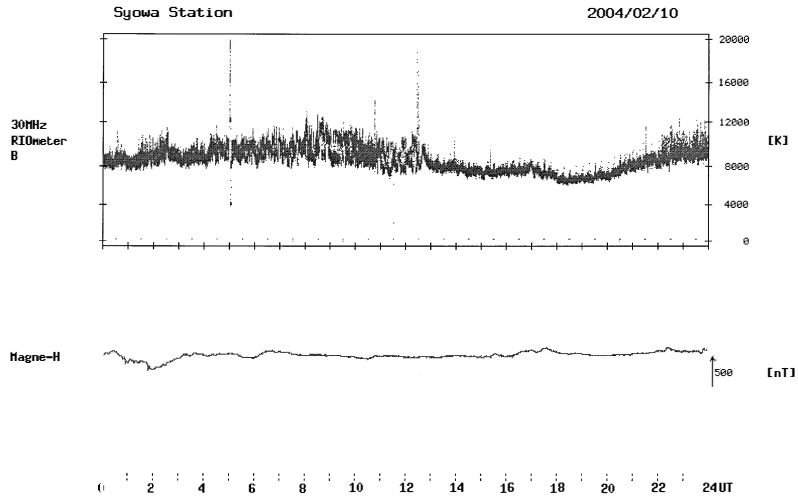




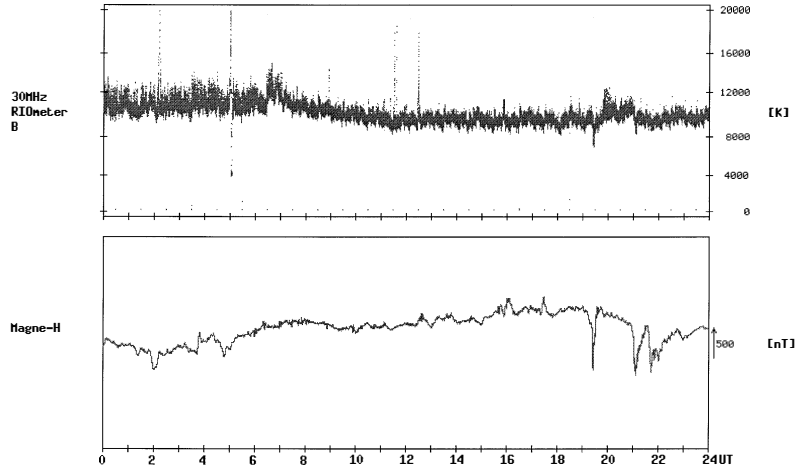


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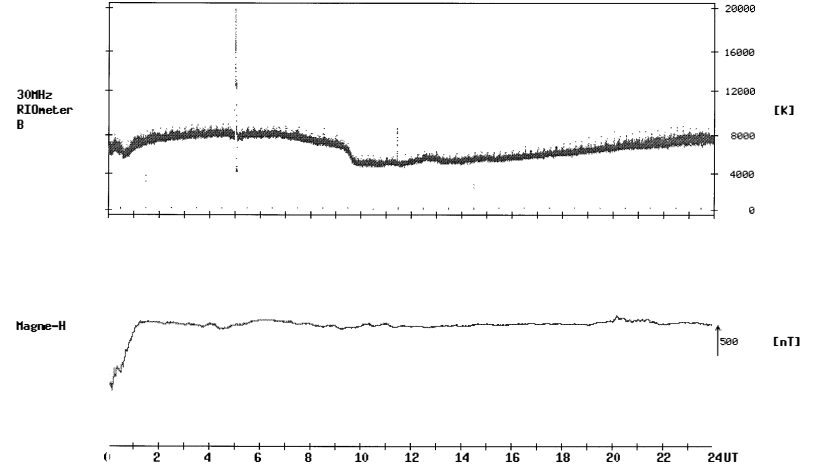




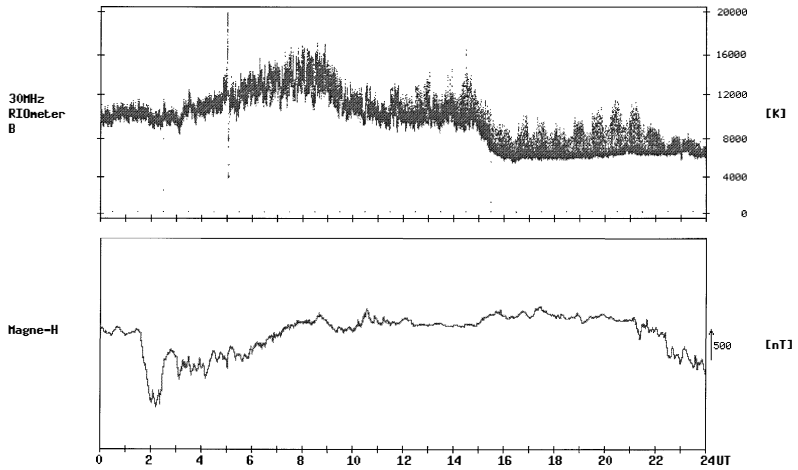
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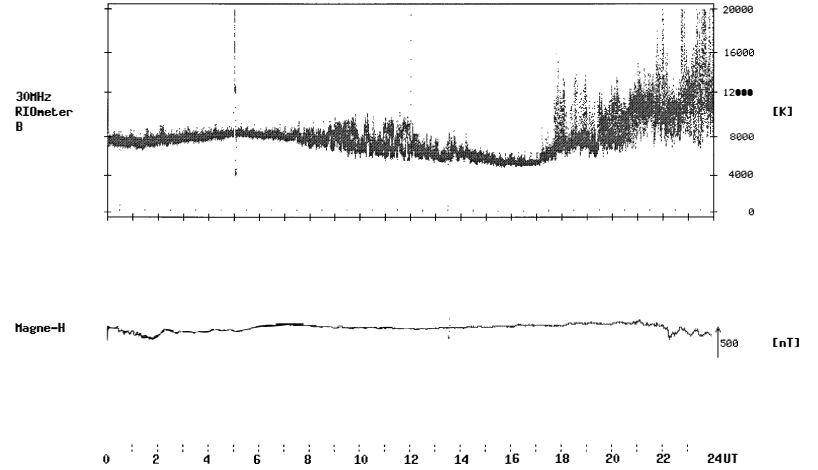
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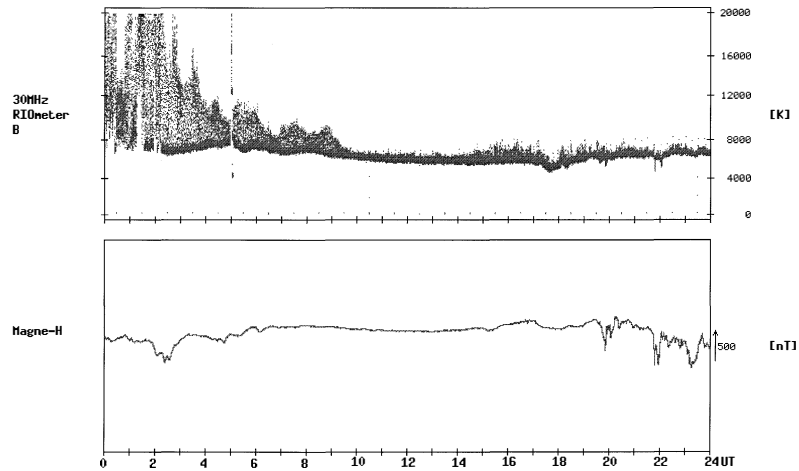
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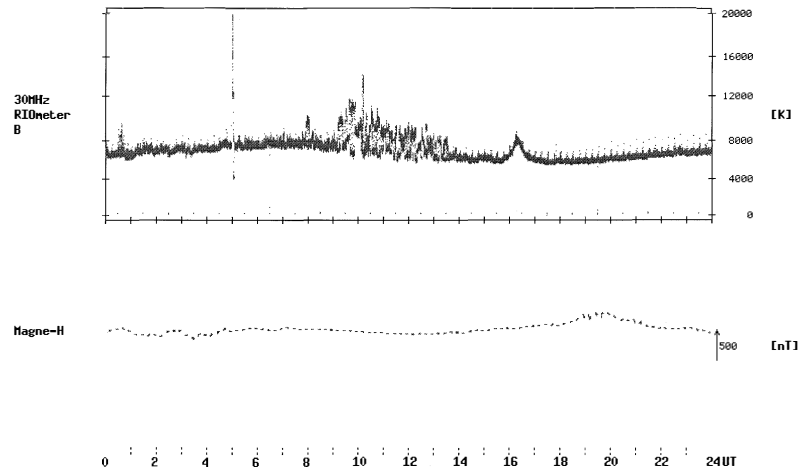
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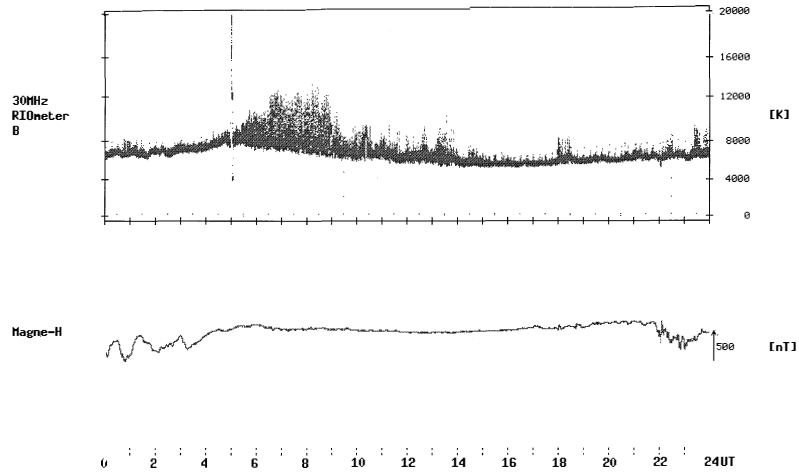
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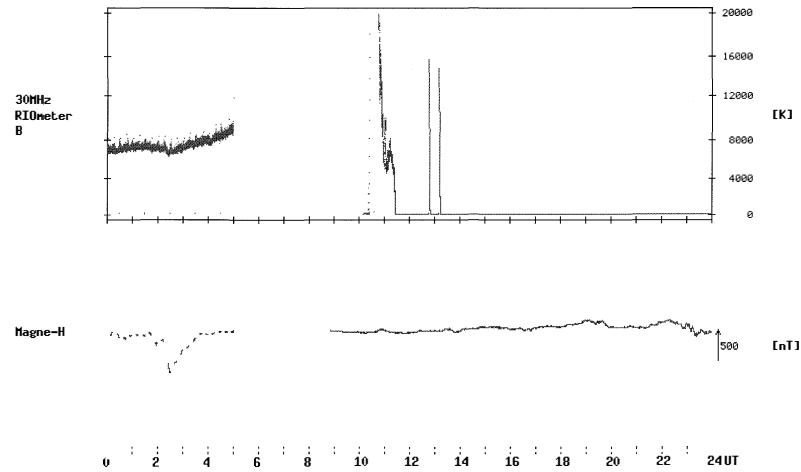
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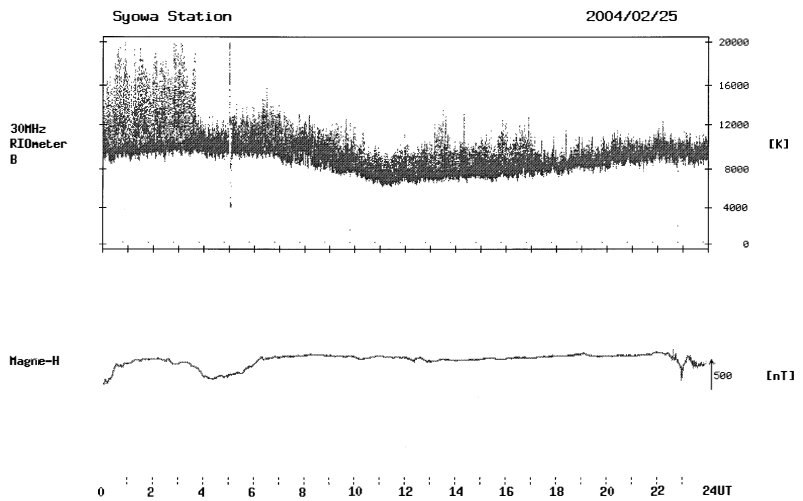
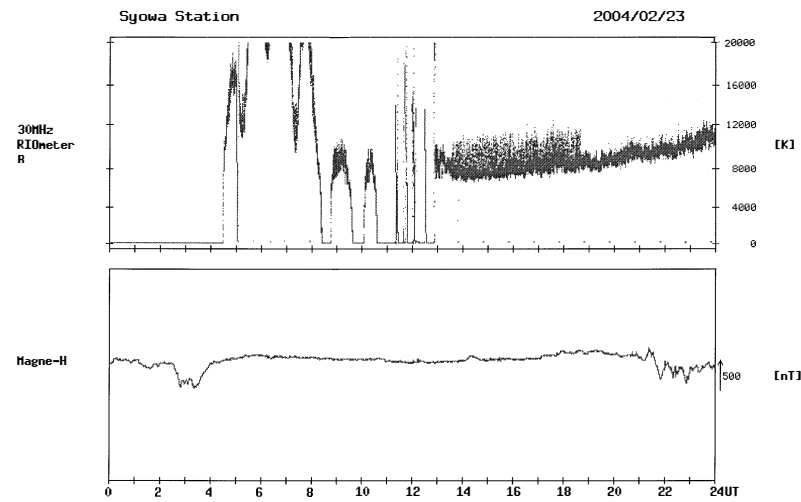
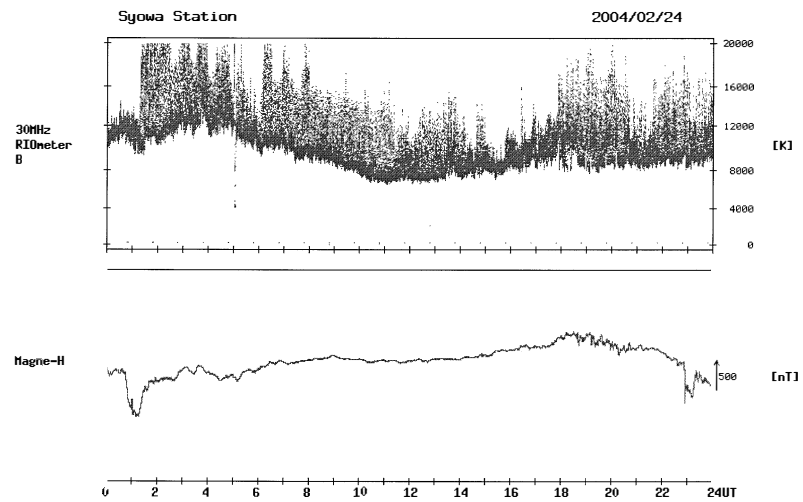
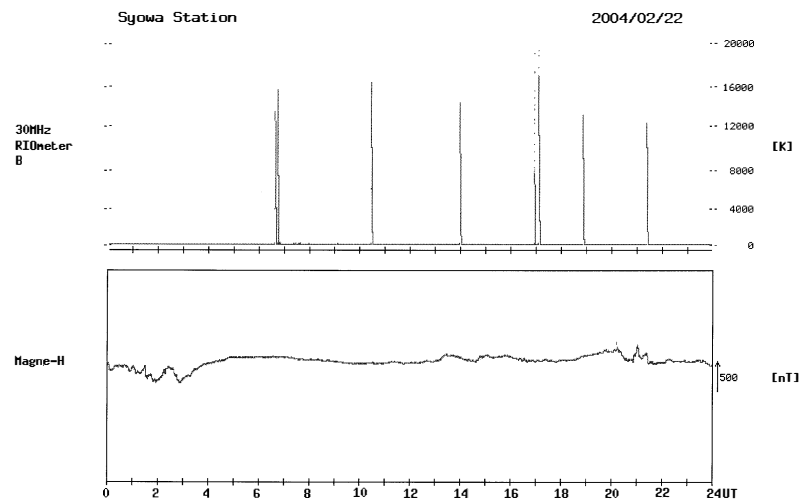


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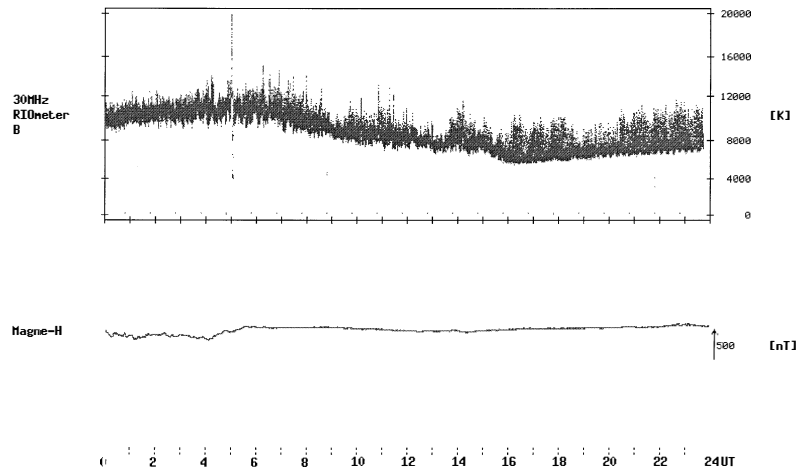


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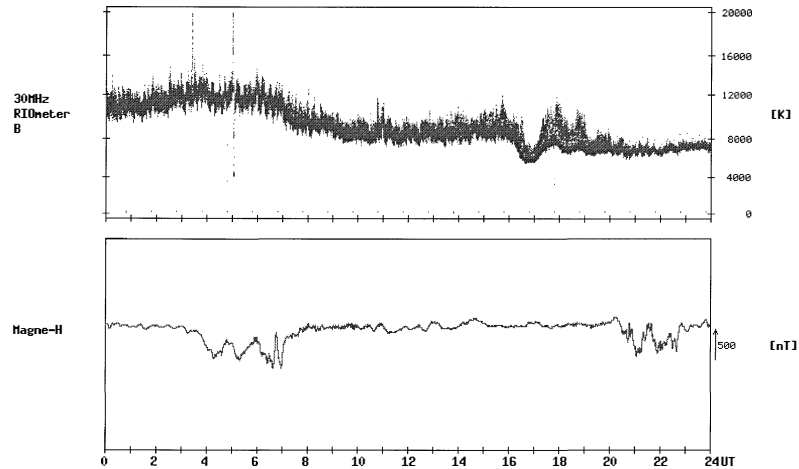




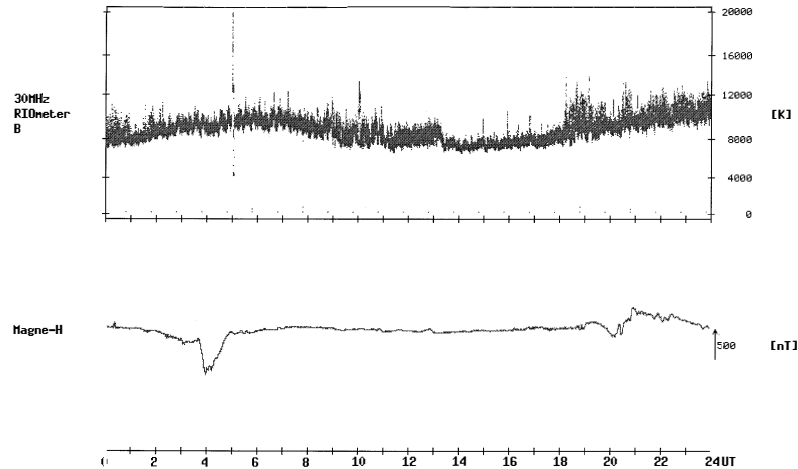
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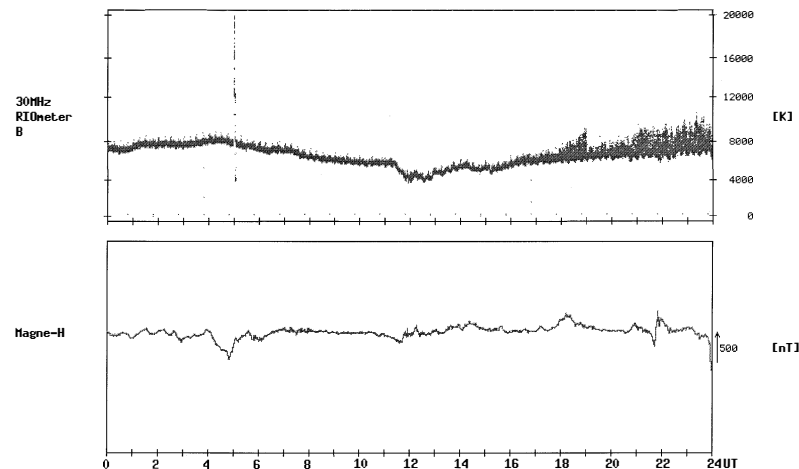
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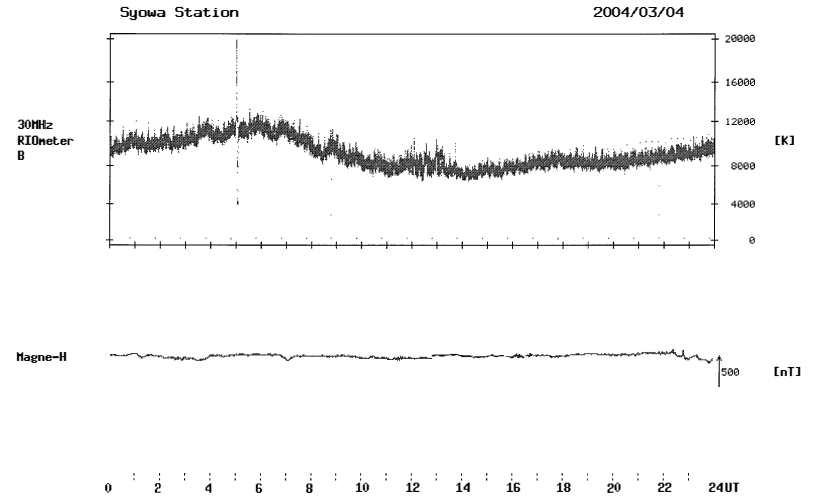
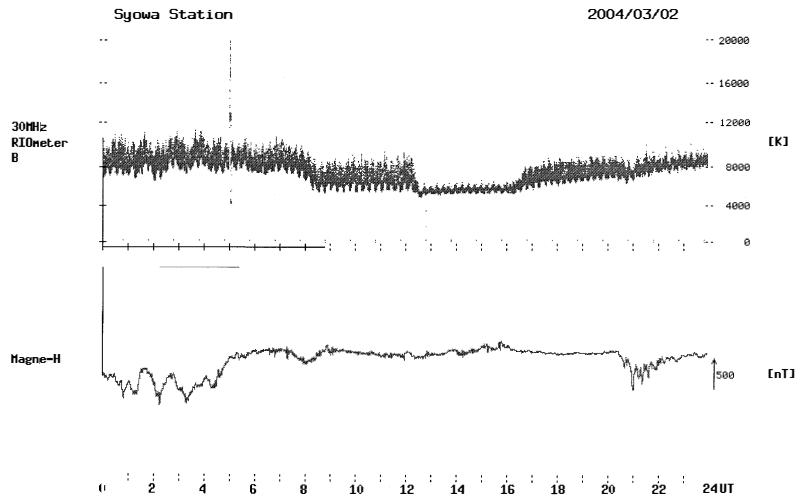
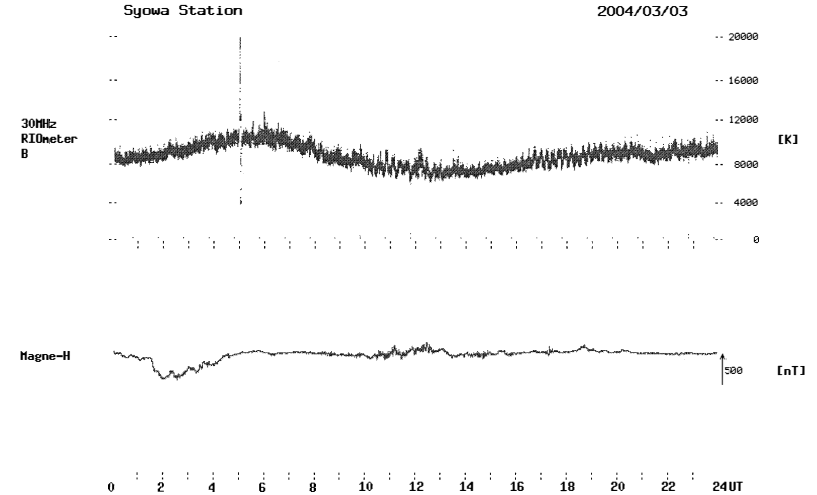
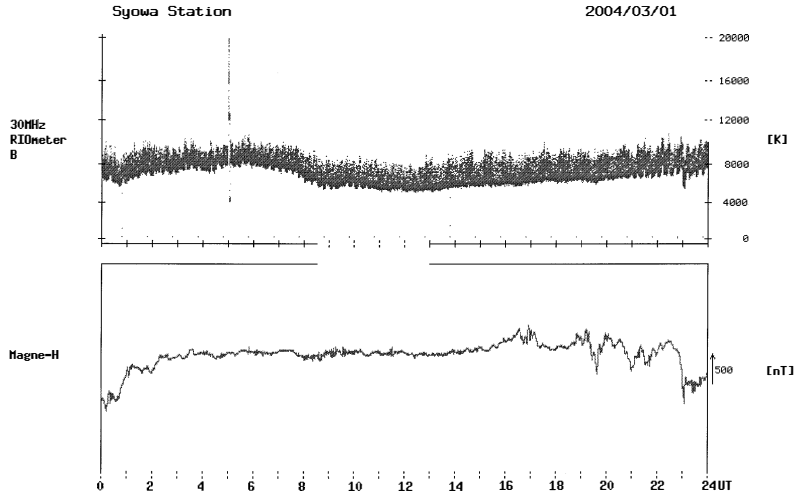


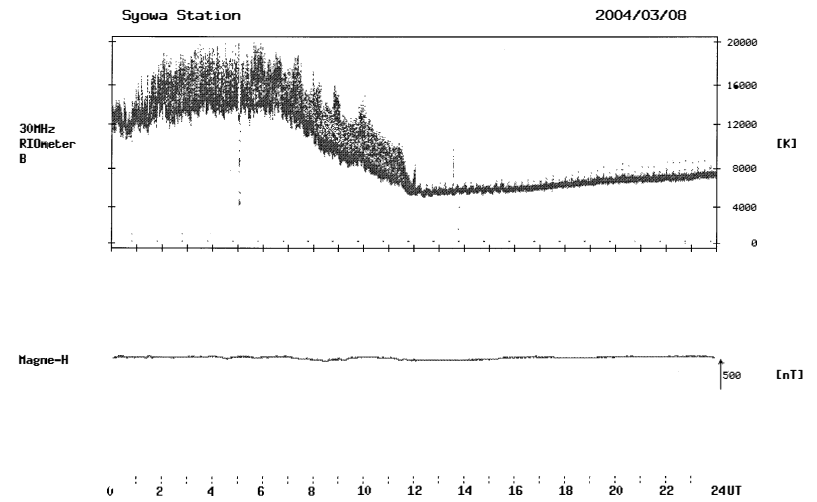
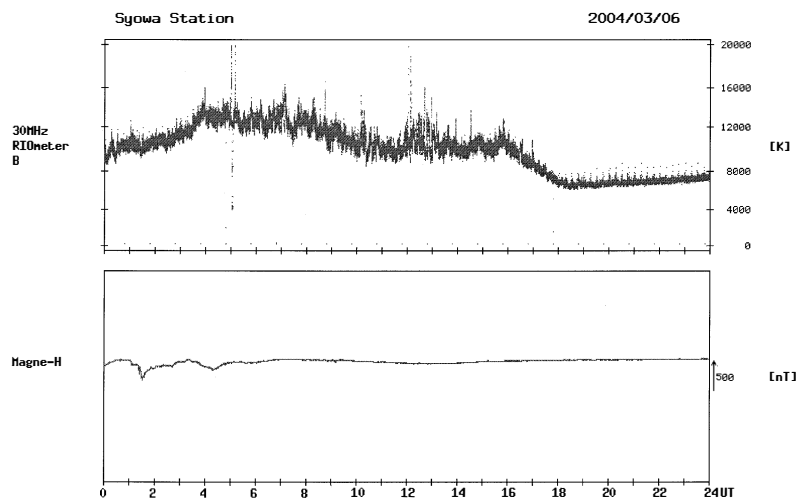
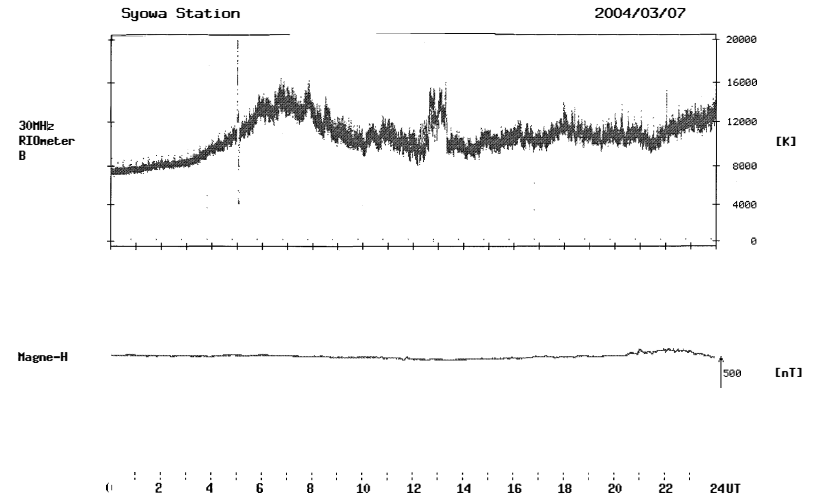
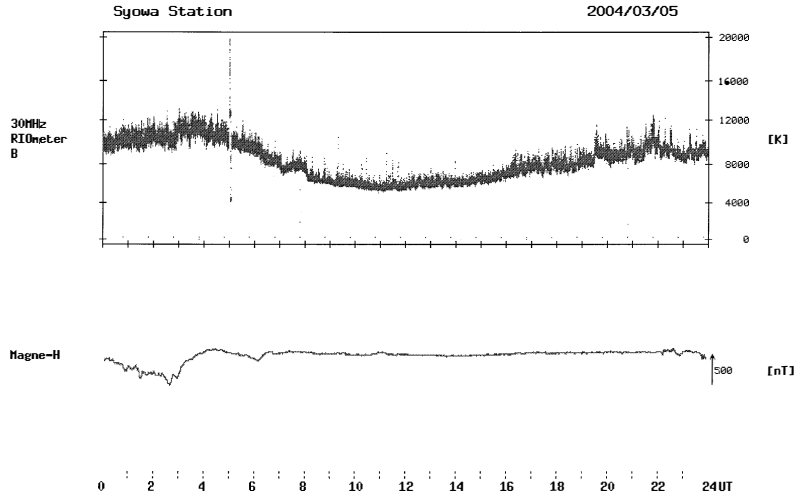
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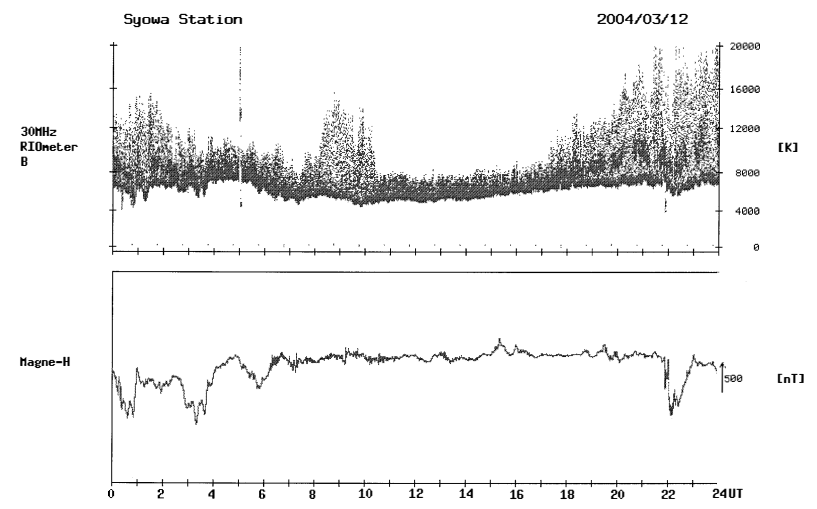
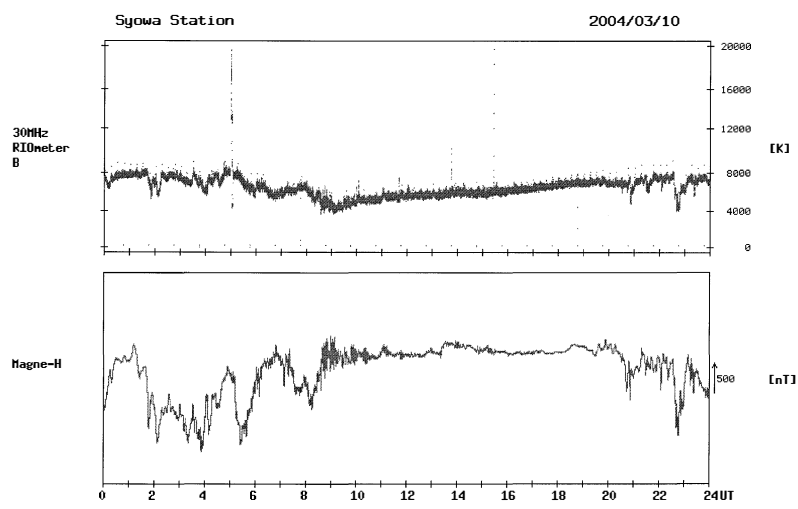
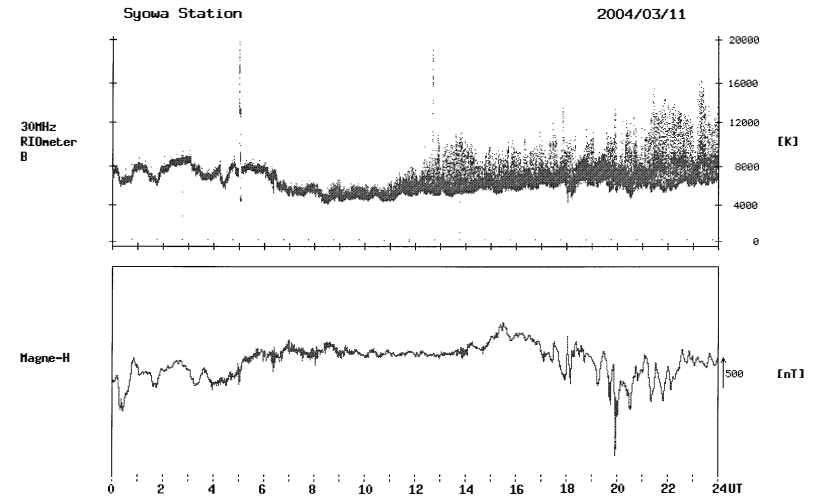
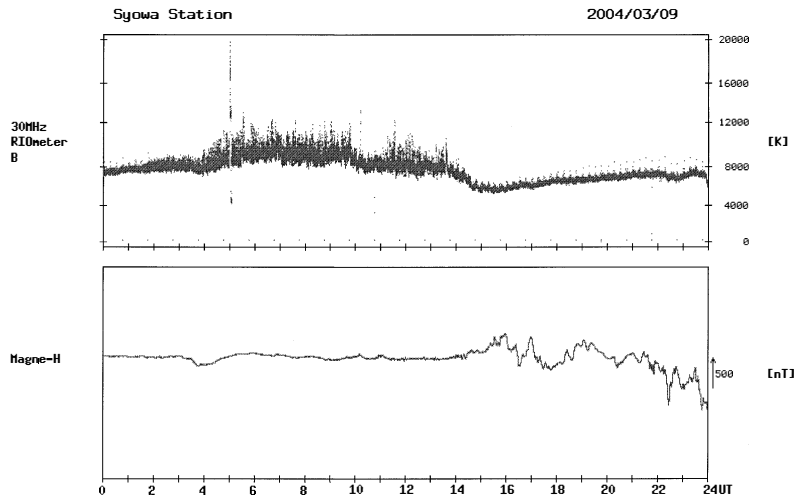


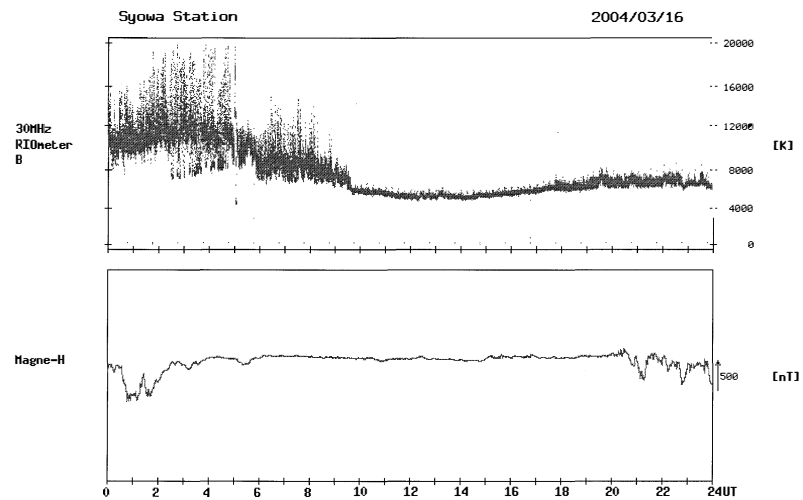
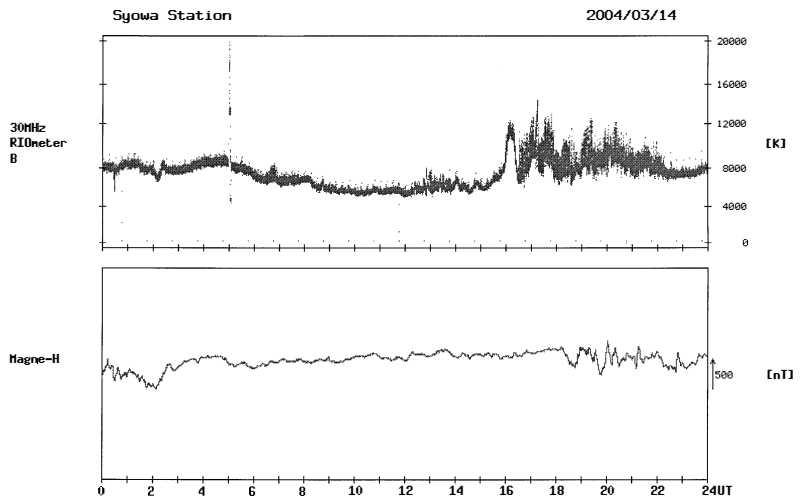
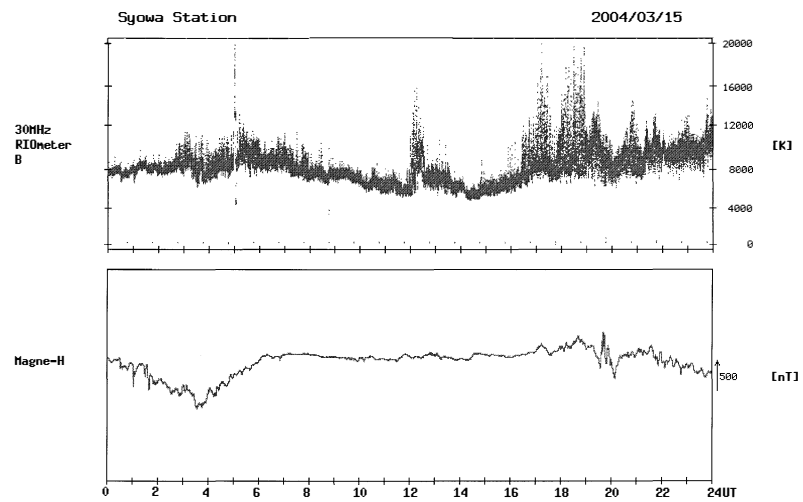
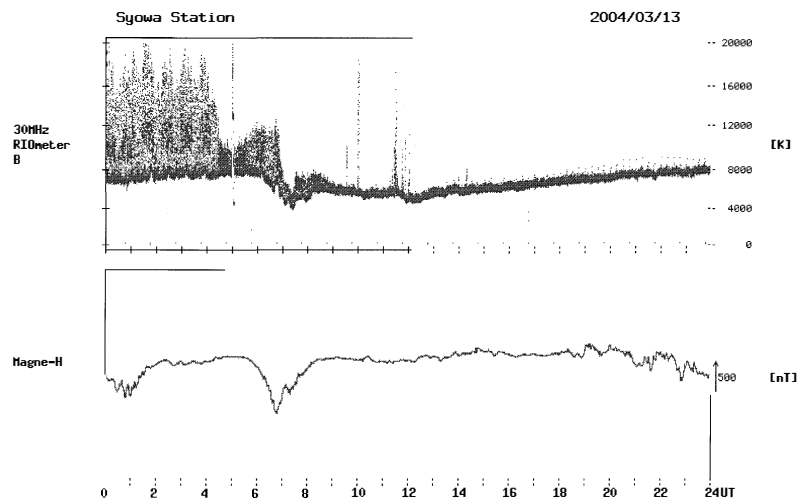
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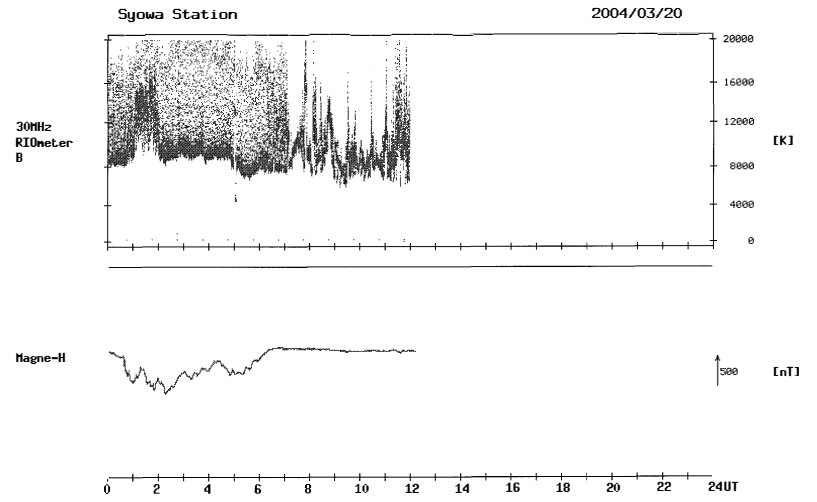
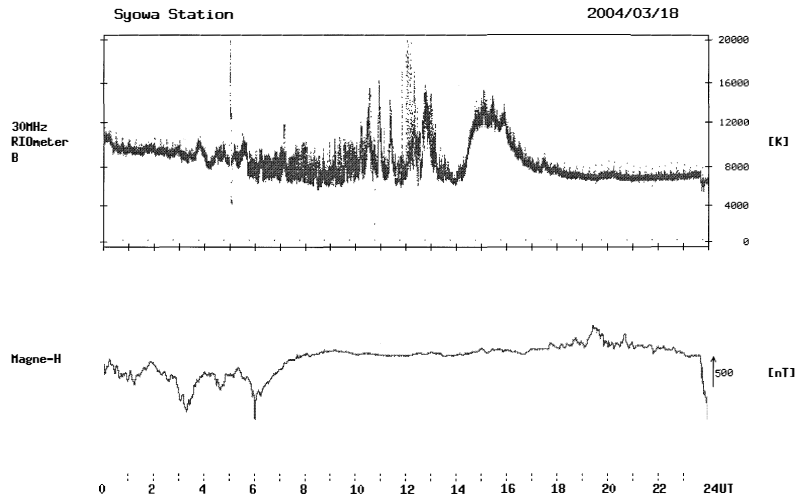
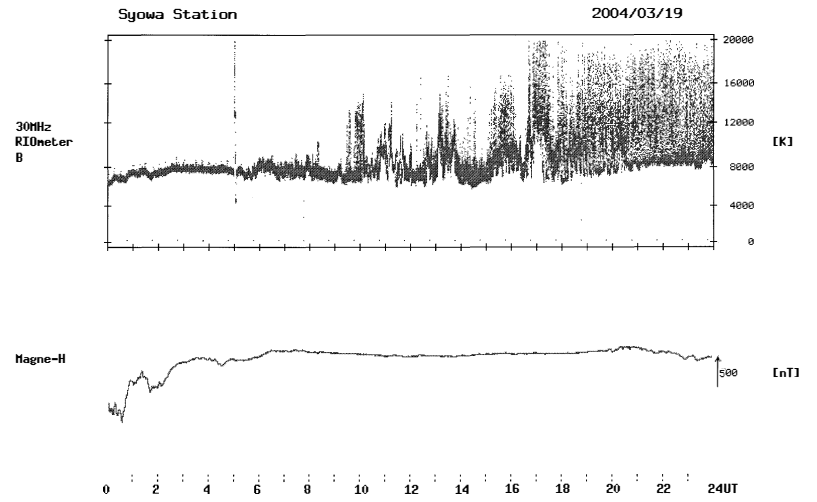
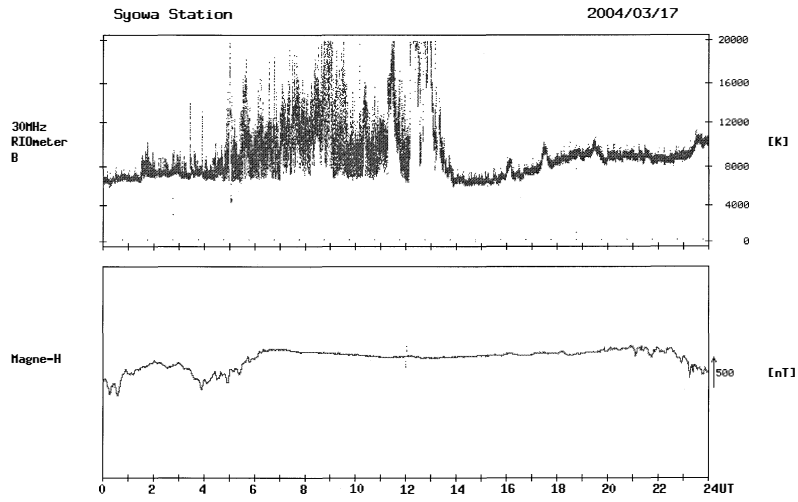




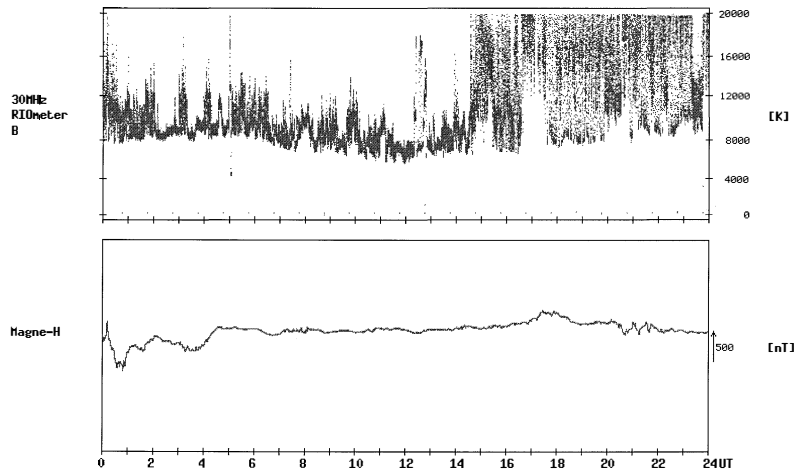




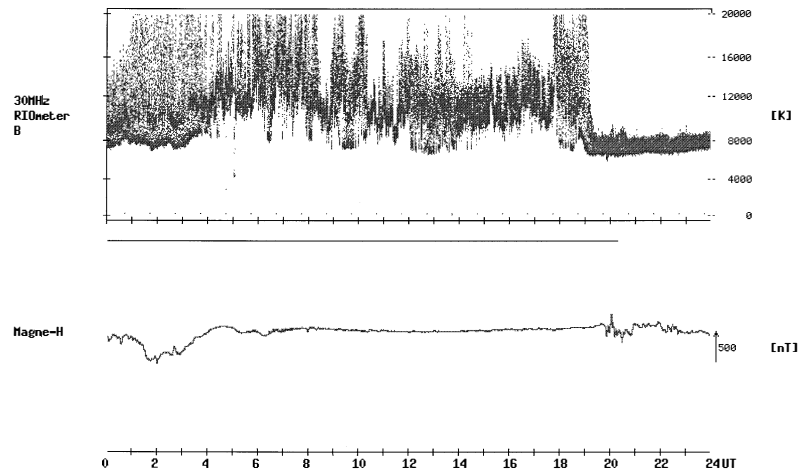




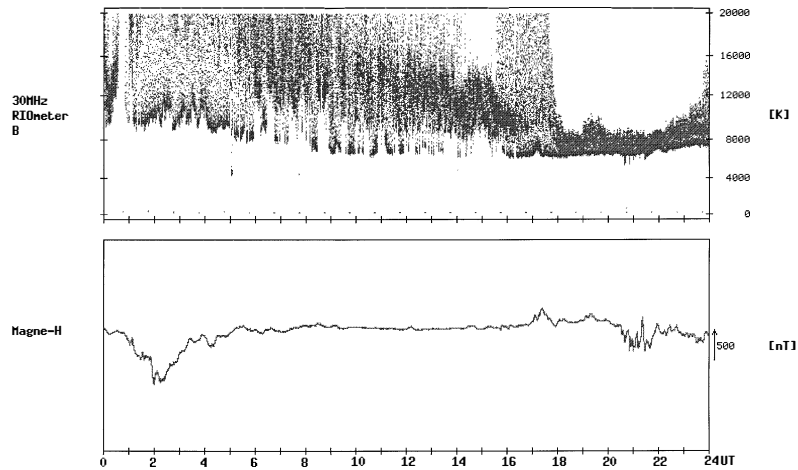
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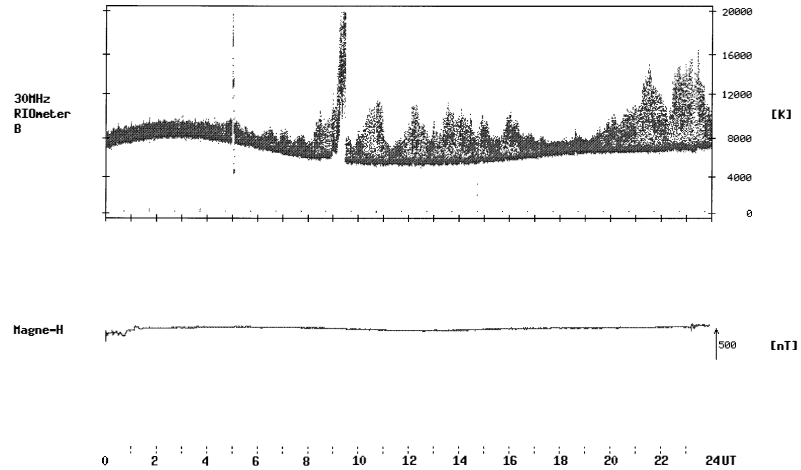
Syowa Station 2004/03/23



