THE INTERNATIONAL CONFERENCE ON THE 120TH ANNIVERSARY OF THE BULNAY EARTHQUAKE:
ADVANCES IN ASTRONOMY AND GEOPHYSICS

Pc1 hydromagnetic emissions of chevron type

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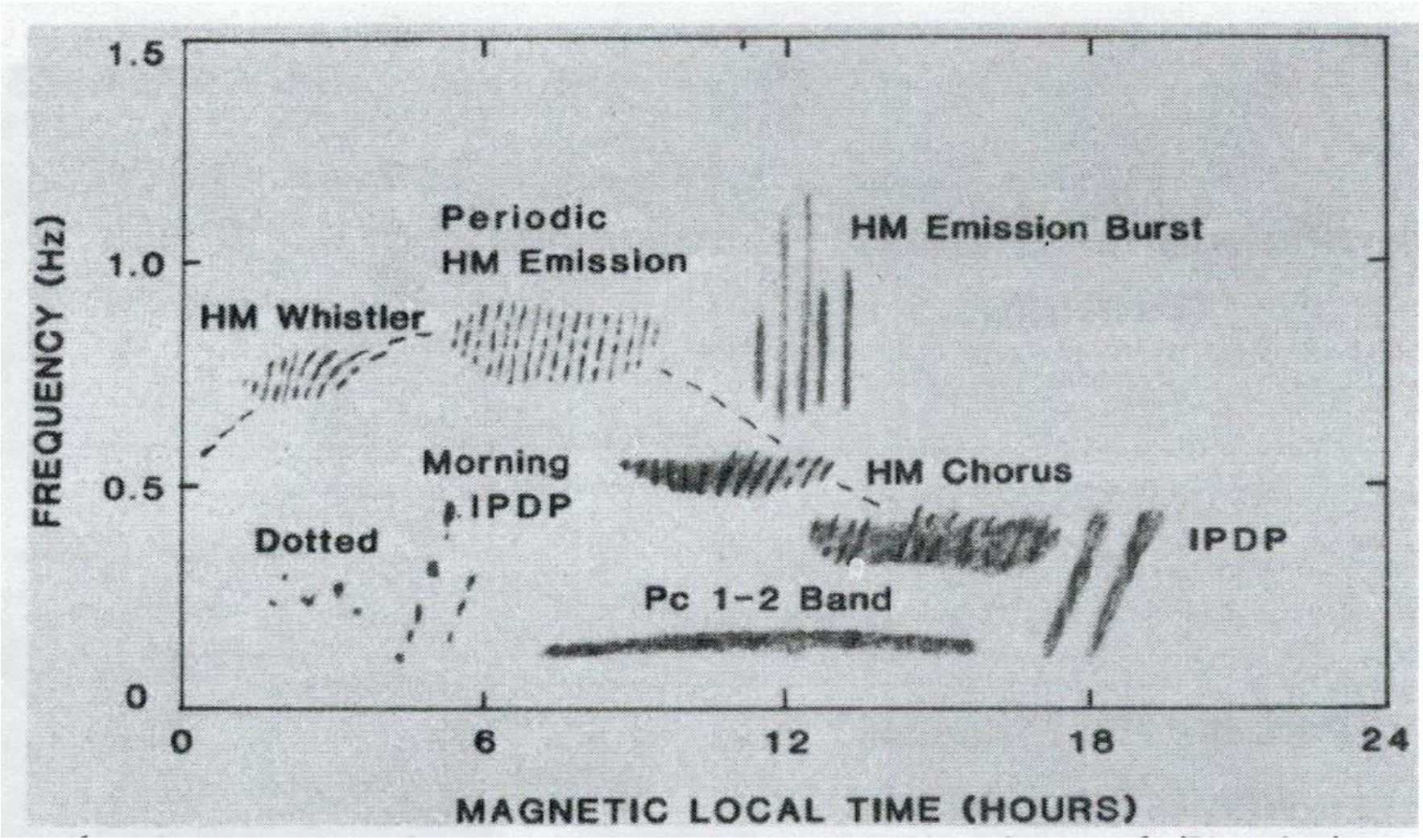
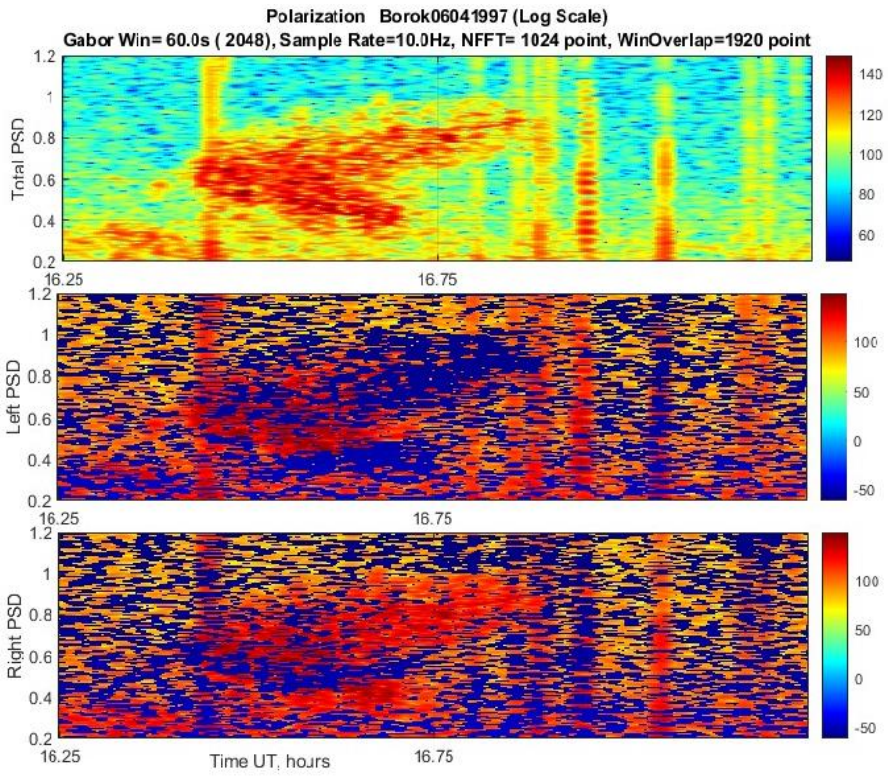
Introduction

