

The plasma density structure of polar ionosphere observed by PWS on-board the Akebono satellite

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Observations of the topside ionosphere have long term history since 1960s when the topside sounder satellites Alouette and ISIS provided us a global structure of the ionosphere. However, the knowledge of the topside ionosphere structures is not sufficient yet, especially for understanding of polar ionosphere region, because strong disturbances make it difficult to establish a statistical view of the ionosphere due to the auroral ionization and Joule heating of the electrojet currents. However, the structure and dynamics of polar ionosphere are recognized as a key of field aligned acceleration and escaping ions from the polar ionosphere forming auroral particles and a polar wind as well as escaping heavy ions. These interesting regions are expected to be located in an altitude range from 1000 km to 3000 km where a ground based observation techniques remains difficulty. Then, the topside sounder observation has a significant potential providing us important data for the study of plasma physics in the polar ionosphere.

The Akebono satellite launched in 1989 has been making the topside sounding observation above the ionosphere. Ionograms obtained in the region of polar ionosphere sometimes showed an unique trace of sounder echoes. According to the N-H profile analysis, it has been found to be an enhanced ionization region has been found in the altitude range from 1000 to 2500km, with an enhancement of the scale height parameter. For example, the ionogram observed in the auroral precipitation region on Jan, 31, 1990 showed an unique density profile; the density and scale height profiles above 800km become larger than those of other ionogram traces separated with 32 seconds, and the scale height of this structure has peak at 1500 km. The scale height peak showed three times larger than that of other traces. Benson et al.[1979] reported a similar structure, named as bulge, associated with the auroral cavity in the auroral precipitation region by using ISIS-1 topside sounder data. They call this structure bulge structure.

With the PWS observations in the polar region, 29 bulge structures were found in 6376 ionograms, and all of them exist polar ionosphere where invariant latitude is larger than 58 degrees. It was also shown that the bulge structure appears in winter ionosphere condition.

The purpose of this theses is to study on the seasonal dependence of electron density structure in the polar ionosphere by using Akebono PWS experiments and Ohzora SPW experiments.