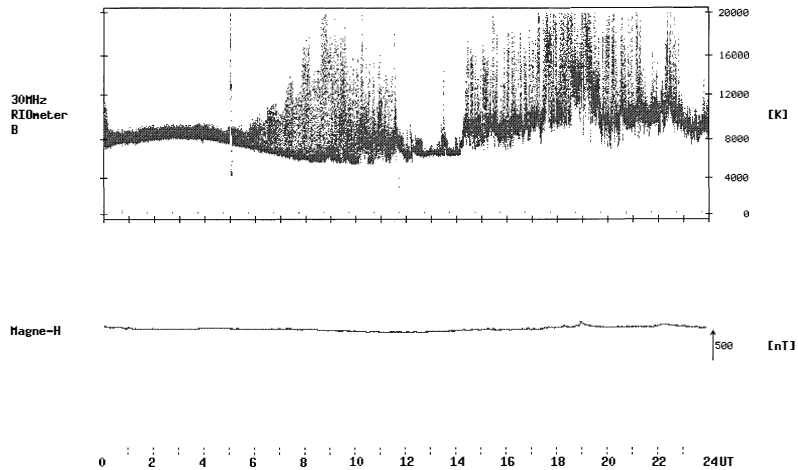
Syowa Station 2004/03/22



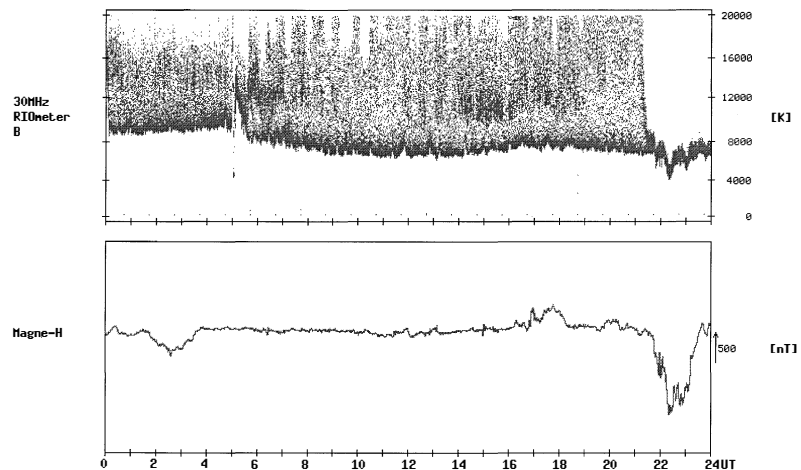
Syowa Station 2004/03/24



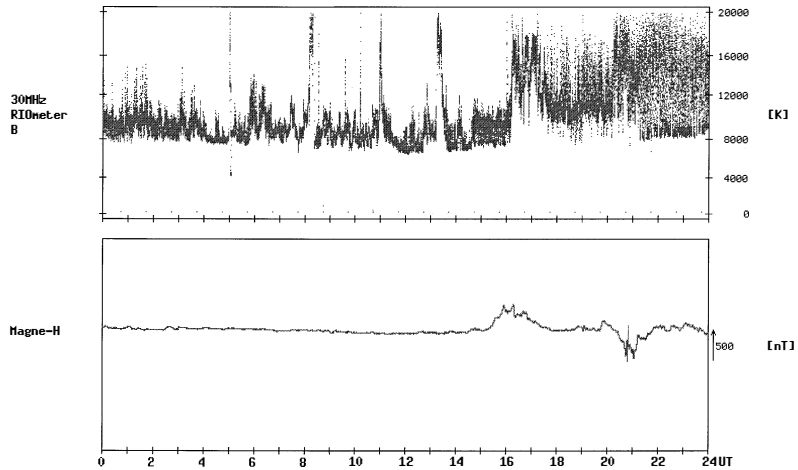
Syowa Station 2004/03/25



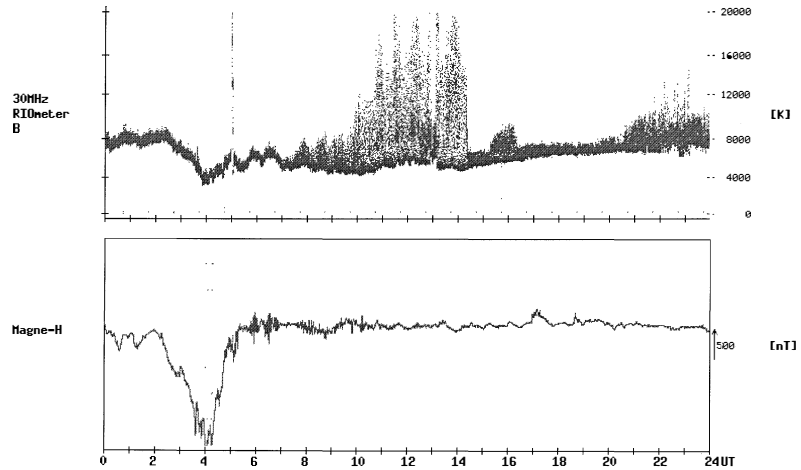
Syowa Station 2004/03/27



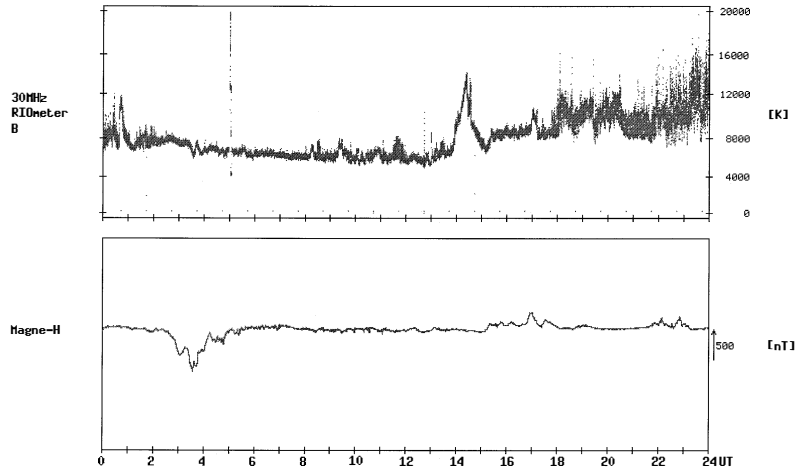
Syowa Station 2004/03/26



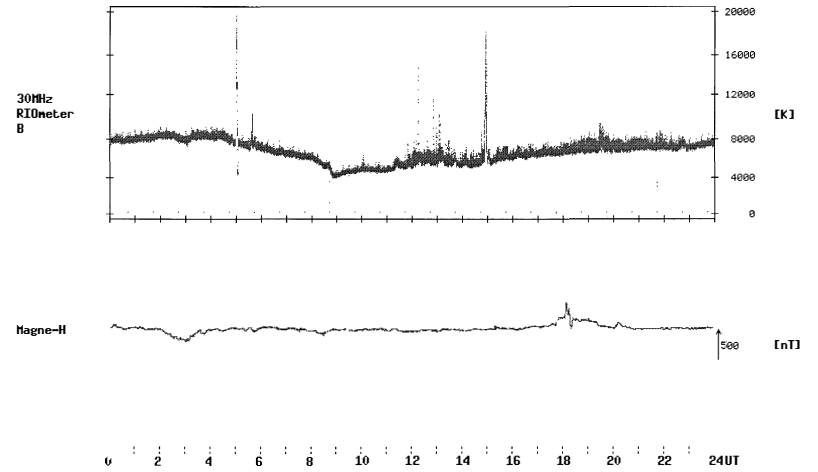
Syowa Station 2004/03/28



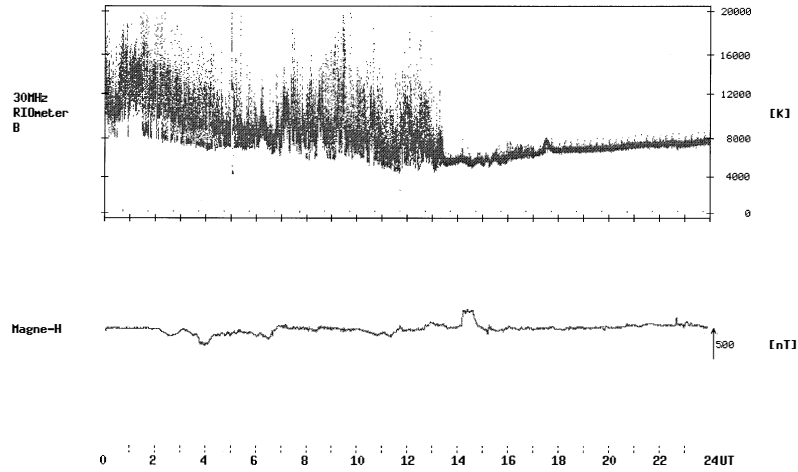
Syowa Station 2004/03/29



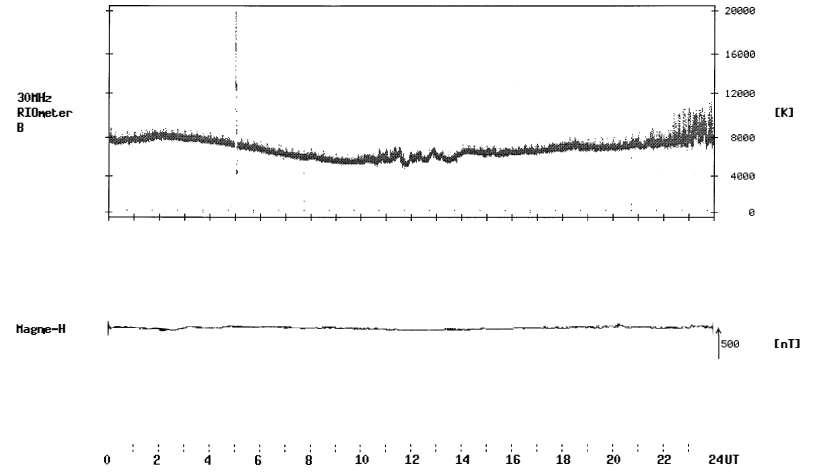
Syowa Station 2004/03/31

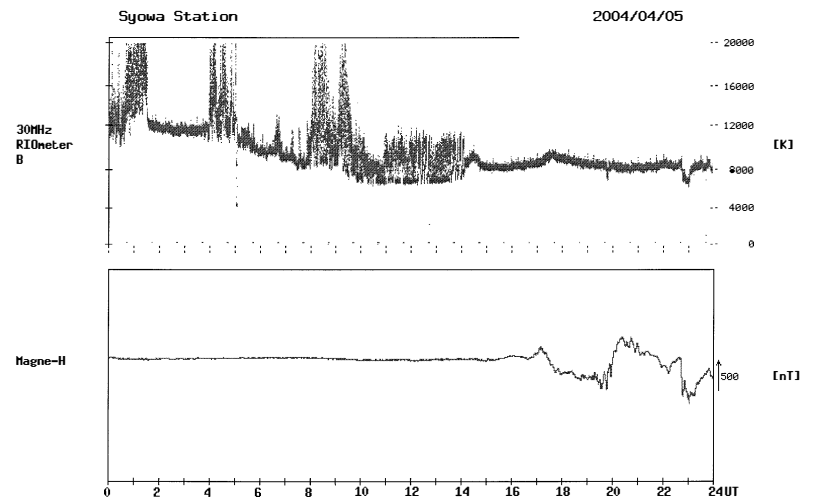
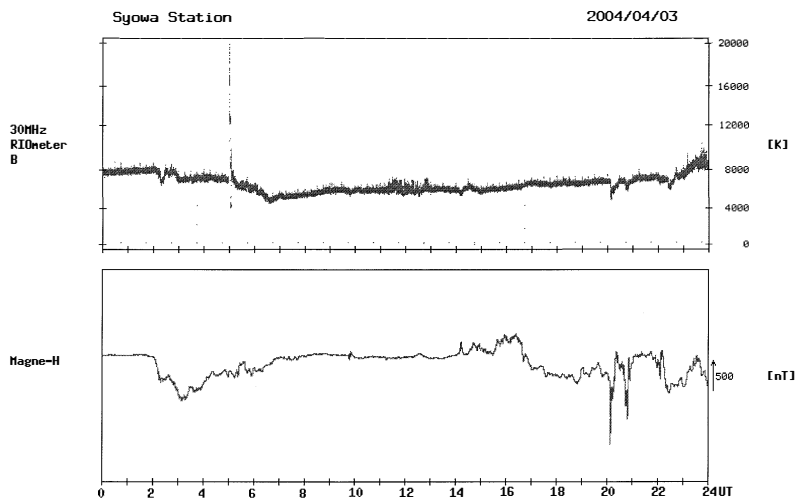
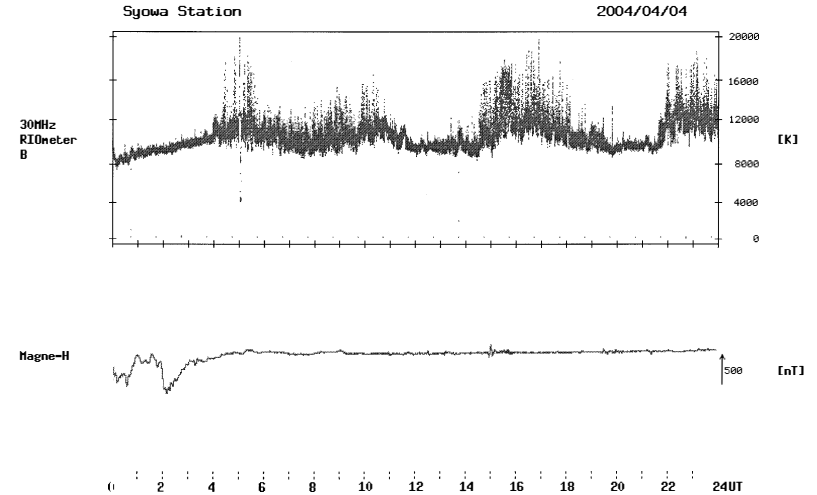
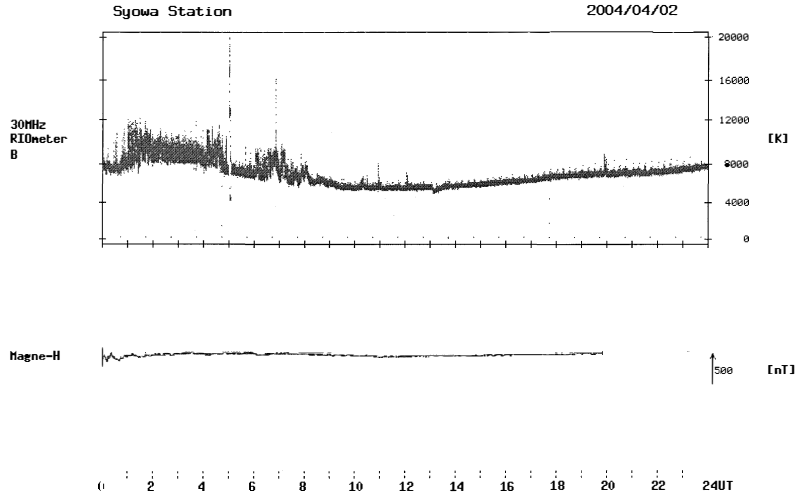


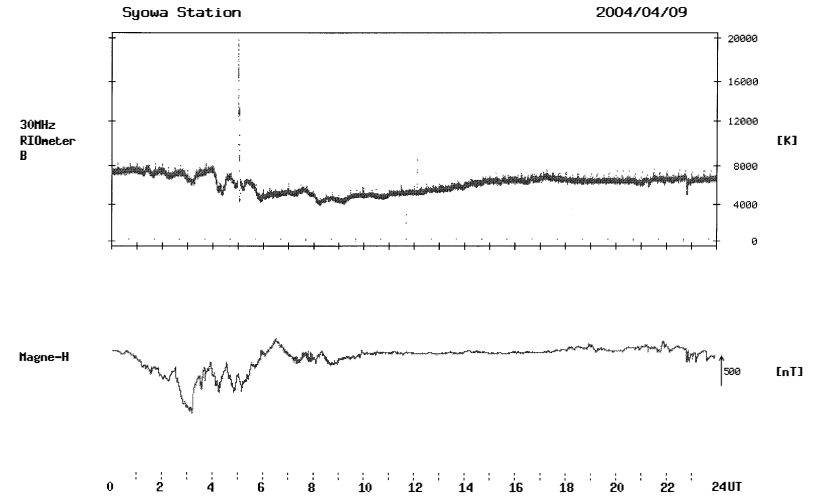
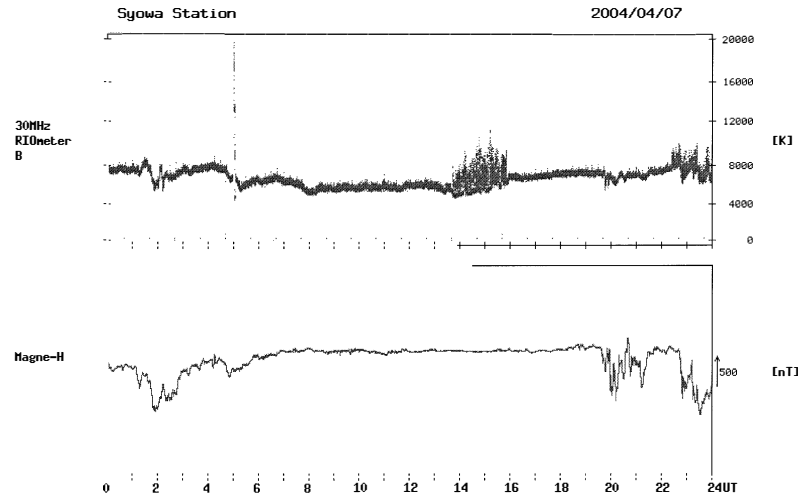
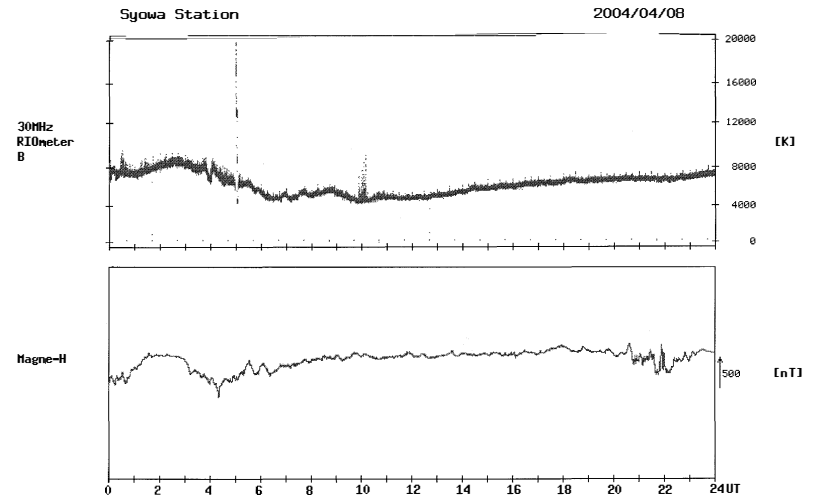
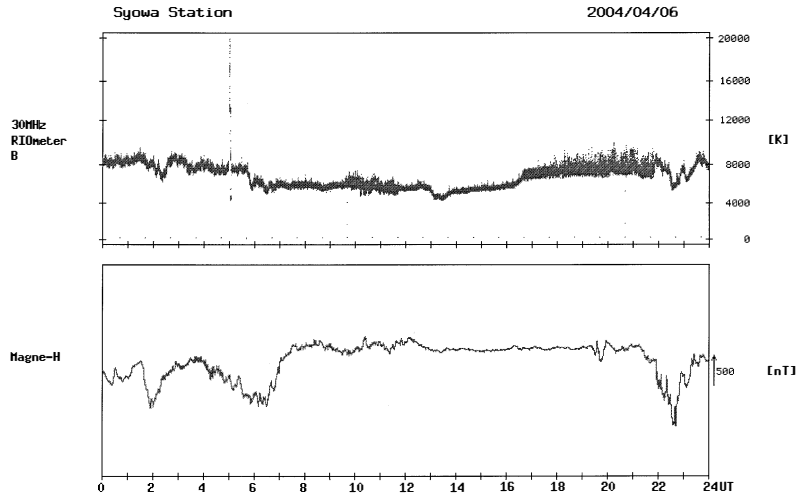
Syowa Station 2004/03/30

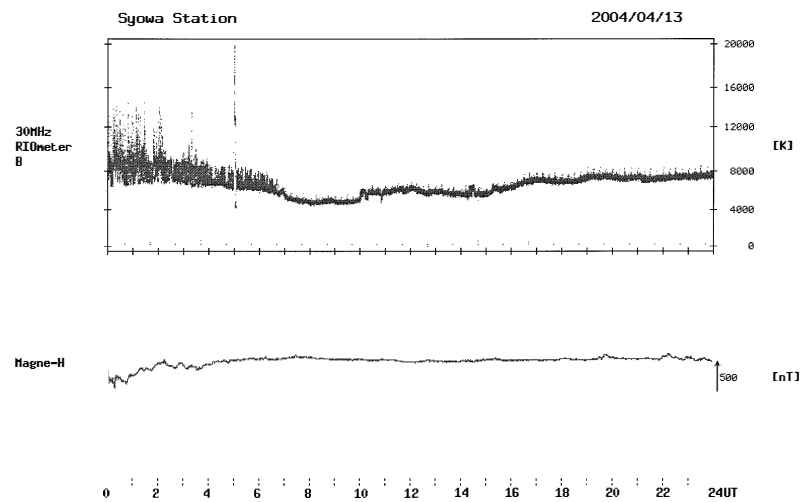
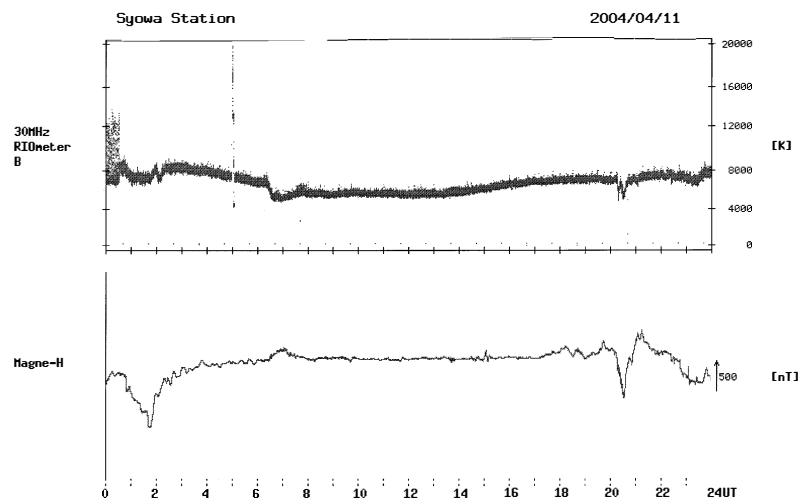
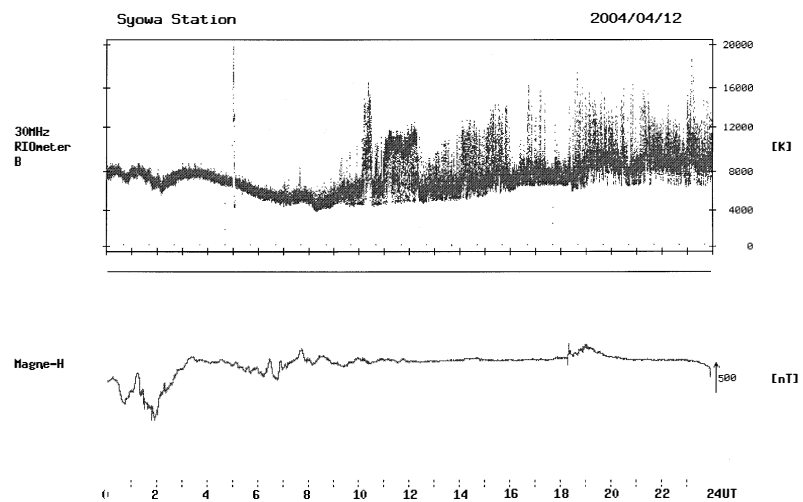
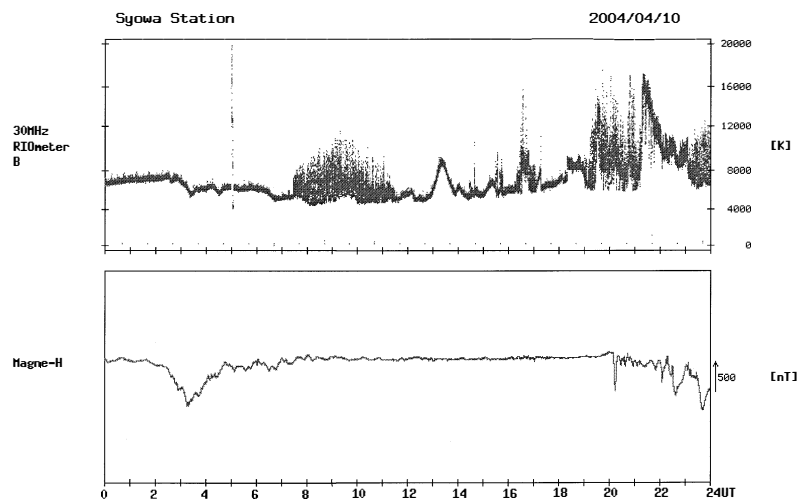


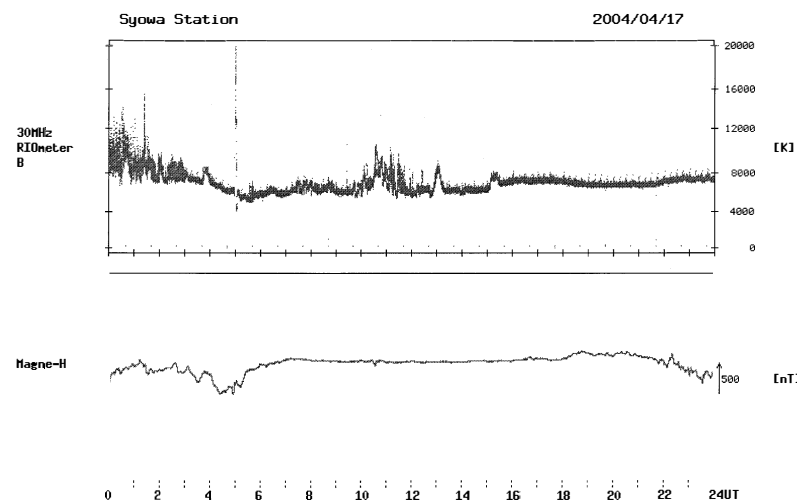
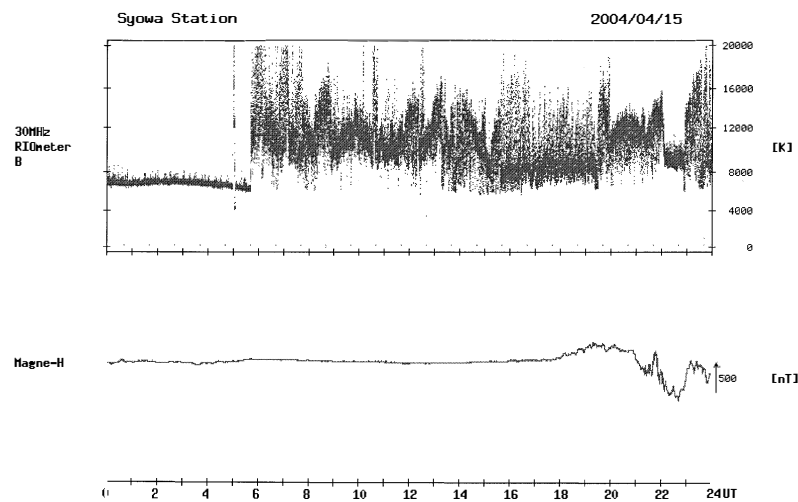
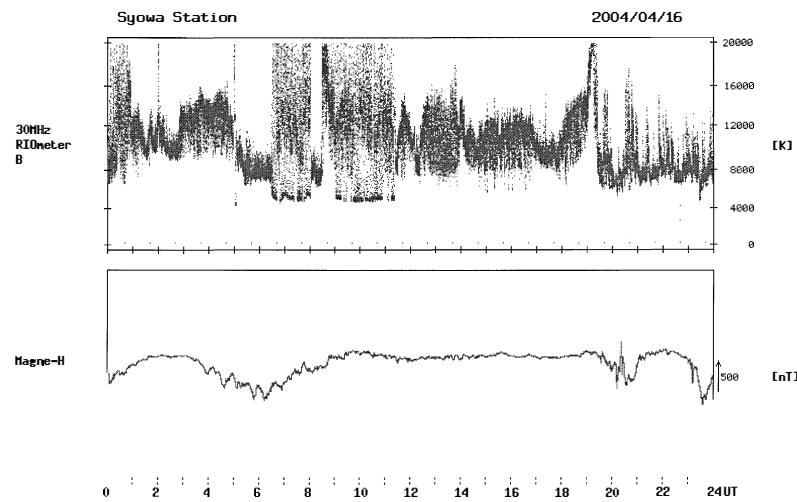
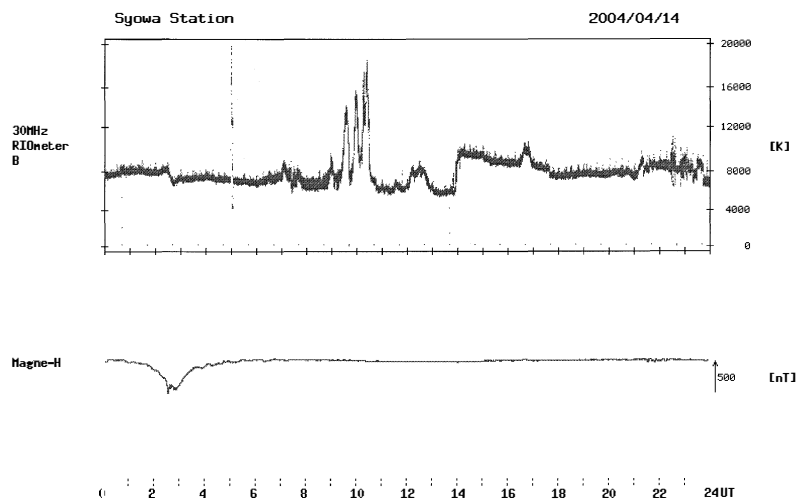
Syowa Station 2004/04/01



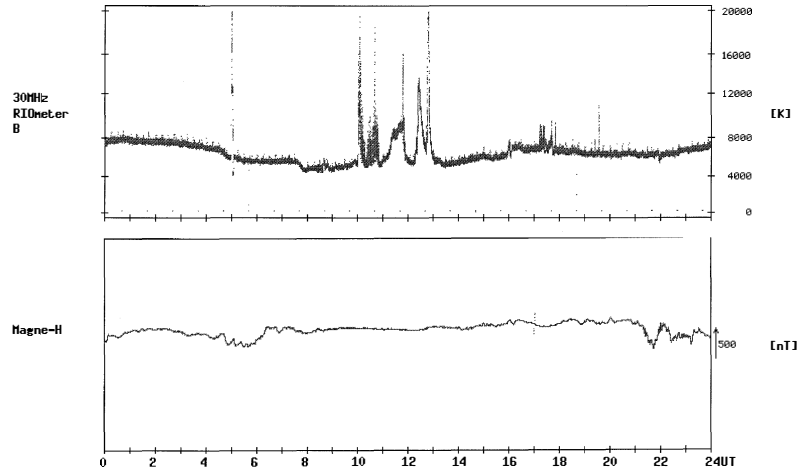




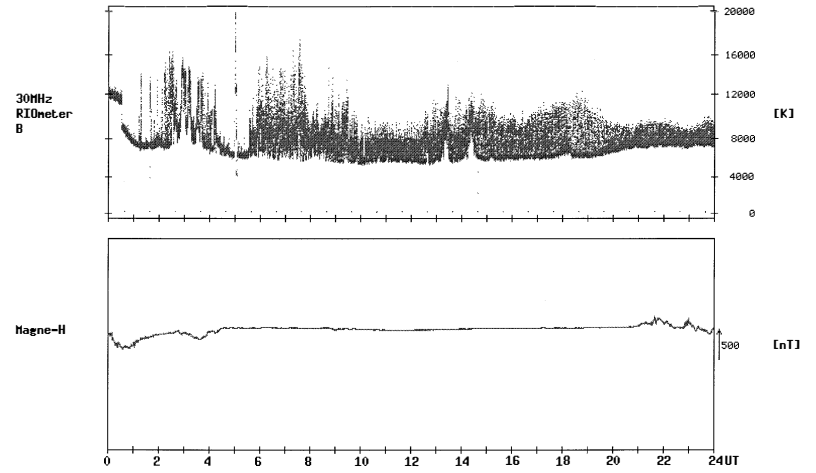




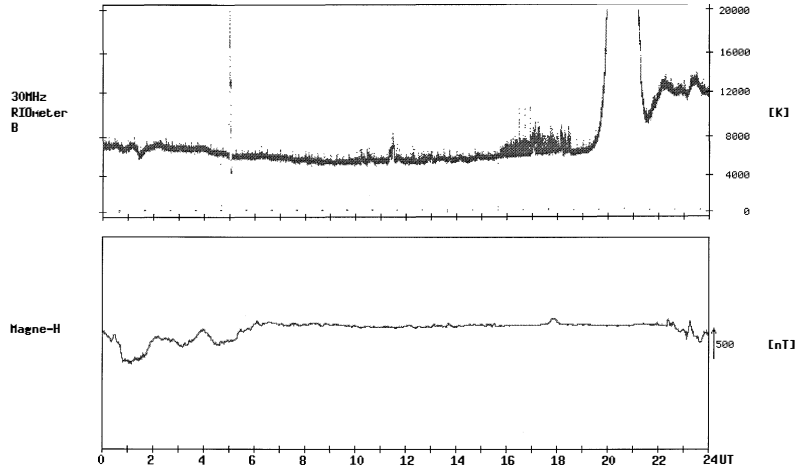
Syowa Station 2004/04/18



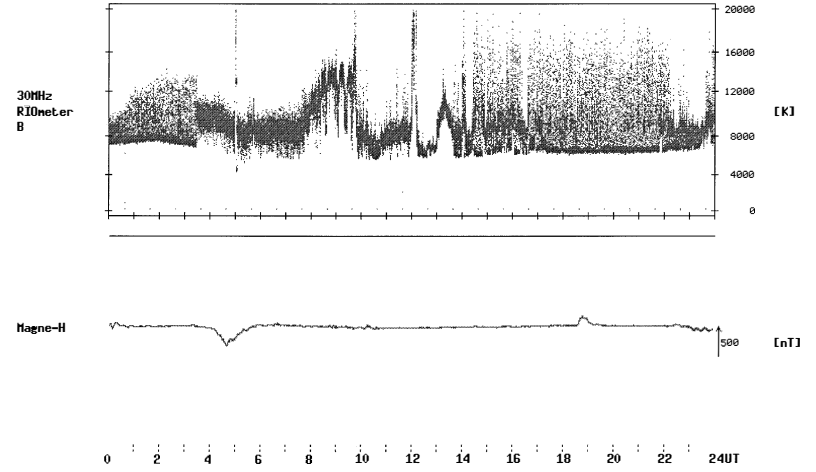
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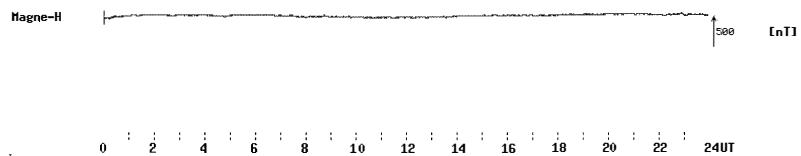
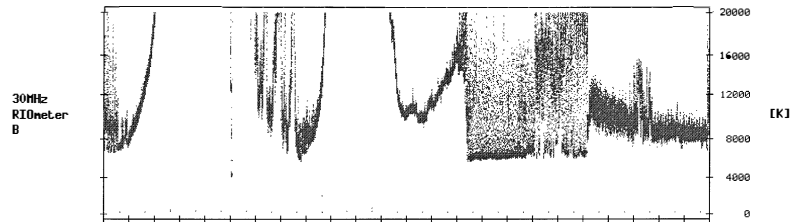
Syowa Station 2004/04/19



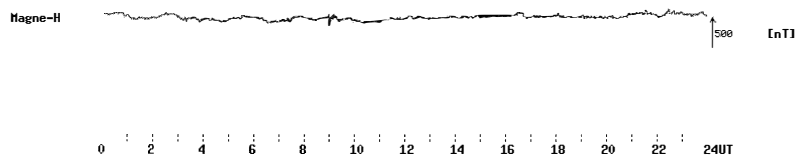
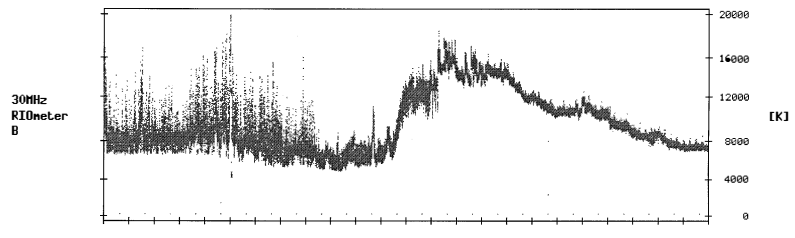
Syowa Station 2004/04/21



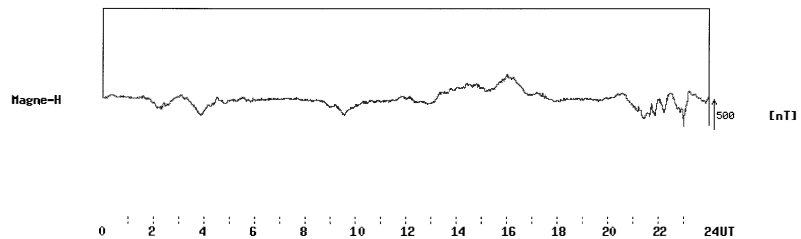
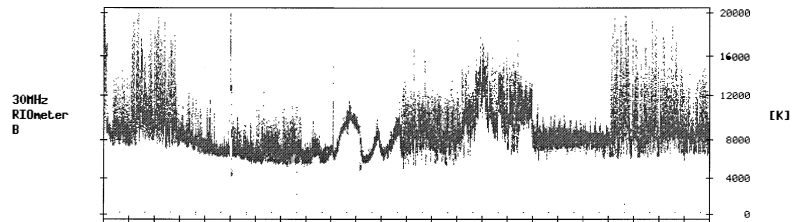
Syowa Station 2004/04/22



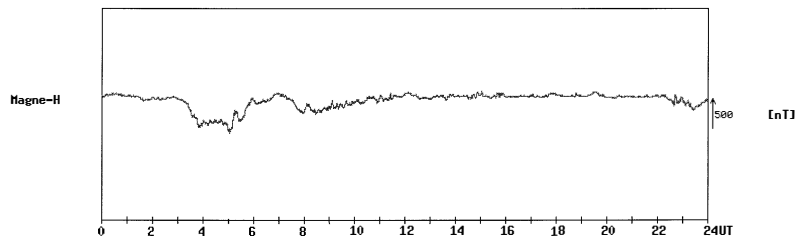
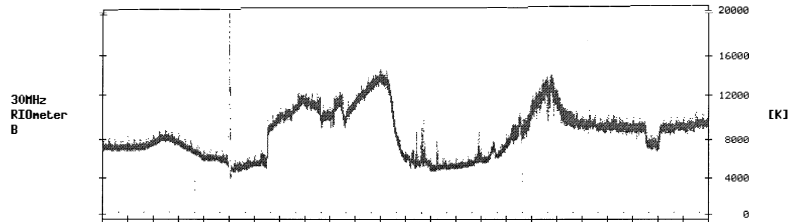
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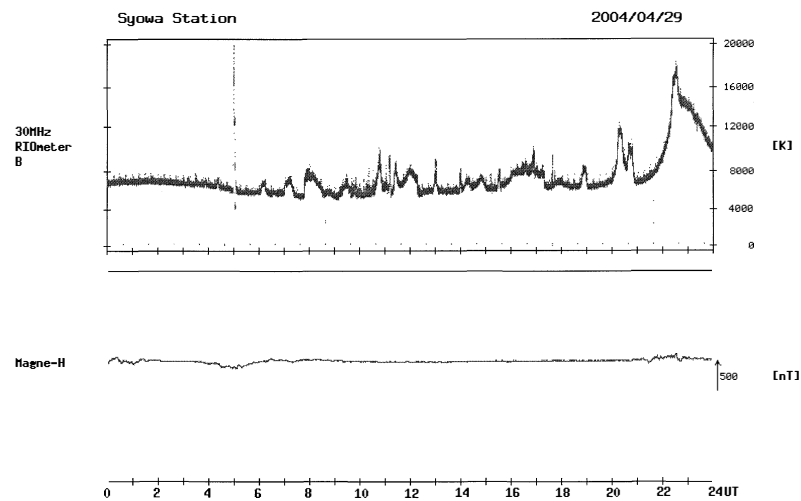
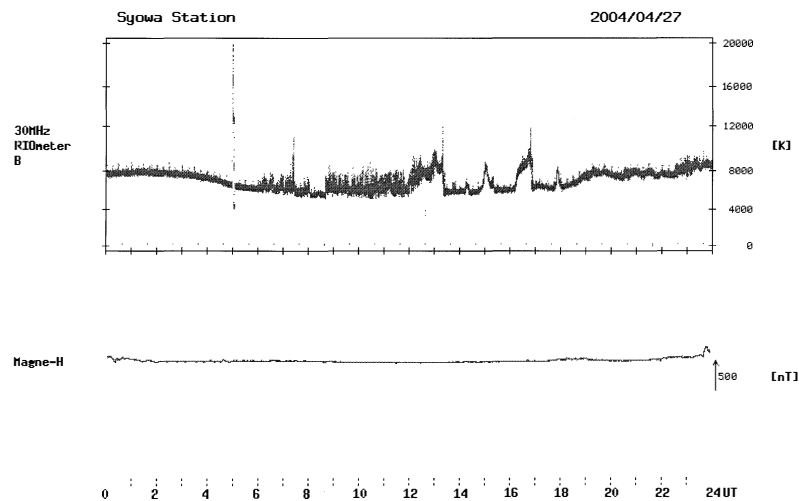
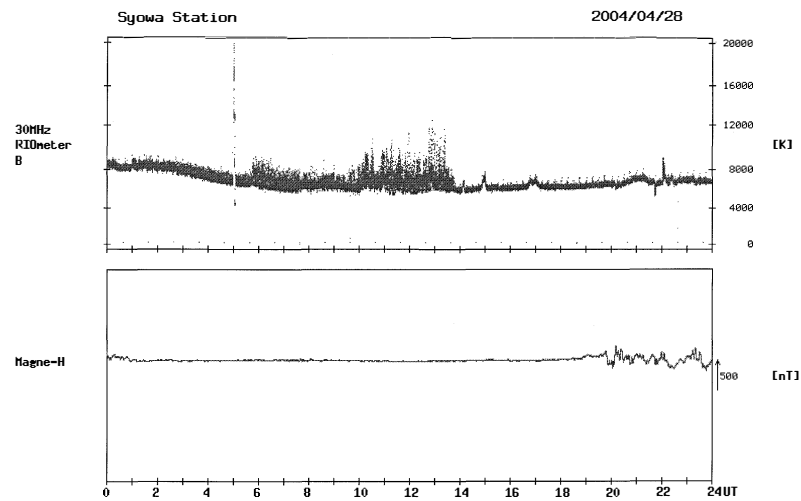
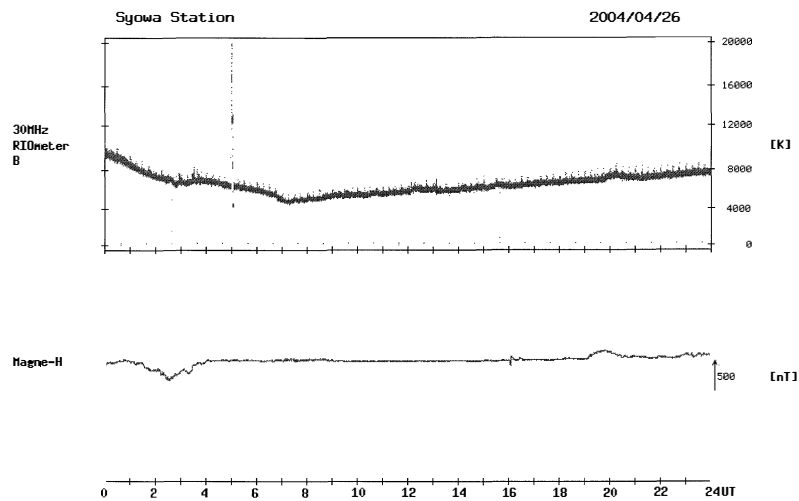


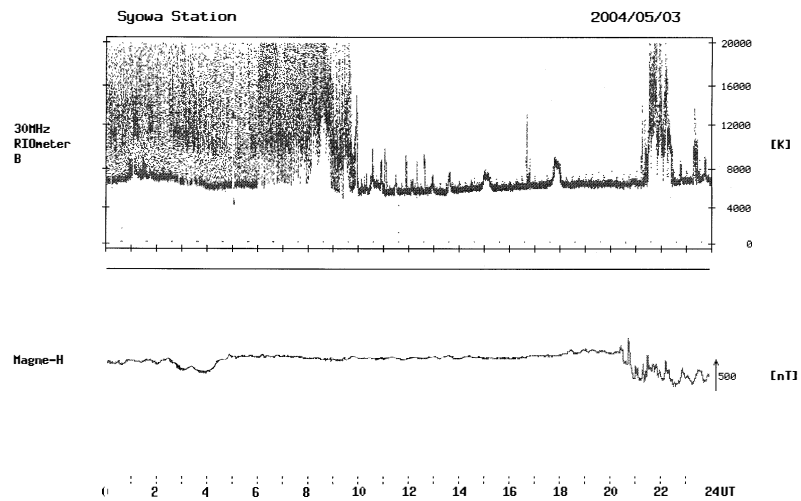
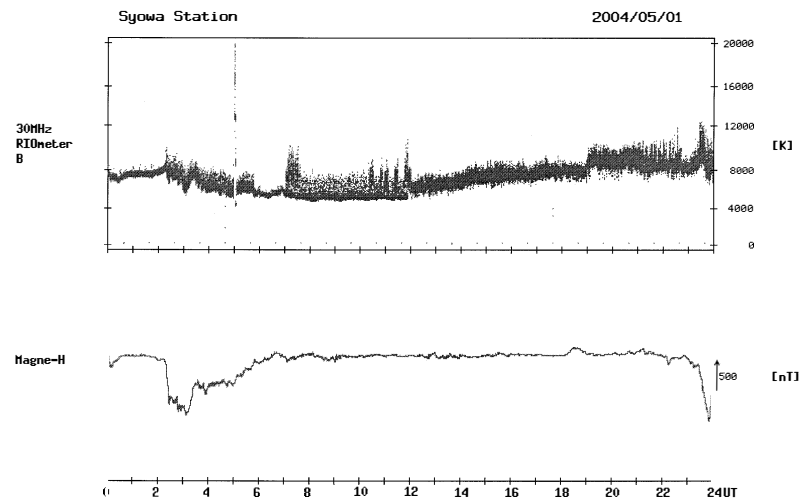
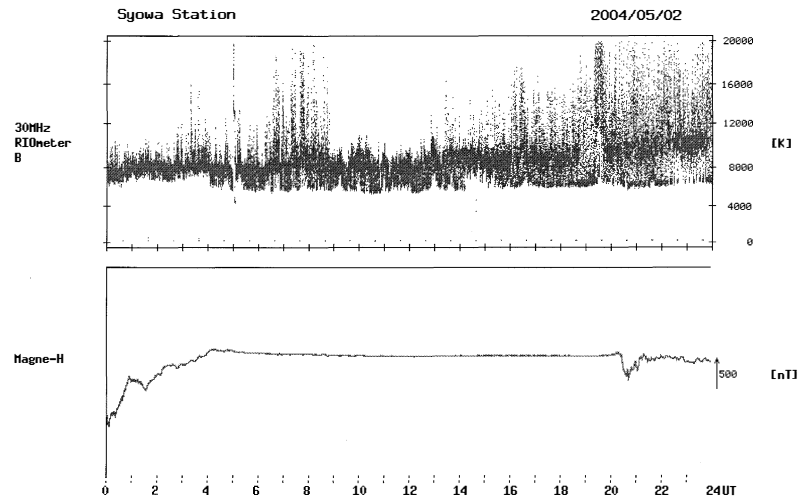
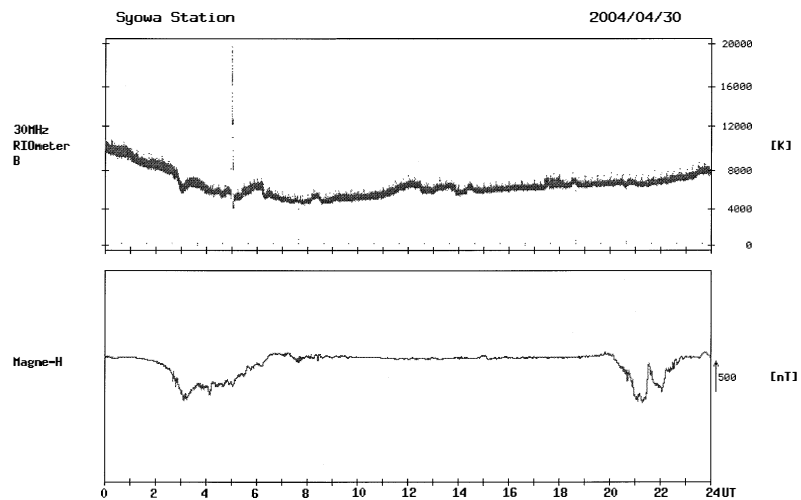
Syowa Station 2004/04/23

