

## Observation of the electron density and plasma wave with PWM onboard the sounding rocket S-520#23

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In order to verify the momentum exchange between the thermospheric neutral wind and the ionospheric plasma through the collisional process by performing an in-situ observation, the sounding rocket (S-520#23) was launched at Uchinoura on 02 September 2007. This sounding rocket experiment, called as the wind measurement for ionized and neutral atmospheric dynamic study (WIND) campaign, is aimed at verifying the micro-process of interaction between the thermospheric neutral wind and the ionospheric plasma which plays an important role for mid latitude ionospheric disturbances and acquiring the observational technique of the neutral wind by releasing lithium.

The PWM system onboard S-520#23 was developed to observe the electron density profile along the trajectory and the plasma wave in HF range. These ionospheric parameters play important rolls not only for clarifying the problem of momentum exchange but also for monitoring influence of lithium releasing on the ionosphere. The PWM system consists of the impedance probe system (PWM-I) and the spectrum analyzer of the plasma wave in HF range (PWM-W.)

The PWM-I system detects the UHR resonance by imposing AC voltage on the ribbon antenna of 1.0 (m) immersed in the ionospheric plasma. Ionospheric electron density can be then acquired with a high resolution using the measured UHR frequency and the measured strength of magnetic field. The range of observable electron density, sampling time and magnitude of typical error for the current sounding rocket experiment are from 103 to  $2 \times 10^6$  (/cc), 500 (ms) and less than 4 %, respectively.

The PWM-W system receives the signal of the ionospheric plasma wave measured with the inflatable antenna (tip-to-tip 5 (m)) of EVMR and performs a spectrum analysis. The range of observable frequency range, dynamic range and sampling time are from 0.03 to 5 (MHz), from -110 to -60 (dBm) as the equivalent electric power input (50 ohm) and 500 (ms), respectively.

The PWM system onboard S-520#23 successfully observed the electron density and plasma wave. As a result of the preliminary analysis of the measured electron density profile, remarkable features, namely, a weak irregularity in the E-region, a kink of the electron density profile in the lower F-region were found. On the other hand, as a result of the preliminary analysis of the measured spectrum of the plasma wave, a characteristic plasma wave related with the wake region of the rocket body was found. In addition, it was found that the electron density was increased and the plasma wave in the observational frequency range was suppressed due to the lithium release. In this paper, we present the observational results and discuss possible mechanisms for the observed features of the electron density profile as well as the spectrum of the plasma wave.