The report presents the results of the study of previously unknown ULF (Ultra-Low Frequency) bursts in the frequency range of 0.5 – 2.5 Hz (range of Pc1 geomagnetic pulsations), showing simultaneous increase (~0.01 Hz/min) and decrease (~0.01 Hz/min) in frequency from the initial mean frequency, named due to their external similarity to chevrons on officer uniforms of the Pc1 type. These bursts were observed during strong short-term (~1 hour) substorms with a large gradient of ionospheric currents (dH/dt ~ 1 – 1.3 nT/s).



Fukunishi, H., Toya, T., Koike, K., Kuwashima, M., Kawamura, M. (1981) Classification of hydromagnetic emissions based on frequency-time spectra. J. Geophys. Res., v. 86, No. A11: 9029-9039, https://doi.org/10.1029/JA086iA11p09029



To estimate signal polarization, initial data are presented in the form of complex numbers, where one component represents a real part, and another component represents an imaginary part of horizontal transverse electromagnetic oscillations [13].

$$s(t) = x(t) + jy(t)$$

For any angular frequency ω one gets two complex Fourier coefficients, one for the negative frequency $\omega -$ and the other for positive frequency $\omega +$. It is convenient to present the coefficients in polar coordinates. Parameters of the original signal polarization are set by Fourier transforms $S(\omega+)$ and $S(\omega-)$.