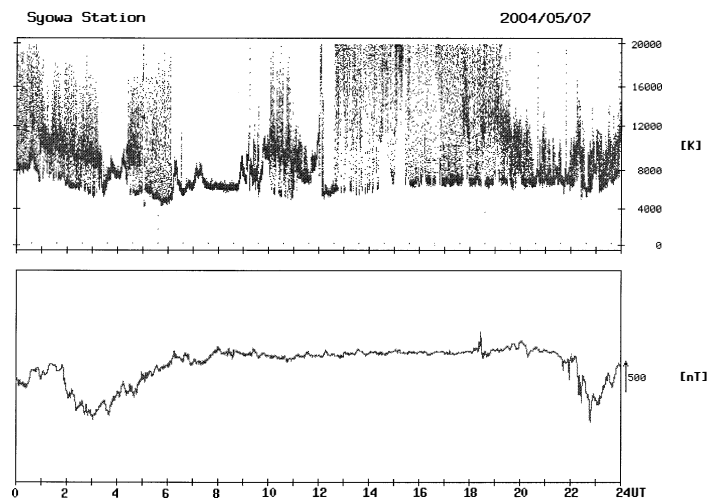
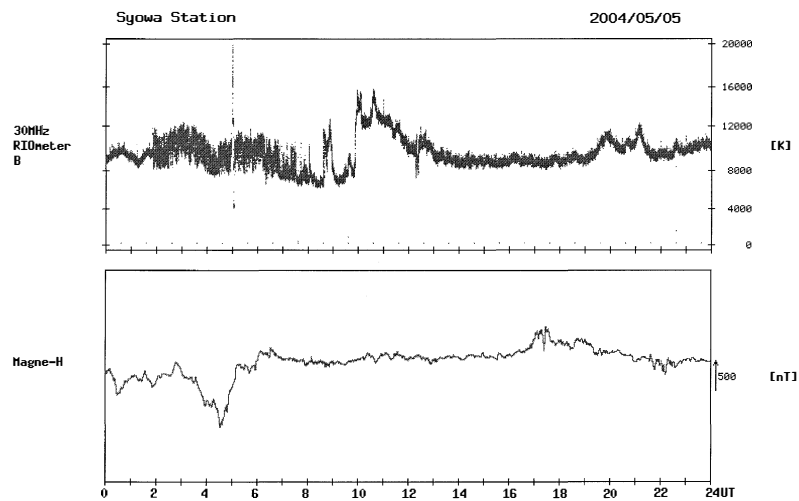
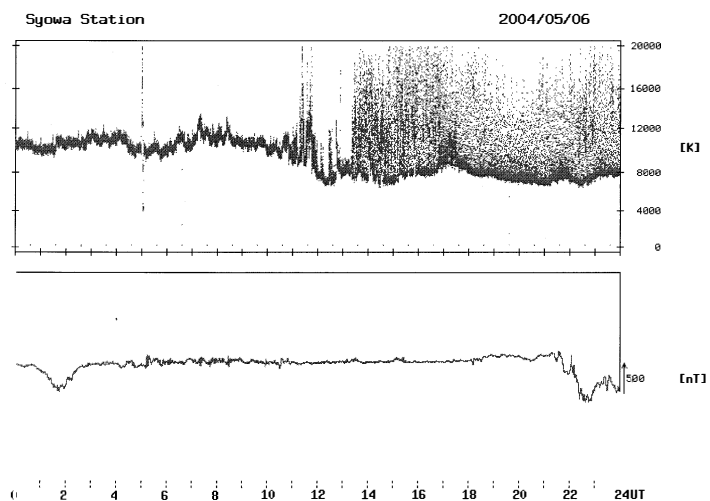
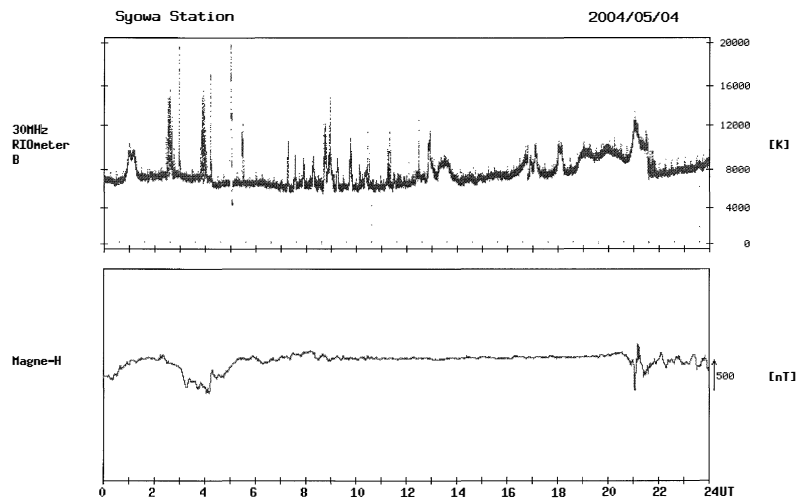


Syowa Station 2004/04/25

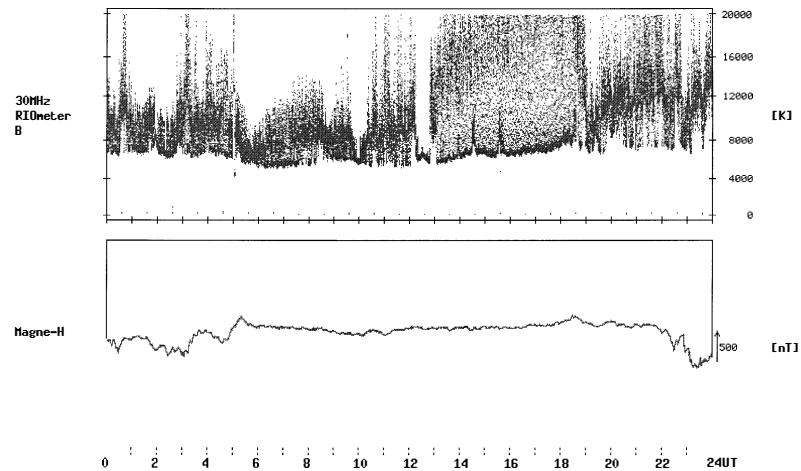




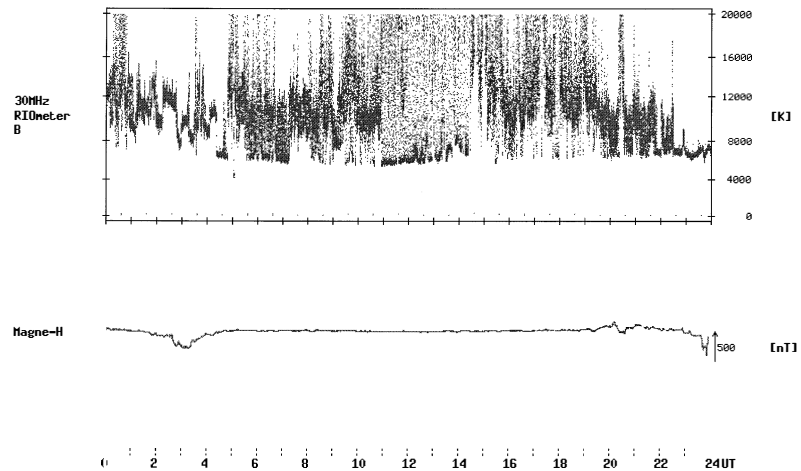




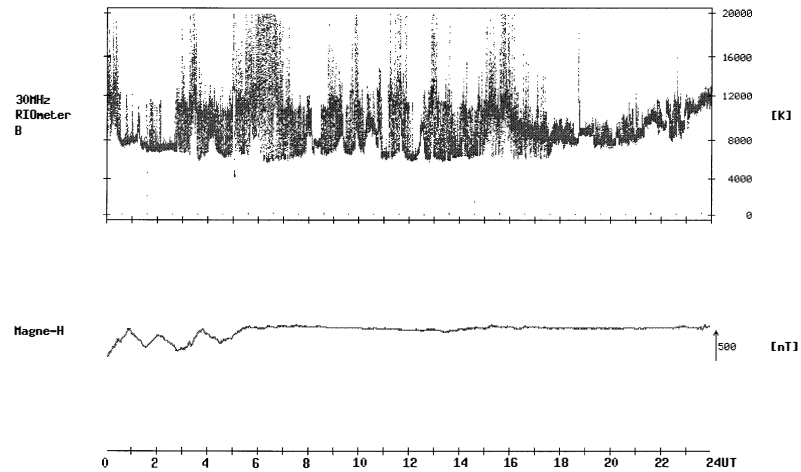
Syowa Station 2004/05/08



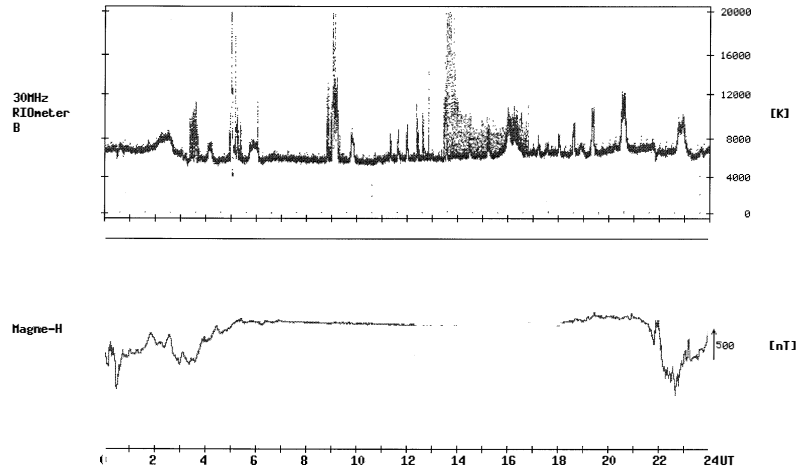
Syowa Station 2004/05/10



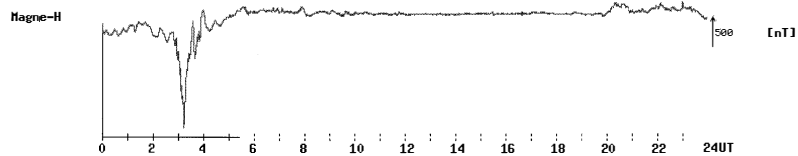
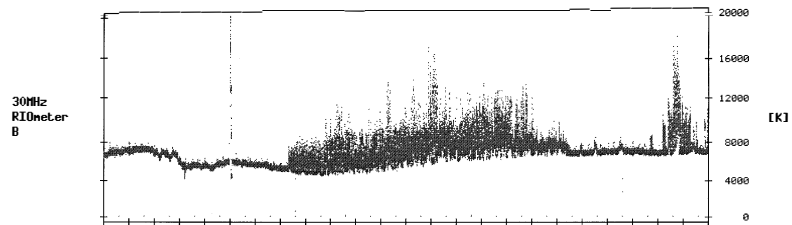
Syowa Station 2004/05/09



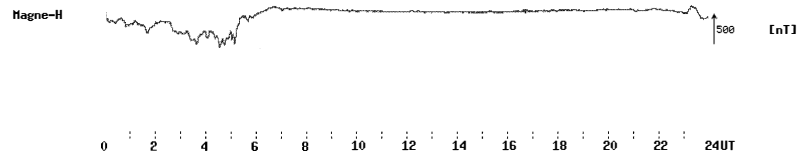
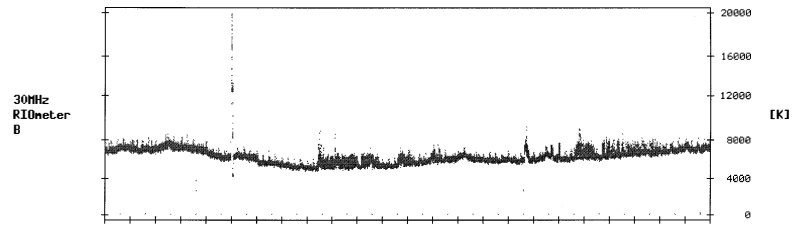
Syowa Station 2004/05/11



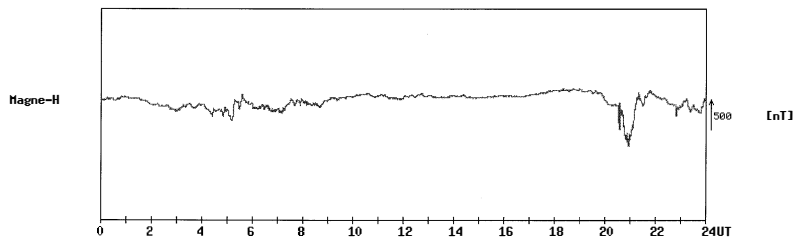
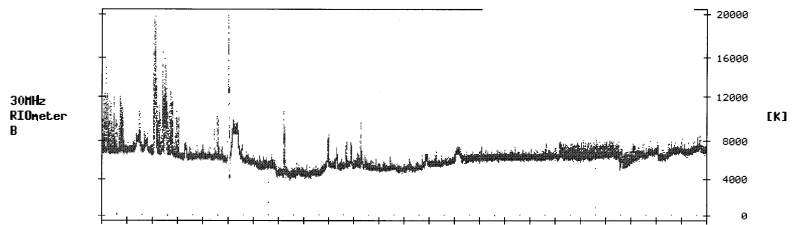
Syowa Station 2004/05/12



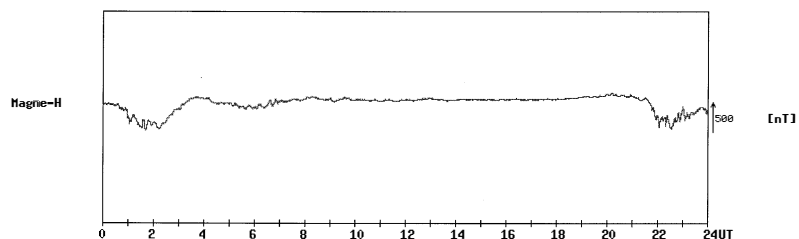
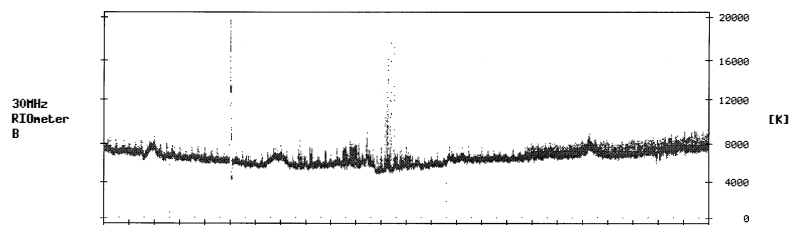
Syowa Station 2004/05/14



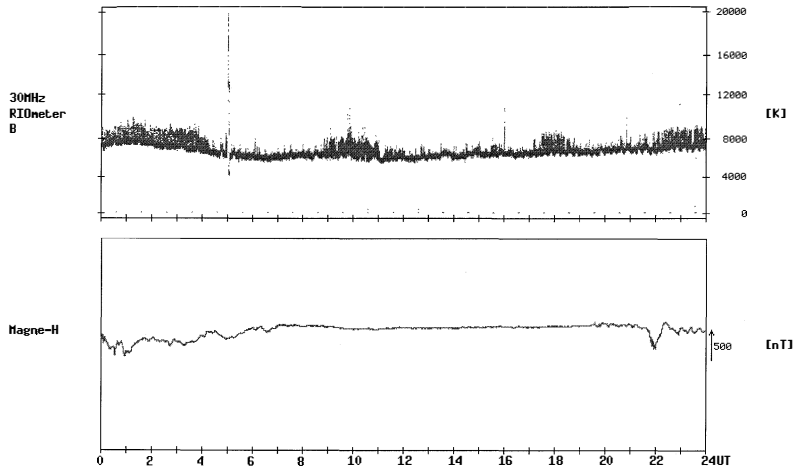
Syowa Station 2004/05/13



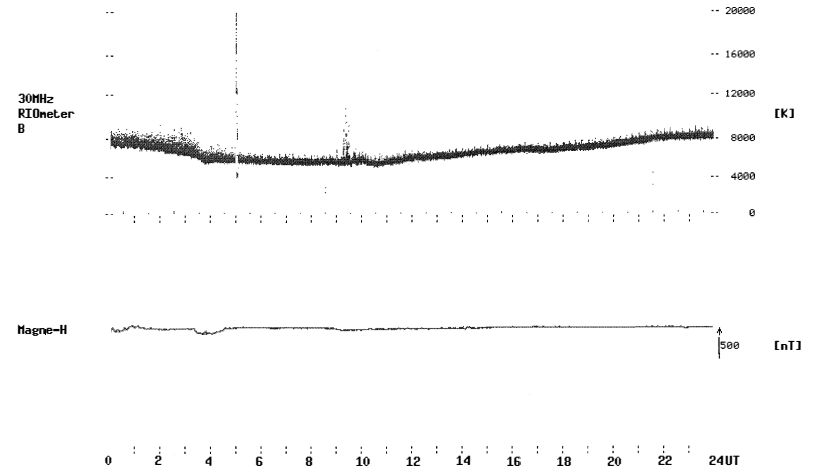
Syowa Station 2004/05/15



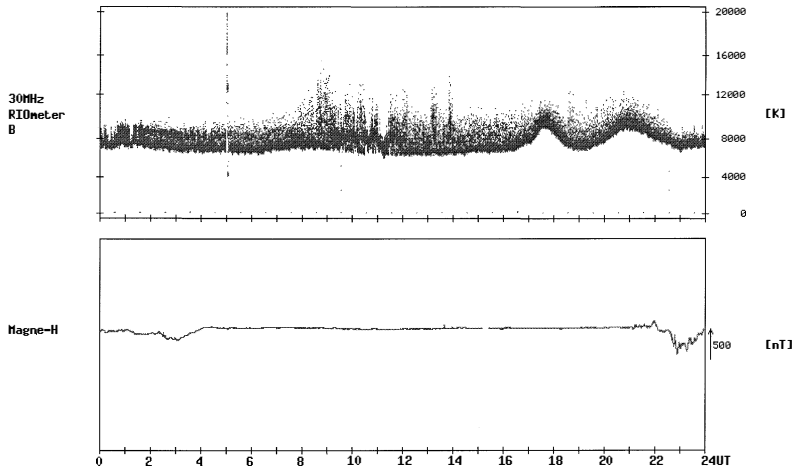
Syowa Station 2004/05/16



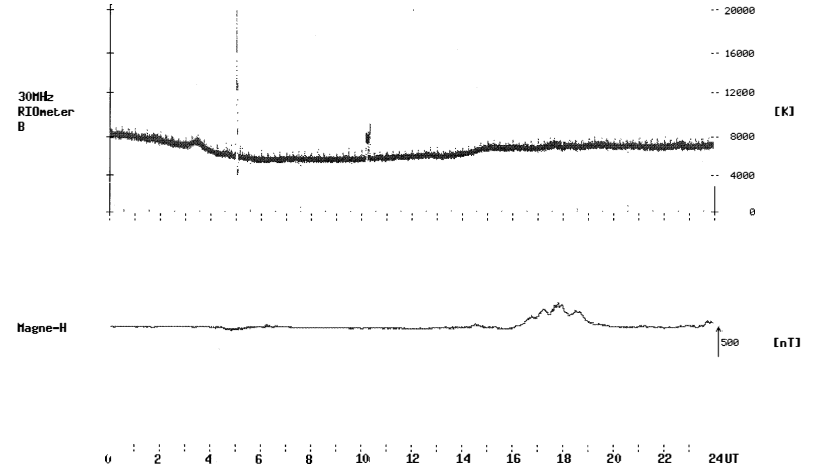
Syowa Station 2004/05/18

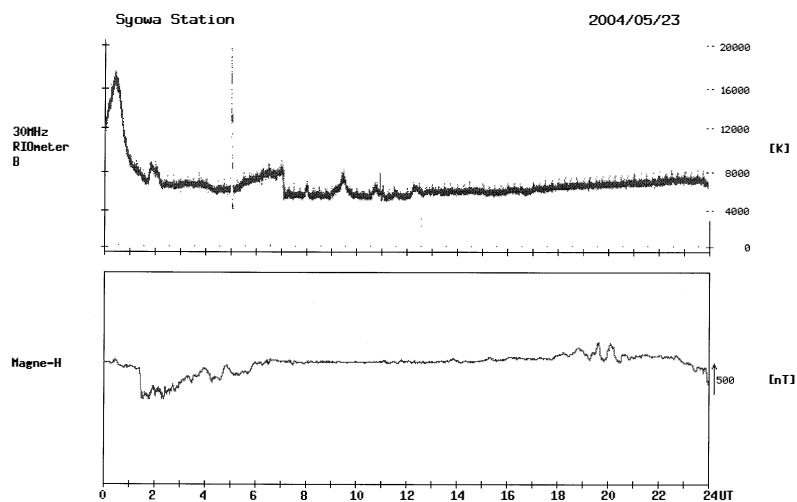
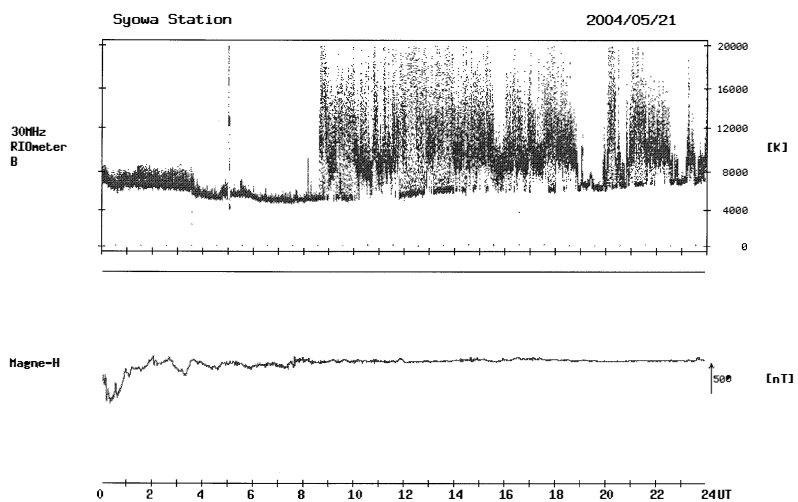
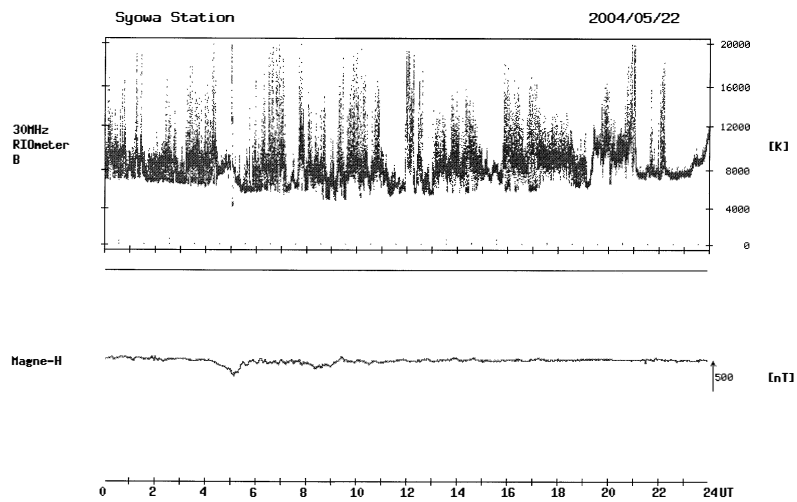
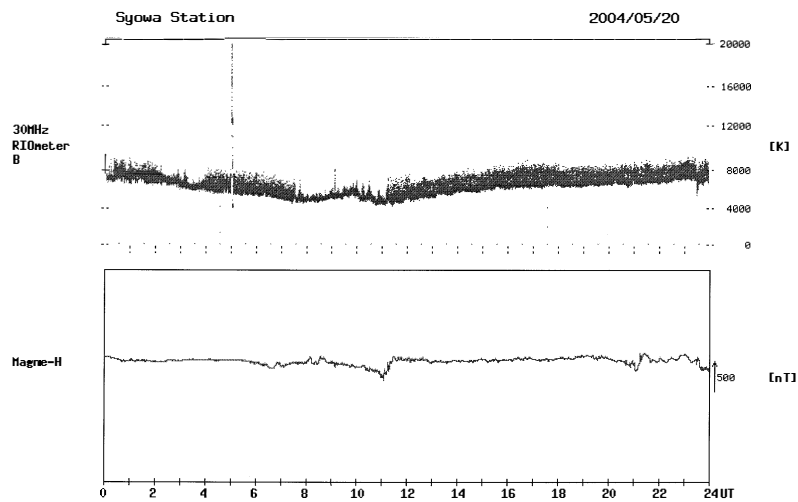


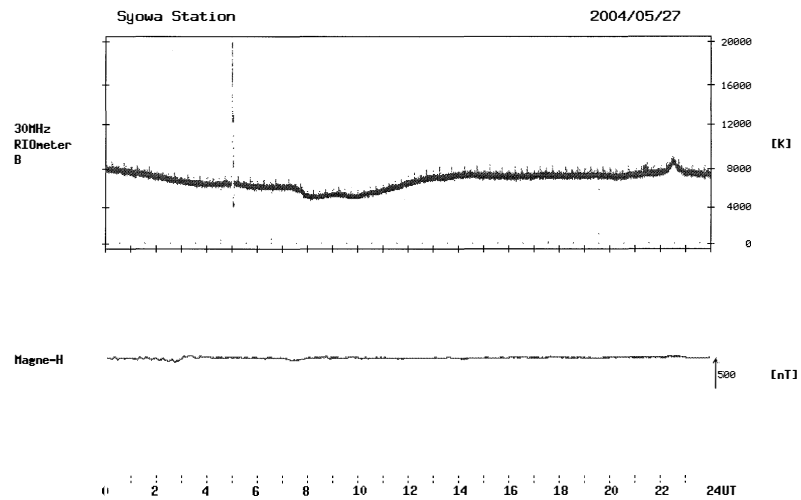
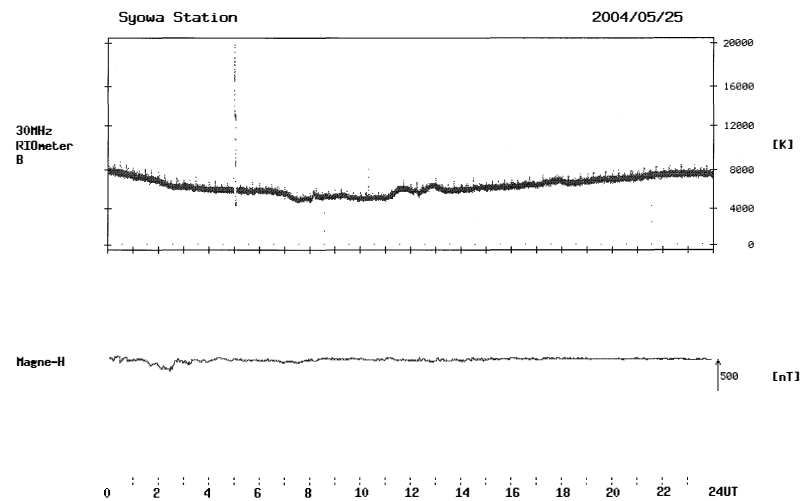
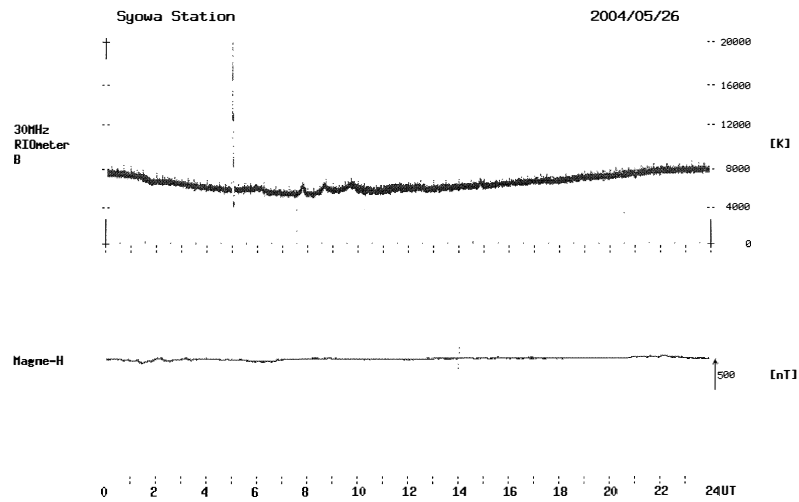
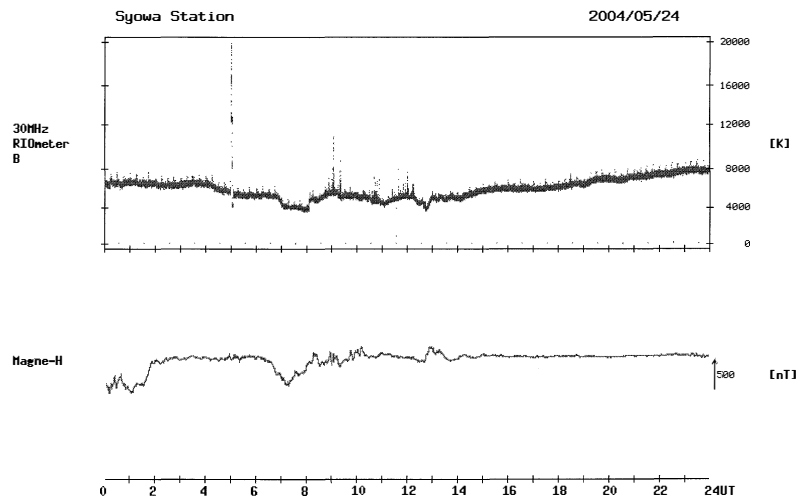
Syowa Station 2004/05/17



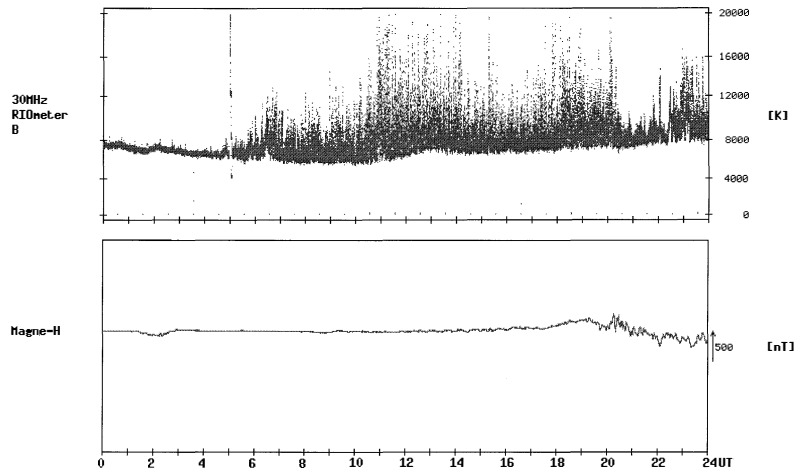
Syowa Station 2004/05/19



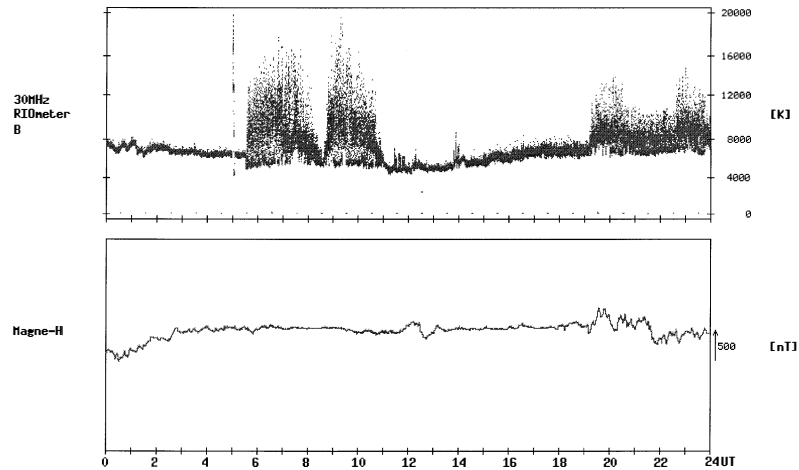




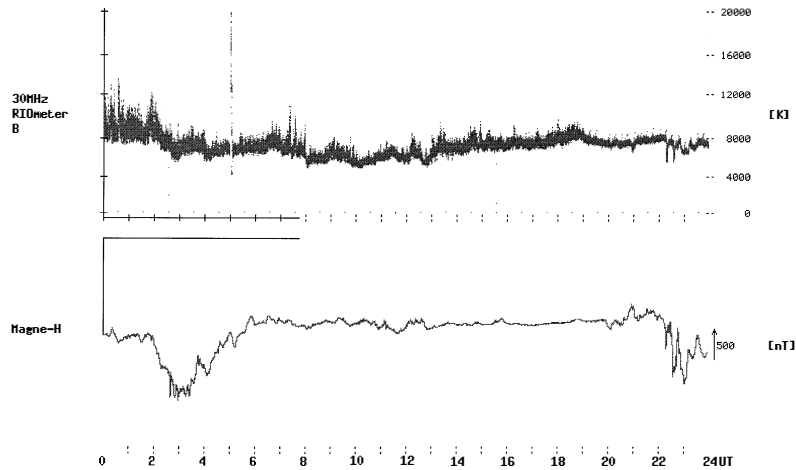
Syowa Station 2004/05/28



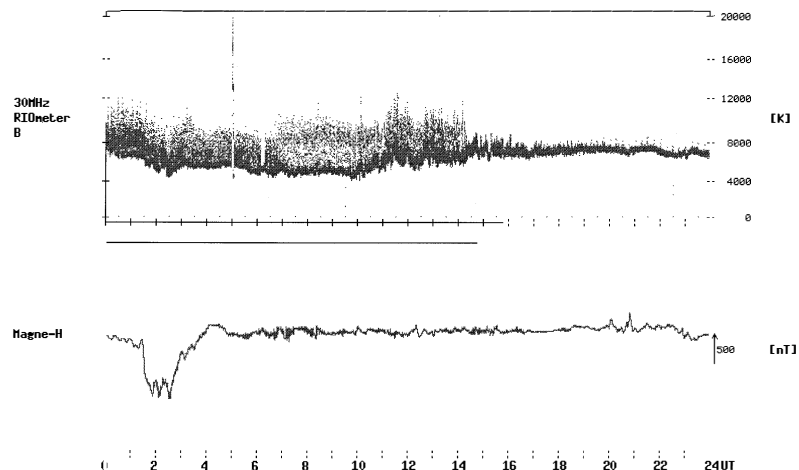
Syowa Station 2004/05/30

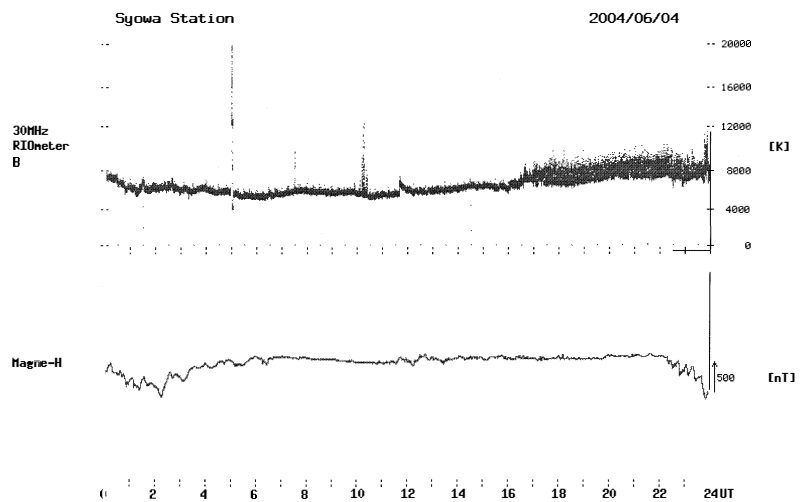
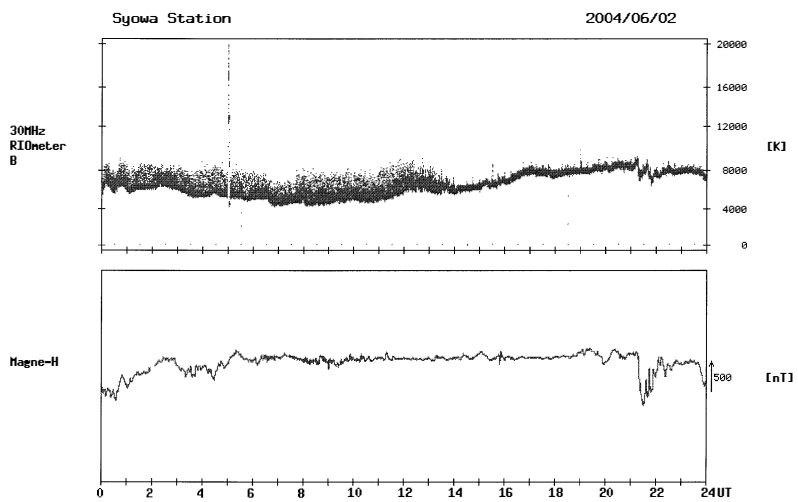
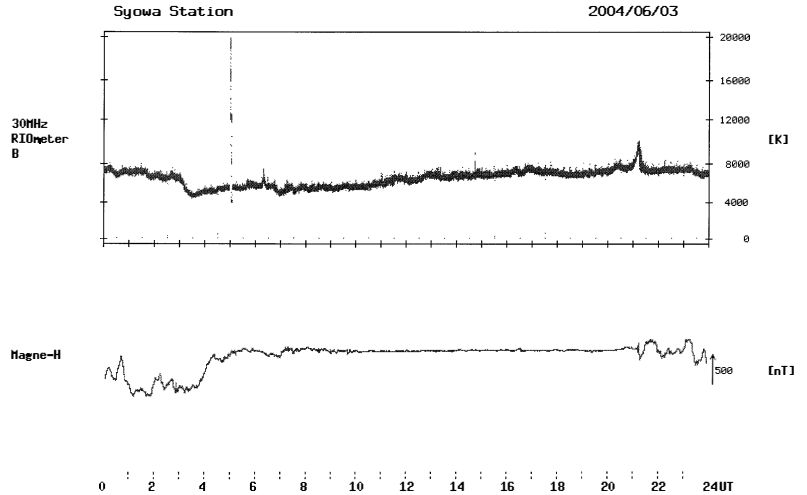
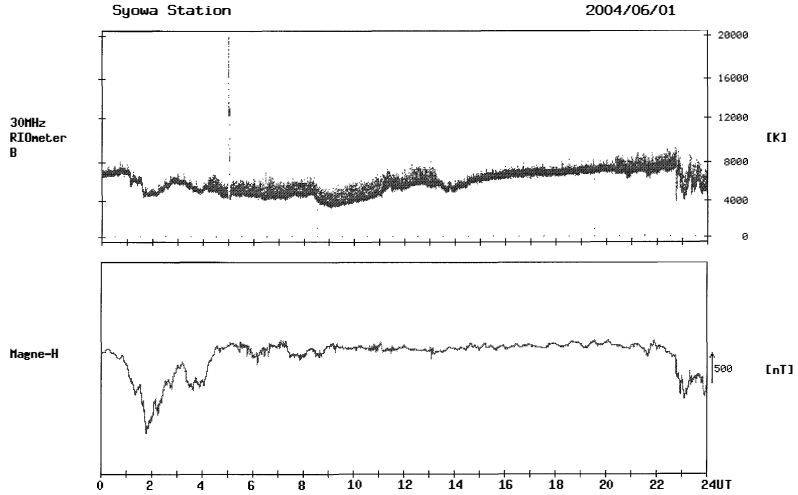


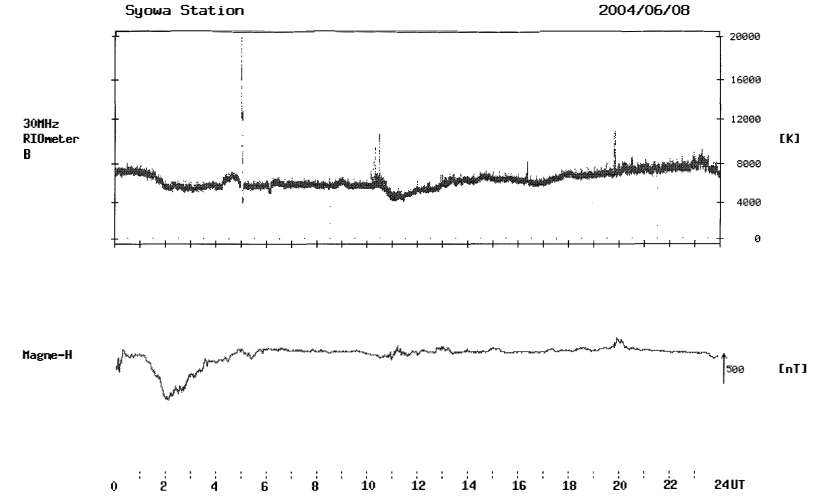
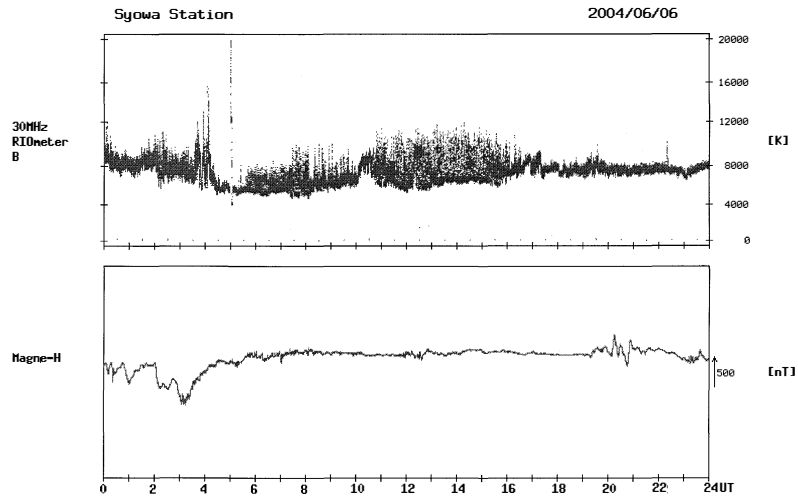
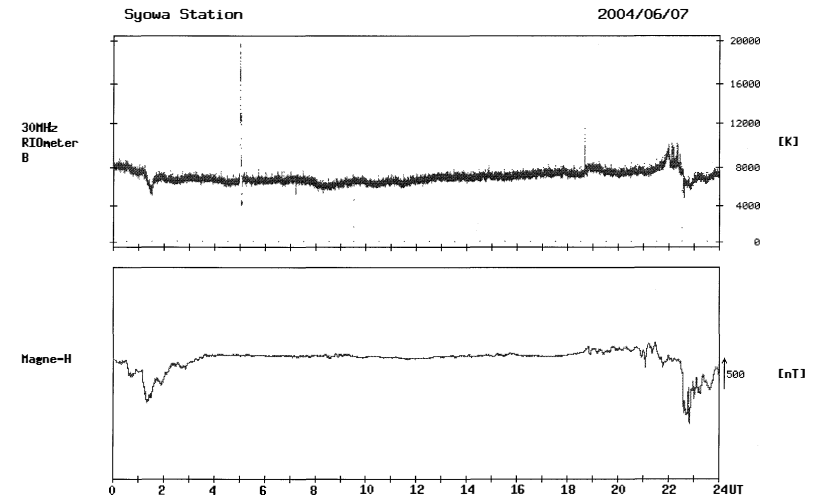
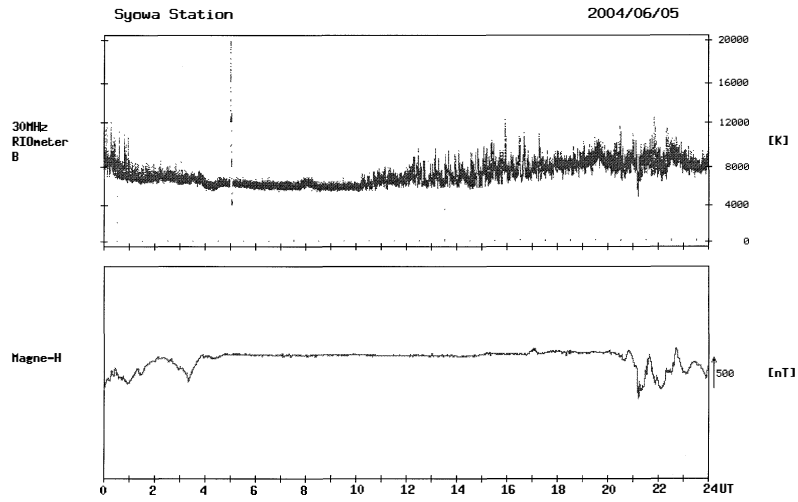
Syowa Station 2004/05/29

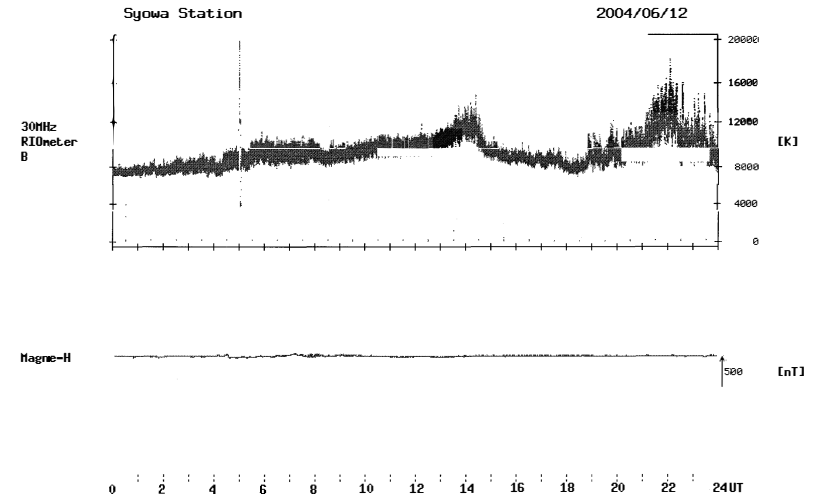
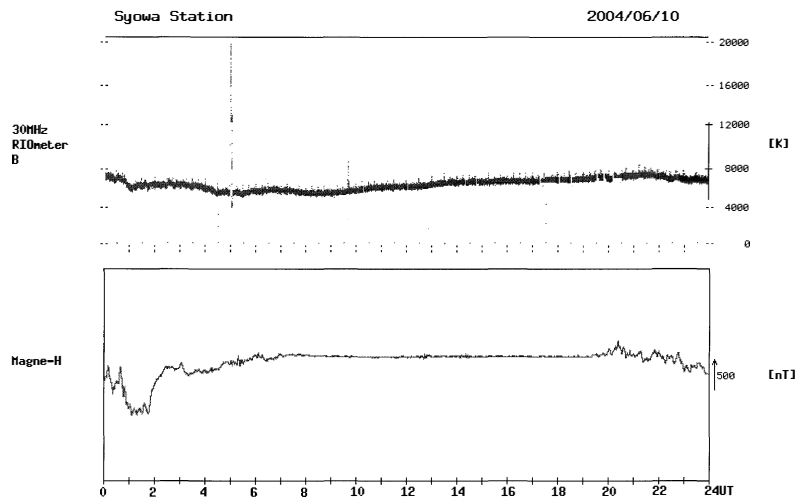
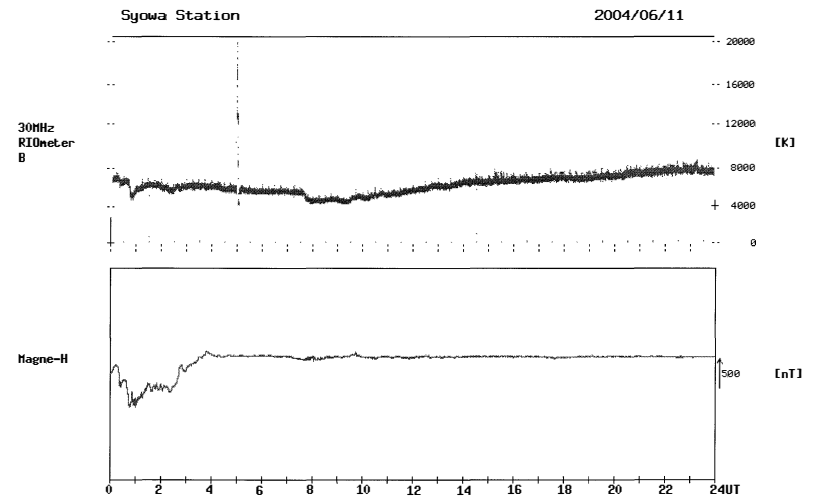
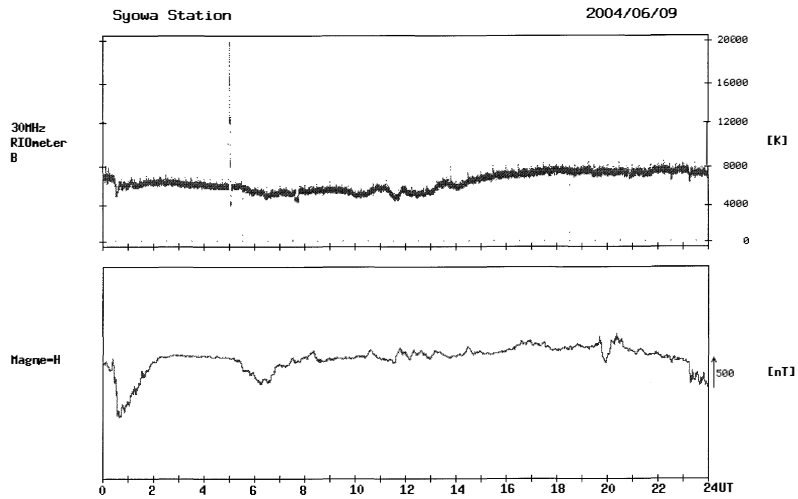


