

## Studying vertical structure of middle scale traveling ionospheric disturbance using airglow data observed at five points

# Kenta Yamakawa[1]; Akinori Saito[2]; Minoru Kubota[3]

[1] Geophysics, Kyoto Univ; [2] Dept. of Geophysics, Kyoto Univ.; [3] NICT

<http://www-step.kugi.kyoto-u.ac.jp/index-j.html>

We investigated the vertical structure of medium scale traveling ionospheric disturbance (MSTID) by using airglow data observed simultaneously at five sites.

MSTID has wavelength of about 100-300km and velocity of about 50-100km/s. It propagates southwestward in the northern hemisphere and northwestward in the southern hemisphere at night. 630nm airglow is emitted when oxygen and electron reacts in dissociative recombination process. Around an altitude of 250km, the 630nm emission rate reaches a maximum. The electron density variation inside MSTID causes the variation of the 630nm airglow intensity. The horizontal structure of MSTID can be observed by the 630nm airglow imager.

Airglow data of FRONT-1 (F-region Radio and Optical measurement of Nighttime TID) campaign was used to clarify the vertical structure of MSTID. The imagers were installed at five points, Moshiri, Zao, Kiso, Shigaraki, and Bisei. The wave-like structure of MSTID was observed by GPS total electron density data and airglow data through FRONT-1 campaign. The vertical structure of MSTID has not been studied in detail. The airglow imager has field of view of 600km radius at 250km altitude. The distances between Bisei and Shigaraki, Shigaraki and Kiso, Kiso and Zao were 270km, 150km, 420km, respectively. The fields of views were overlapped each other.

If we assume that the thin-layer approximation which doesn't concern about the vertical structure of ionosphere is valid, two airglow images obtained by two imagers located nearby site will be consistent. However, there were some differences in the images obtained by simultaneous observation. At 23:30LT on May 22, 1998 the MSTID wavefront was observed between Bisei and Shigaraki. The width of the high emission region observed at Bisei was two or three times wider than that of Shigaraki. The intensity of 630nm airglow observed at Shigaraki tended to be larger than that of Bisei. The intensity of Shigaraki attained a maximum about two times larger than that of Bisei.

The observed intensity is integrated value along the line of sight in the airglow emission. When the vertical structure of airglow emission exists, the observed images don't consistent because of lines of sight. Shigaraki is located about 270km east of Bisei. The intensity observed at eastern imager was larger than that observed at western imager. We believe it was caused by the vertical structure of electron density inclining to the west.

In this presentation, we discuss how the vertical structure effects simultaneous observation differences.