$$S(\omega -) = r_{-} \exp(i\theta);$$

$$S(\omega +) = r_{+} \exp(i\theta)$$

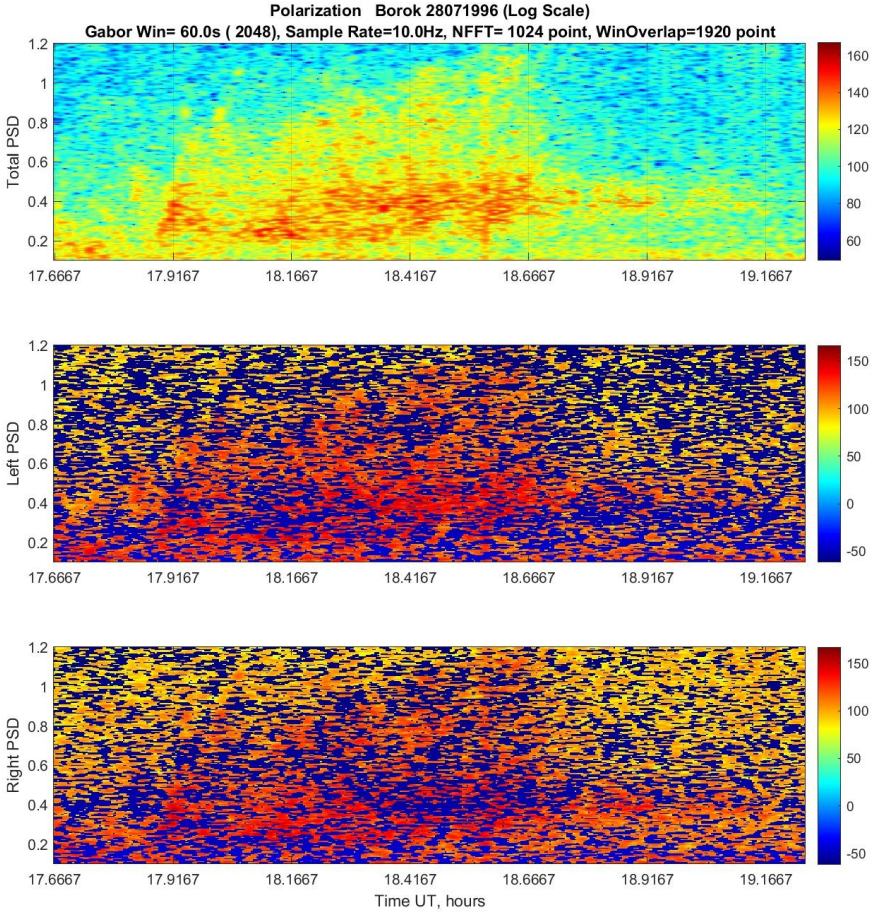
The ellipticity, sense of rotation, and orientation of major axis of the polarization ellipse are easily represented as a function of frequency.