Syowa Station 2004/05/31

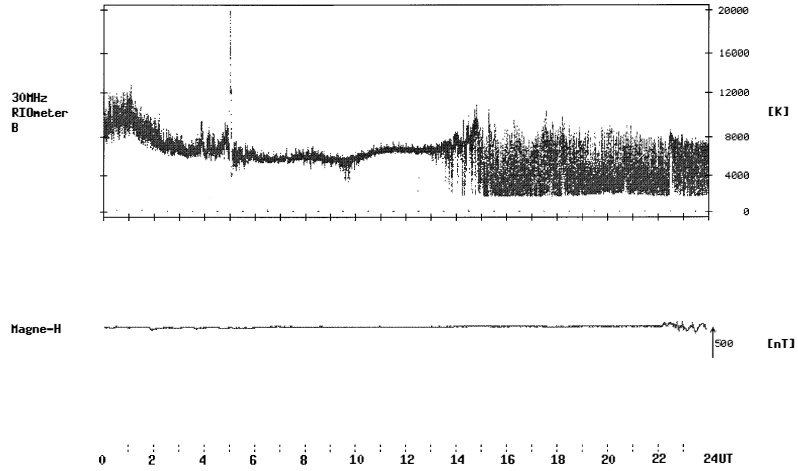




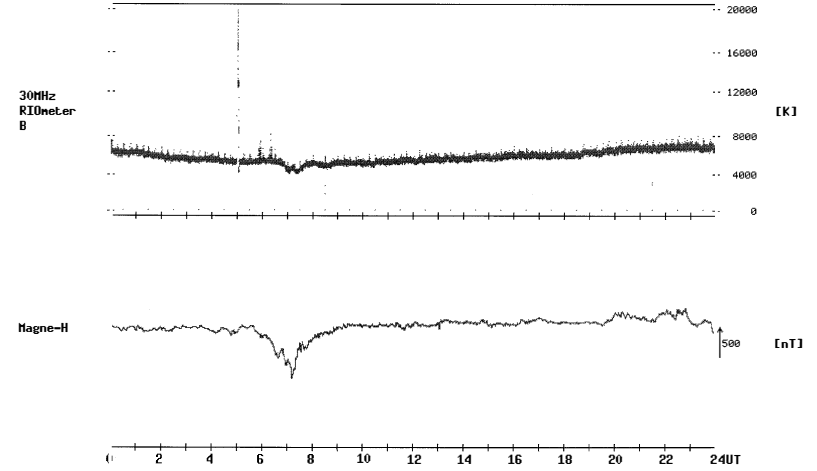




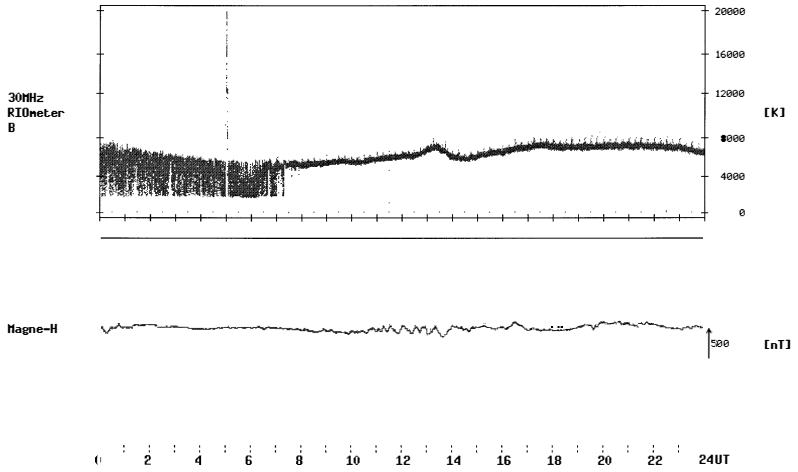
Syowa Station 2004/06/13



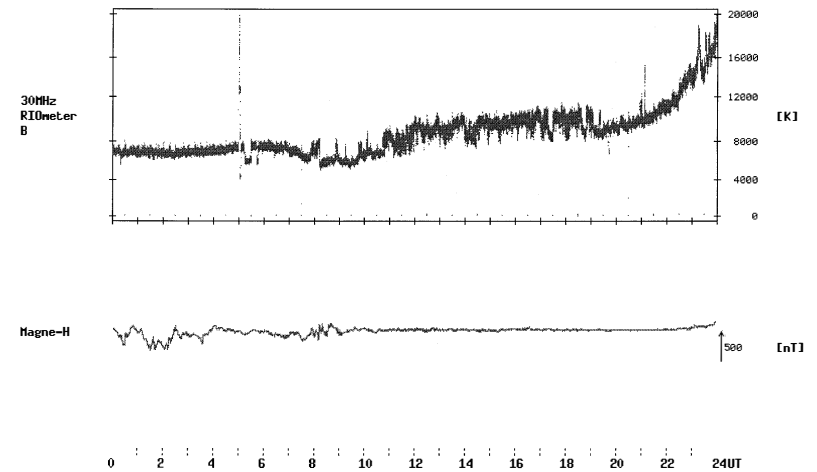
Syowa Station 2004/06/15

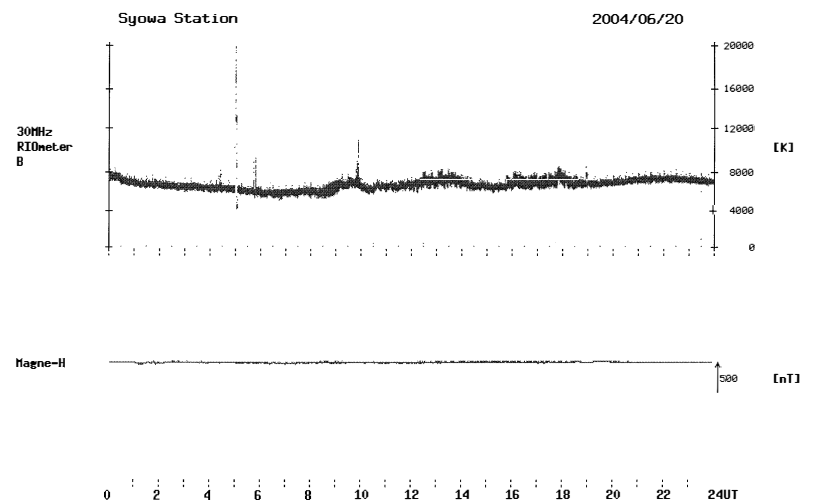
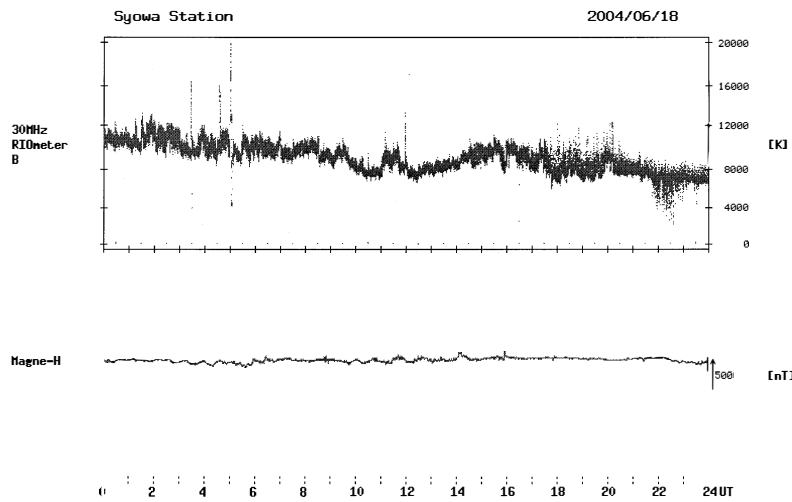
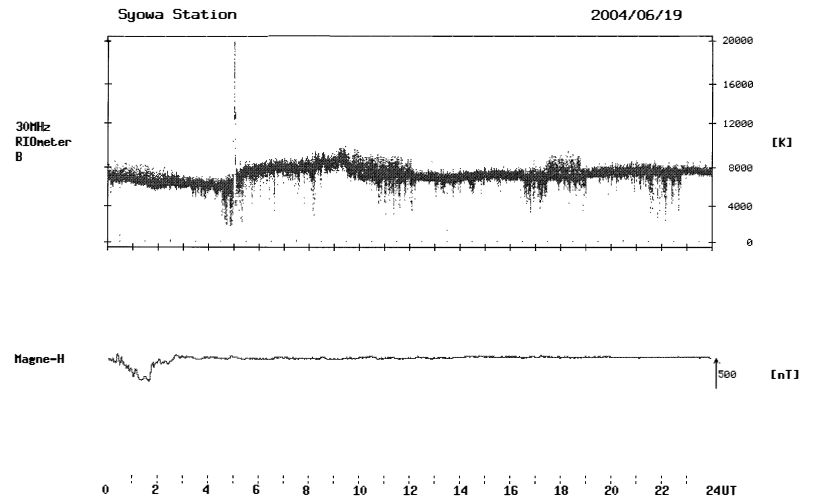
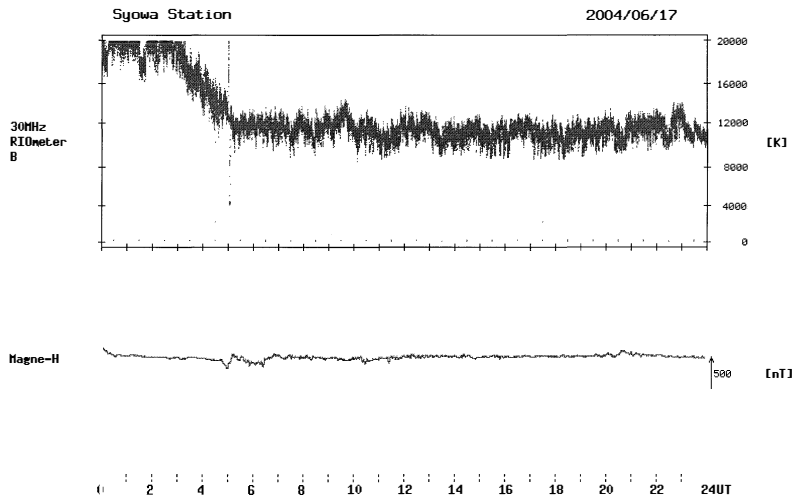


Syowa Station 2004/06/14

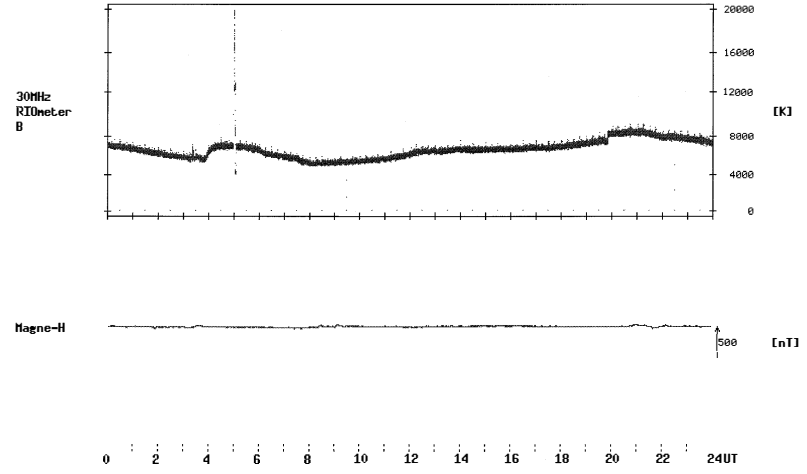


Syowa Station 2004/06/16

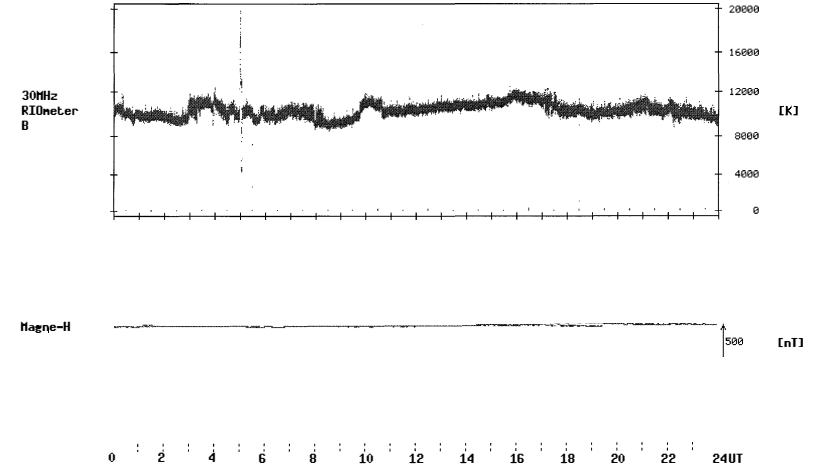




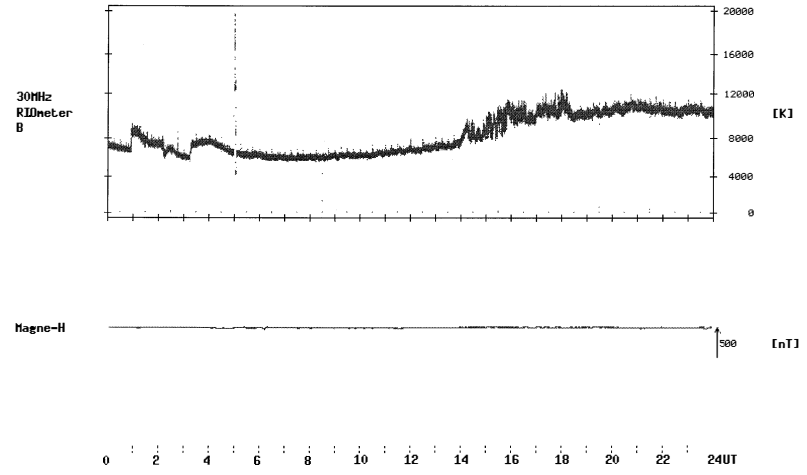
Syowa Station 2004/06/21



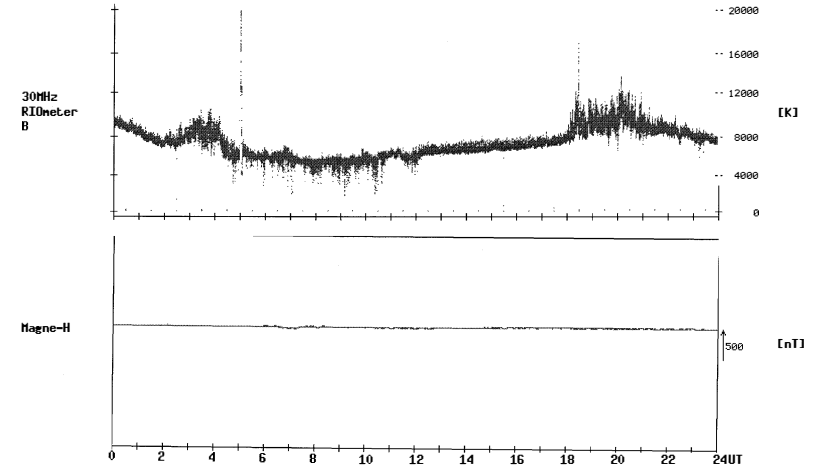
Syowa Station 2004/06/23



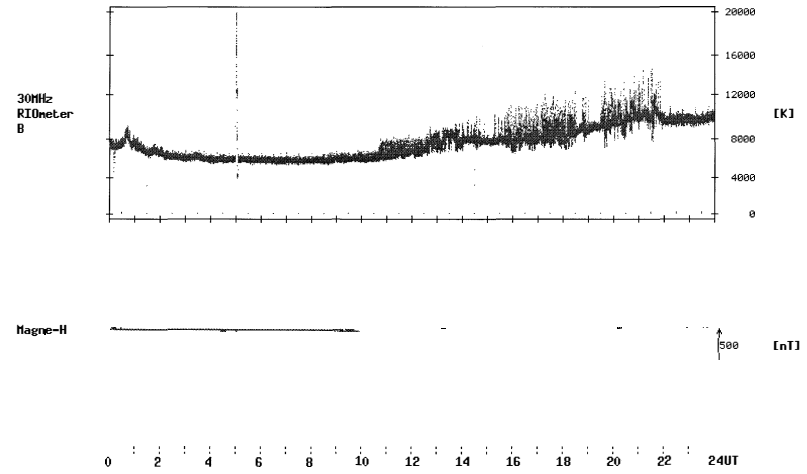
Syowa Station 2004/06/22



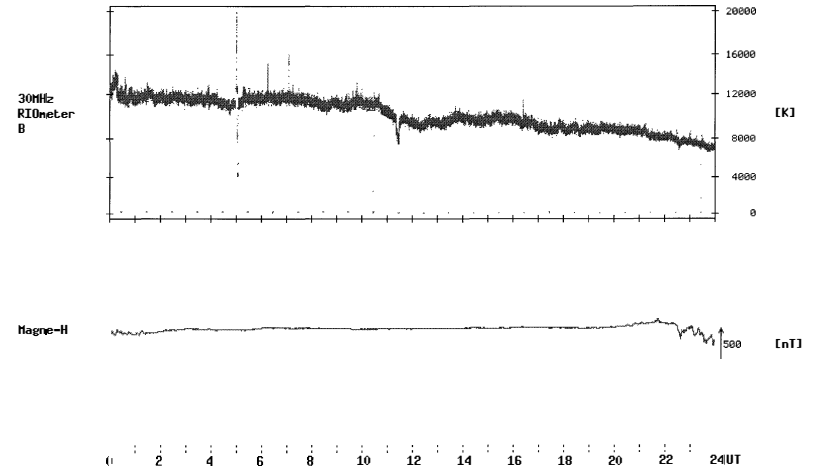
Syowa Station 2004/06/24



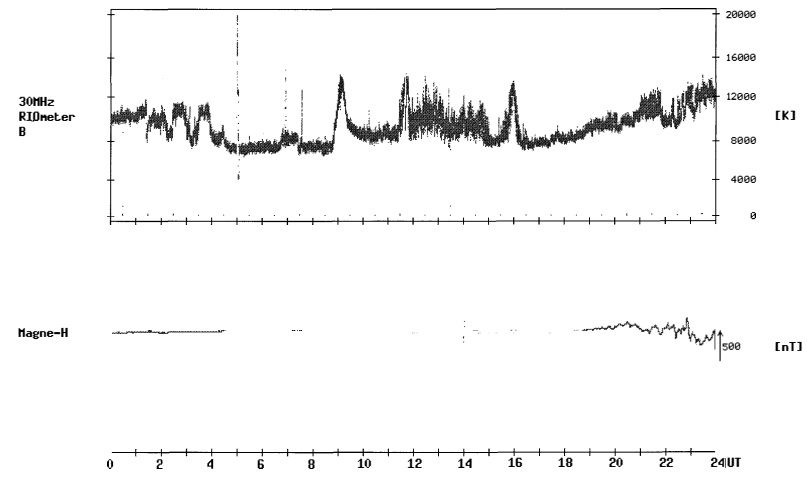
Syowa Station 2004/06/25



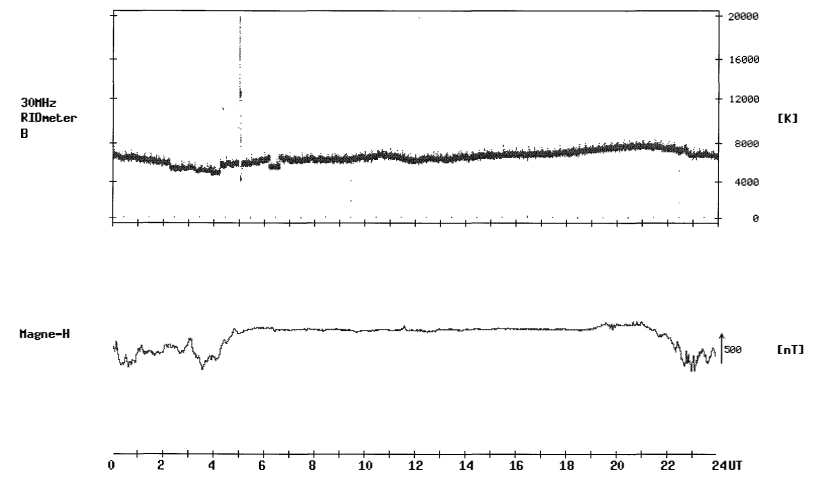
Syowa Station 2004/06/27

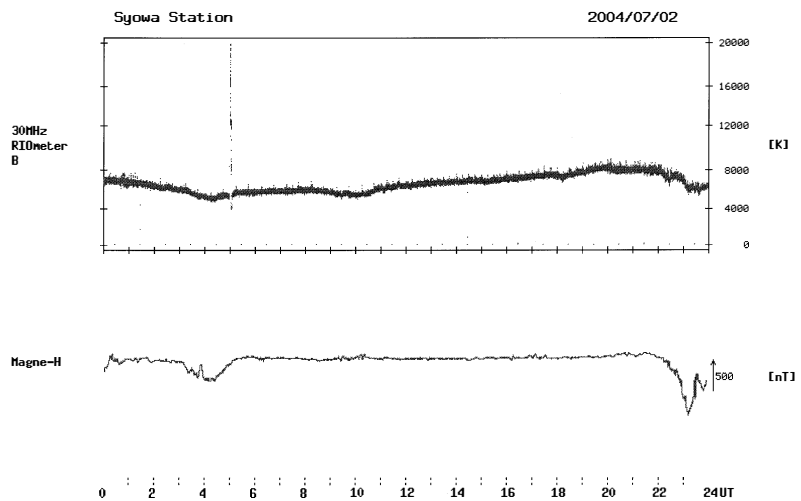
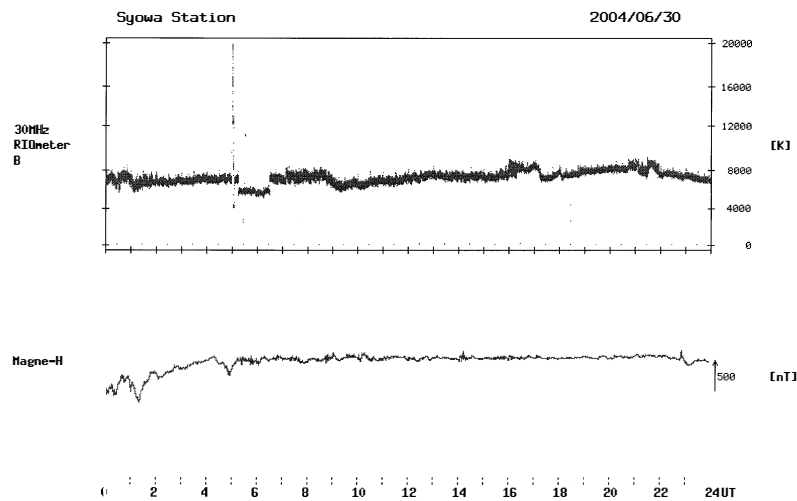
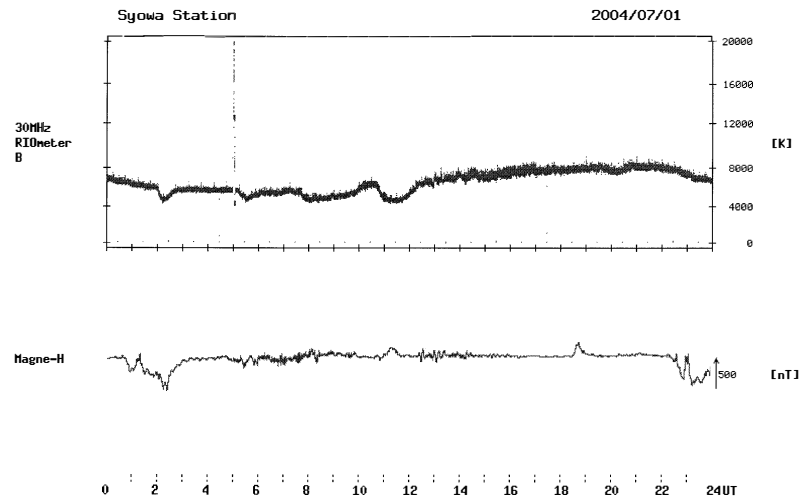
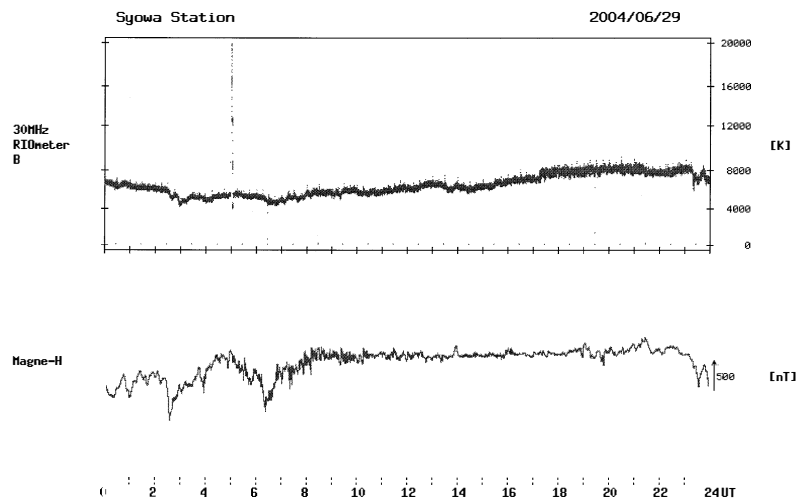


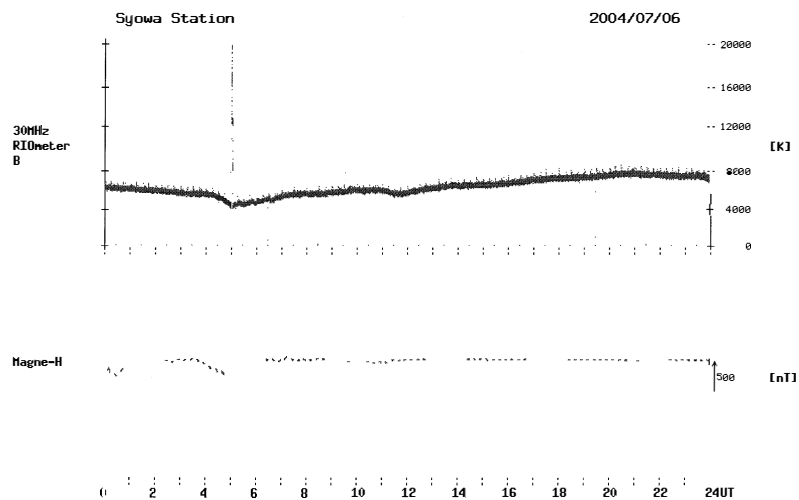
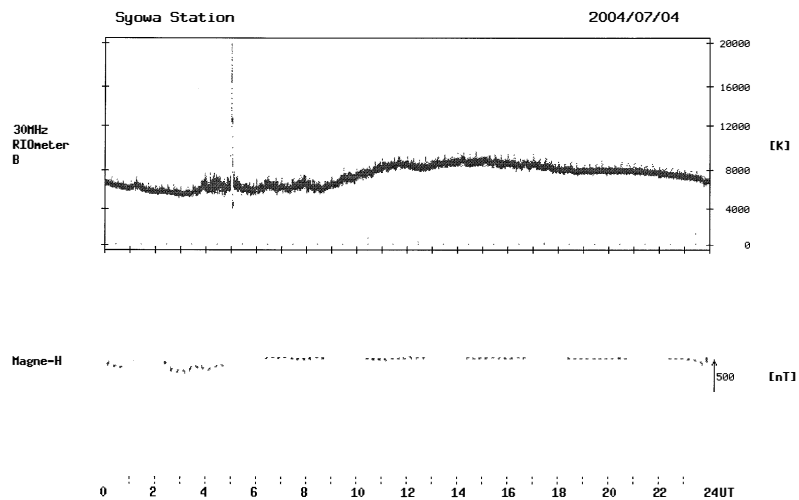
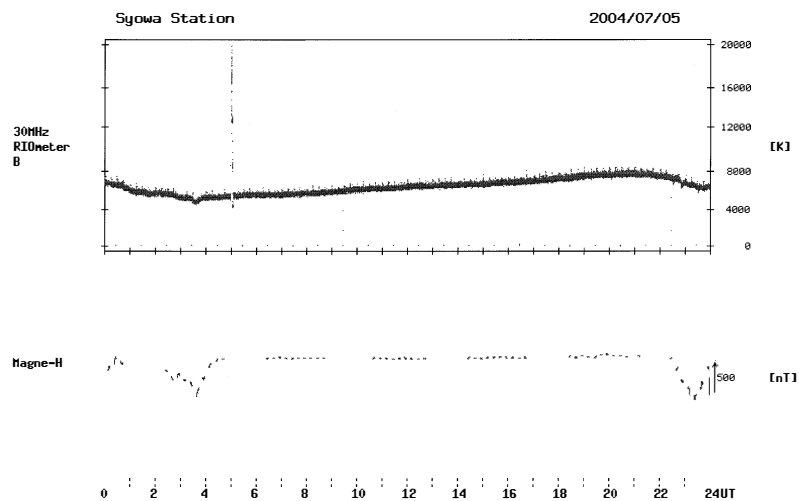
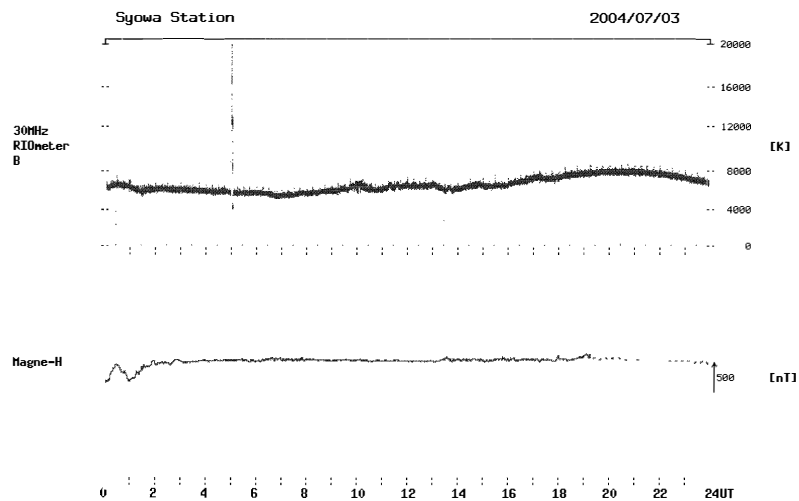
Syowa Station 2004/06/26

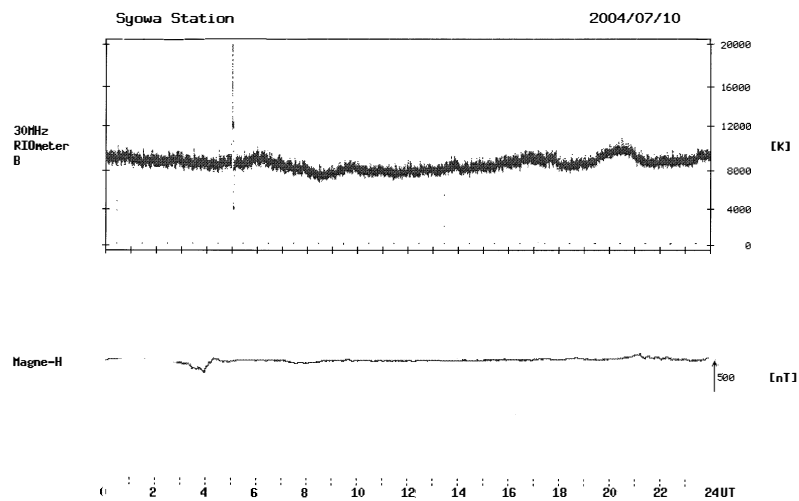
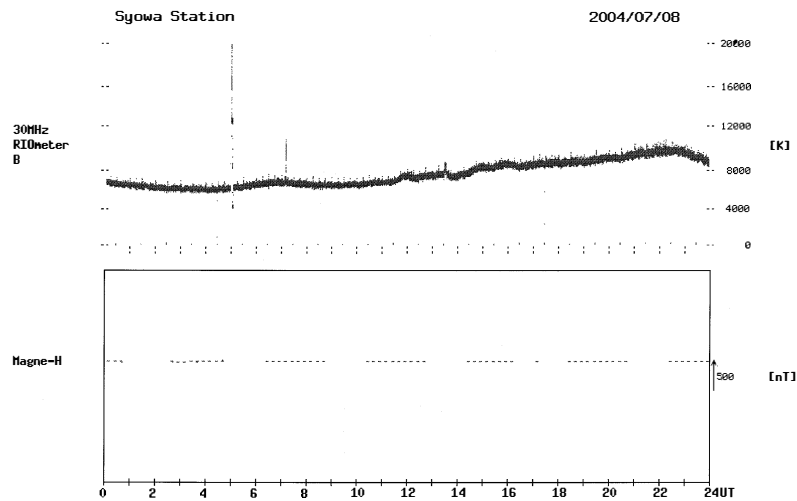
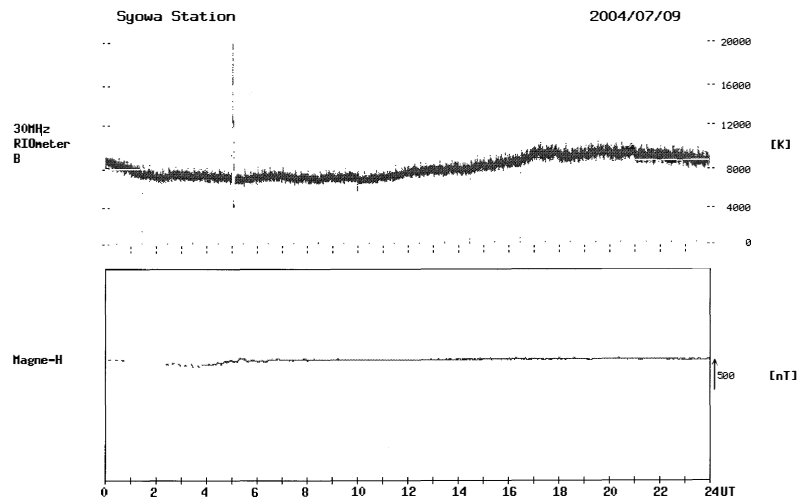
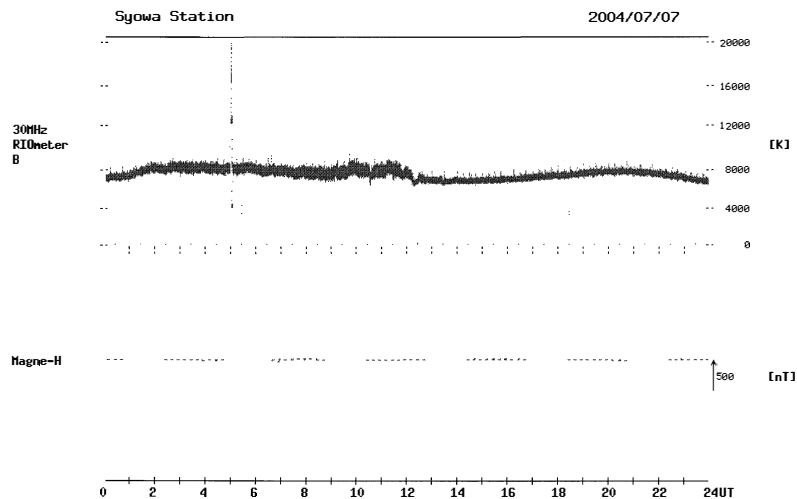


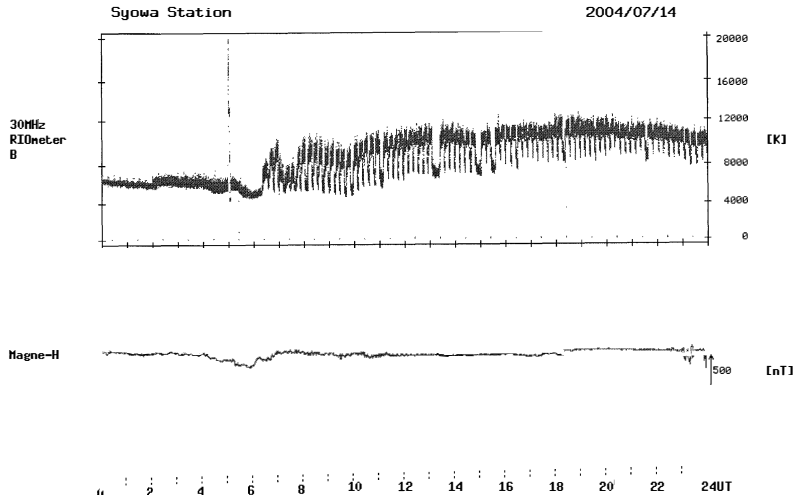
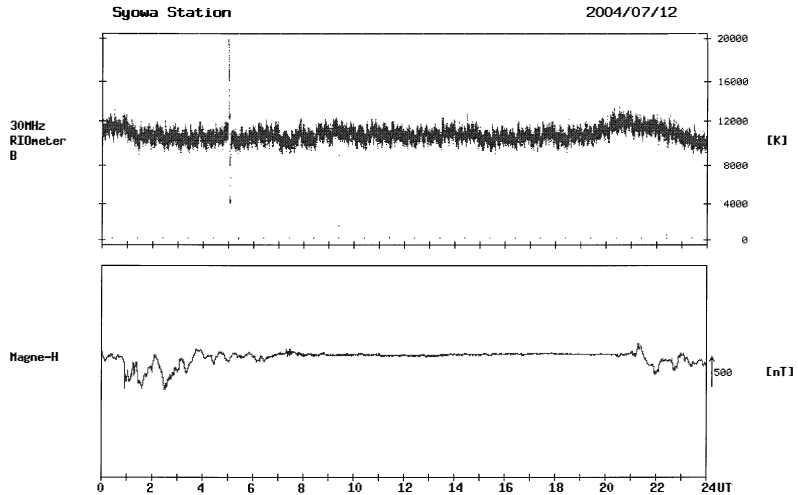
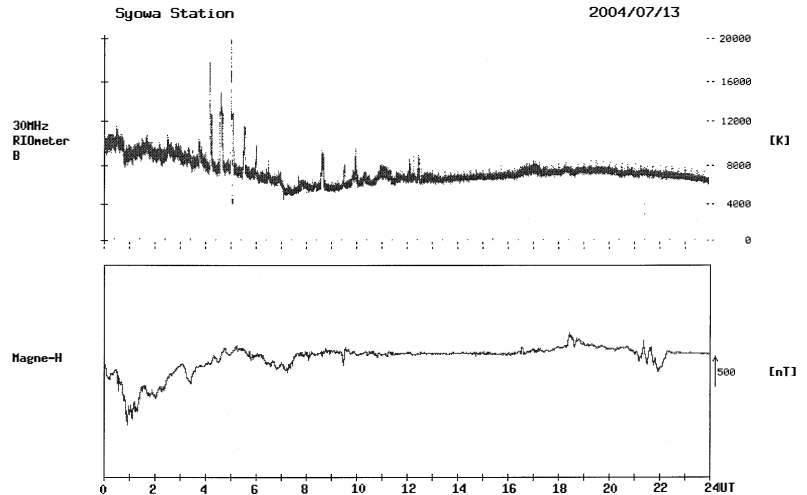
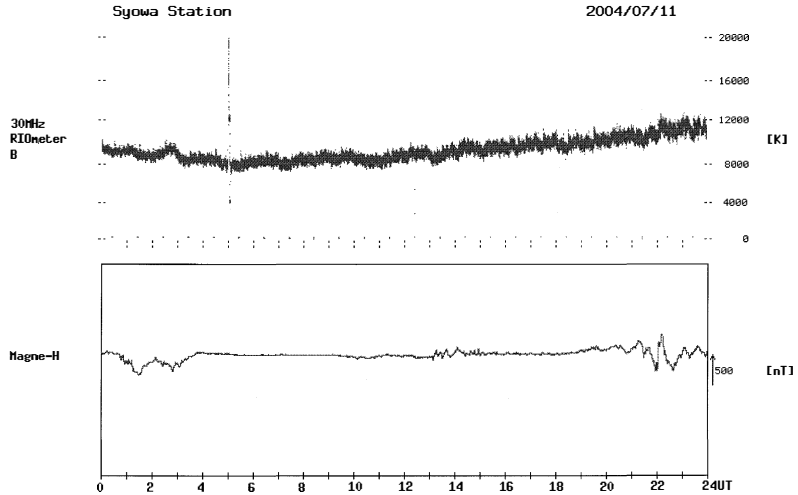
Syowa Station 2004/06/28

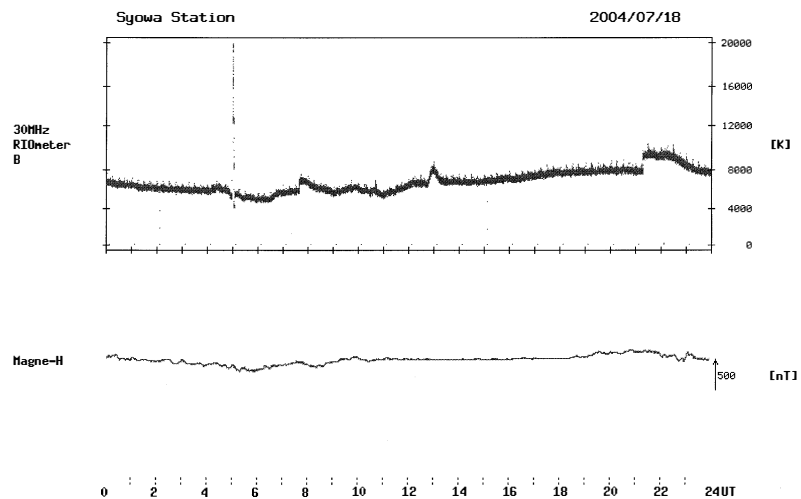
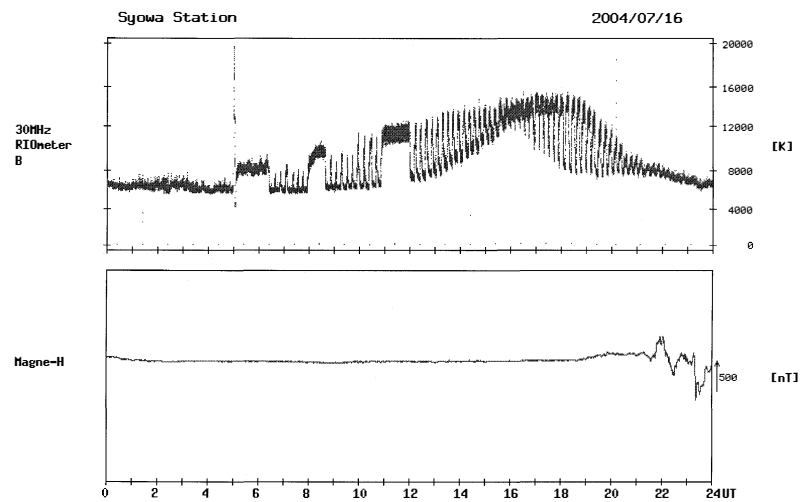
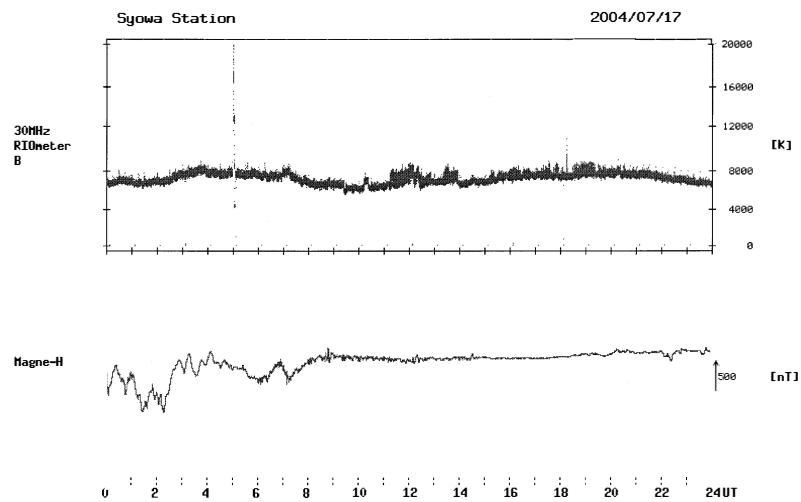
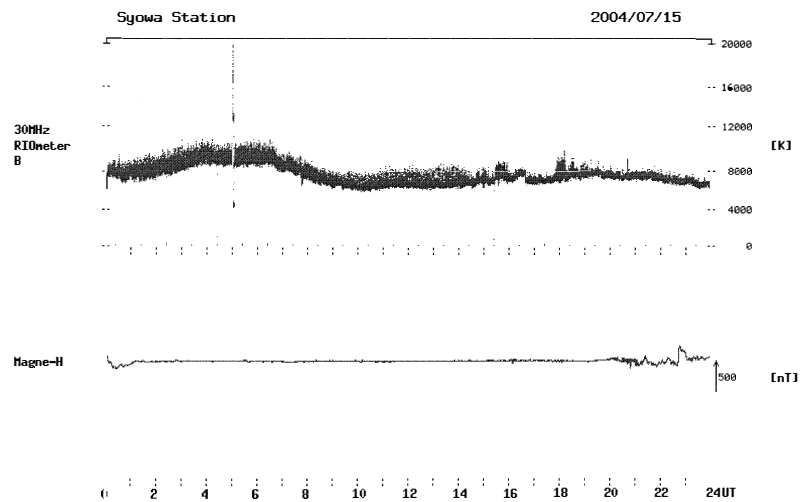




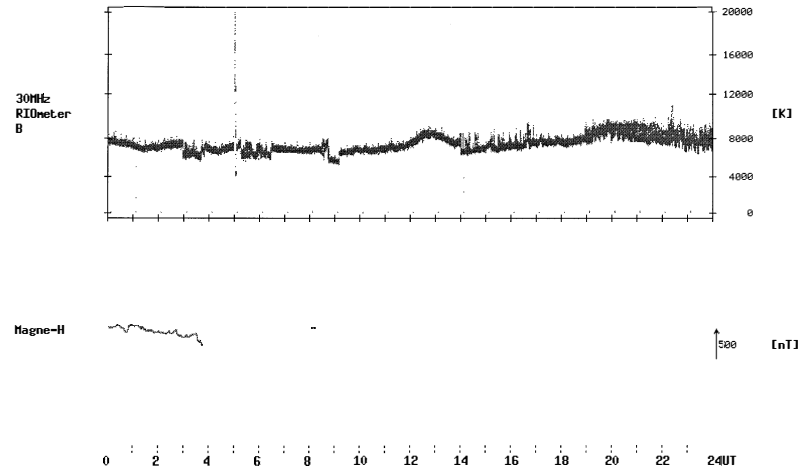




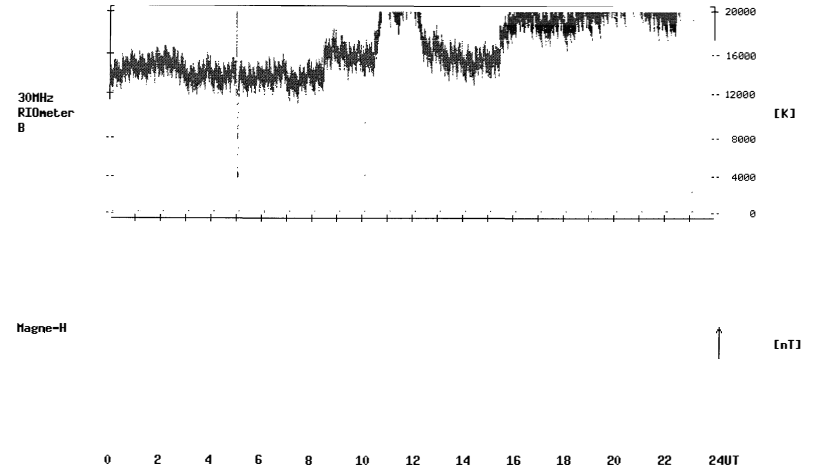




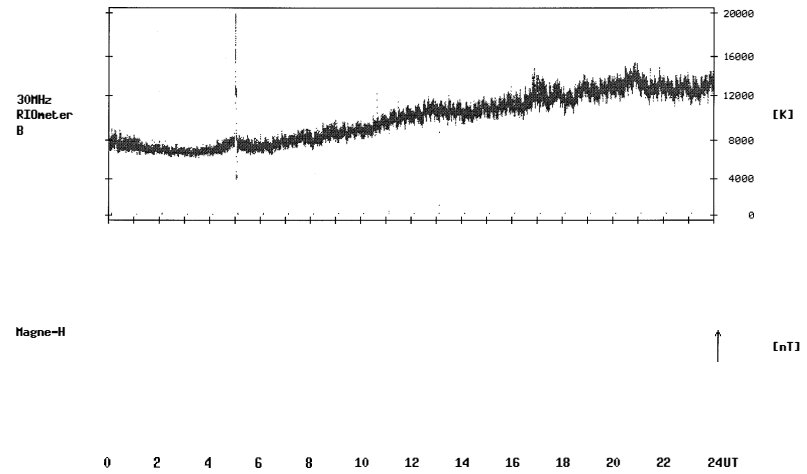
Syowa Station 2004/07/19



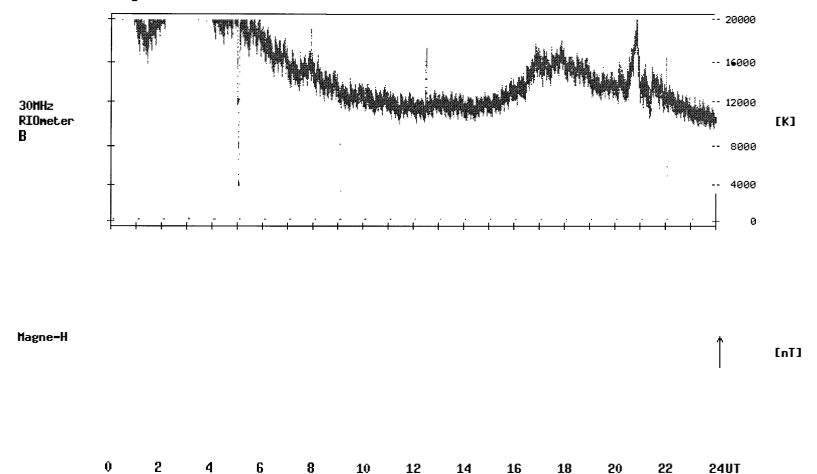
Syowa Station 2004/07/21



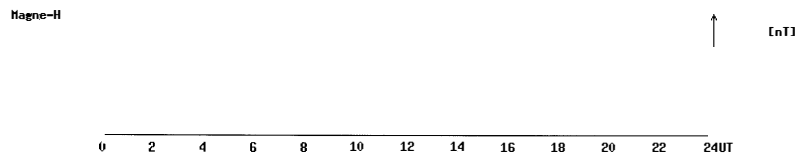
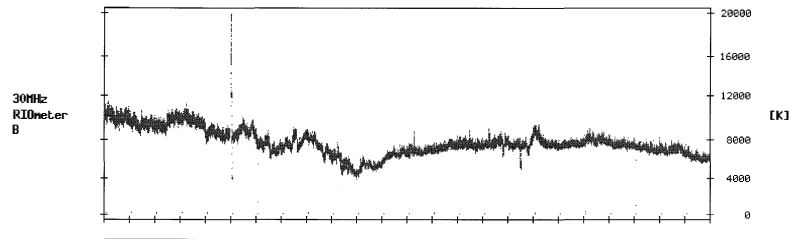
Syowa Station 2004/07/20



