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# ELECTRIC FIELD VARIATION OF THE IONOSPHERE AFTER THE SI ON FEBRUARY 9, 1986

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## Abstract

The relationship is described between geomagnetic variations and HF Doppler frequencies for the oscillative variation following the Si event at 1748 UT on February 9, 1986. After comparing time differences between geomagnetic variations and HF Doppler frequencies, it is suggested that the electric fields variations deduced from the HF Doppler frequencies data for this event are due to compressional mode HM waves excited by the dynamic response of the magnetosphere to the solar wind pressure variations.

## 1. The Si on February 9, 1986 and the following oscillative variations

Reproduced plots of geomagnetic variations and HF Doppler frequencies from digital records of the one-second values of HF Doppler frequencies at Kokubunji are shown in Fig. 1. An Si occurred at 1748 UT with the amplitude of about 90nT and an oscillative variation with the period about 150 seconds follows after it. Since the resonant period of standing oscillation at Kakioka is thought to be in the Pc3 range, it is difficult to regard this event as a geomagnetic pulsation associated with the Si. The oscillative variation shown here must have been caused by another mechanism.

In order to check the phase relation of this event clearly, the high time resolution plot is shown in Fig. 2, where differences of data for ten seconds are plotted. If the ground geomagnetic variations are caused almost by height-integrated ionospheric currents, the functional forms with respect to time for height-integrated ionospheric electric fields can be estimated from geomagnetic variations with the assumptions of the rates of components of height-integrated ionospheric conductivity tensor. E–WEST in Fig. 2 is thus calculated westward electric field using the relation of conductivity of Tsunomura and Araki (1984). It is obvious that E–WEST is almost anti-parallel to HF Doppler frequencies for the oscillative variation after the Si. Therefore, a simple relationship between ionospheric electric fields such as polar originated ones and HF Doppler frequencies variations cannot be applied to this event.

As shown by Kuwashima and Tsunomura (1989), the magnetosphere is thought to have been exposed to the rapid variation of the solar wind pressure at this time. It is likely that the compressional mode HM wave excited by the dynamic response of the magnetosphere to the solar wind pressure variation propagated directly to the low latitude ionosphere.

Time differences of the horizontal component of geomagnetic field in Fig. 3, are almost parallel to HF Doppler frequencies data for the oscillative parts. The mechanism to yield this relationship will be discussed in another paper taking into account the recent theoretical result (Poole et al., 1988).

It also remains to discuss this event globally including the observations by satellites inside and outside the manetosphere.

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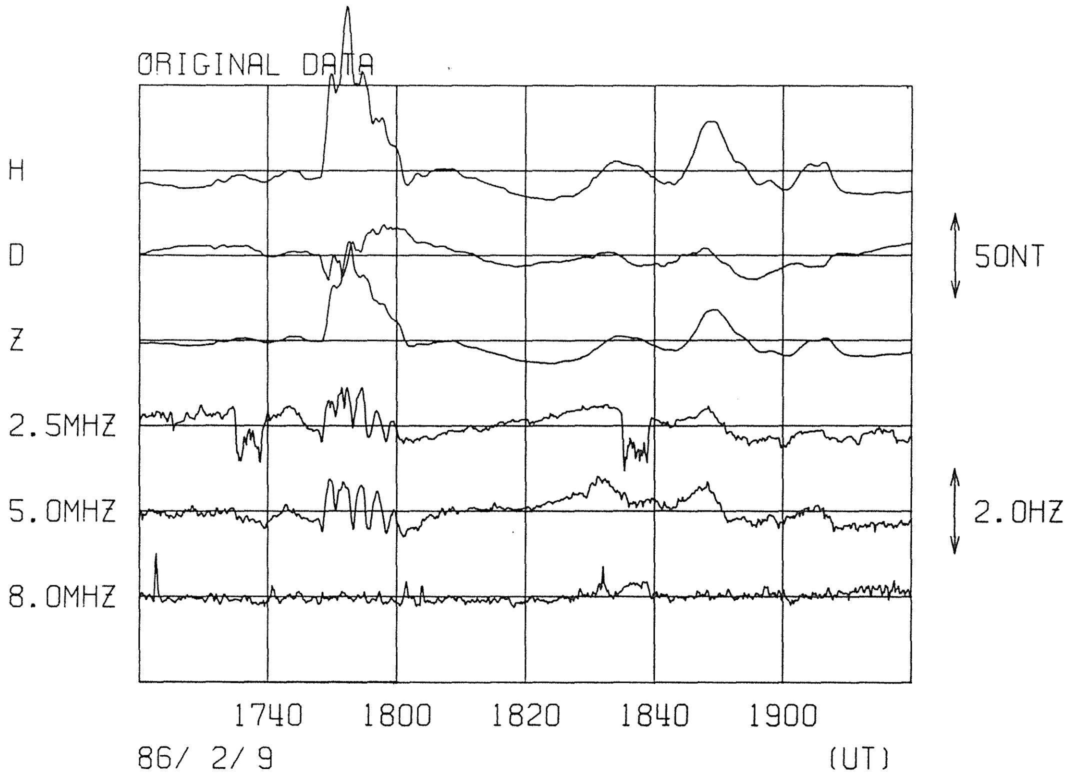


Fig. 1 Geomagnetic variations and HF Doppler frequencies for the Si event on February 9, 1986.