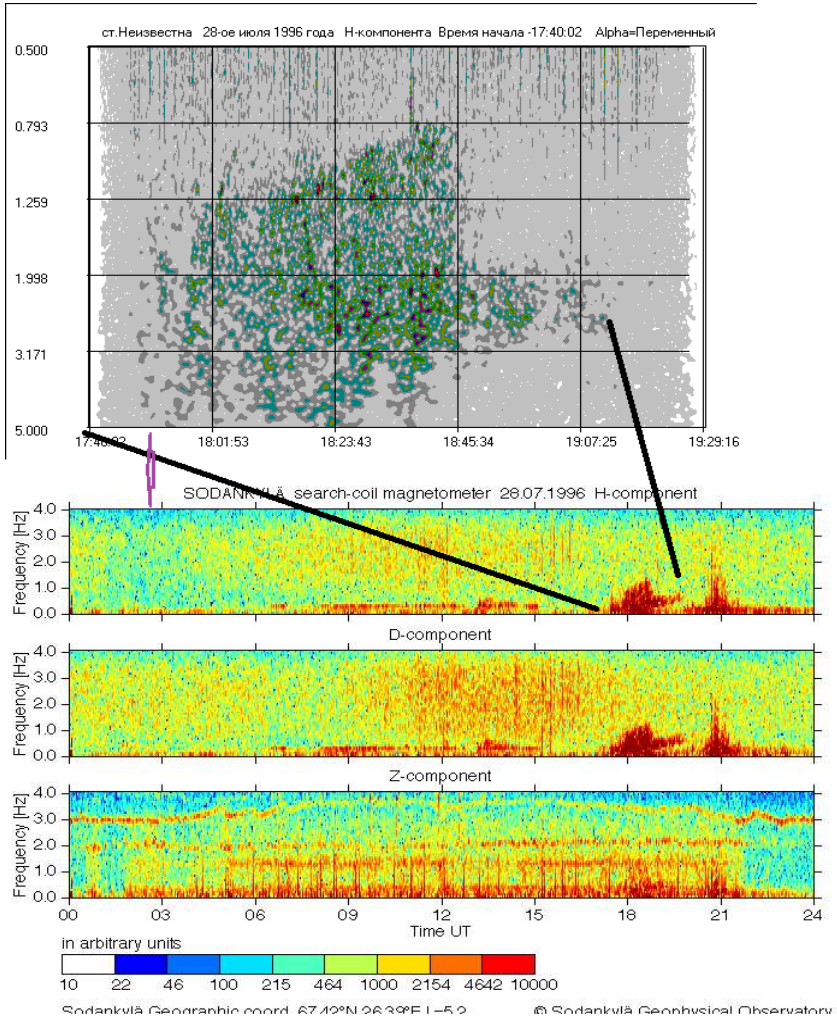
Ellipticity ε equals: $\varepsilon = (r_{+} - r_{-})/(r_{+} + r_{-})$.

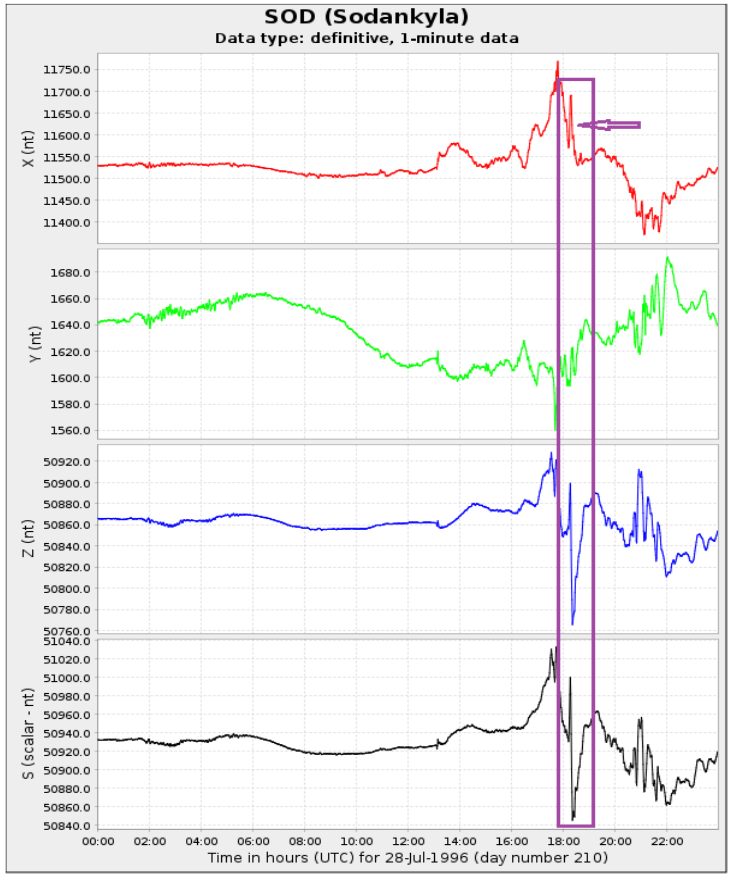
Sense of rotation: $K = sign(r_{+} + r_{-})$, where negative value means right-handed rotation.