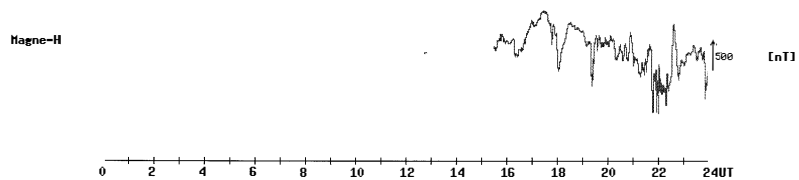
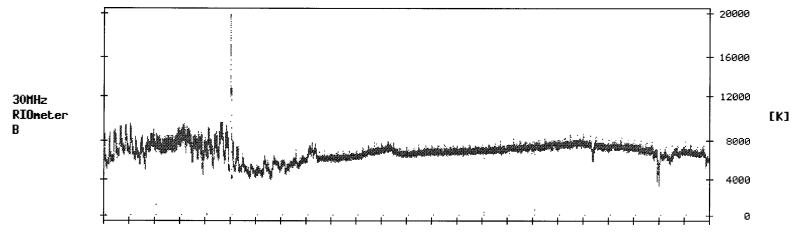
Syowa Station 2004/07/22



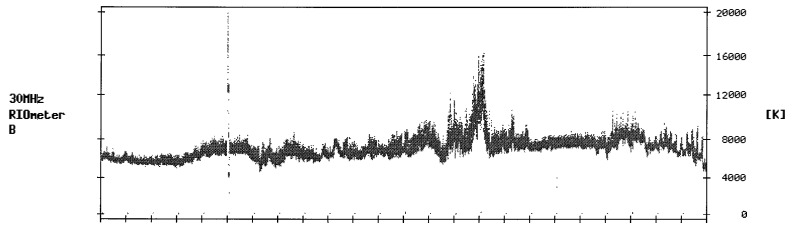
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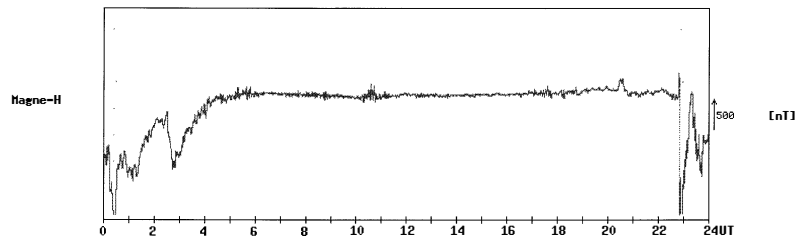
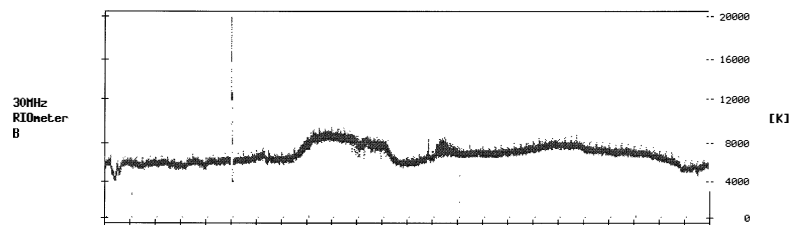
Syowa Station 2004/07/25

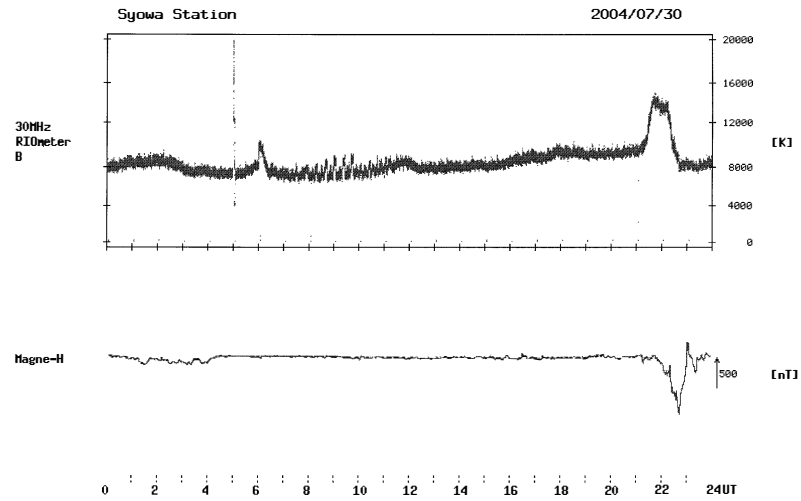
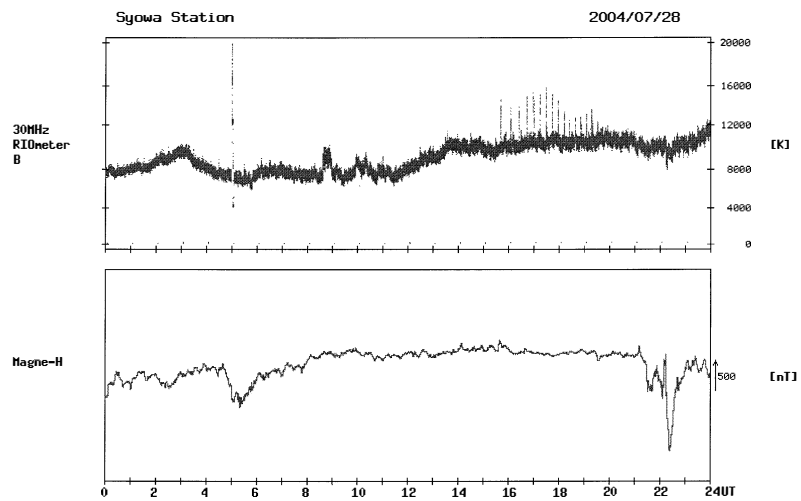
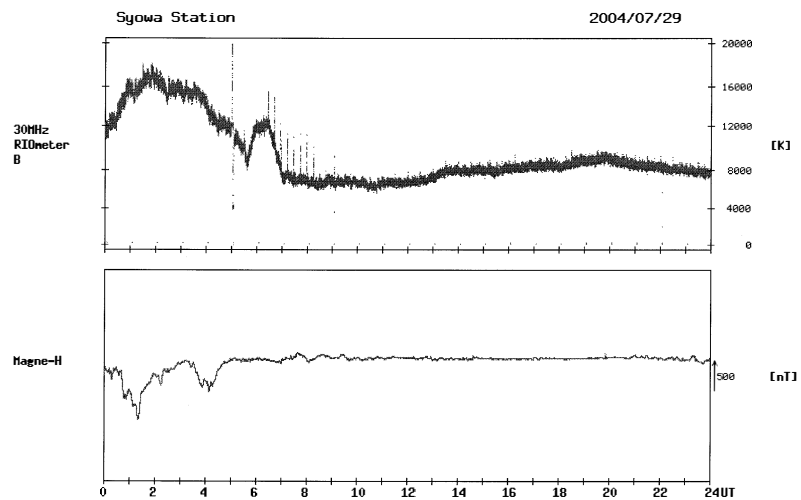
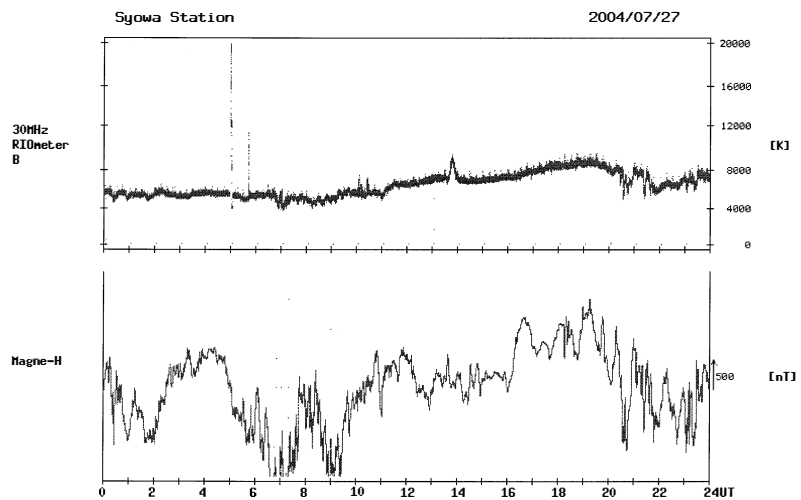


Syowa Station 2004/07/24

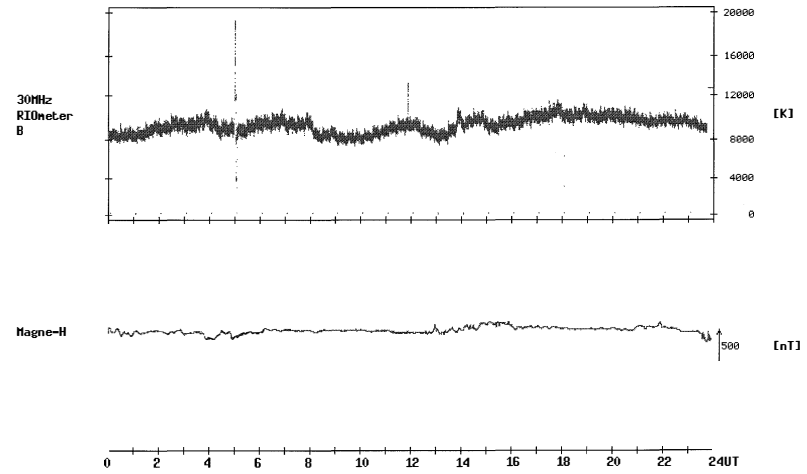


Syowa Station 2004/07/26

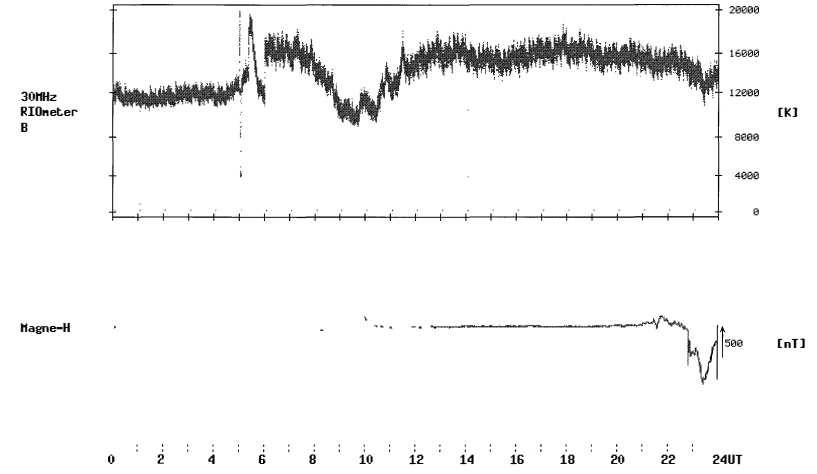




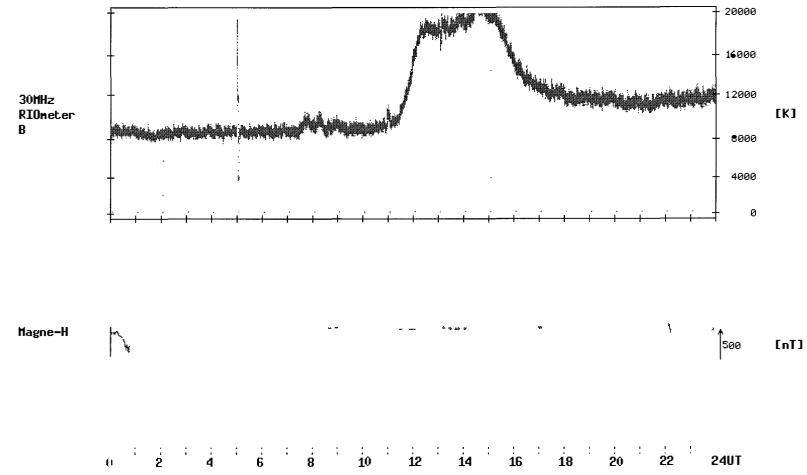
Syowa Station 2004/07/31



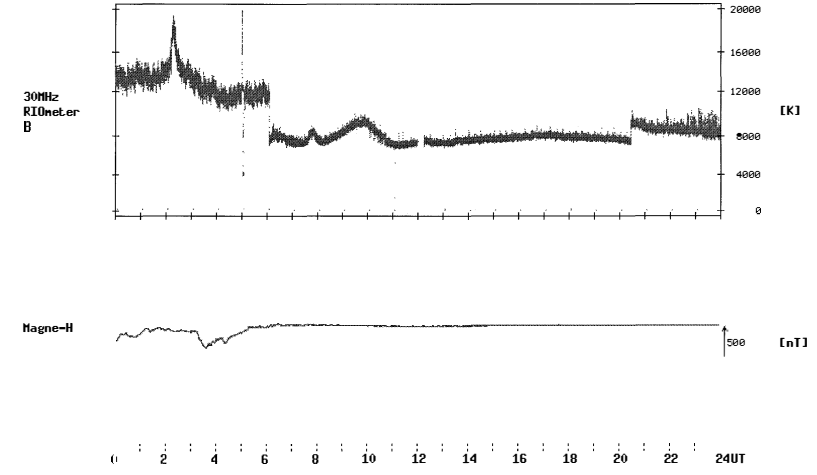
Syowa Station 2004/08/02

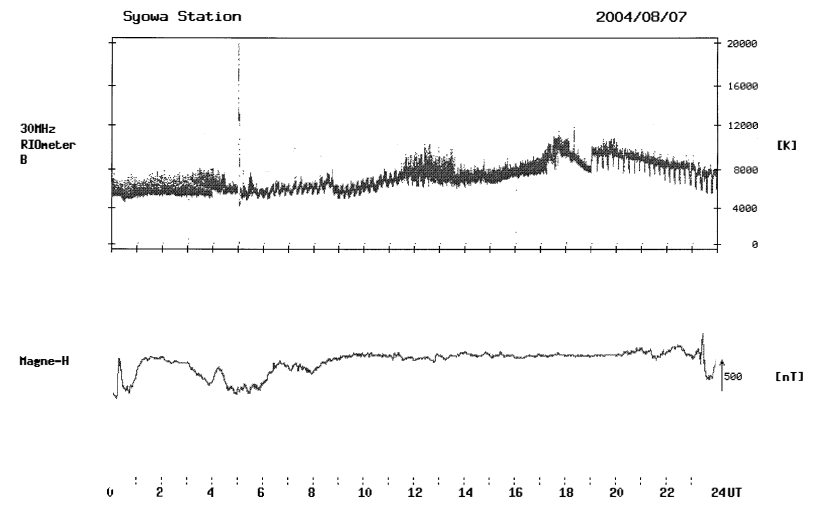
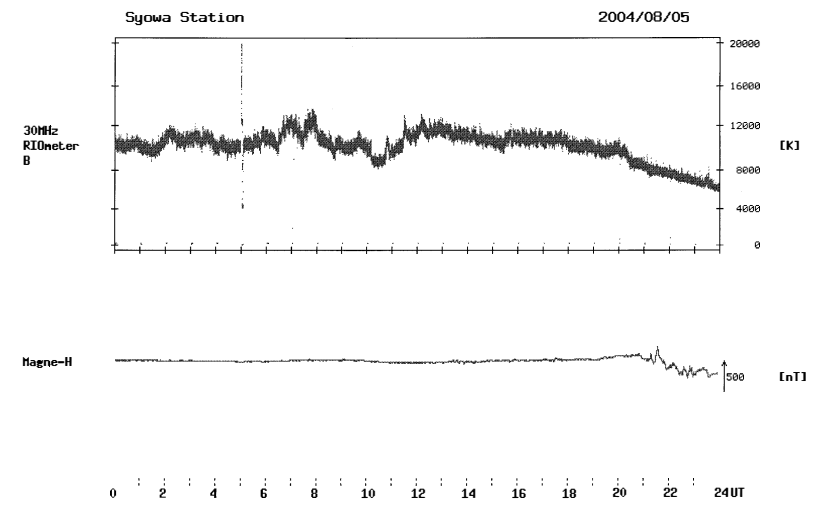
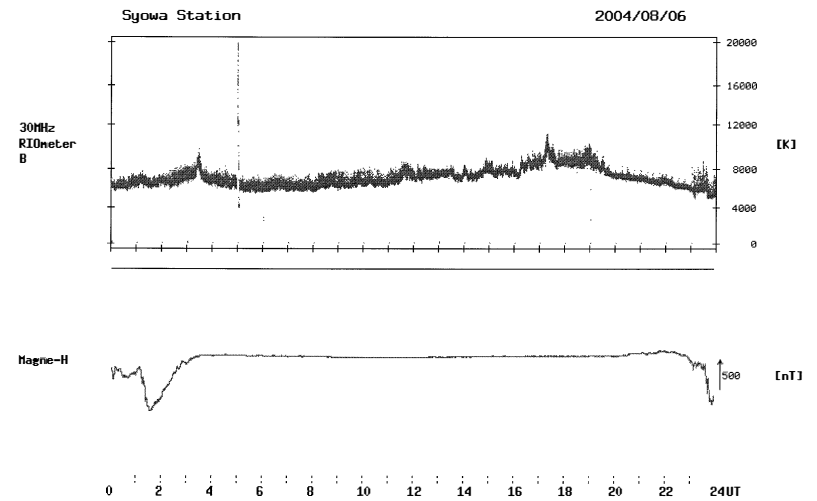
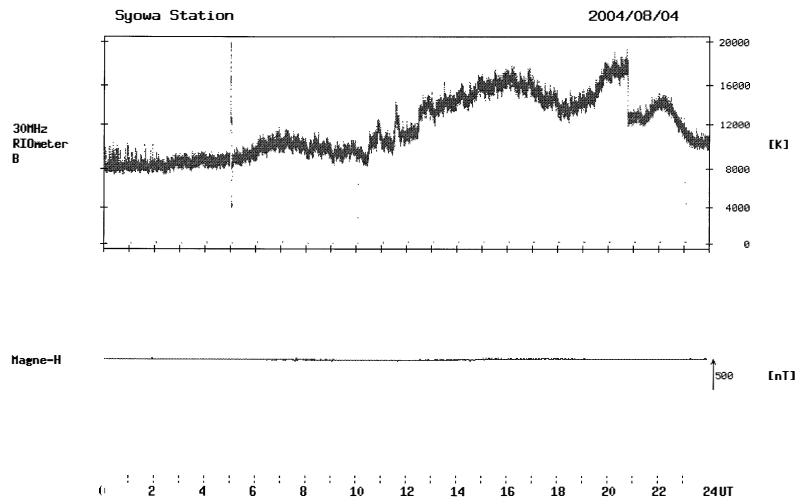


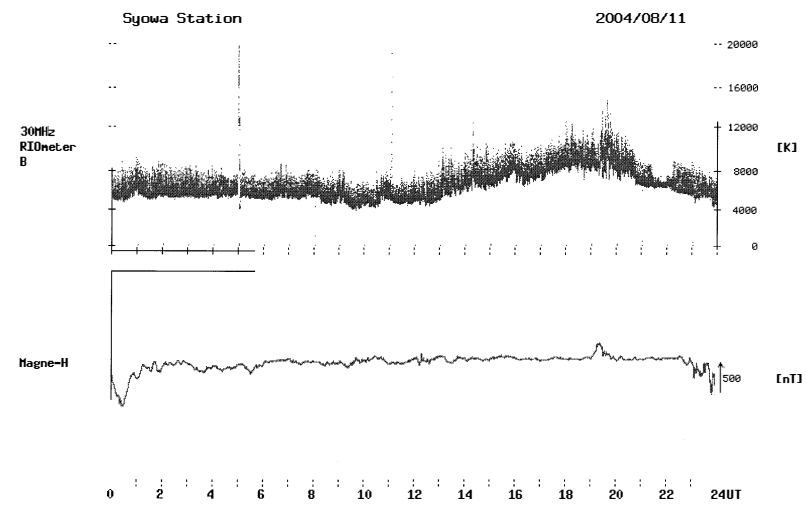
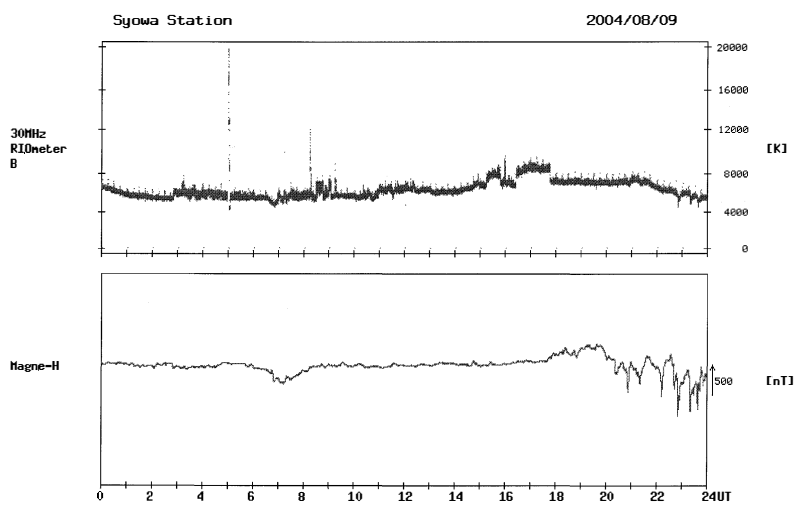
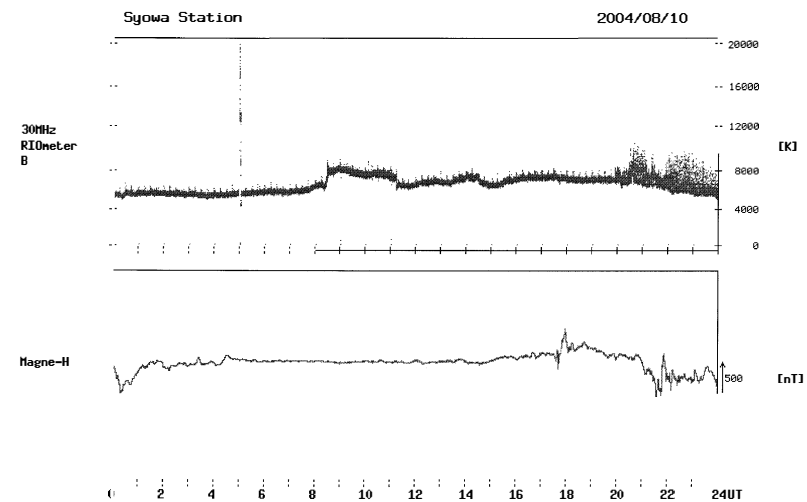
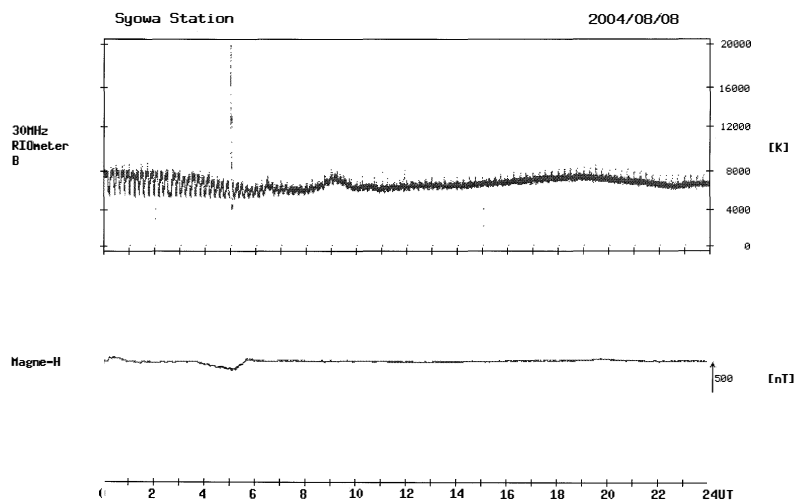
Syowa Station 2004/08/01



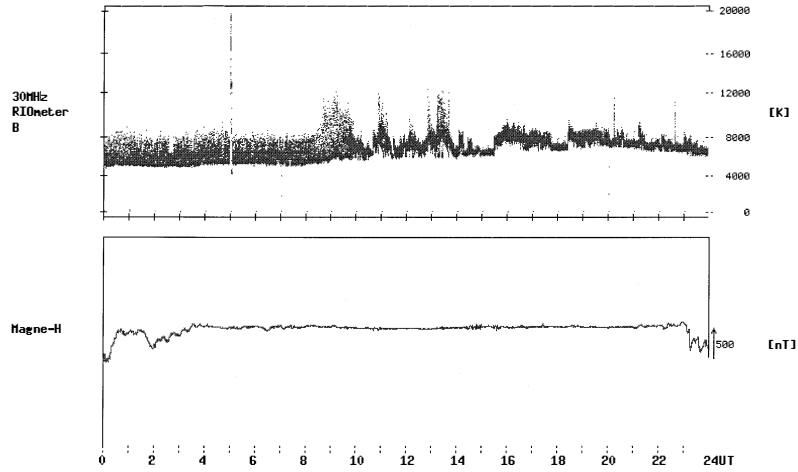
Syowa Station 2004/08/03



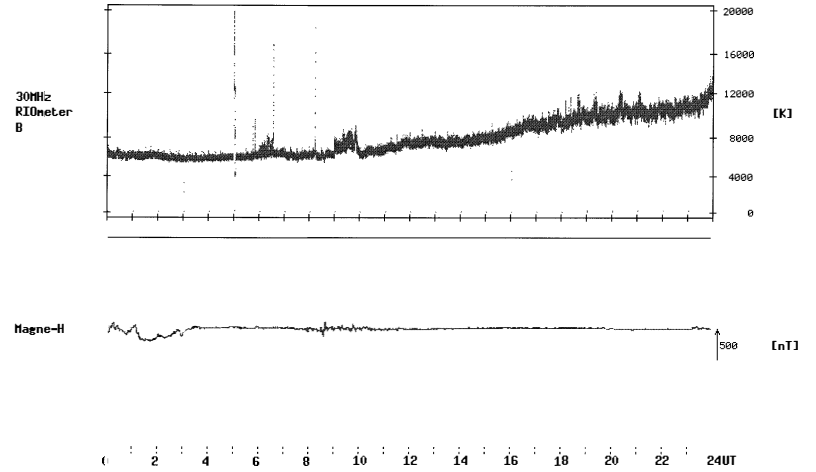




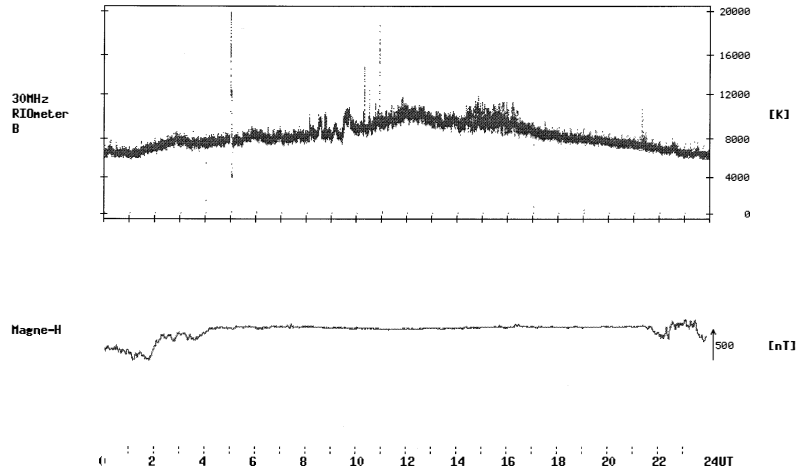
Syowa Station 2004/08/12



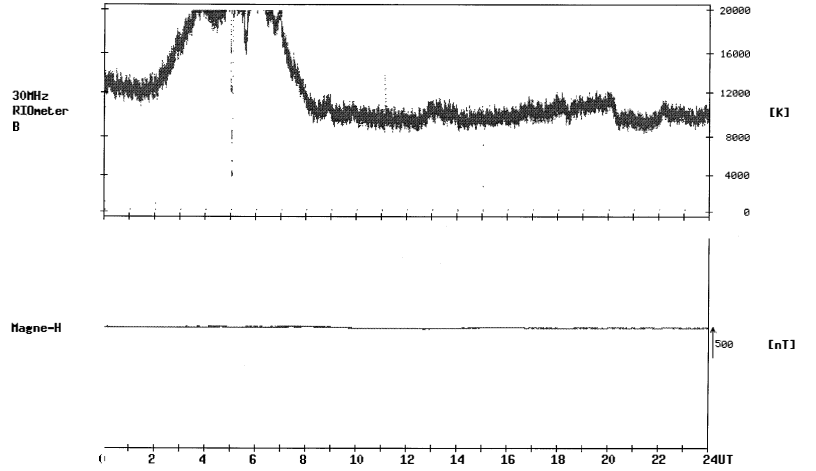
Syowa Station 2004/08/14

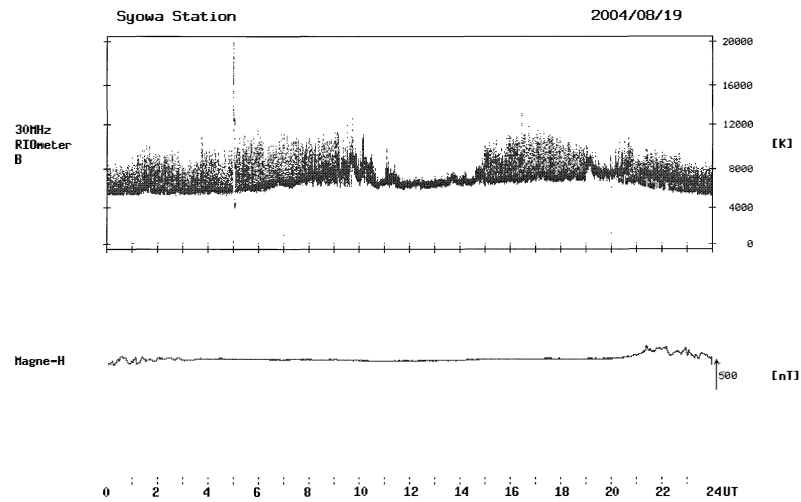
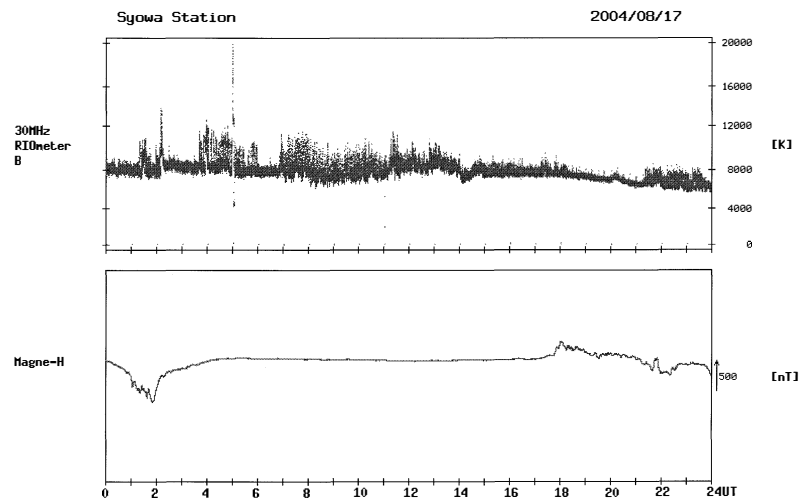
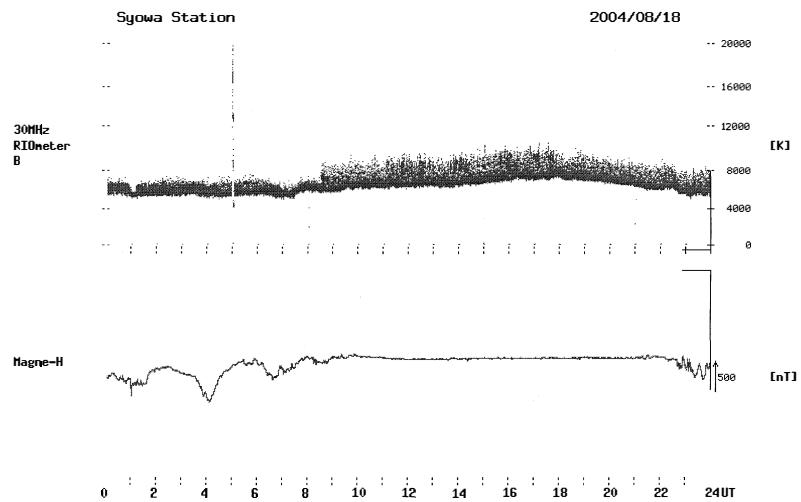
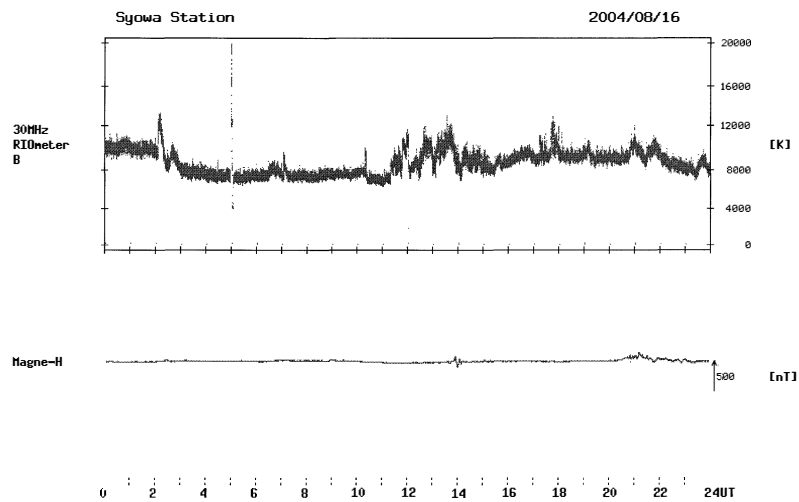


Syowa Station 2004/08/13

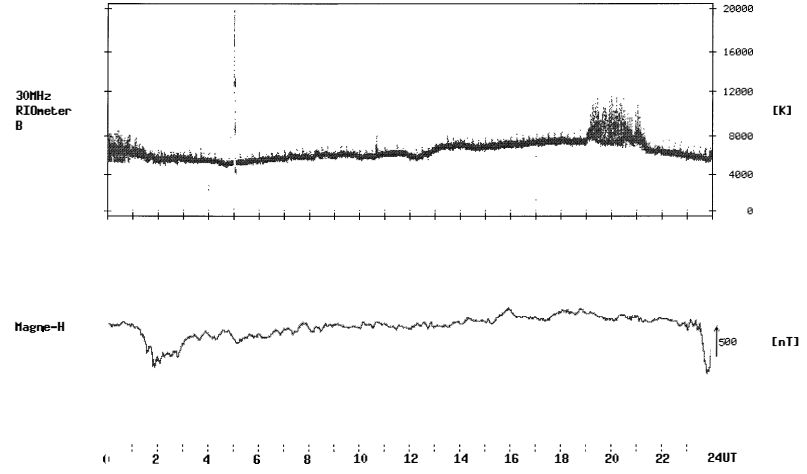


Syowa Station 2004/08/15

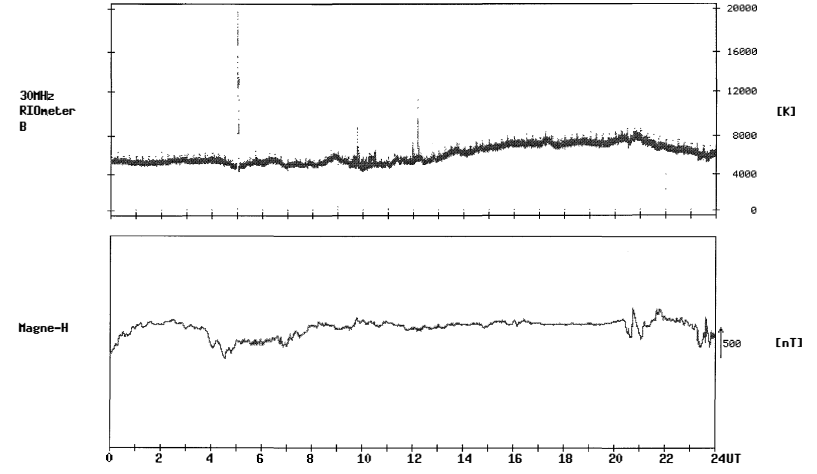




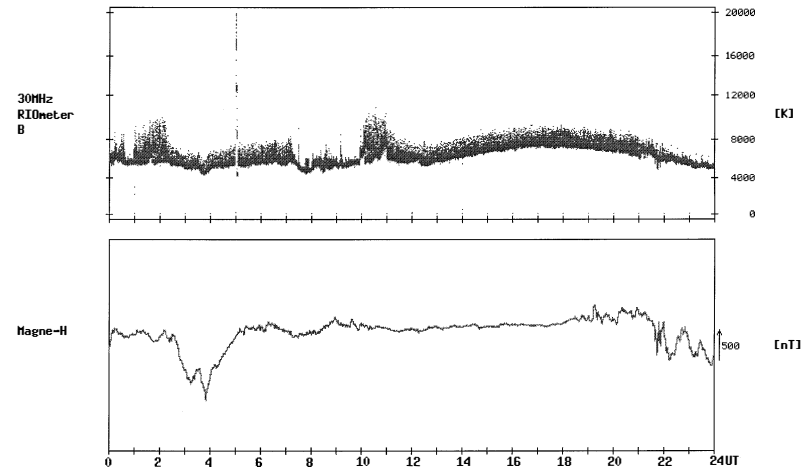
Syowa Station 2004/08/20



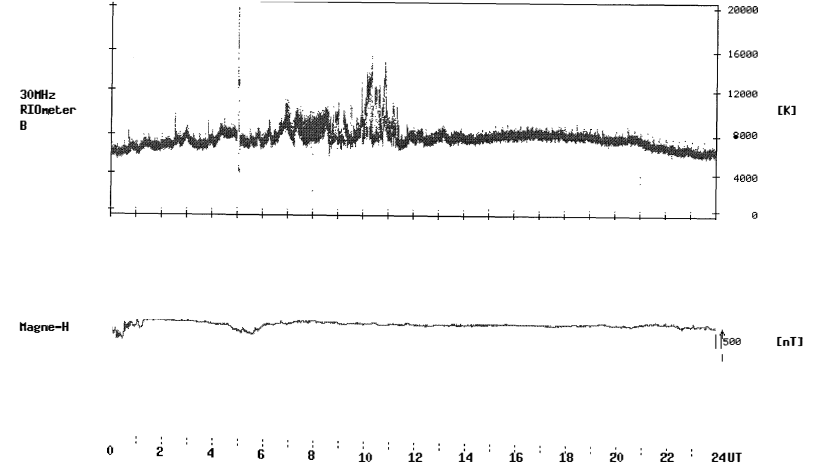
Syowa Station 2004/08/22

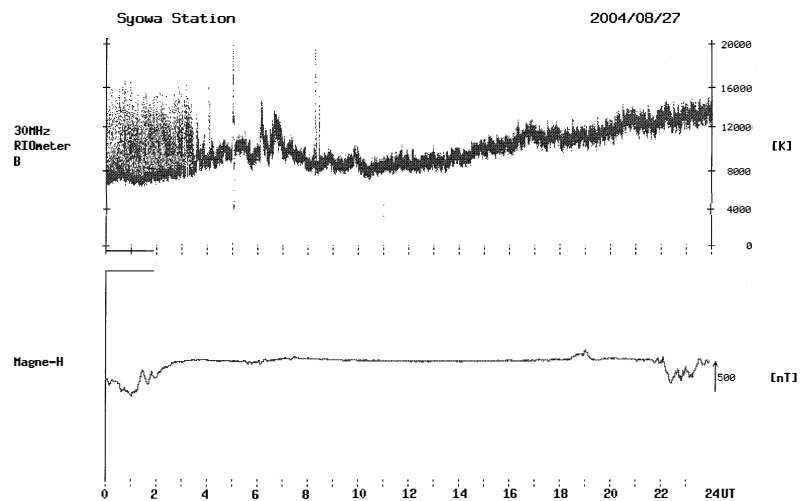
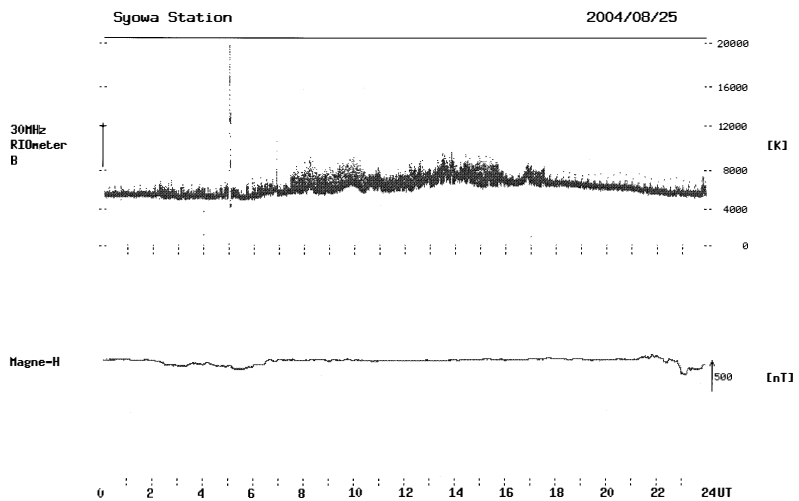
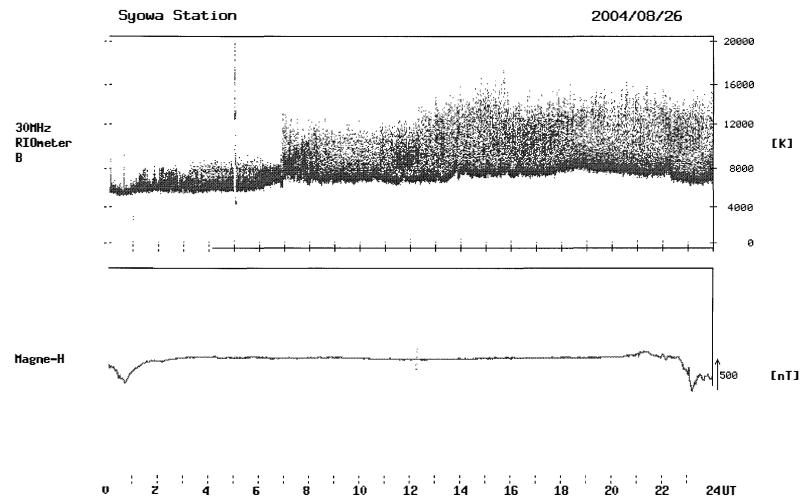
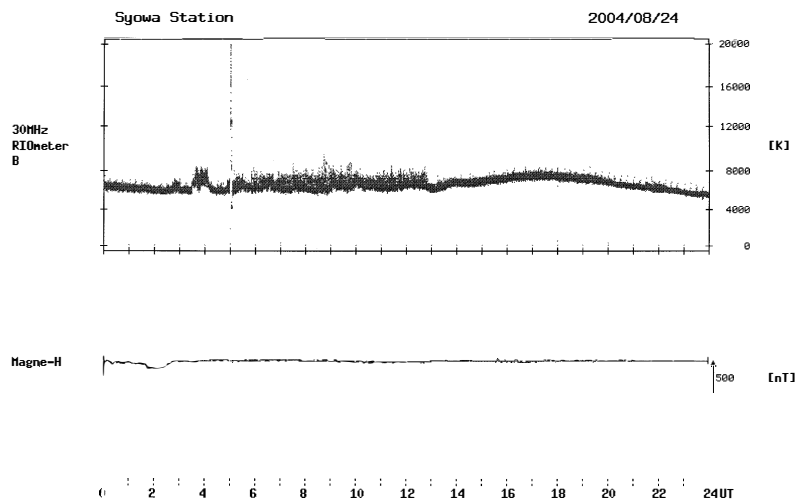