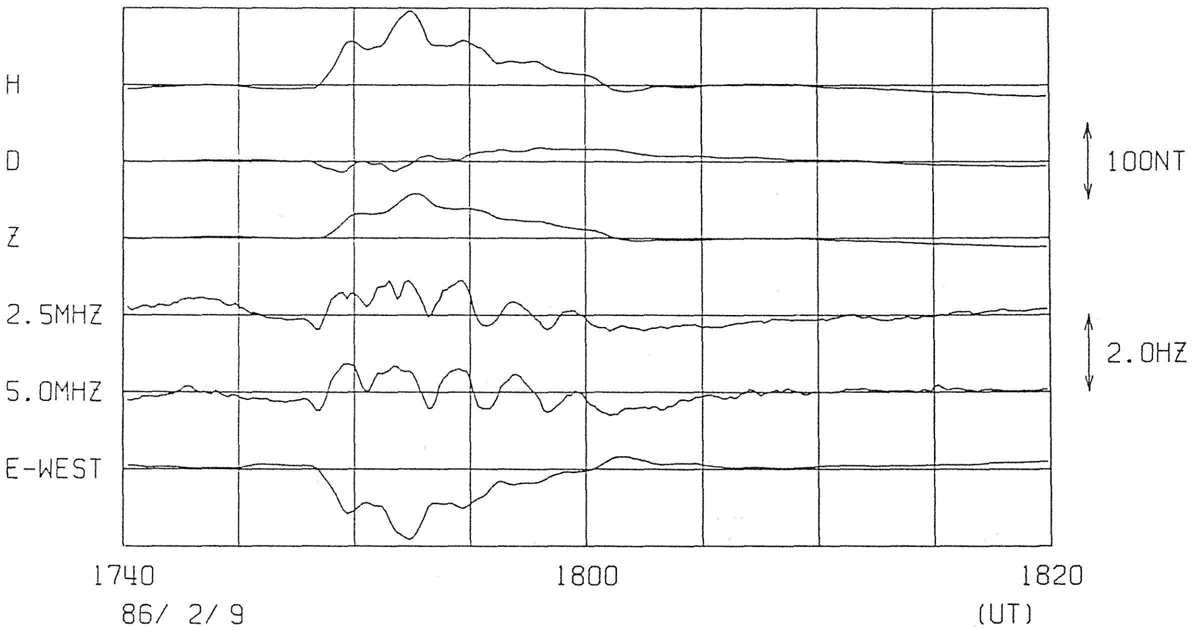


Fig. 2 High time resolution plot of the time difference data for the Si event.

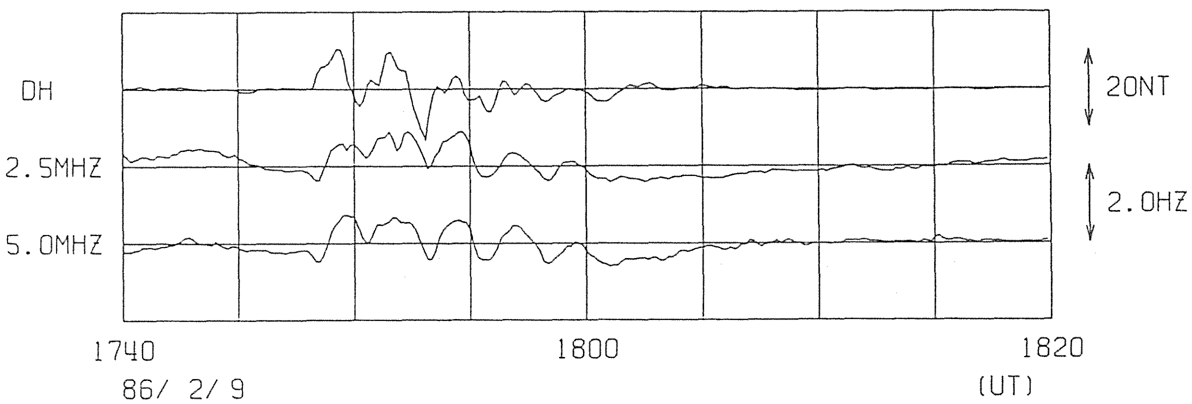


Fig. 3 High time resolution plot of the time difference of H component of geomagnetic field and original HF Doppler frequencies.