The major half axis: $A = (r_{+} - r_{-})$.

Total power: $P = 2r_{+}^2 + 2r_{-}^2$.




ст.Неизвестна 28-ое июля 1996 года H-компонента Время начала -17:40:02 Alpha=Переменный
0.500
0.793
1.259
1.998
3.171
5.000
17:40:02
18:01:53
18:23:43
18:45:34
19:07:25
19:29:16
SODANKYLÄ search-coil magnetometer 28.07.1996 H-component
Frequency [Hz]
D-component
Z-component
00
03
06
09
12
15
18
21
24
Time UT
in arbitrary units
10 22 46 100 215 464 1000 2154 4642 10000
Sodankylä Geographic coord. 67.42°N 26.39°E L=5.2
© Sodankylä Geophysical Observatory


SOD (Sodankyla)
Data type: definitive, 1-minute data
X (nt)
Y (nt)
Z (nt)
S (scalar - nt)
00:00
02:00
04:00
06:00
08:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
Time in hours (UTC) for 28-Jul-1996 (day number 210)

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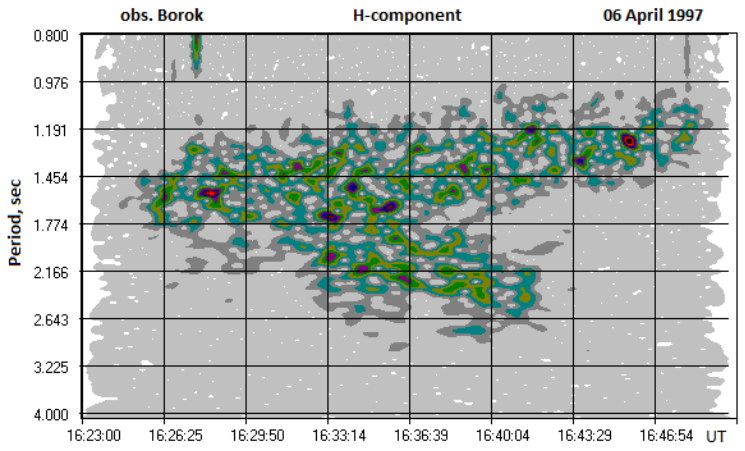

