

Type III Solar Radio Bursts in Inhomogeneous Interplanetary Space Observed by GEOTAIL

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Characteristics of type III solar radio bursts are studied using high frequency resolution of the SFA (Sweep frequency analyzer) of the Plasma Wave Instrument (PWI) onboard the GEOTAIL spacecraft. We often observe abnormal type III bursts, which have separated frequency bands or have prolonged tails at particular frequencies. These observations provide observational clues to detect density inhomogeneities in the upstream interplanetary medium. We propose possible models of interplanetary density structures which can account for some type III spectrum structures observed.

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Type III burst is a radio emission which is characterized on dynamic spectra by a drift in time from high to low frequencies. It is generally accepted that type III bursts are generated by beams of energetic electrons which are ejected from the Sun and travel outward along open magnetic field lines from the Sun through the outer corona and interplanetary space.

In the present paper, we introduce some examples of unusual type III bursts spectra observed by the plasma wave instrument (PWI) onboard GEOTAIL. They exhibit a dynamic spectrum with a continuum and smooth frequency variation from high to low frequency, but show separated segments with frequency gaps and/or are sometimes associated with prolonged tails at particular frequencies.

Abnormal spectra of type III bursts were generally explained in terms of density inhomogeneities in the interplanetary medium, and these observations provide observational clues to detect density inhomogeneities in the upstream interplanetary medium. MacDowall [1989] proposed that radiation of type III is temporarily enhanced in some cases and then decreases because the beam of the type III electrons is scattered in a turbulent "wake" downstream of the shock.

The spectra of type III bursts introduced in the present paper are quite similar to those introduced by MacDowall [1989], but there still remain disagreements with the previous studies.

We propose possible models of interplanetary density structures which can account for some type III spectrum structures observed.

[1] MacDowall, R. J., G.R.L., 16, 923-926, 1989.