Syowa Station 2004/08/21

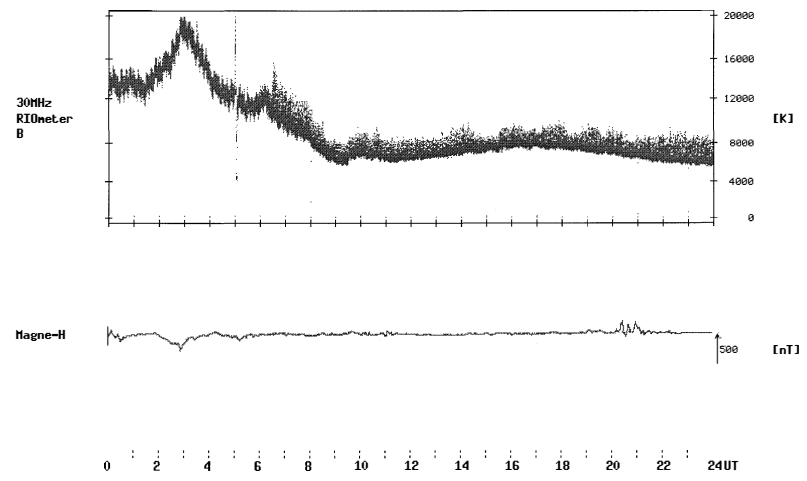


Syowa Station 2004/08/23

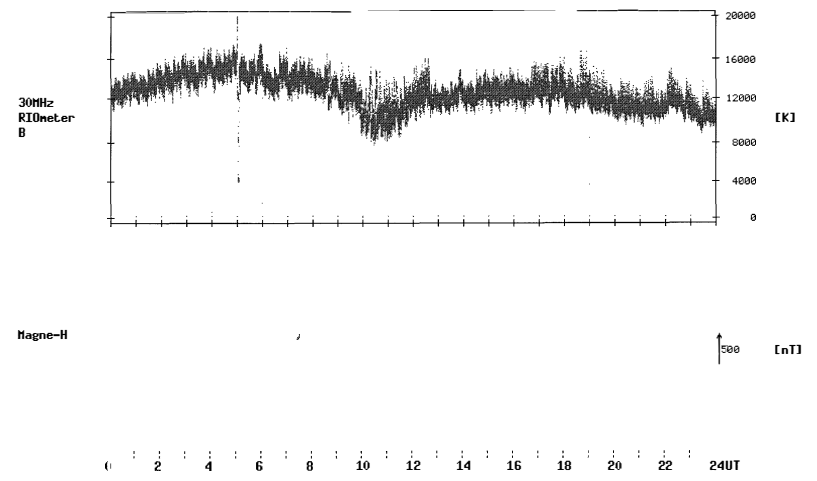




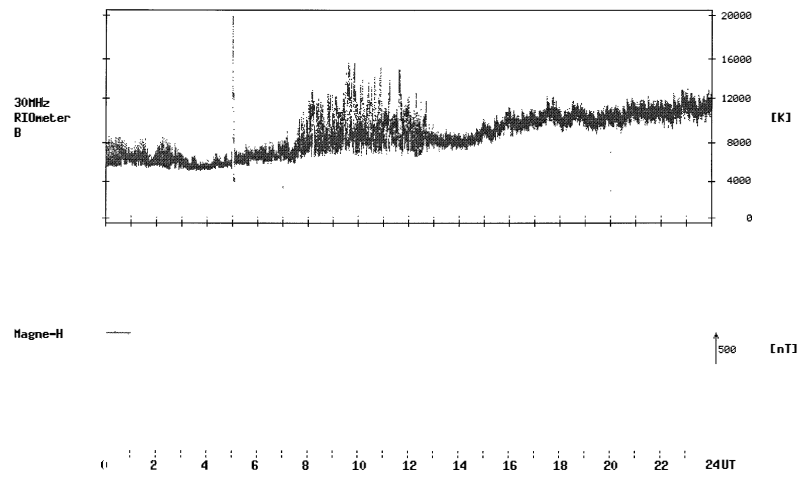
Syowa Station 2004/08/28



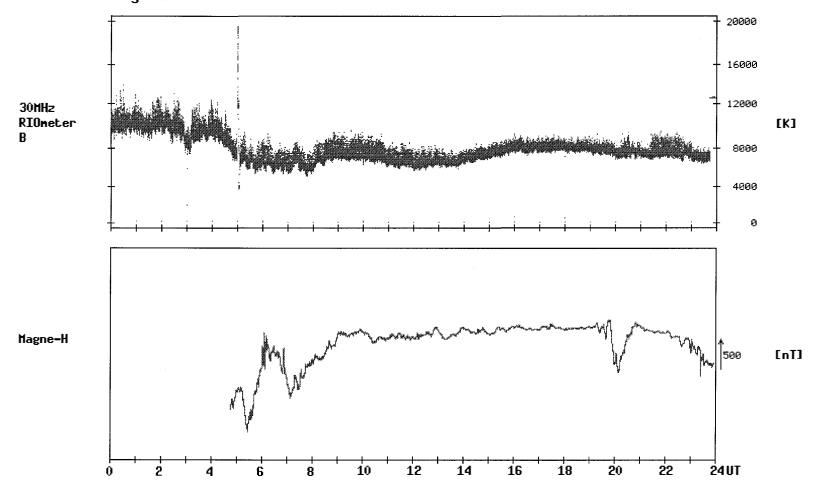
Syowa Station 2004/08/30

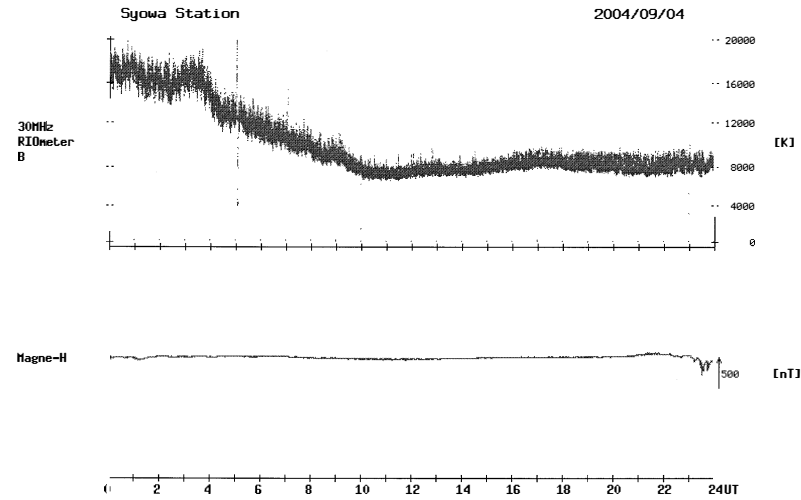
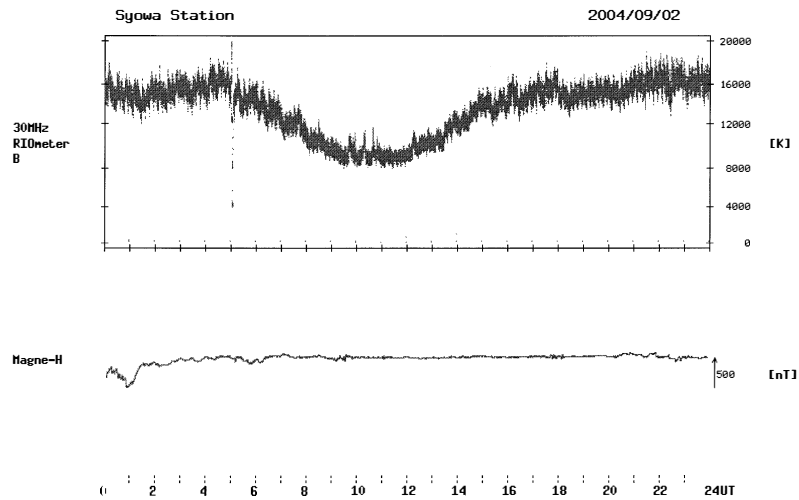
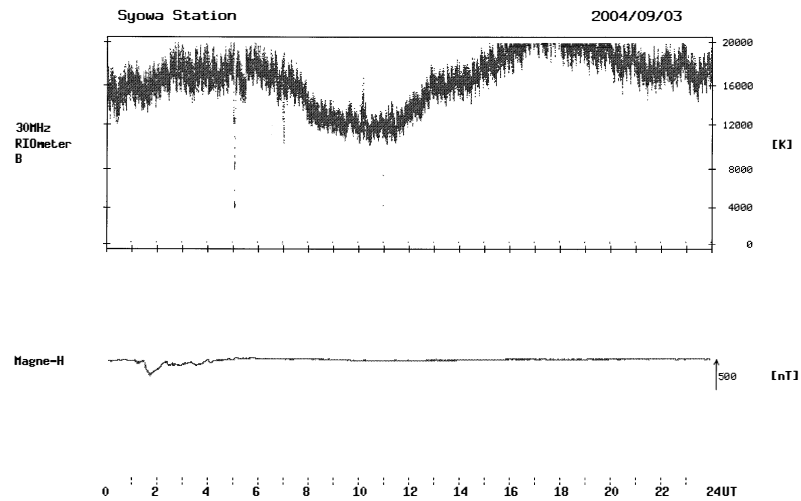
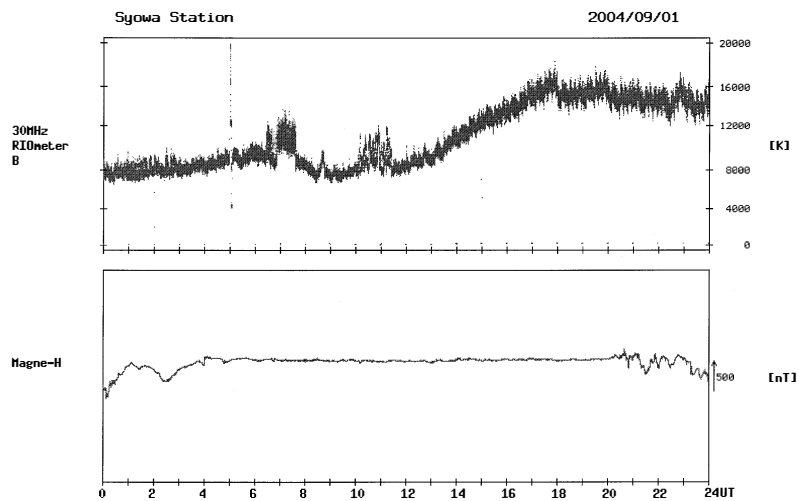


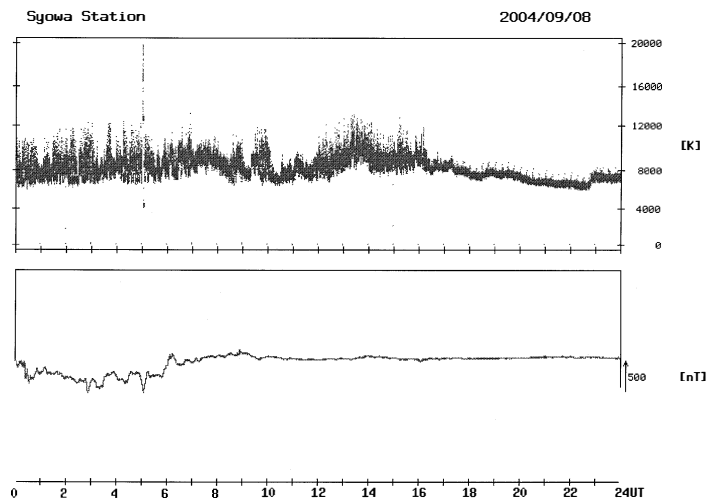
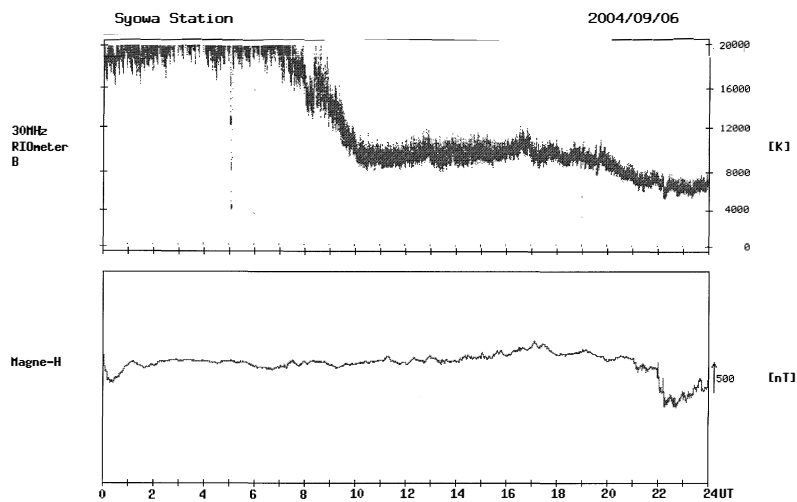
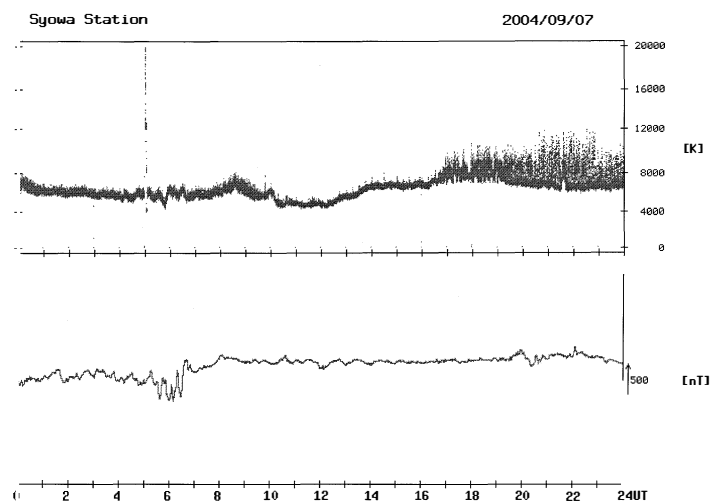
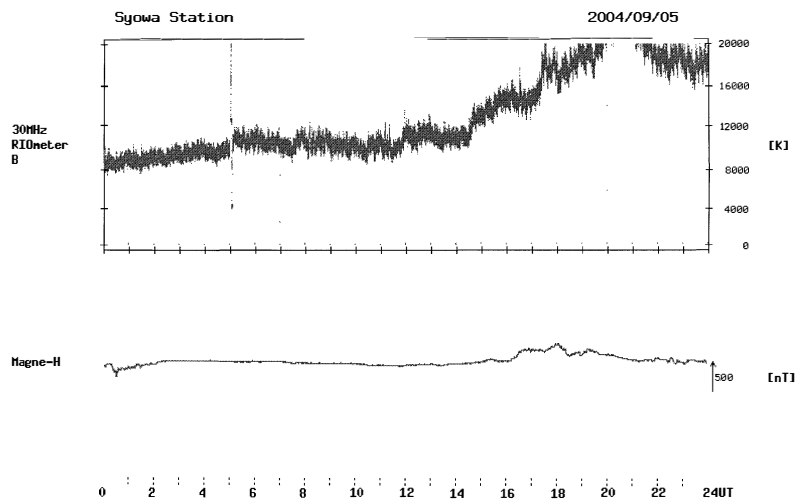
Syowa Station 2004/08/29

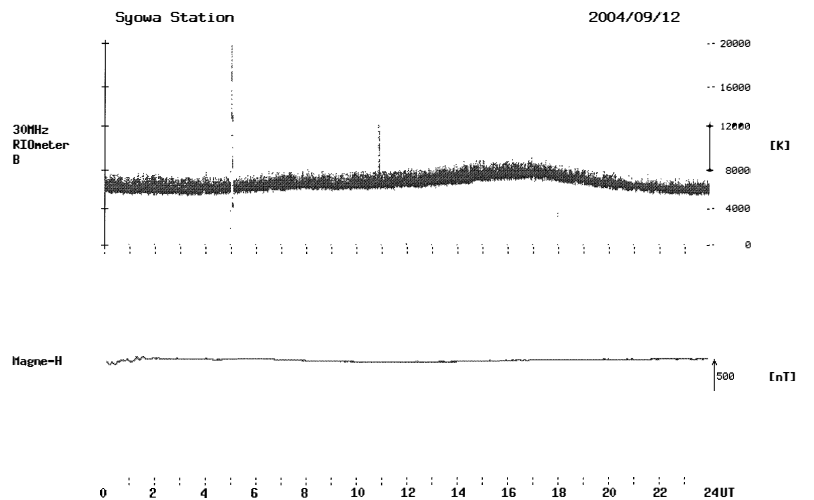
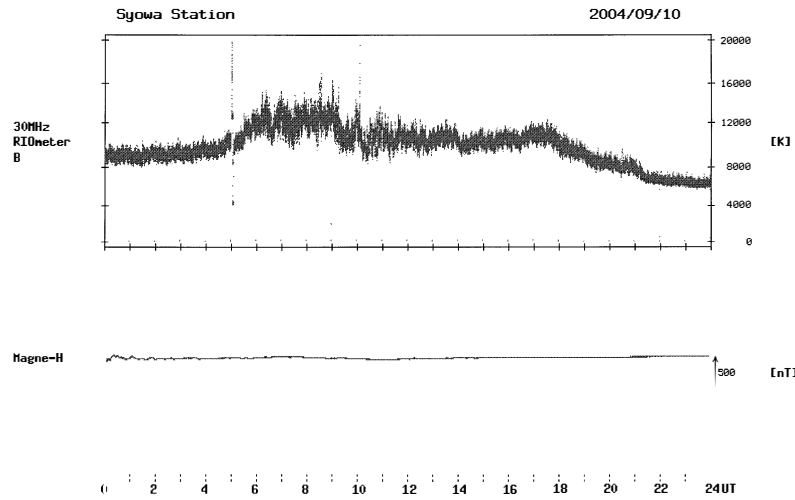
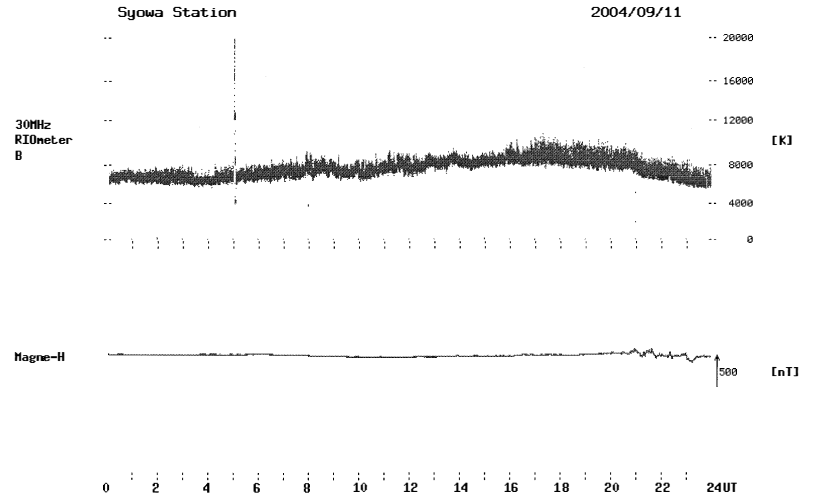
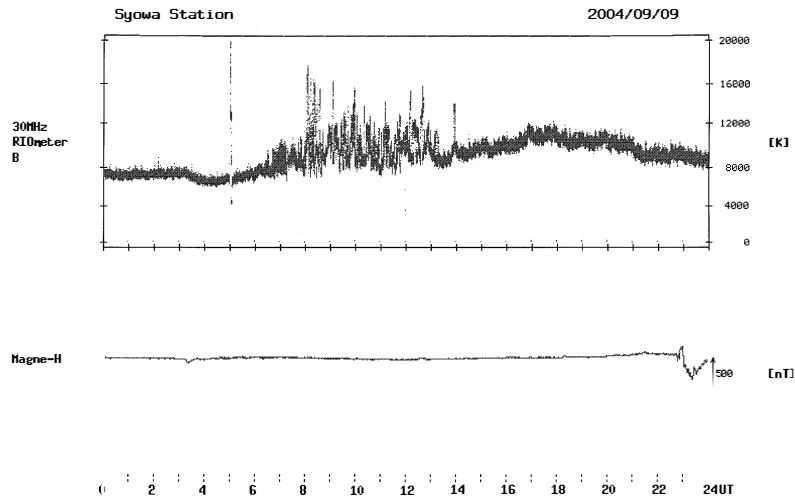


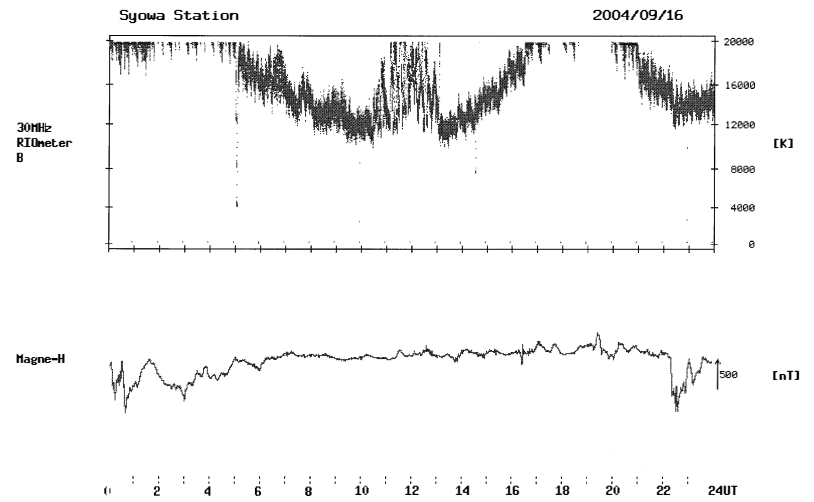
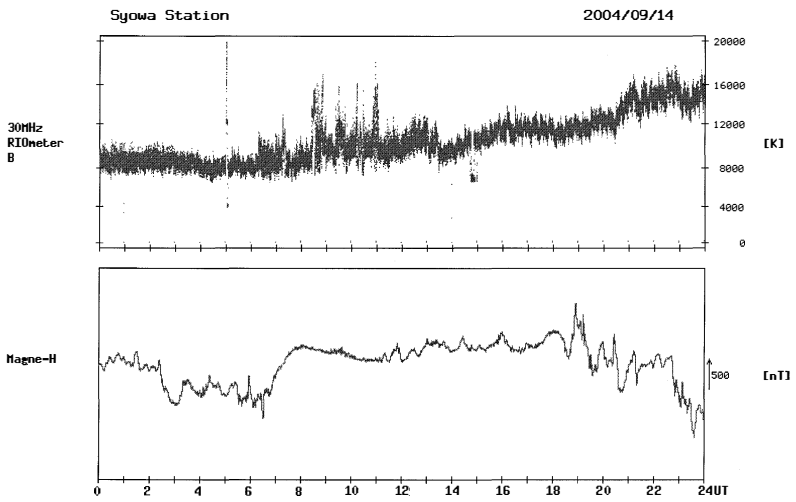
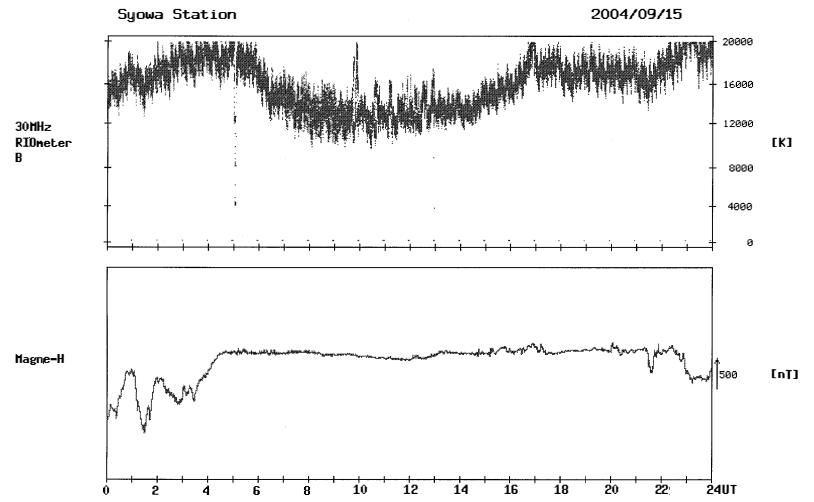
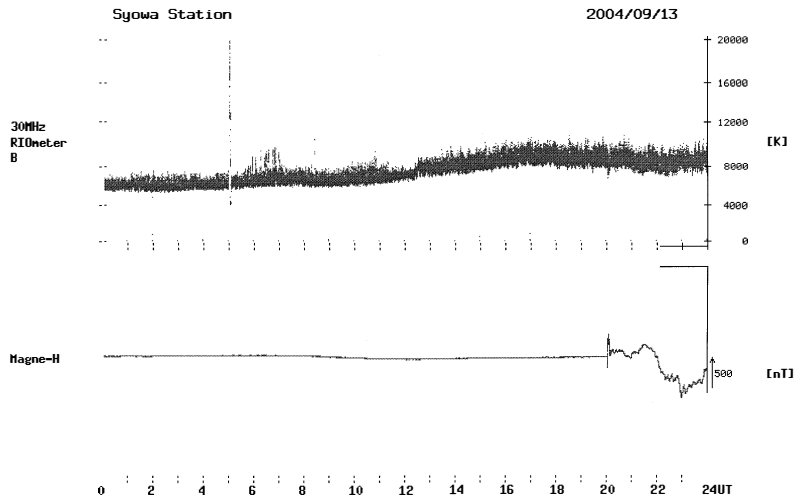
Syowa Station 2004/08/31



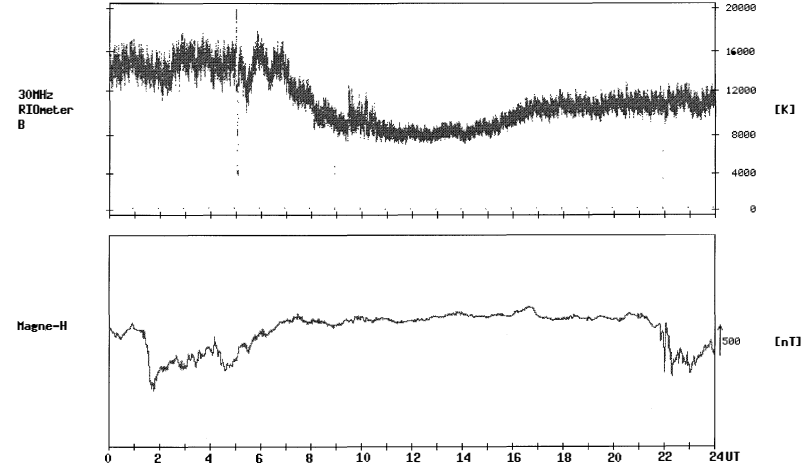




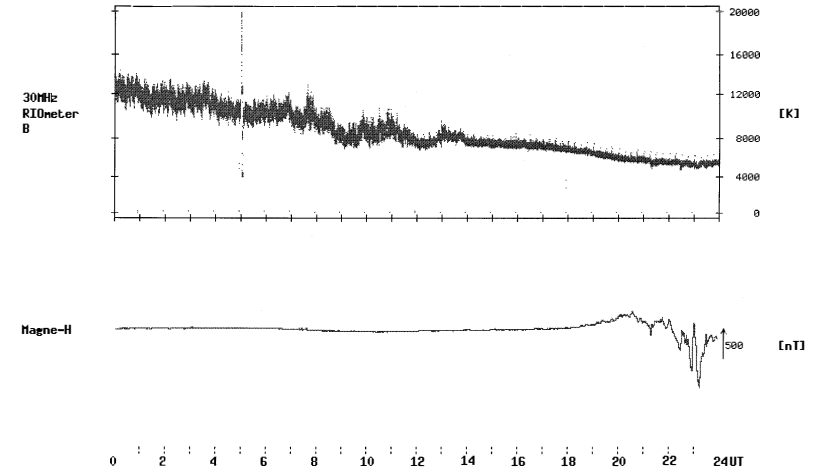




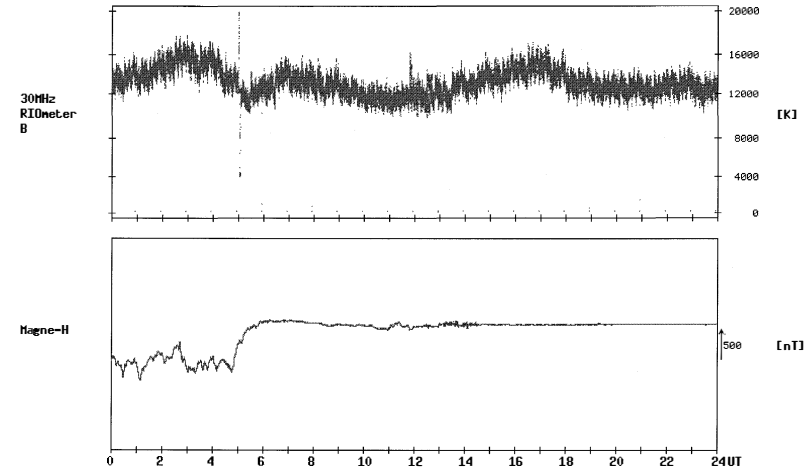
Syowa Station 2004/09/17



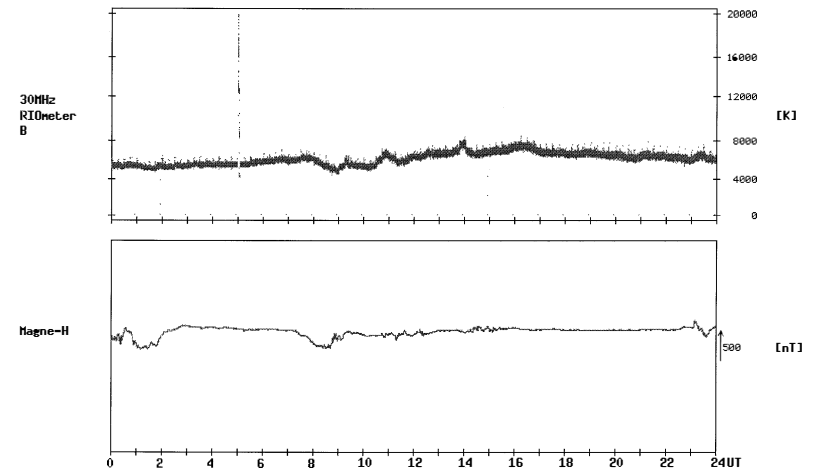
Syowa Station 2004/09/19



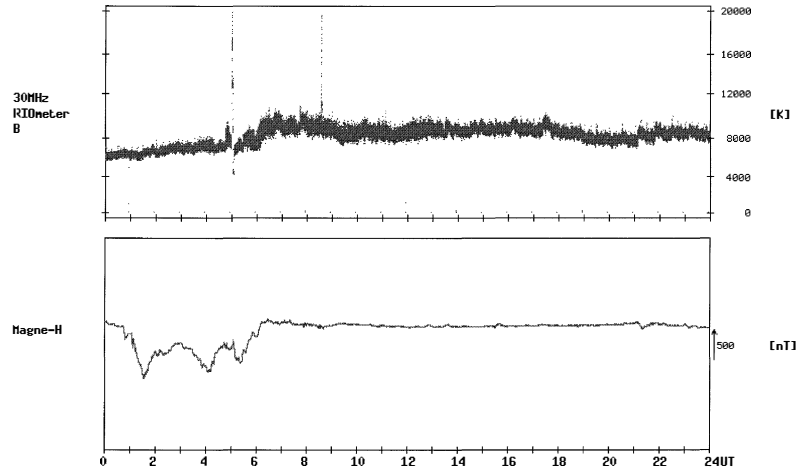
Syowa Station 2004/09/18



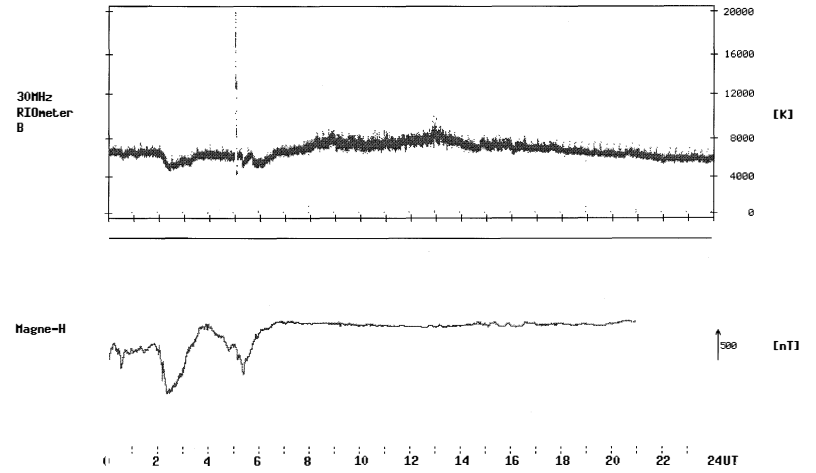
Syowa Station 2004/09/20



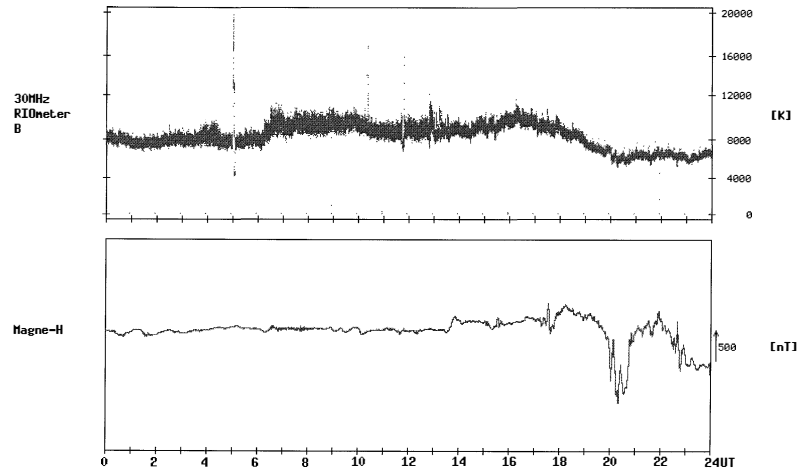
Syowa Station 2004/09/21



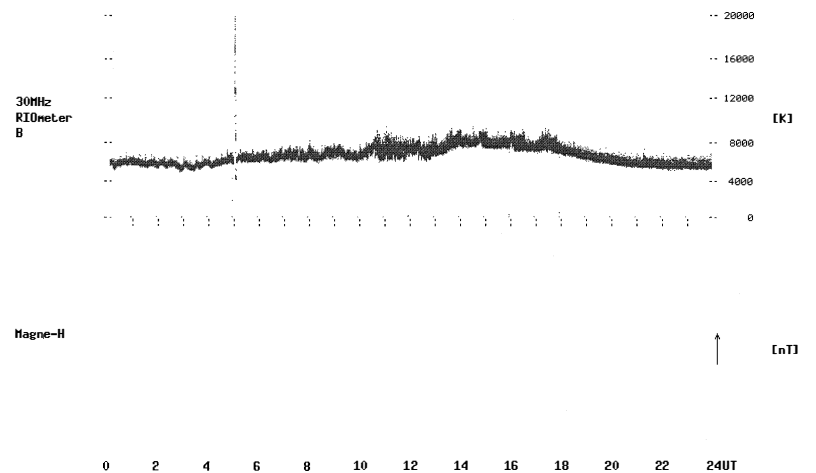
Syowa Station 2004/09/23

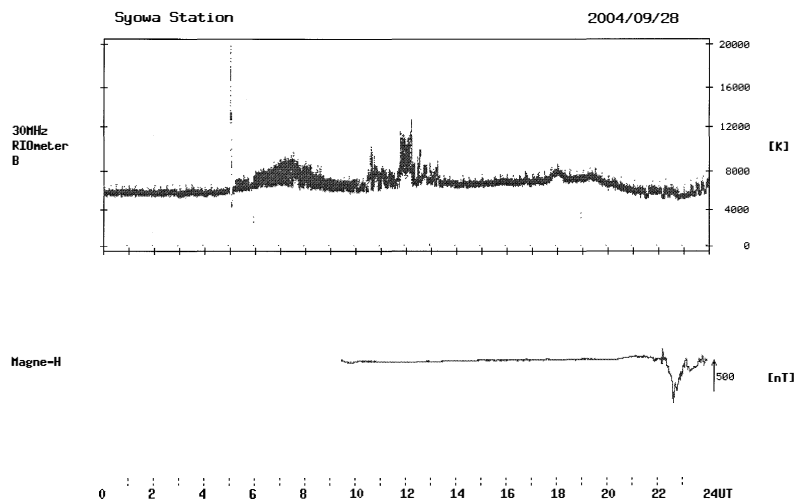
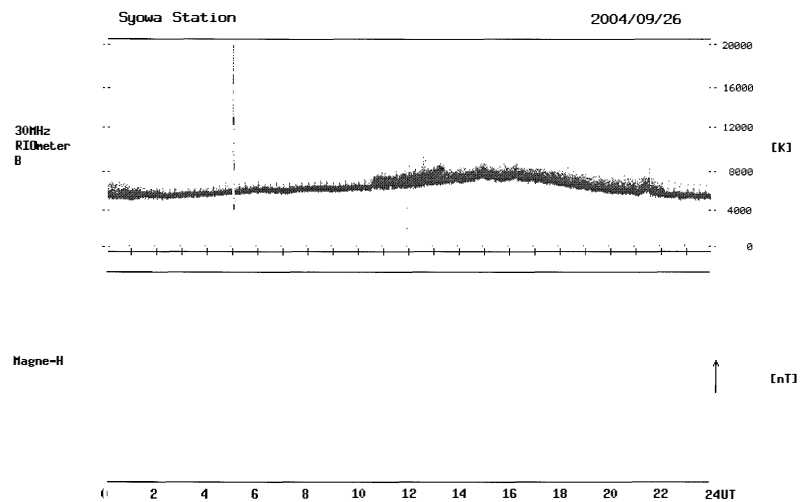
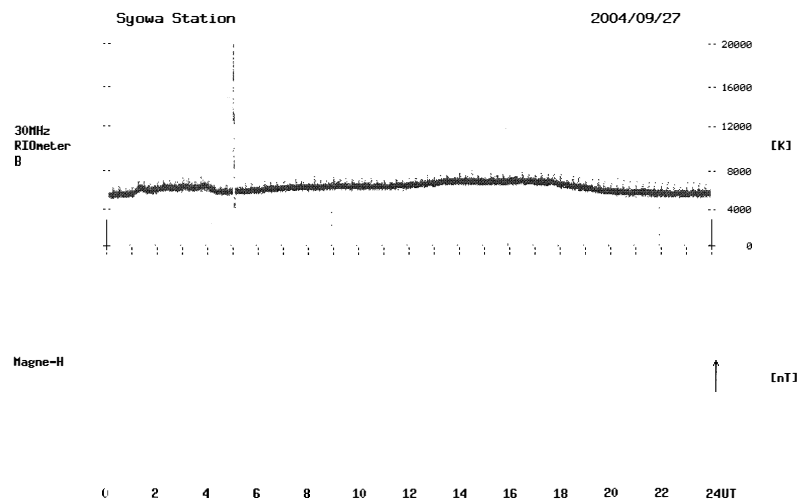
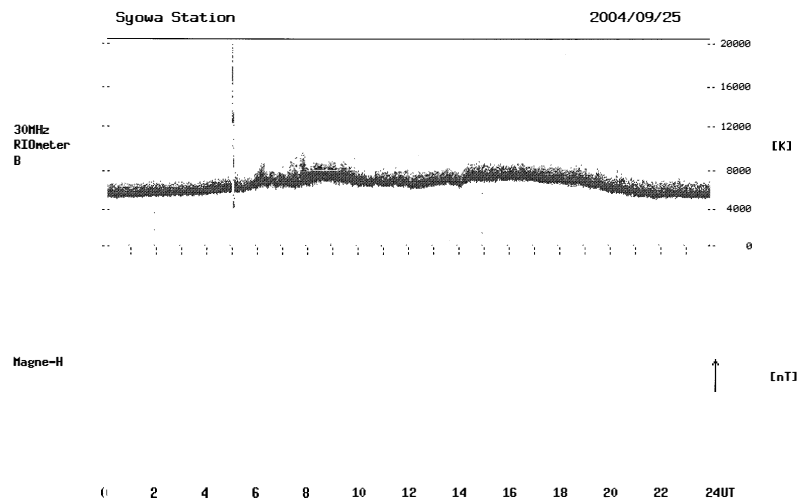


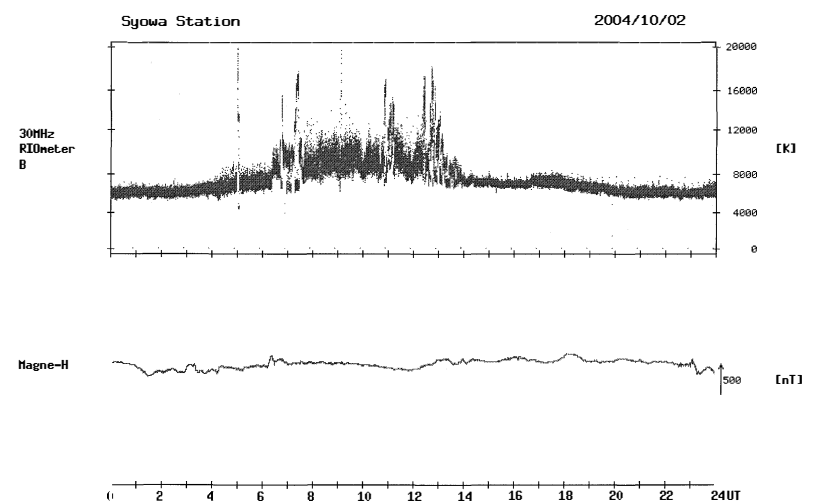
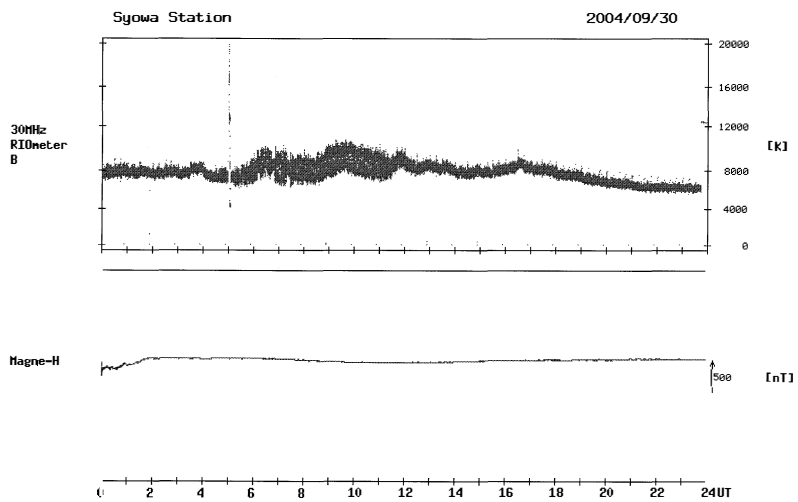
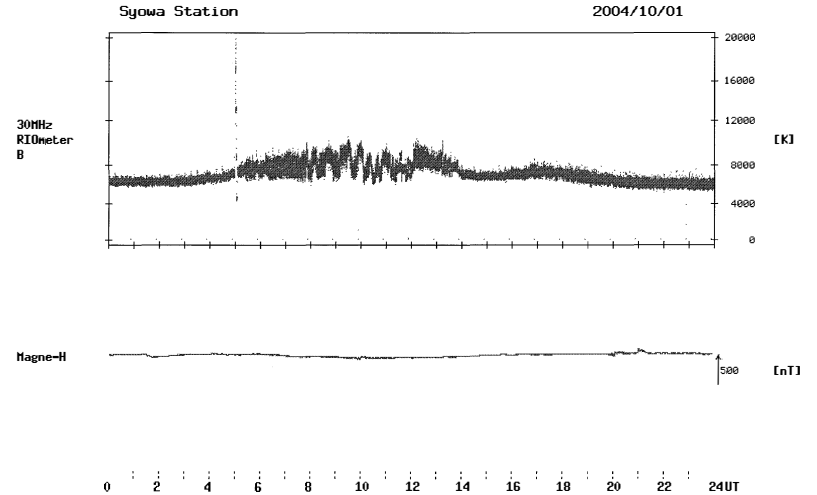
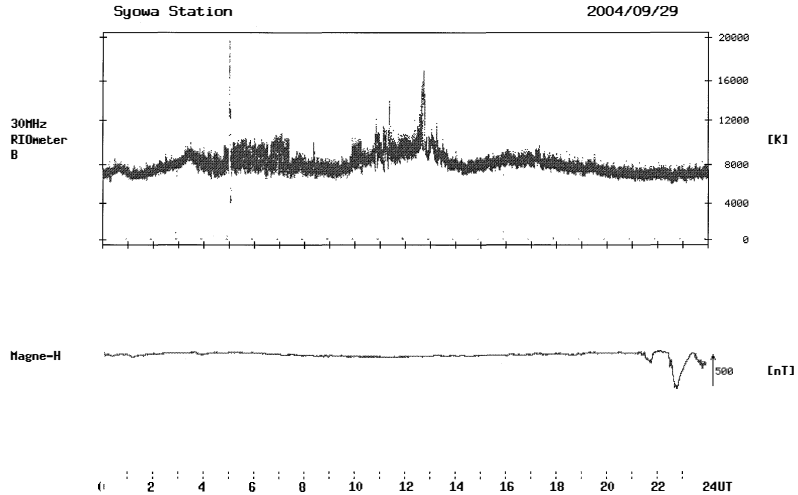
Syowa Station 2004/09/22



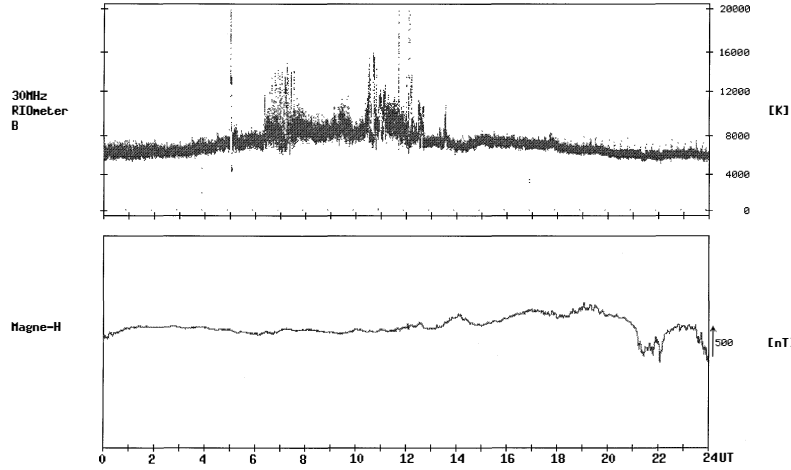
Syowa Station 2004/09/24



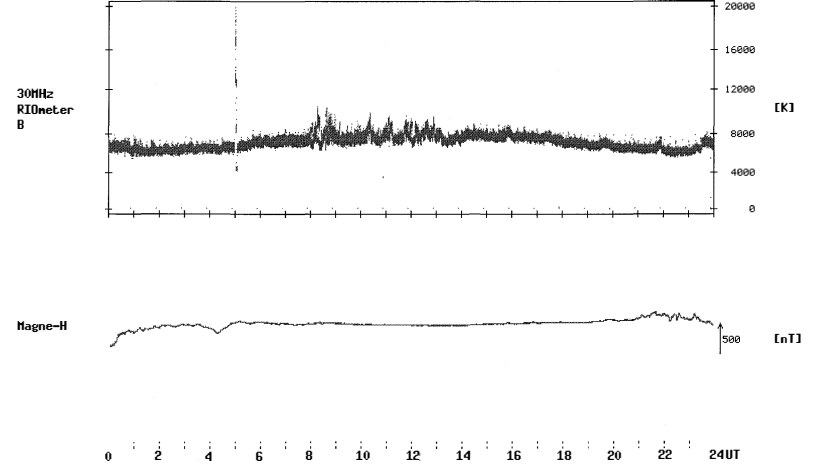




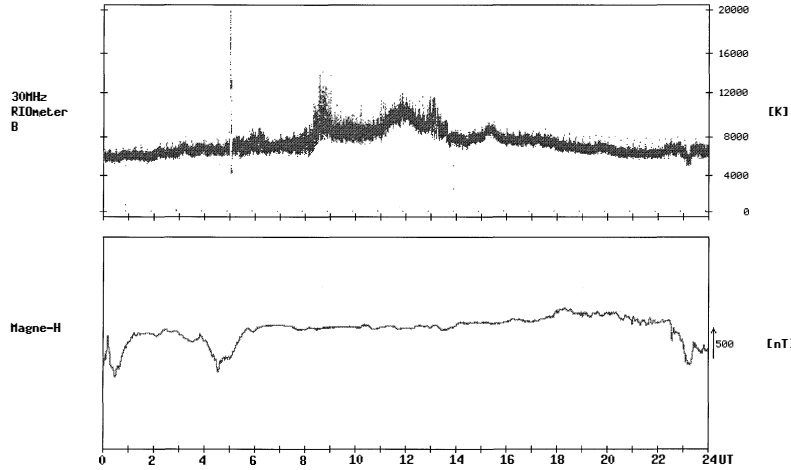
Syowa Station 2004/10/03



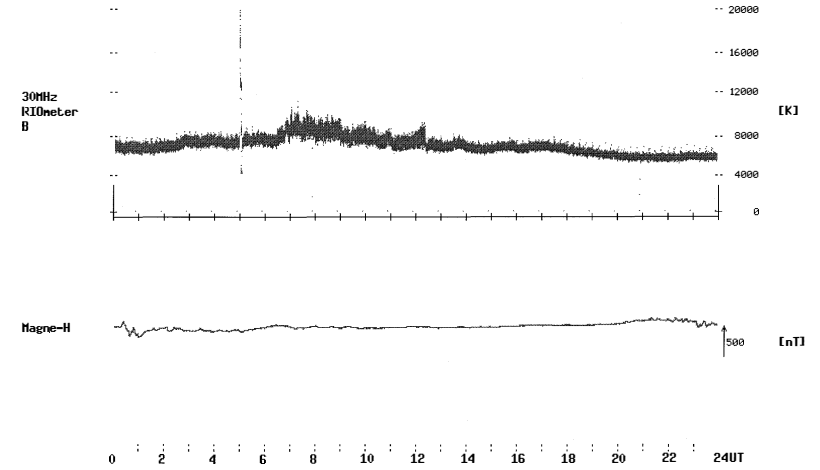
Syowa Station 2004/10/05

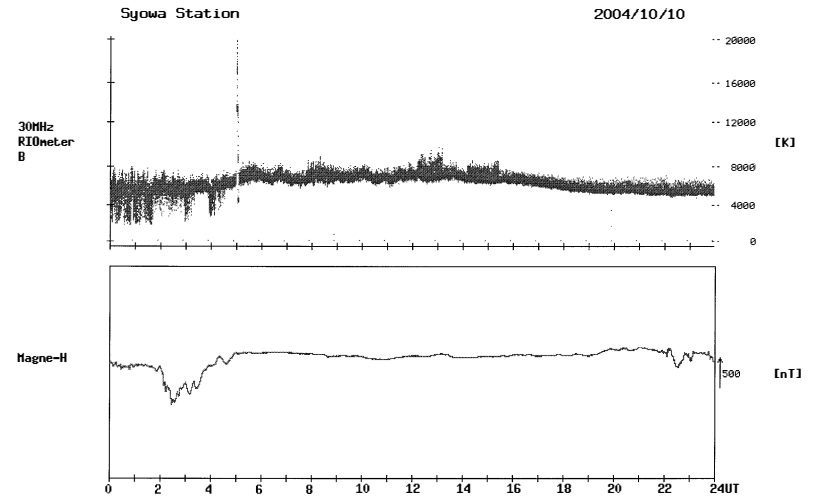
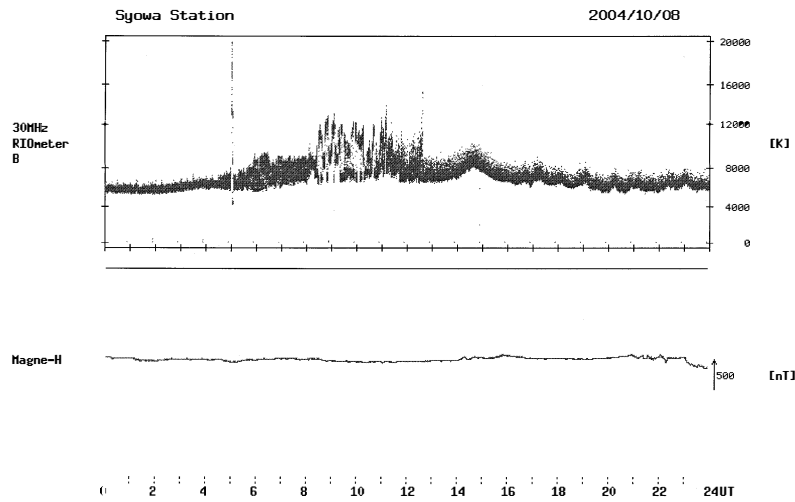
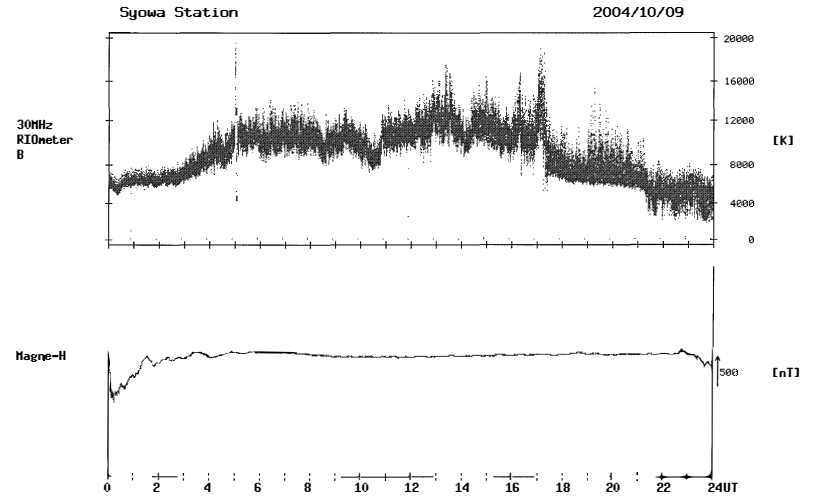
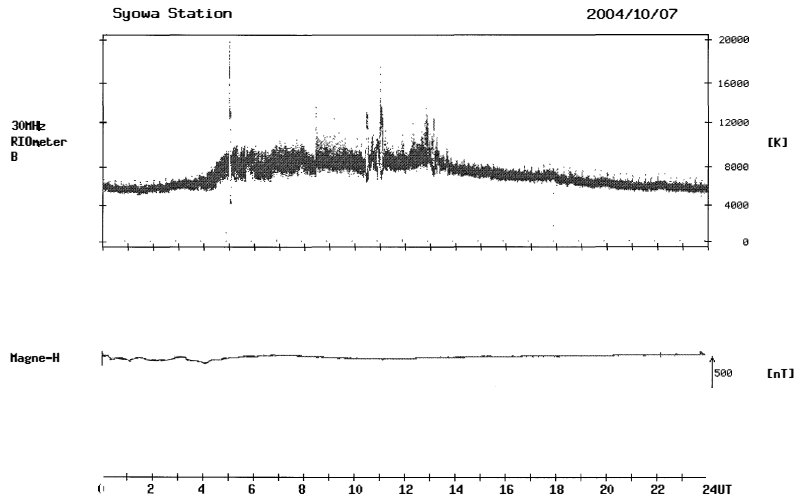