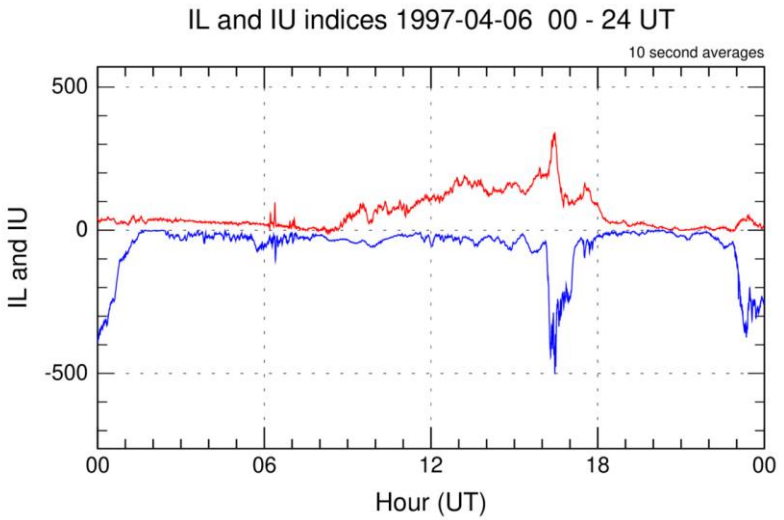

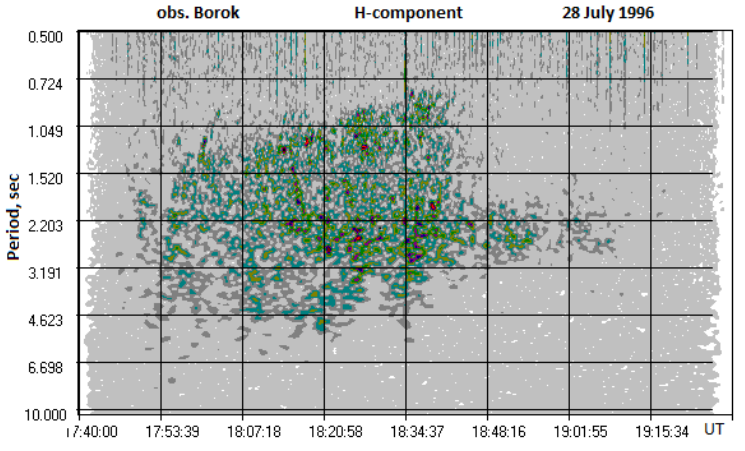

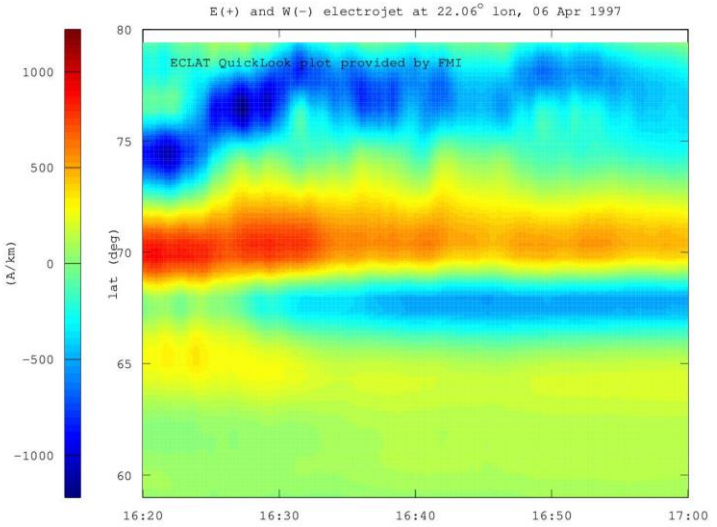

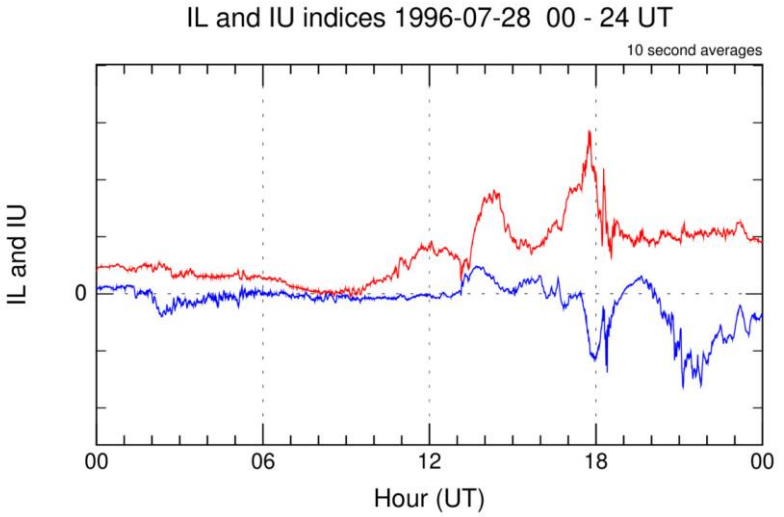

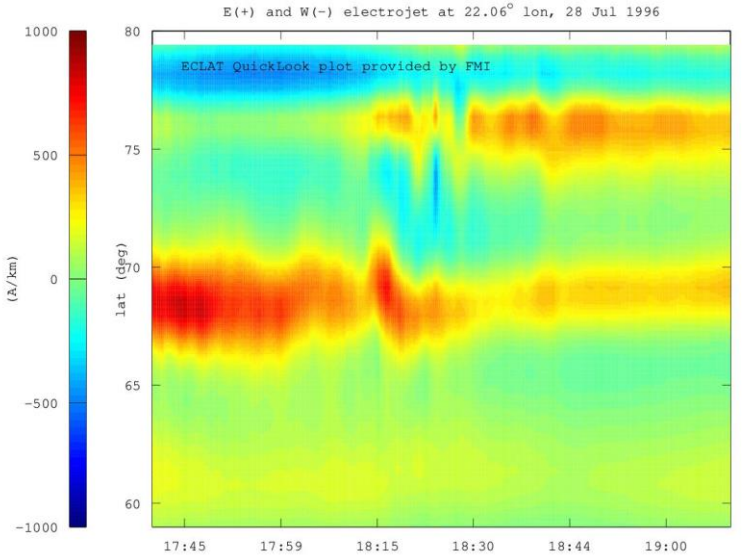

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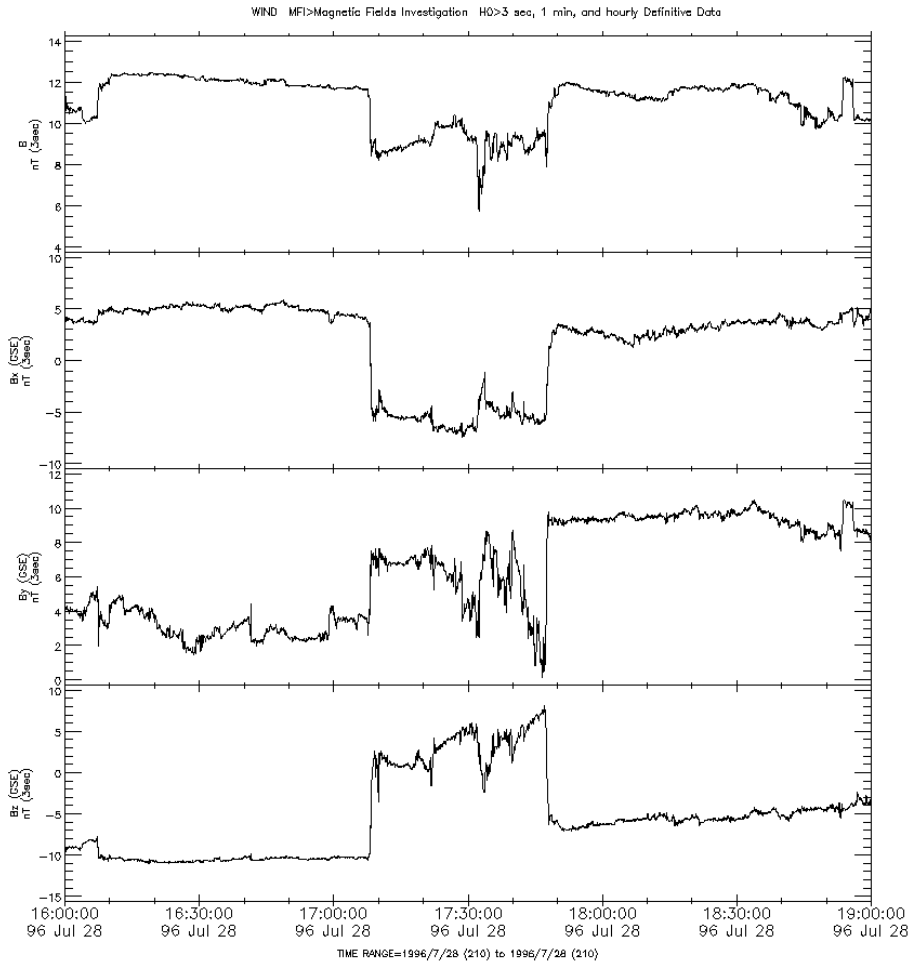
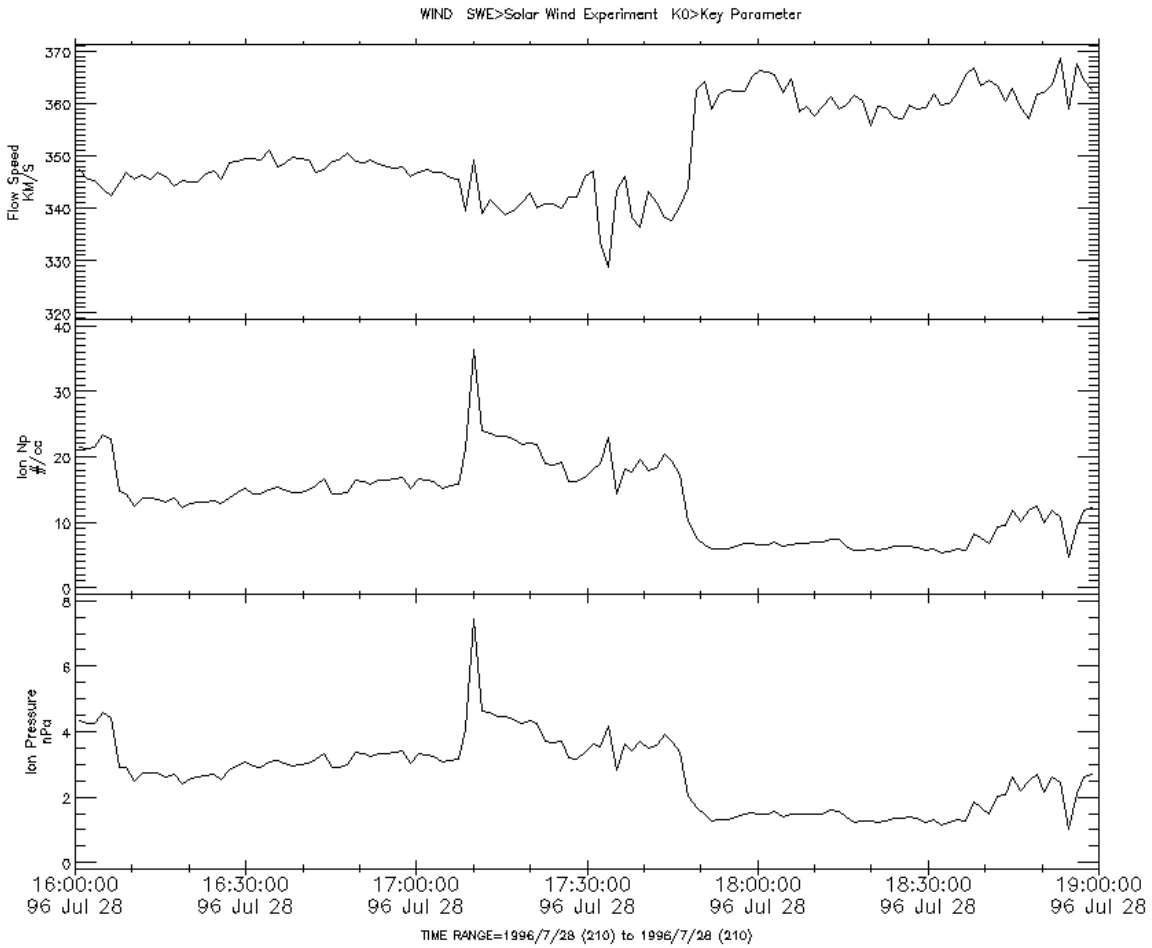


Please acknowledge PI, A. Koval at UMBC, NASA/GSFC and CDAWeb when using these data.
Key Parameter and Survey data (labels K0,K1,K2) are preliminary browse data.
Generated by CDAWeb on Sun Aug 10 05:34:07 2025



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Анхаарал тавьсан Та бүгдэд талархая!

Спасибо Вам за ваше внимание!

Thank you for your attention!