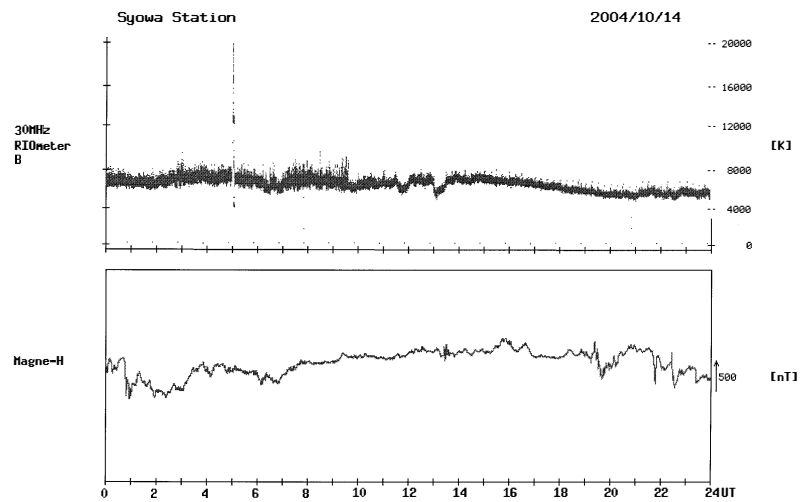
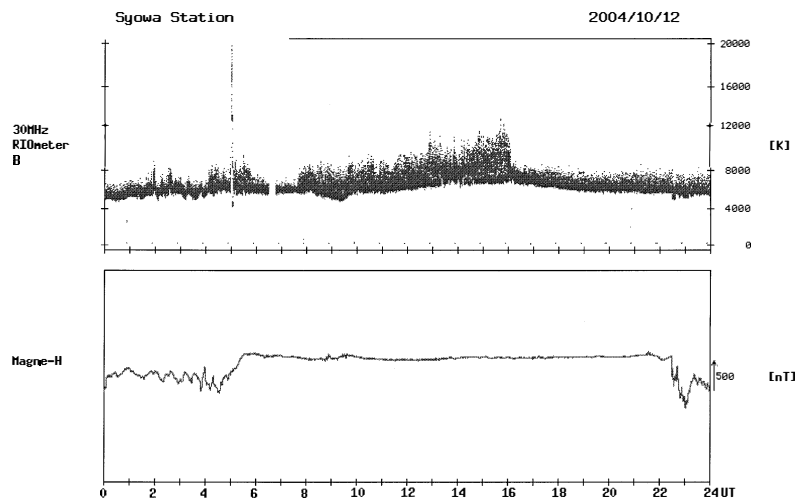
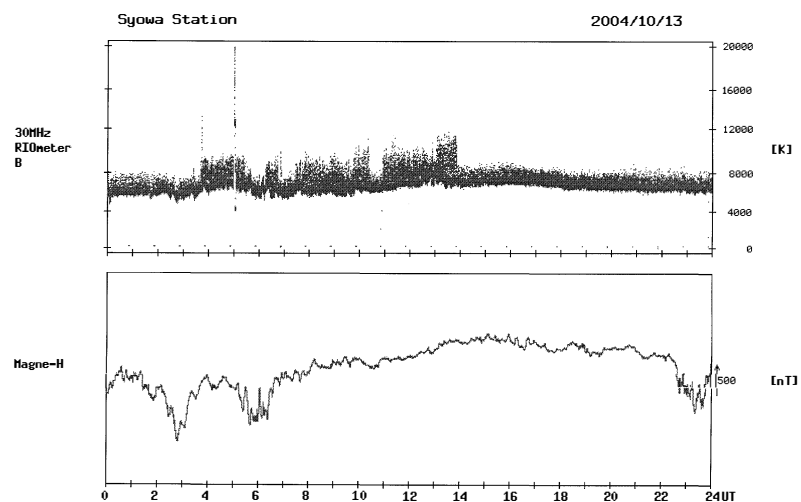
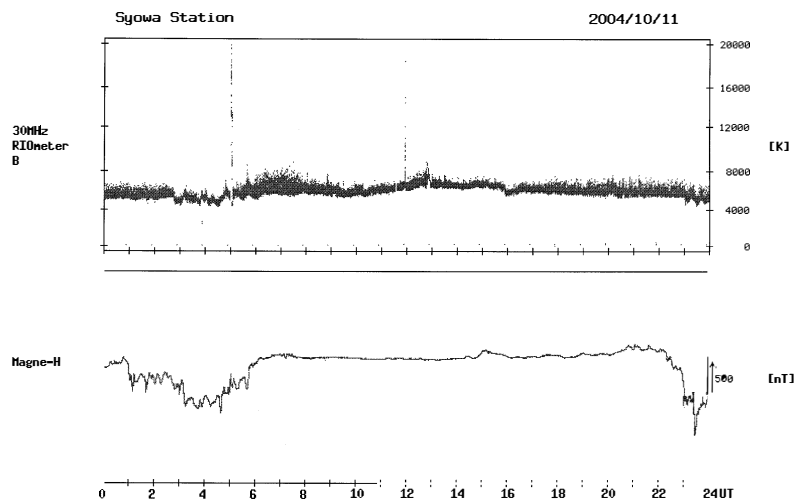
Syowa Station 2004/10/04



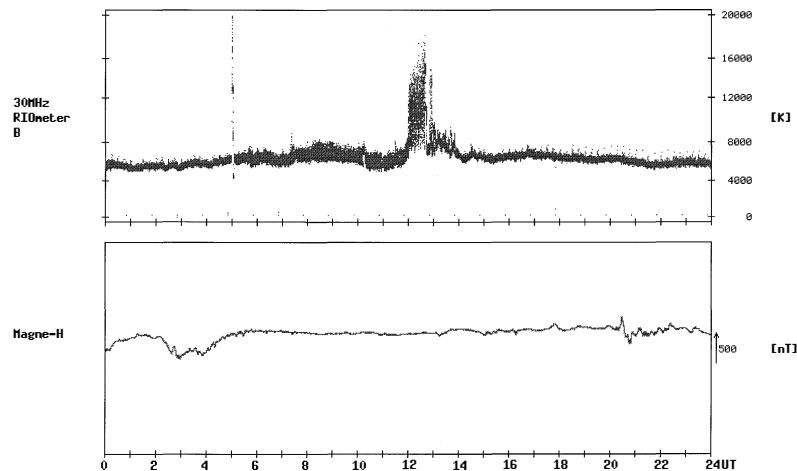
Syowa Station 2004/10/06



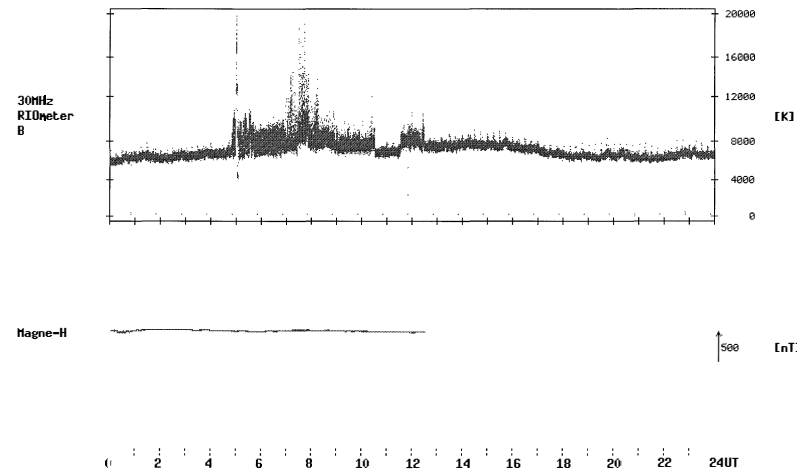




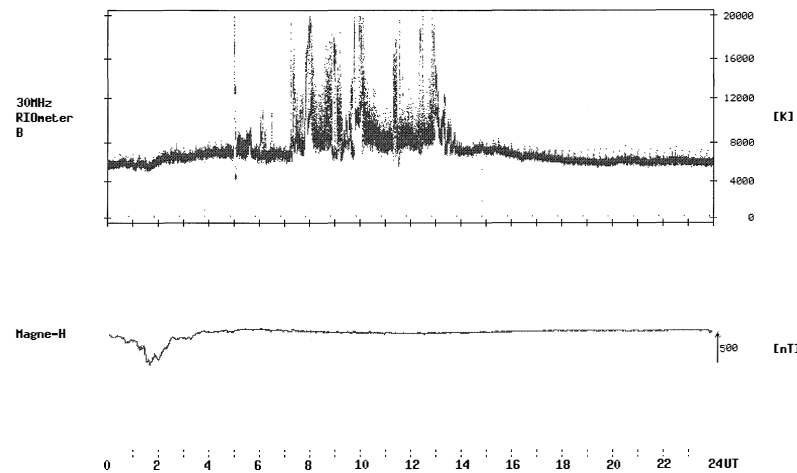
Syowa Station 2004/10/15



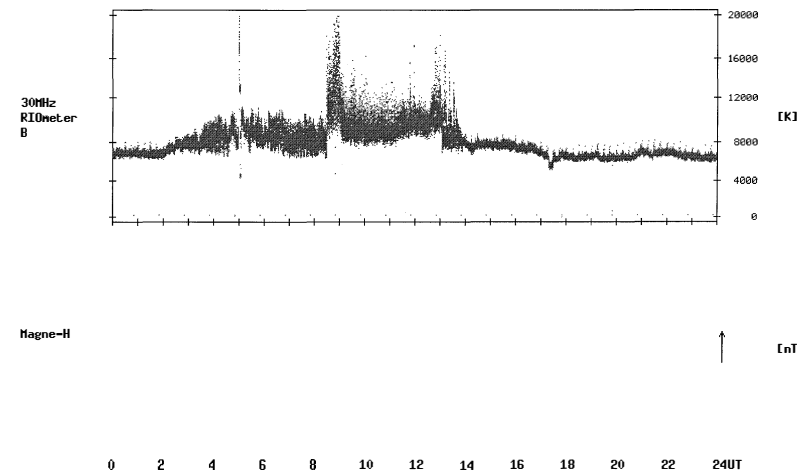
Syowa Station 2004/10/17

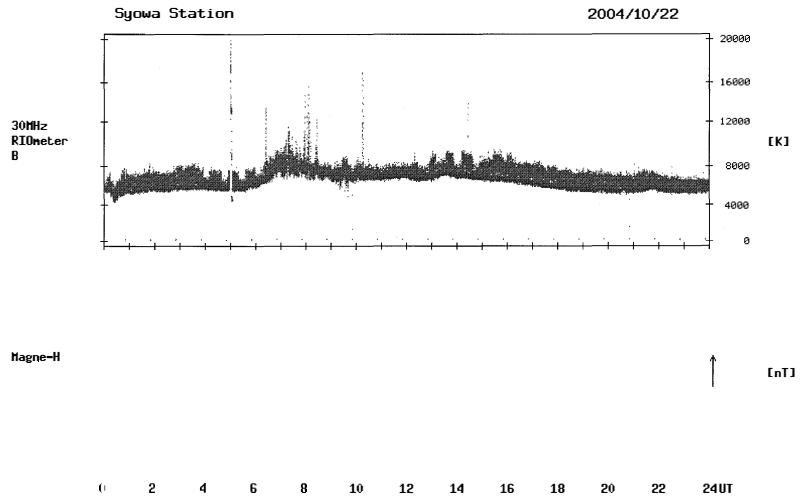
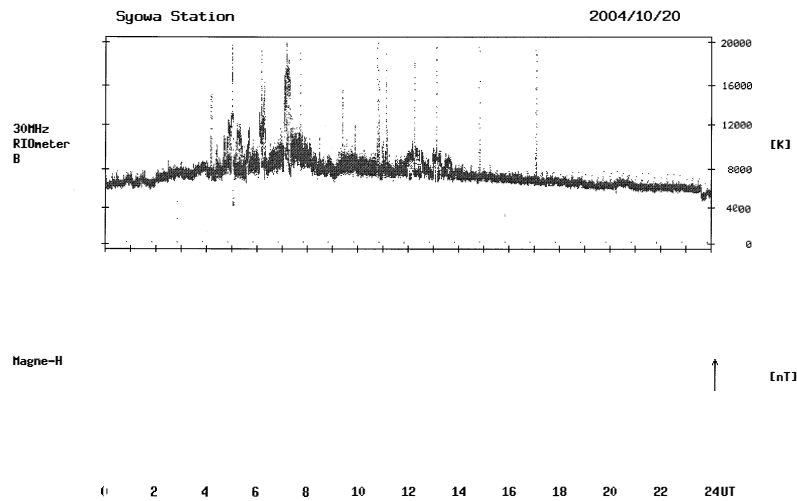
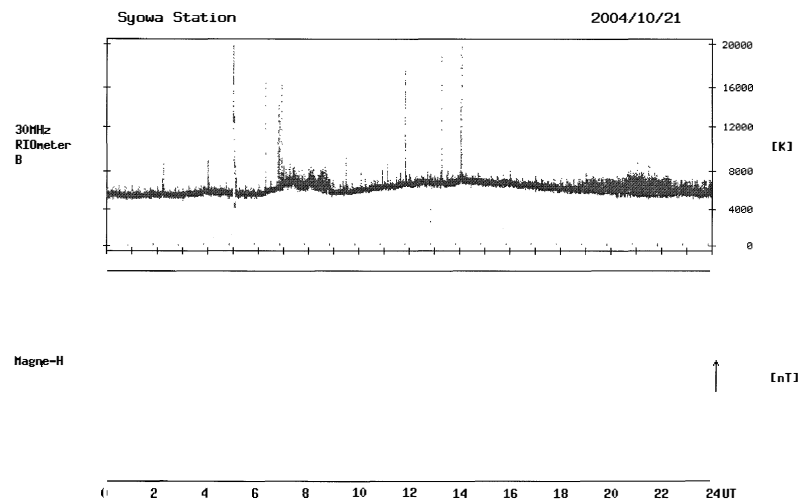
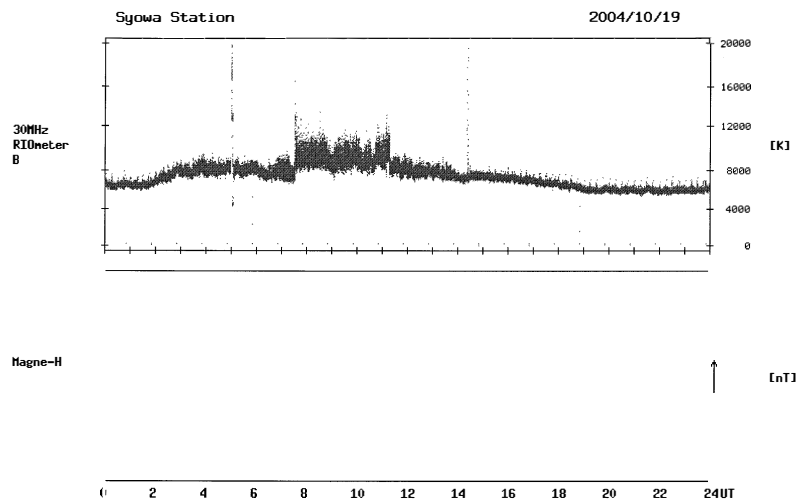


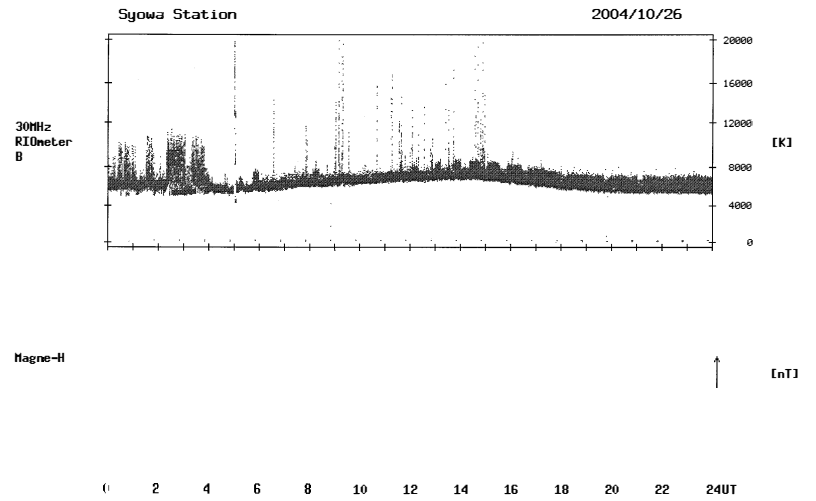
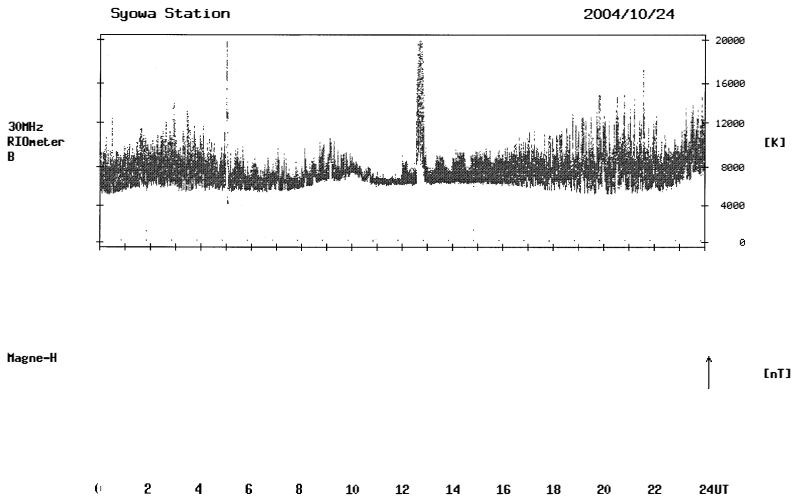
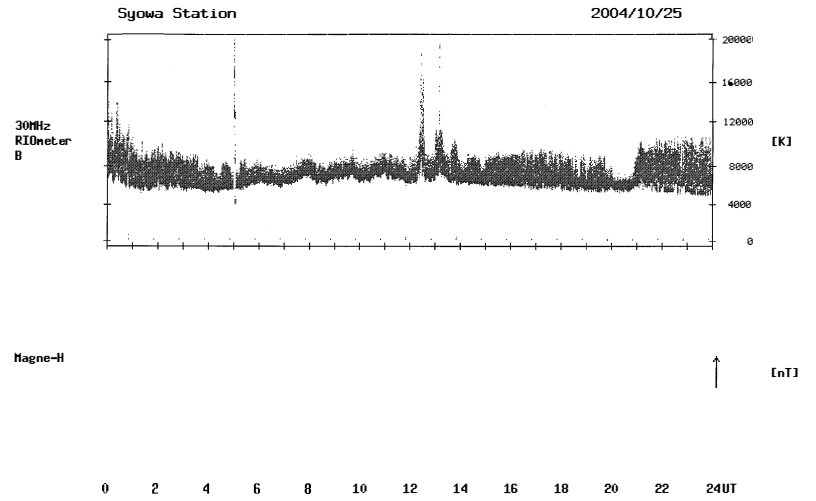
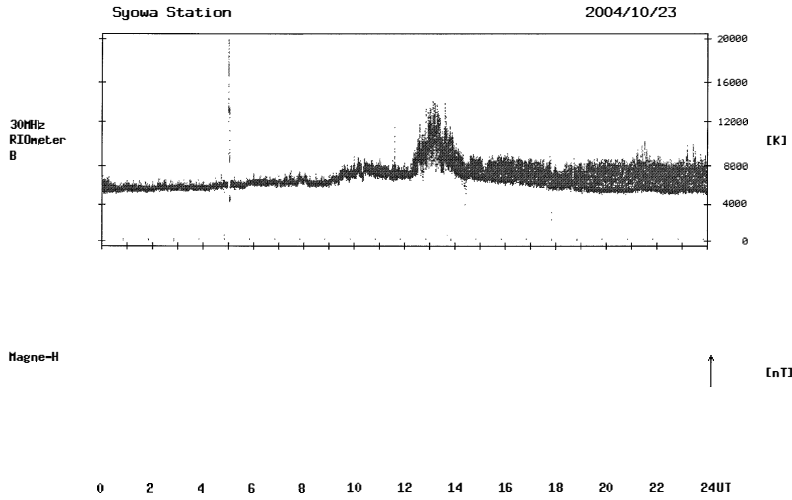
Syowa Station 2004/10/16

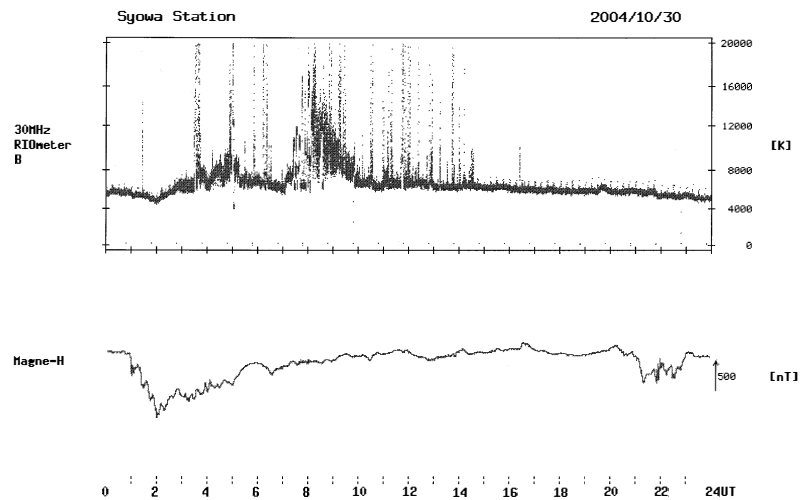
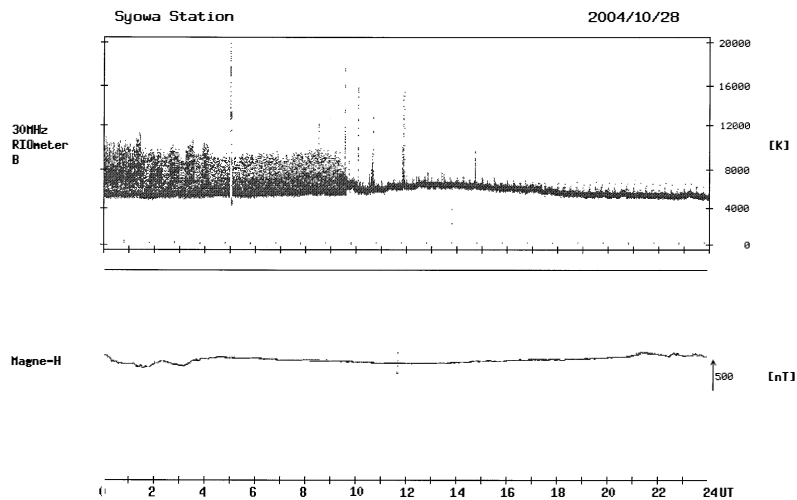
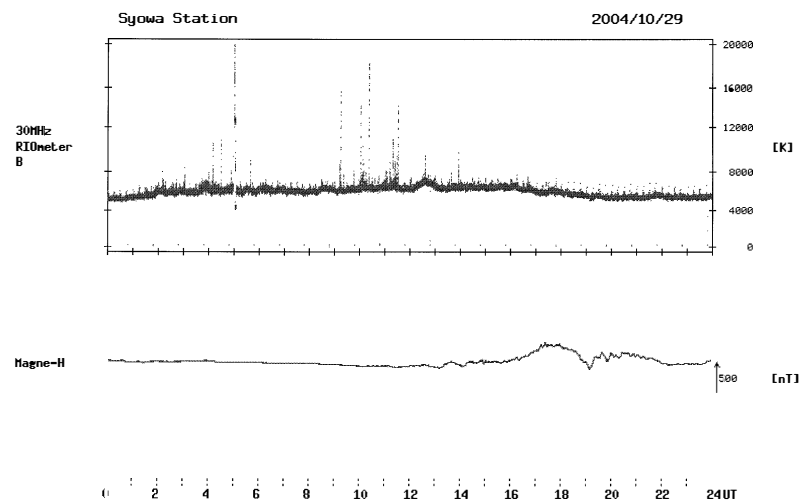
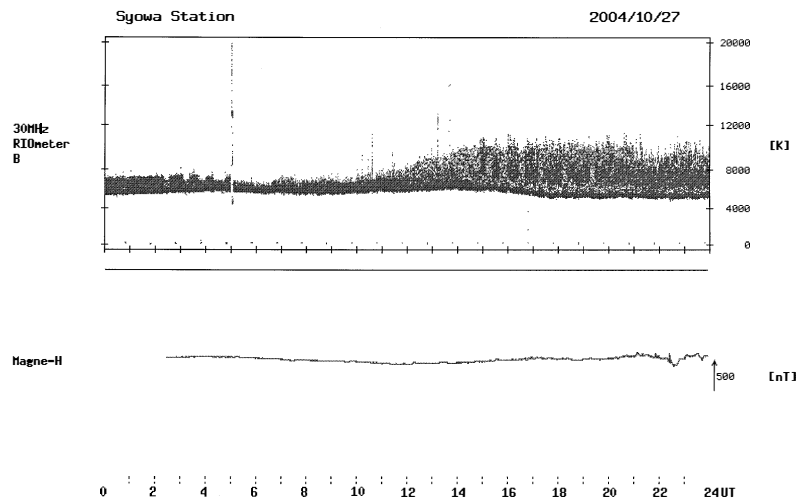


Syowa Station 2004/10/18

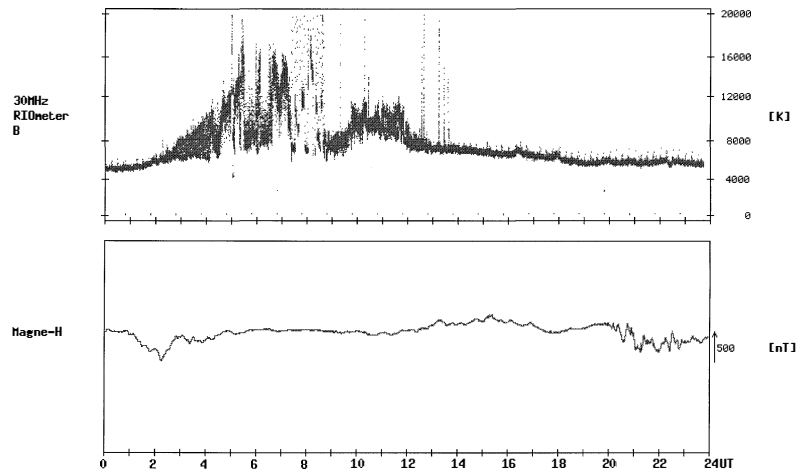




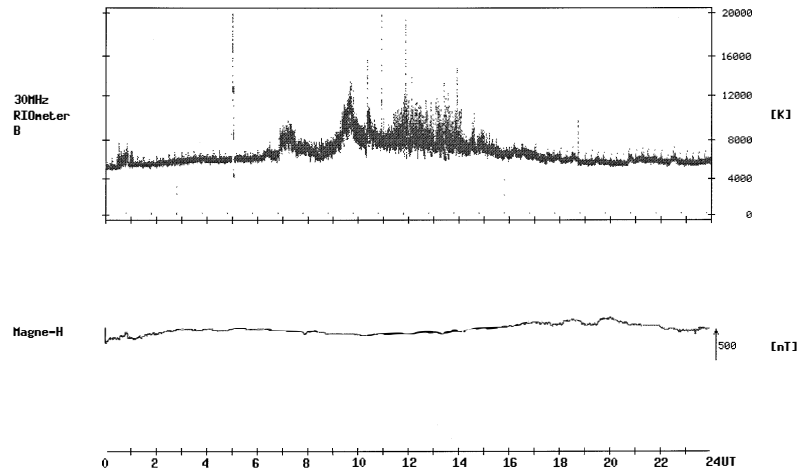




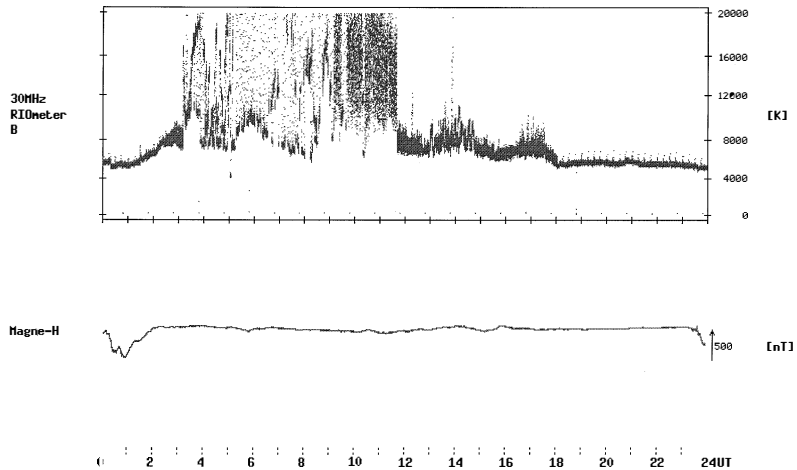
Syowa Station 2004/10/31



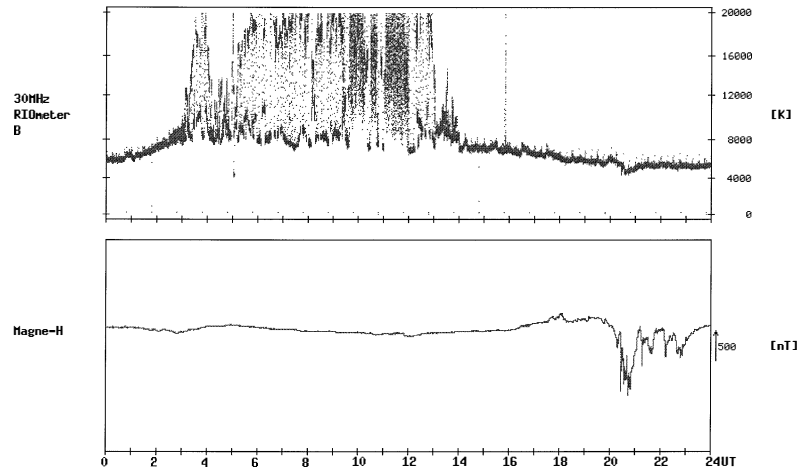
Syowa Station 2004/11/02



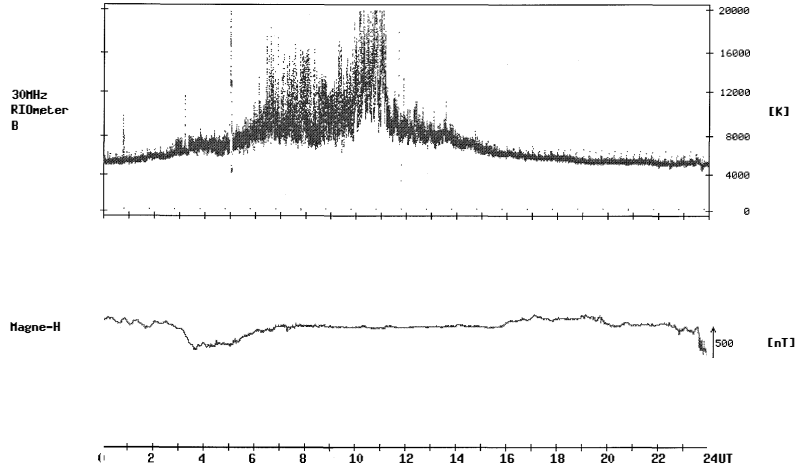
Syowa Station 2004/11/01



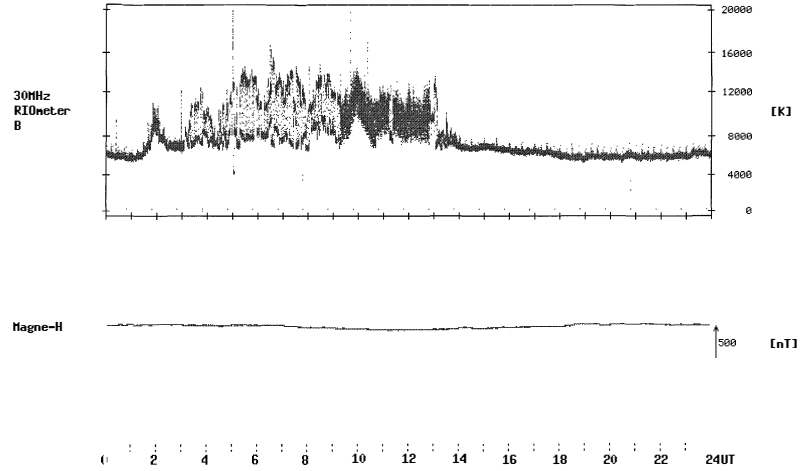
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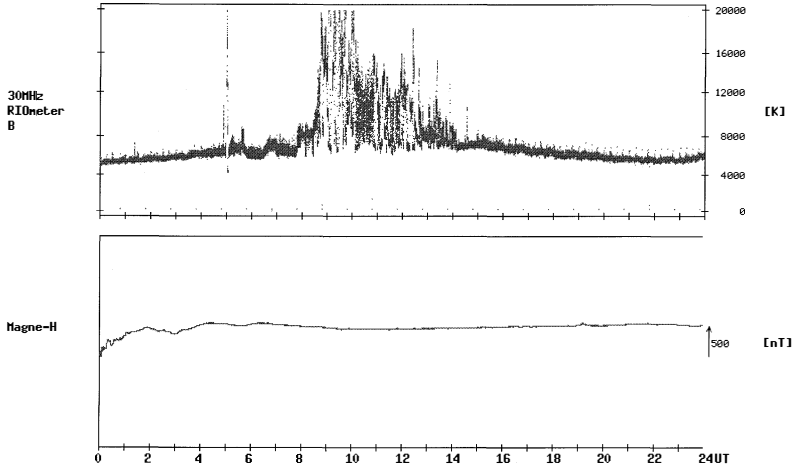
Syowa Station 2004/11/04



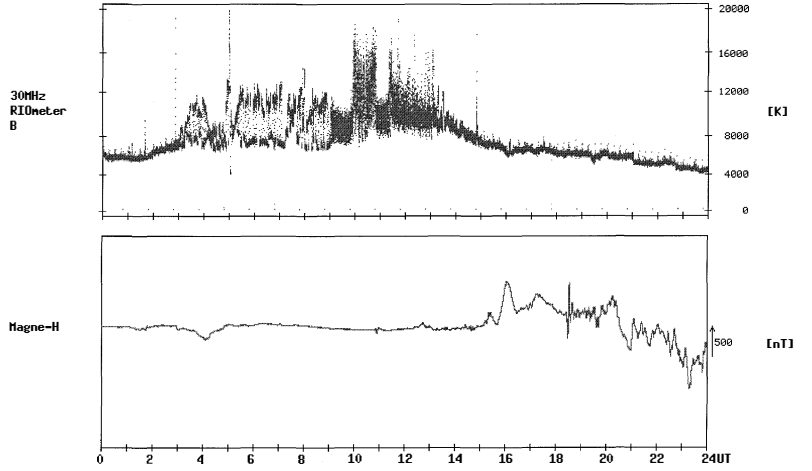
Syowa Station 2004/11/06

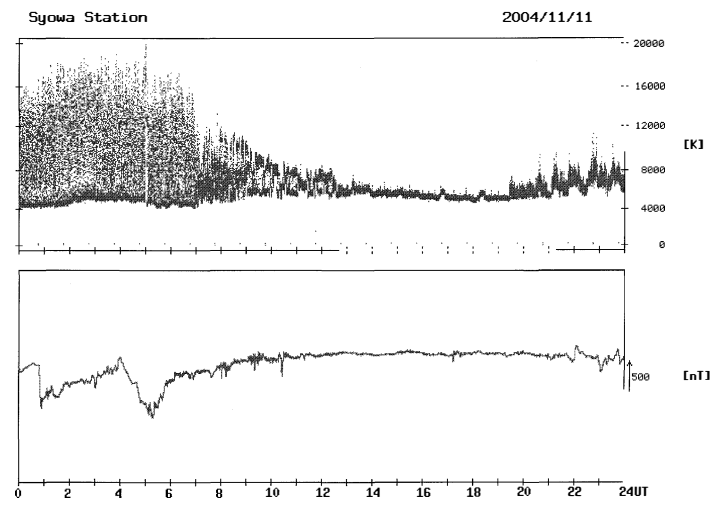
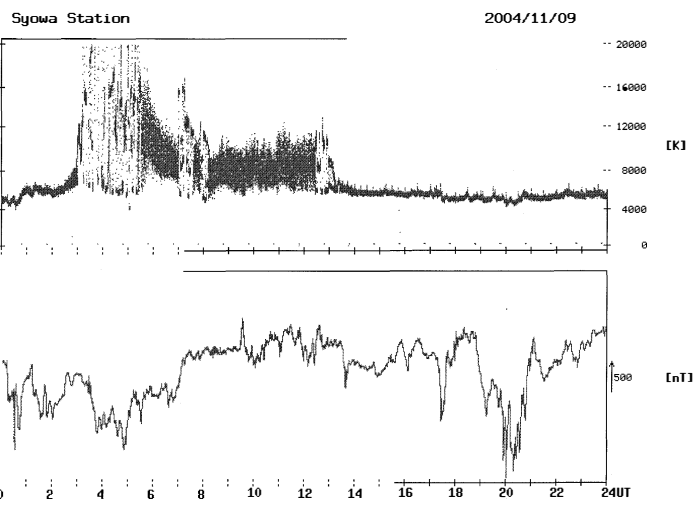
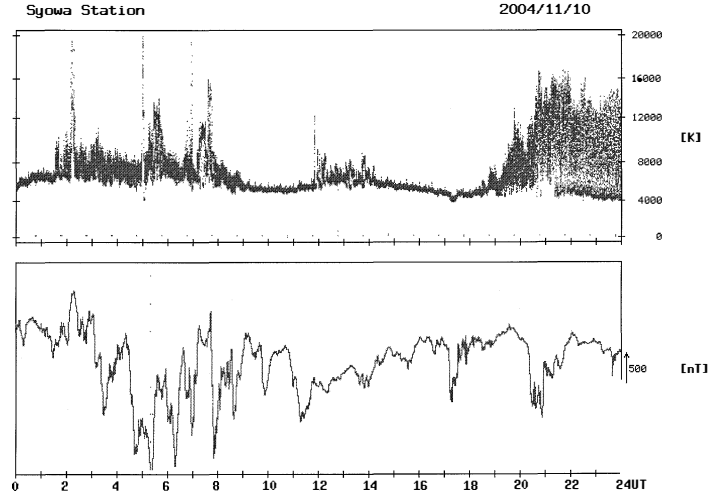
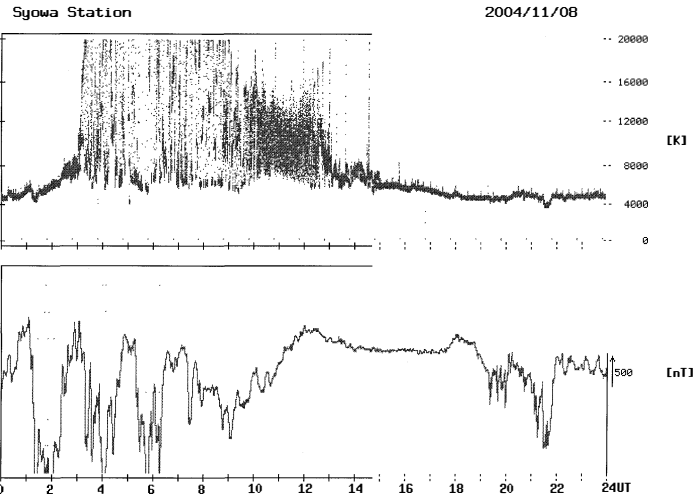


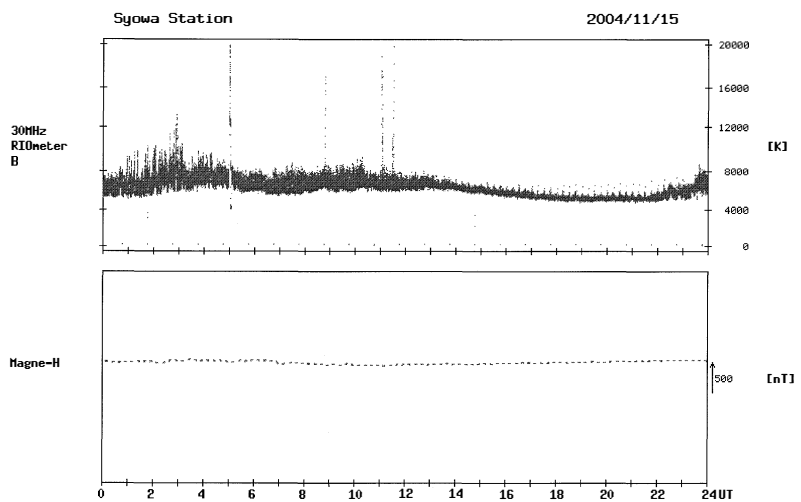
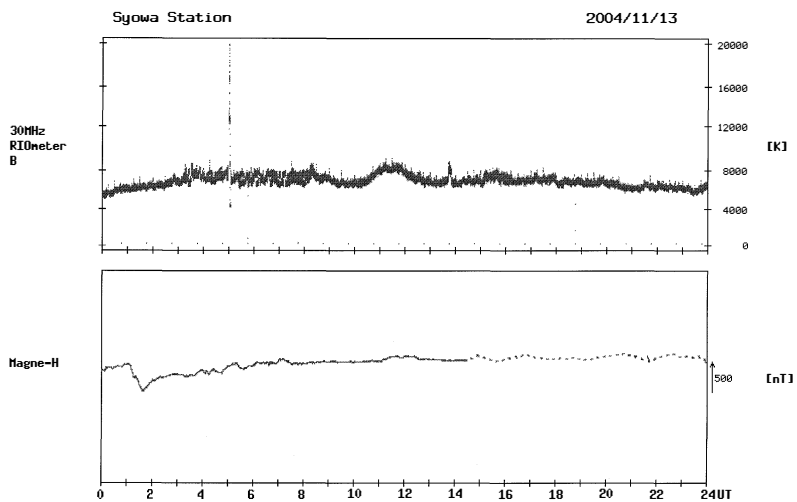
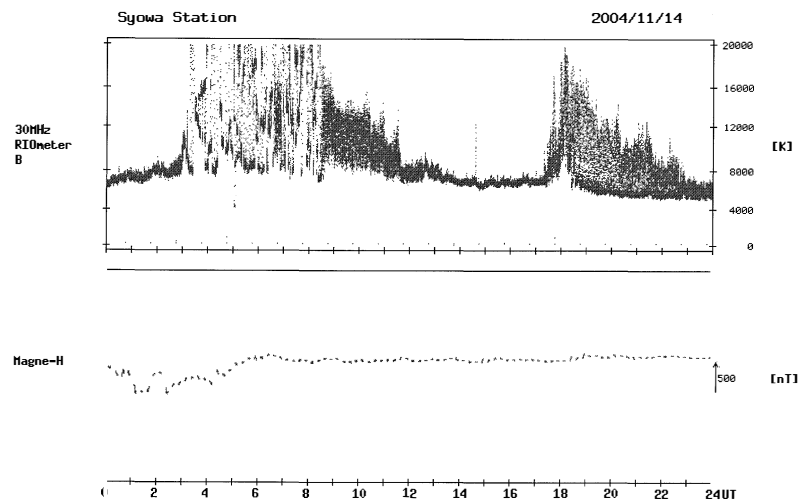
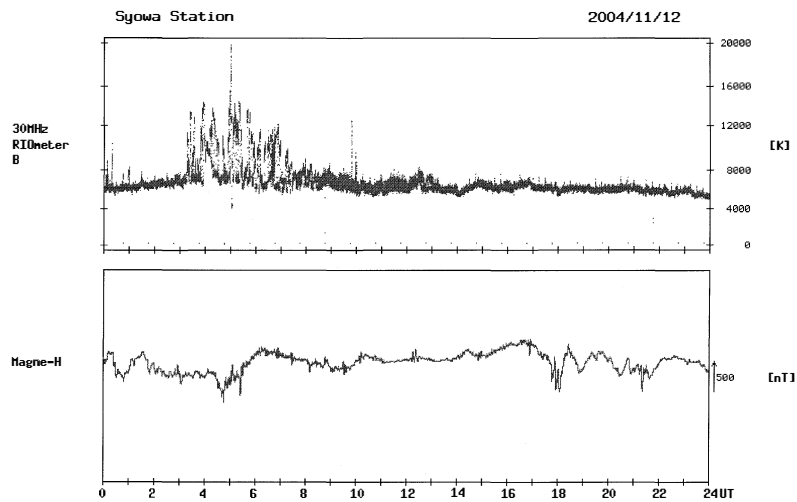
Syowa Station 2004/11/05



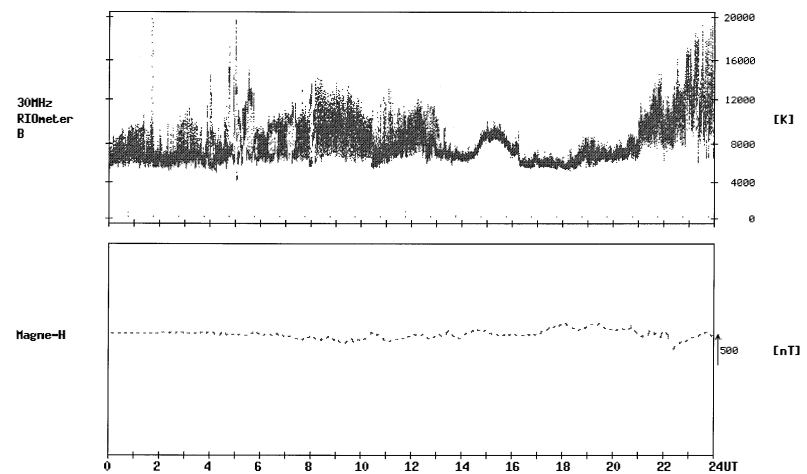
Syowa Station 2004/11/07



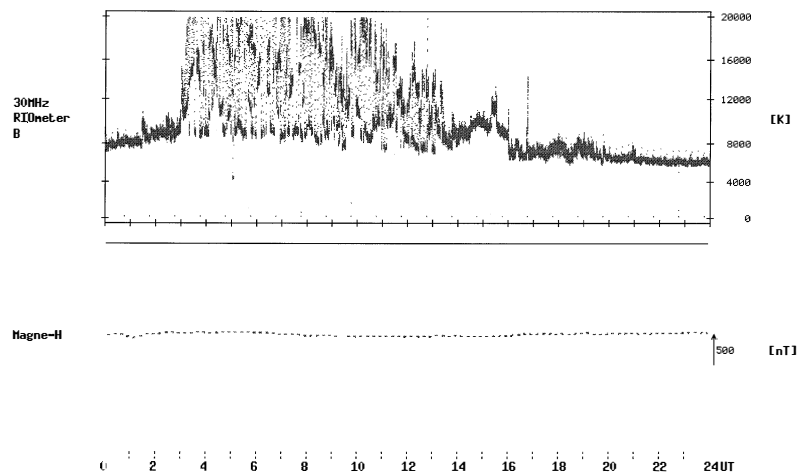




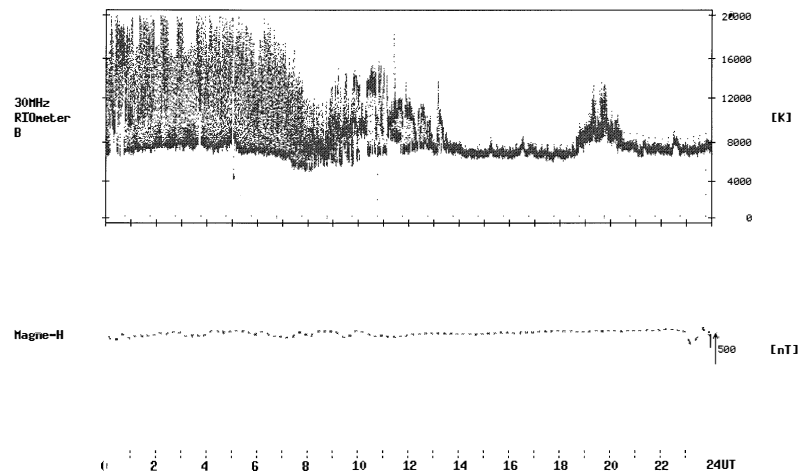
Syowa Station 2004/11/16



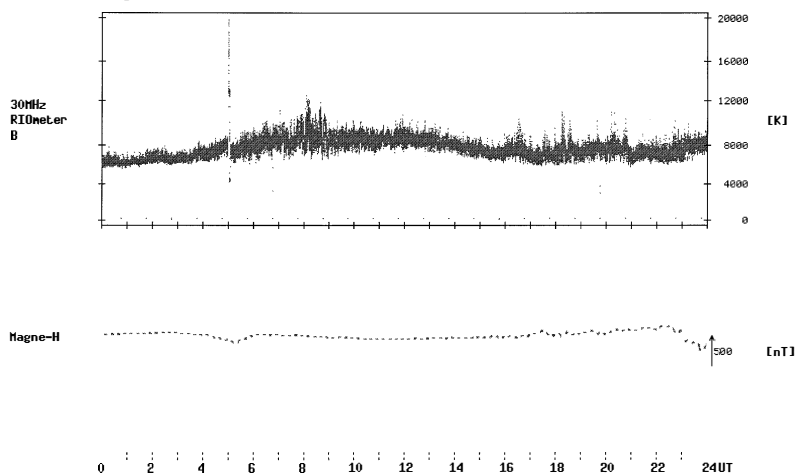
Syowa Station 2004/11/18

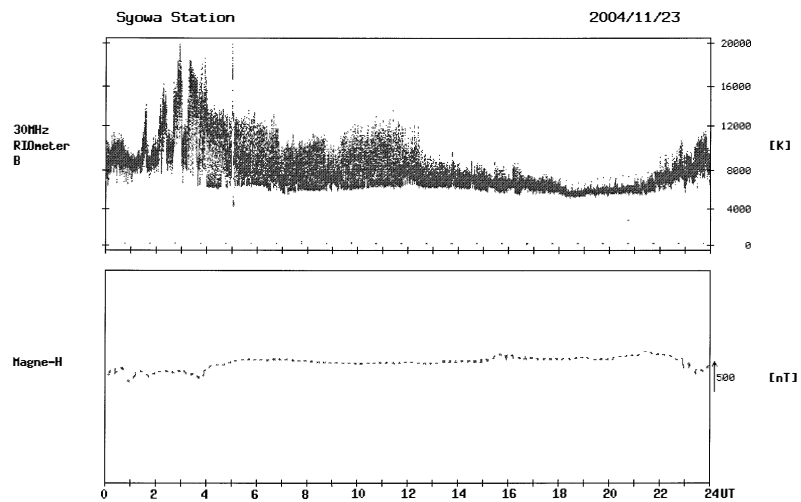
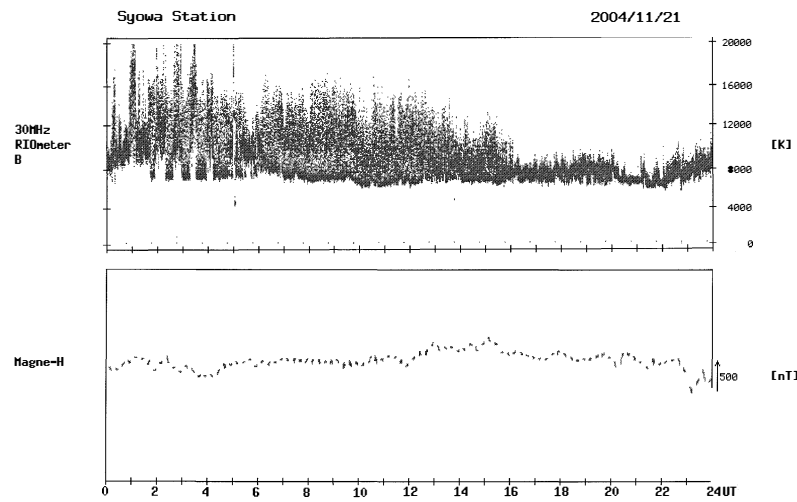
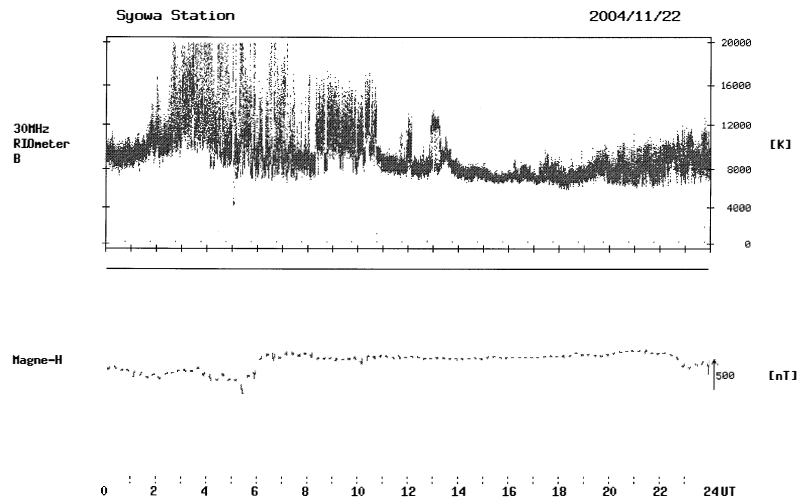
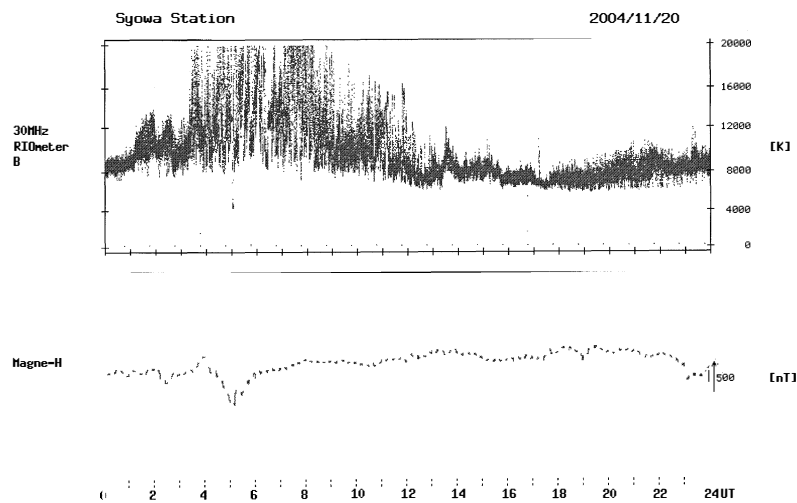


Syowa Station 2004/11/17



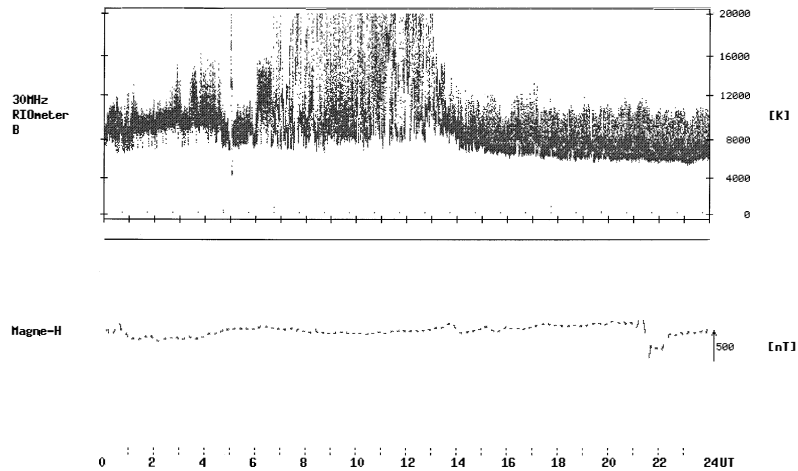
Syowa Station 2004/11/19





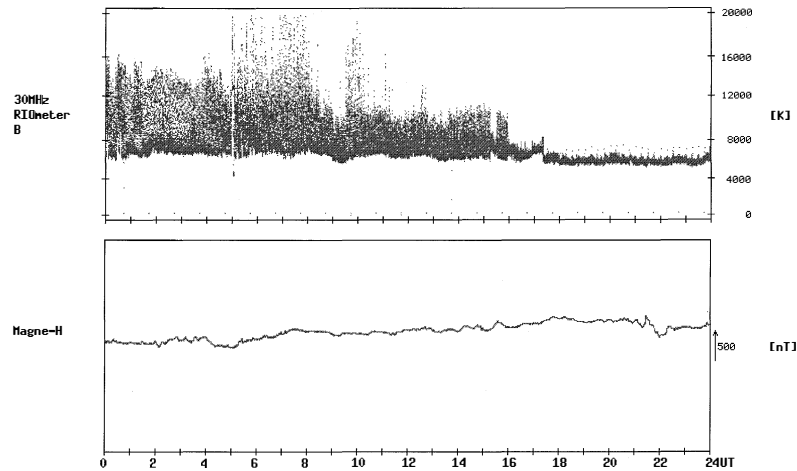
Syowa Station

2004/11/24



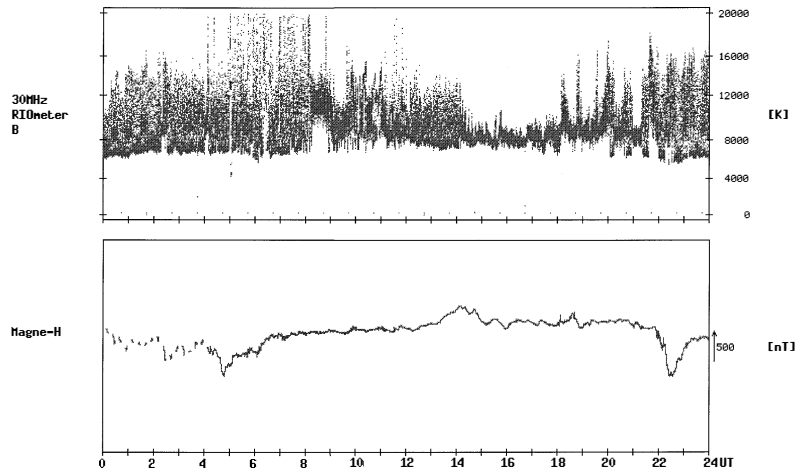
Syowa Station

2004/11/26



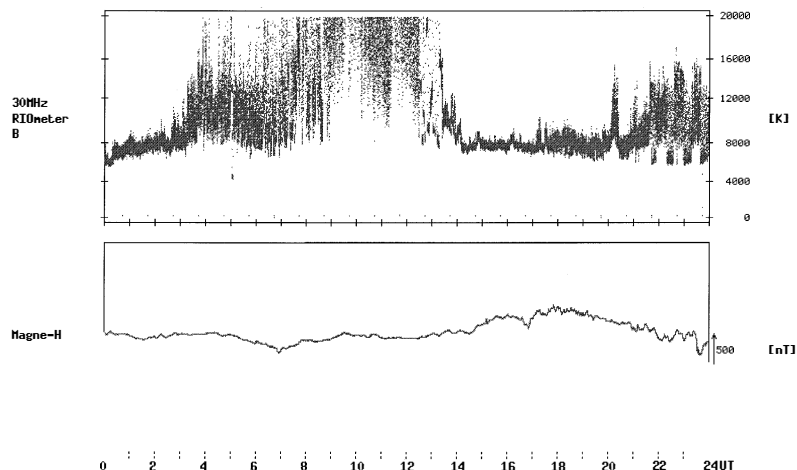
Syowa Station

2004/11/25

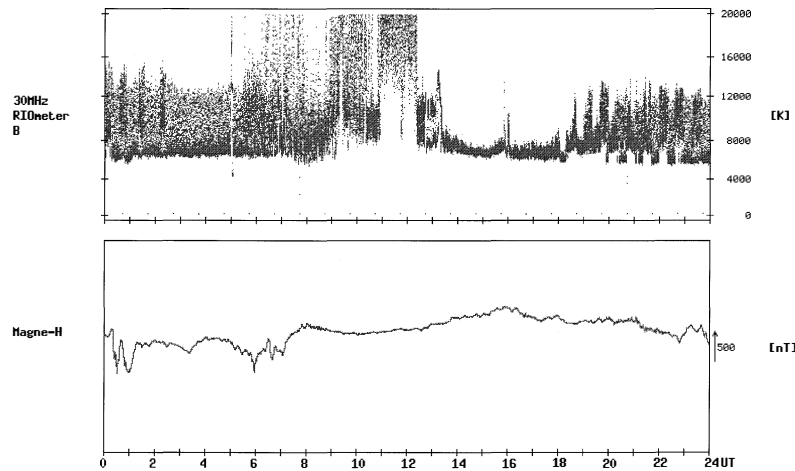


Syowa Station

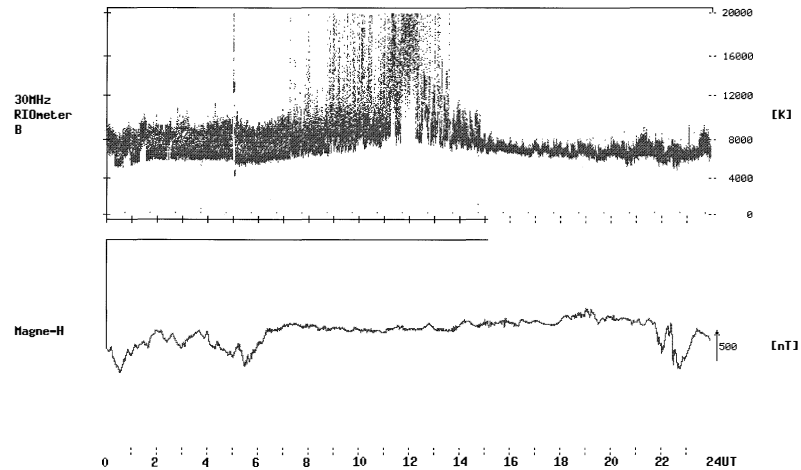
2004/11/27



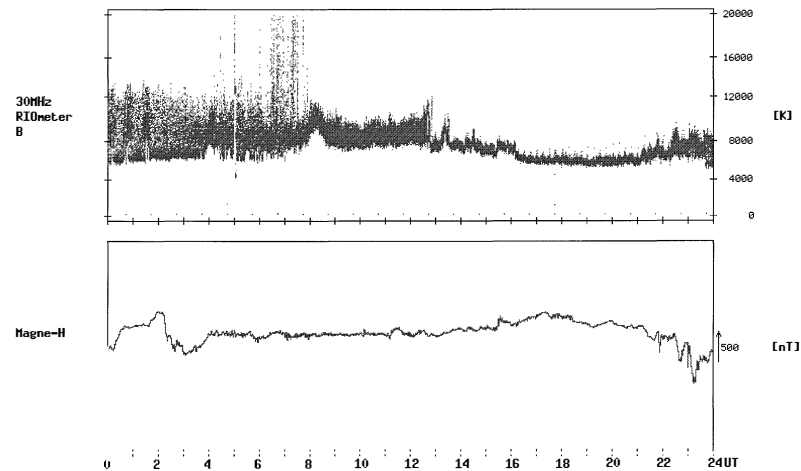
Syowa Station 2004/11/28



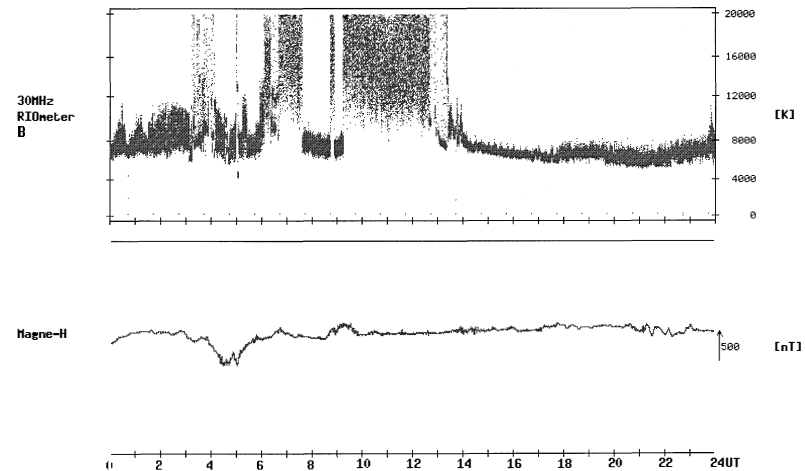
Syowa Station 2004/11/30



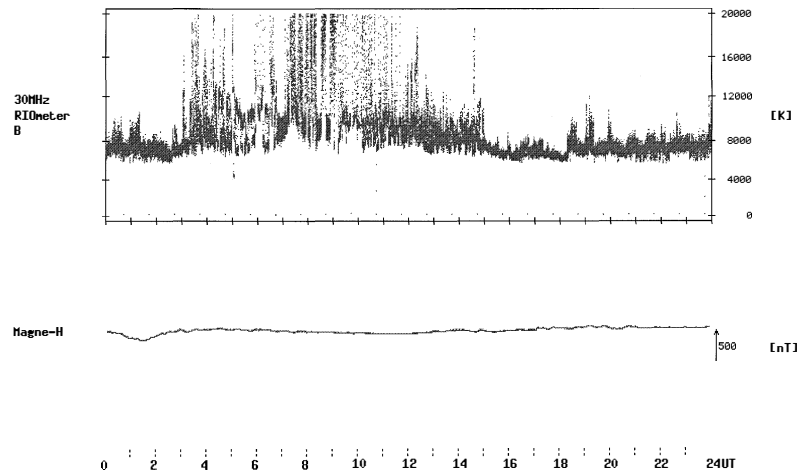
Syowa Station 2004/11/29



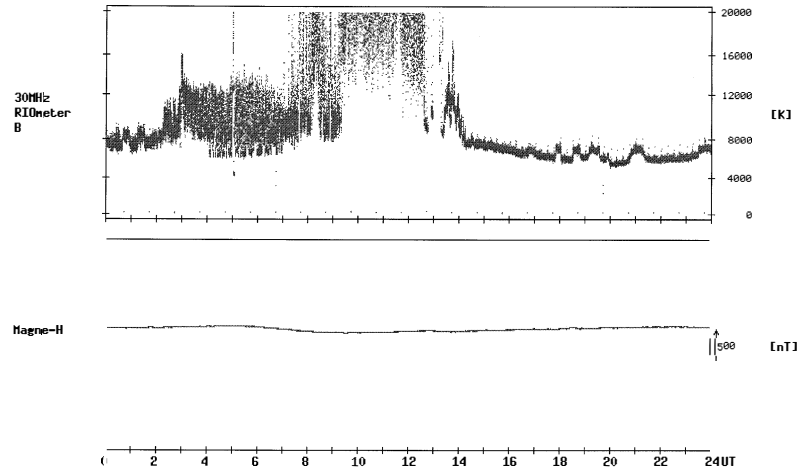
Syowa Station 2004/12/01



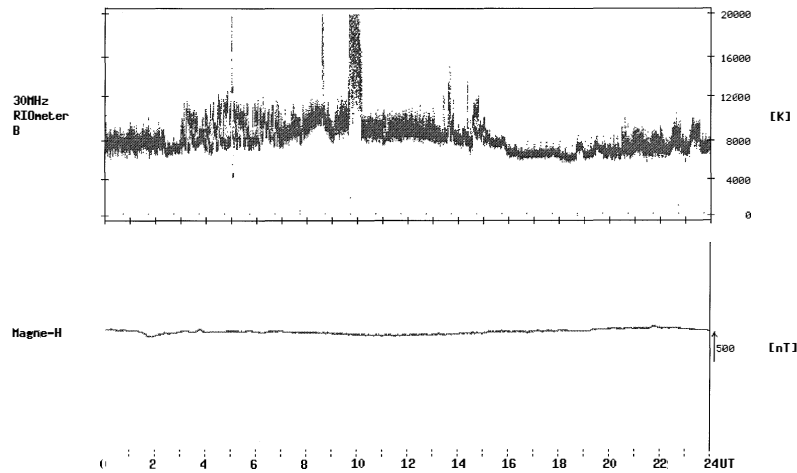
Syowa Station 2004/12/02



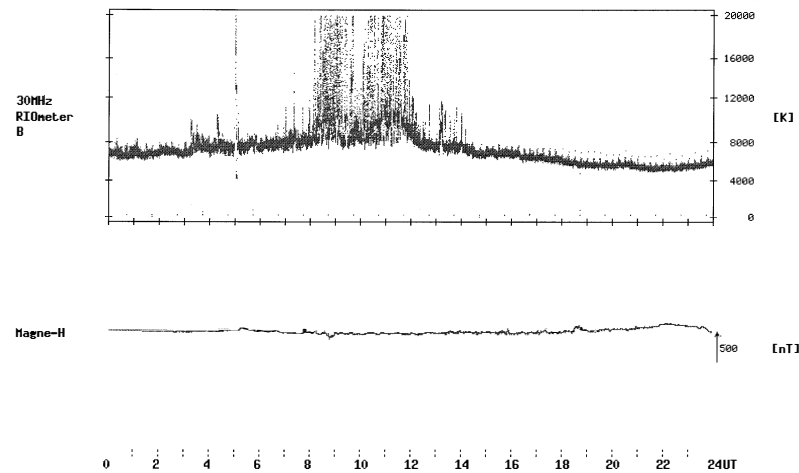
Syowa Station 2004/12/04



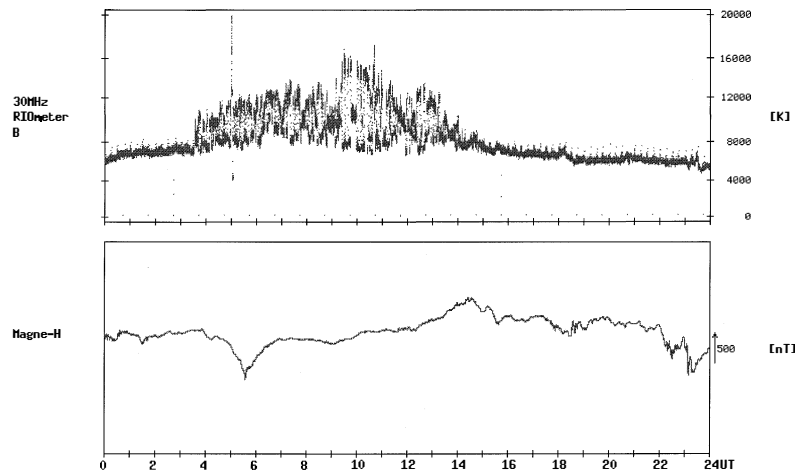
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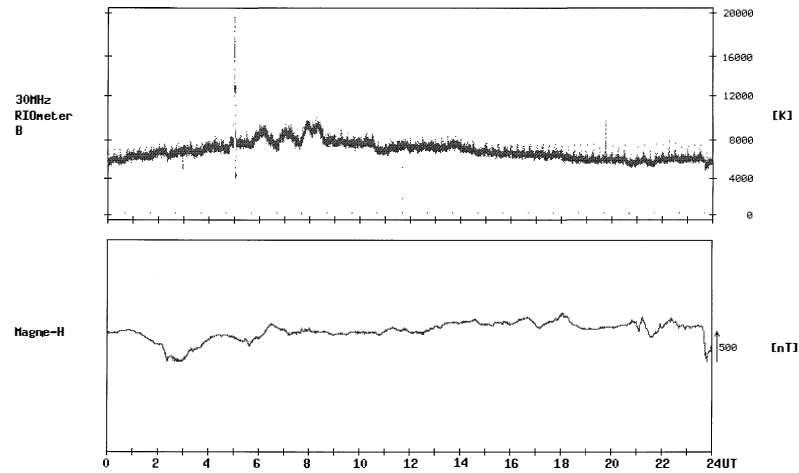
Syowa Station 2004/12/05



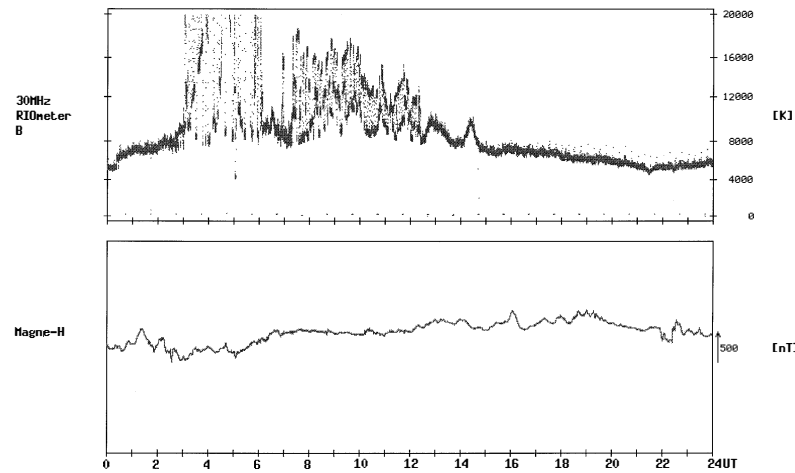
Syowa Station 2004/12/06



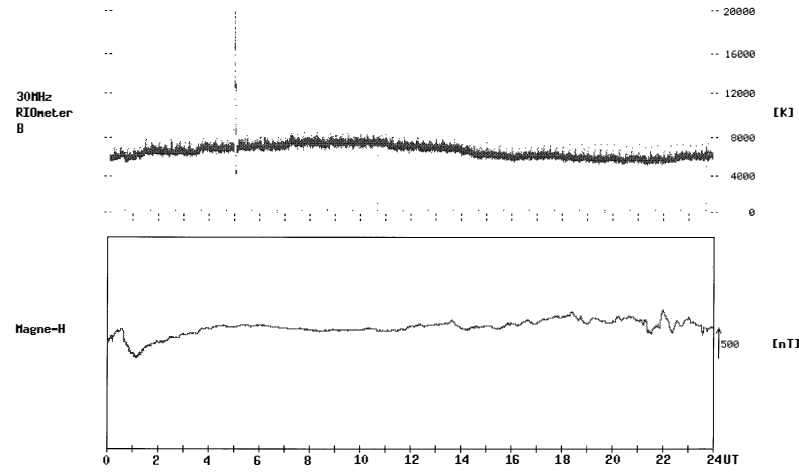
Syowa Station 2004/12/08



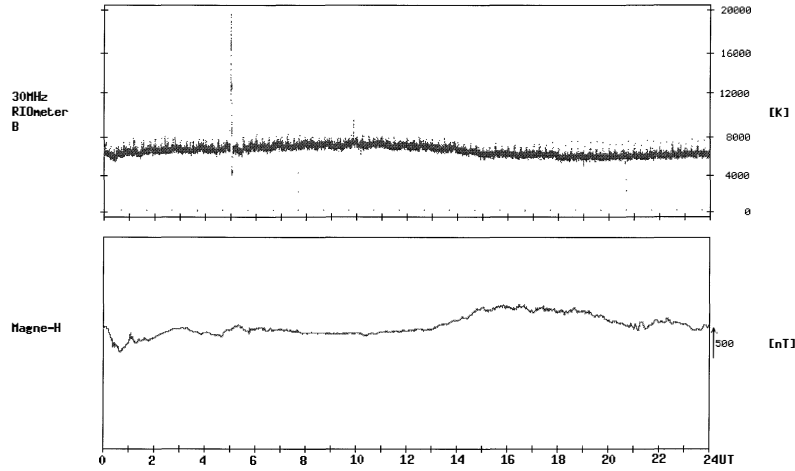
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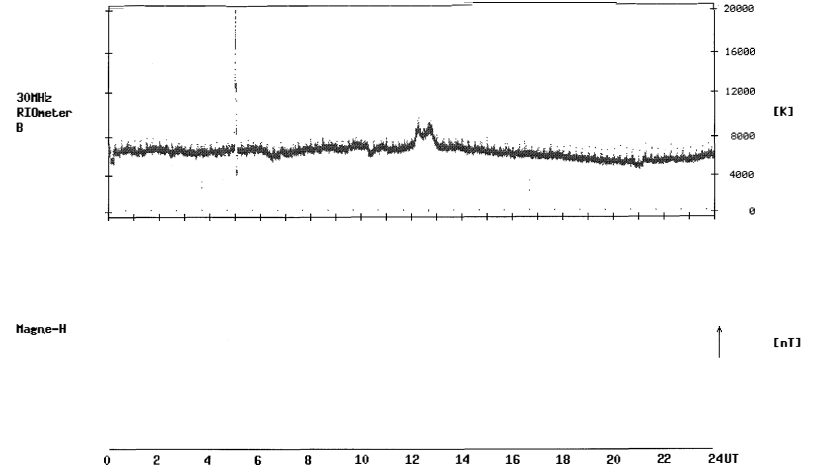
Syowa Station 2004/12/09



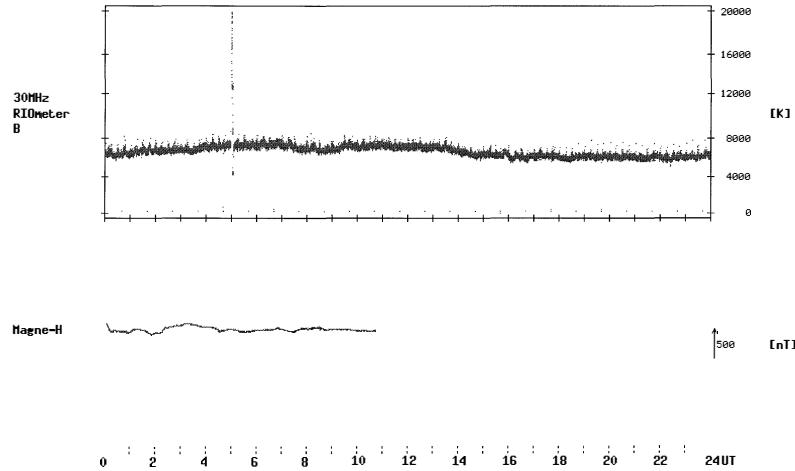
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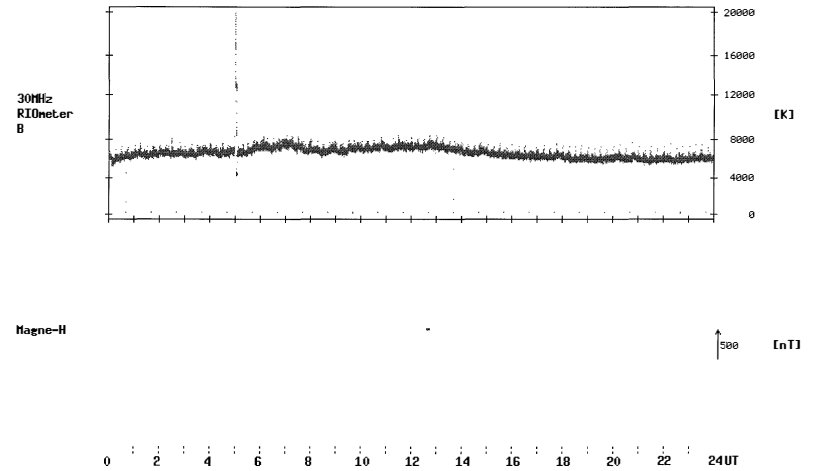
Syowa Station 2004/12/12

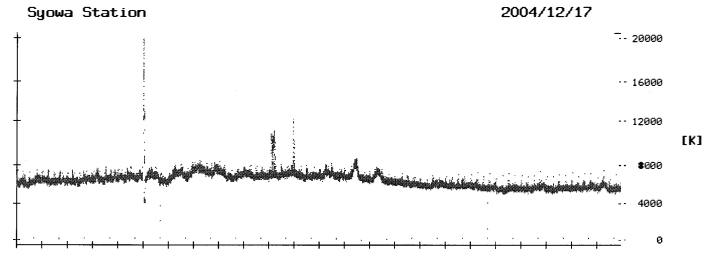
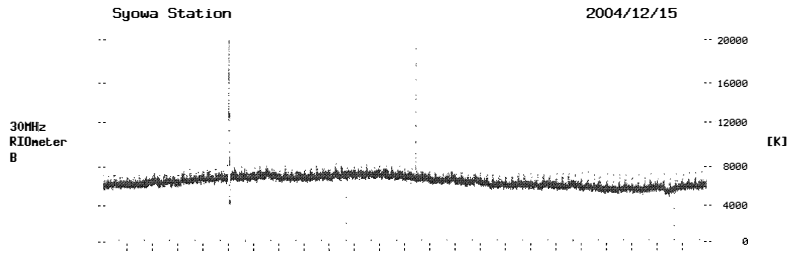
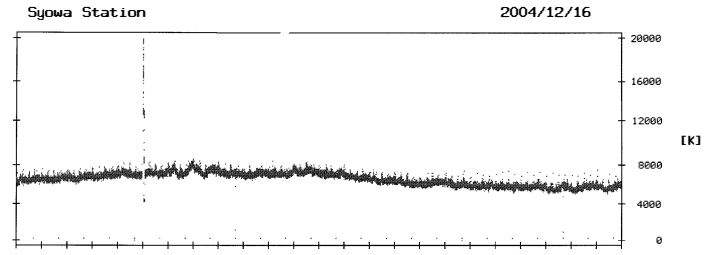
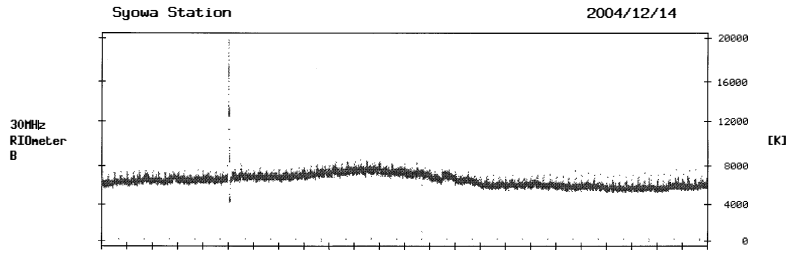


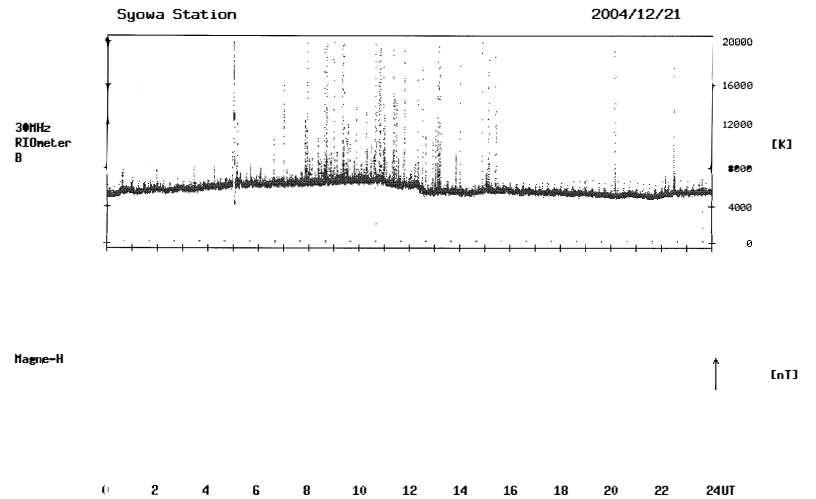
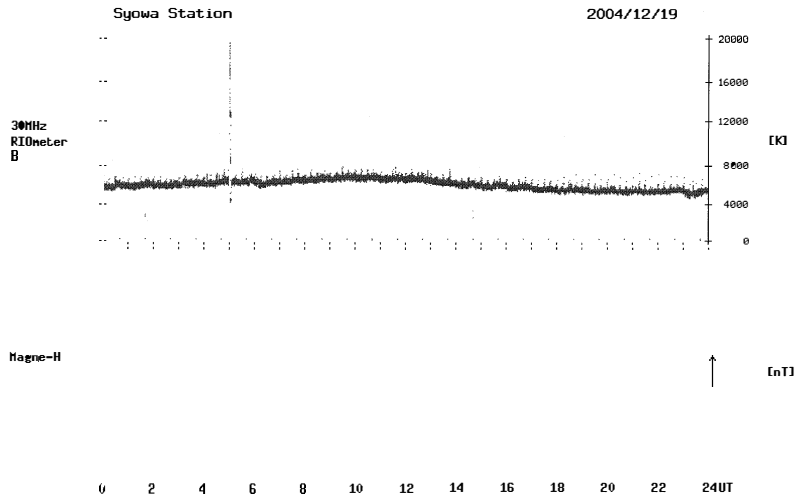
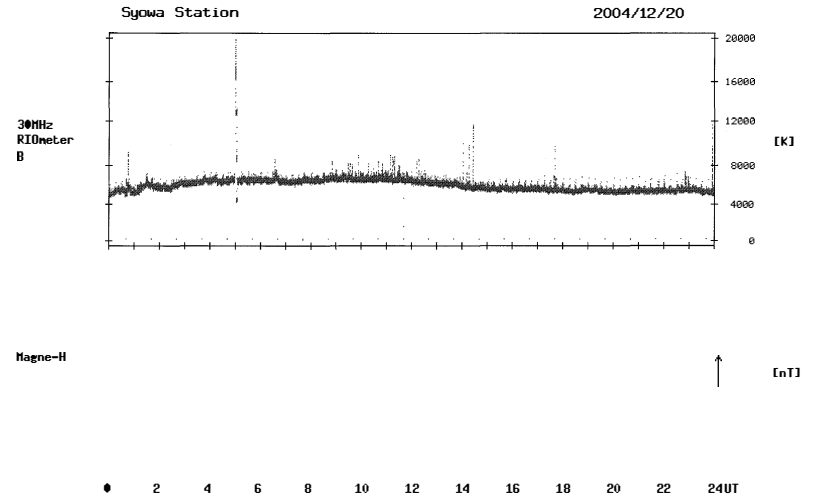
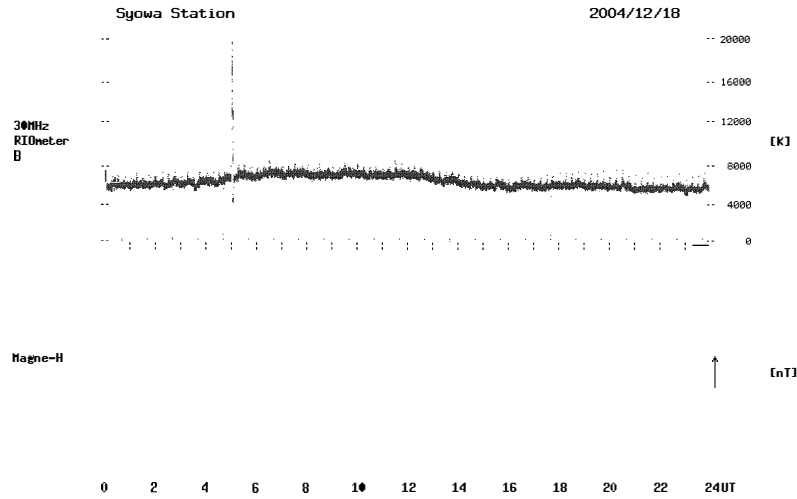
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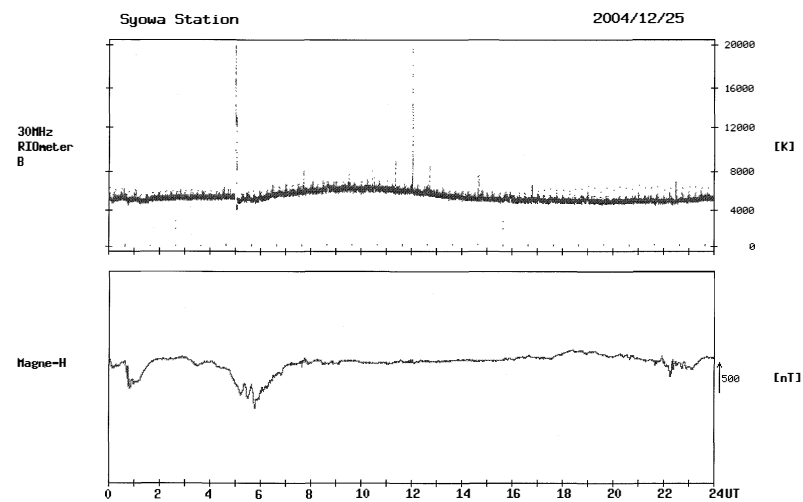
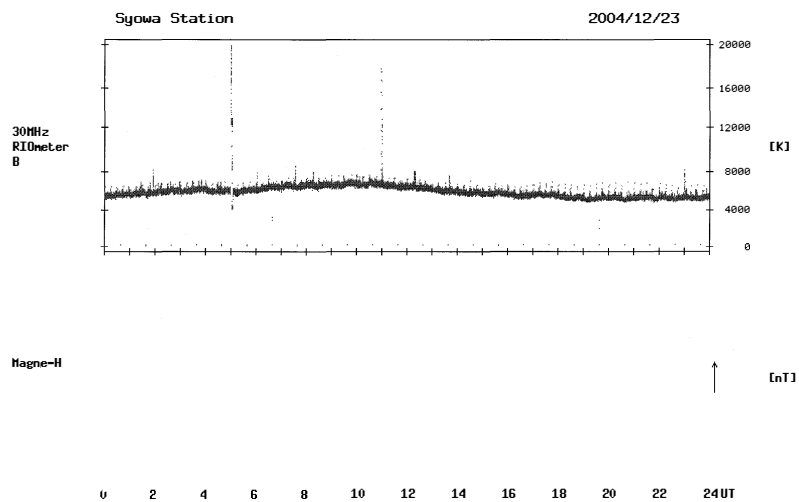
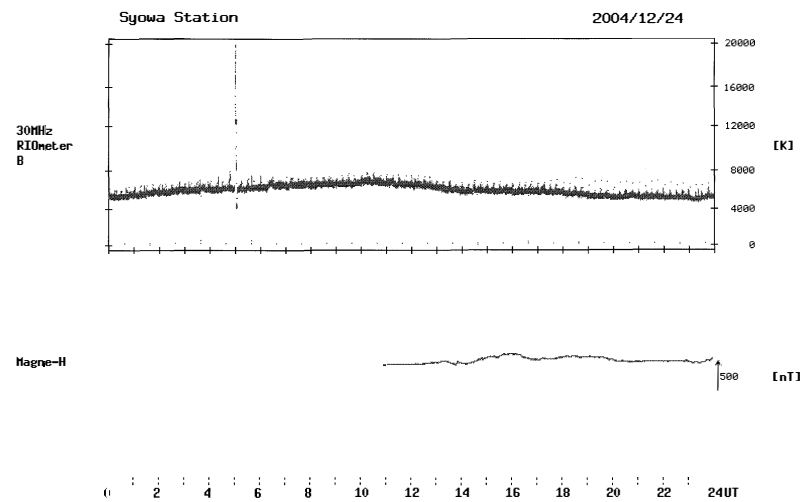
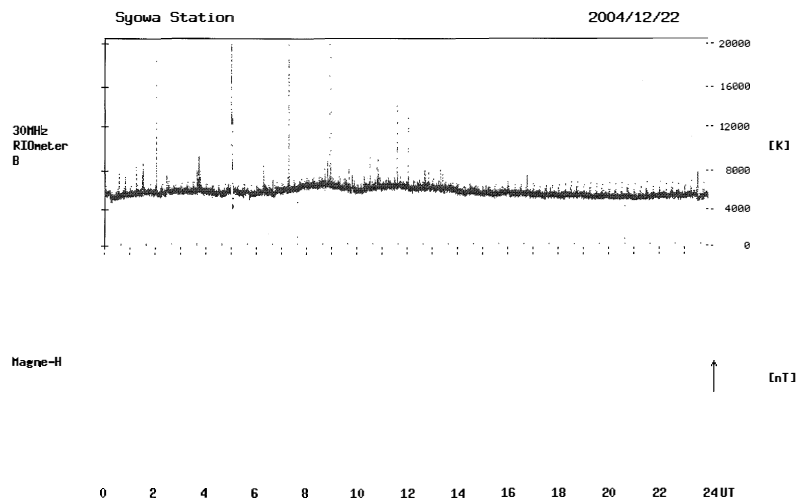


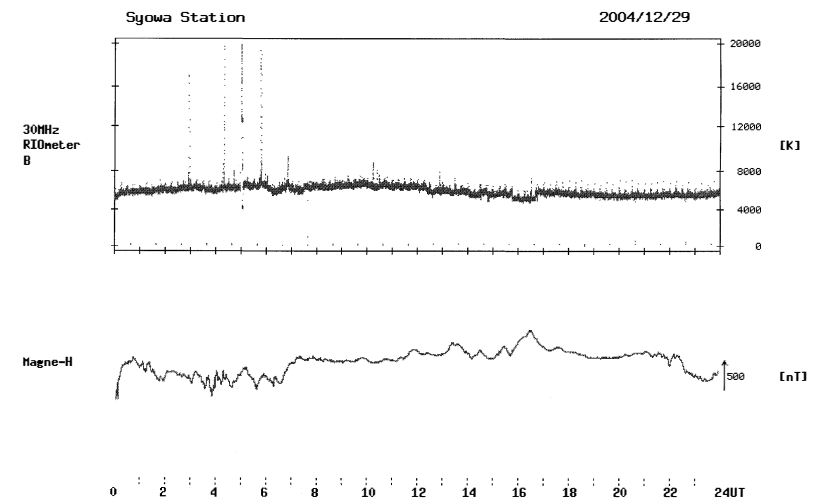
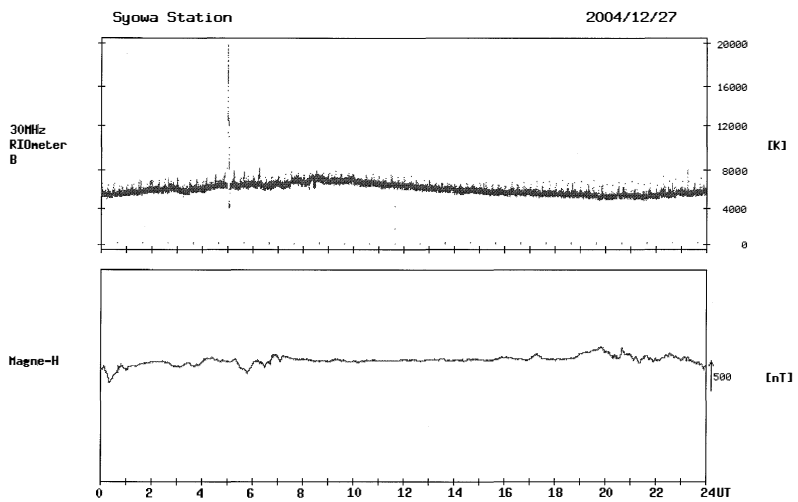
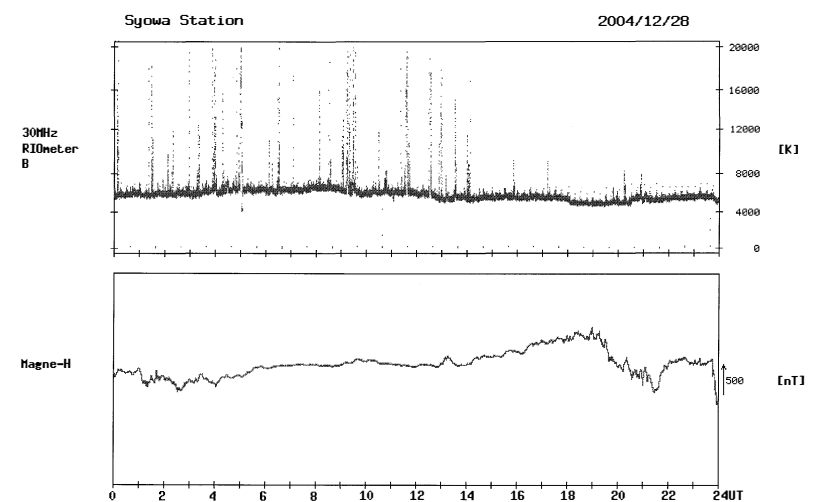
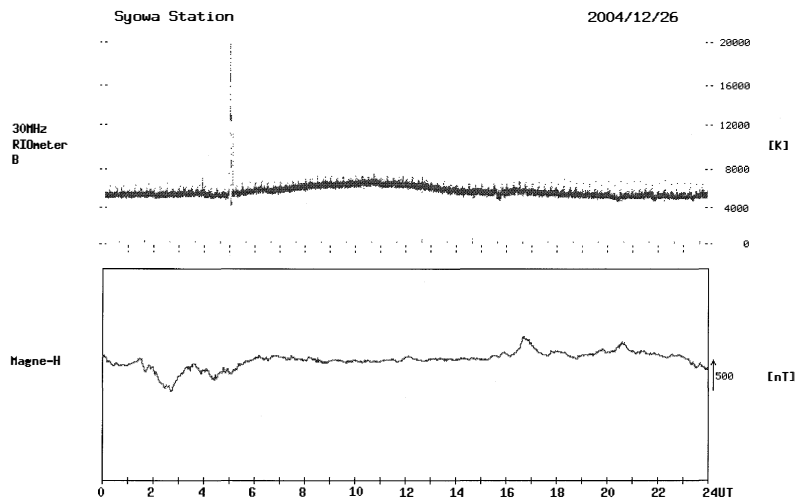
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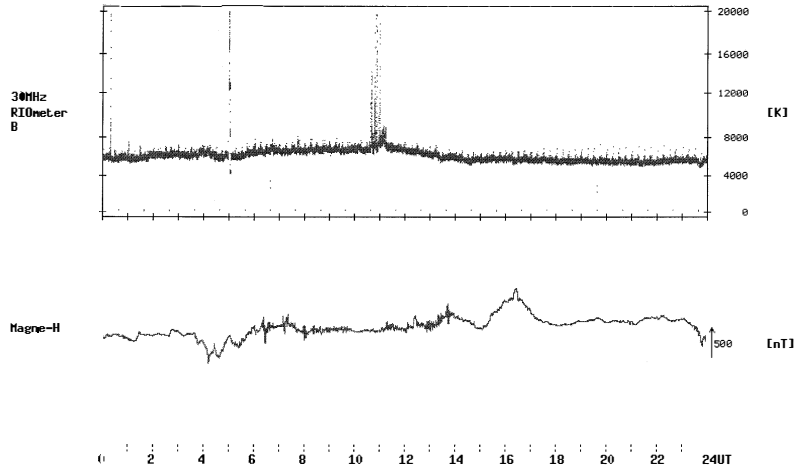








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