Anisotropy of ion temperature associated with ion upflow in the winter cusp observed with the EISCAT radars

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we have investigated events when significant anisotropy of the ions is found by comparing the ion temperatures from the EISCAT Svalbard radar (ESR) and the EISCAT VHF radar. The event are associated with ion upflow on the dayside in the vicinity of the cusp. The anisotropy of ion temperature is also associated with enhancements of electron density, isotropic increases of electron temperature and frequent occurrence of naturally enhanced ion acoustic lines (NEIALs). The NEIALs are seen not only in the field-aligned direction by the ESR, but also in the oblique direction by the EISCAT VHF radar. Enhancements of the electric field strength, which may cause ion anisotropy, are also observed with the anisotropy of ion temperature in this winter case.

In order to understand the mechanism of ion heating associated with ion upflow in the topside ionosphere, we have investigated events when significant anisotropy of the ions is found by comparing the ion temperatures from the EISCAT Svalbard radar (ESR) and the EISCAT VHF radar. The events are associated with ion upflow on the dayside in the vicinity of the cusp. The data were obtained from November 25 to December 4, 2000.

The anisotropy of ion temperature is also associated with enhancements of electron density, isotropic increases of electron temperature and frequent occurrence of naturally enhanced ion acoustic lines (NEIALs). These relations are consistent with a precious study in summer [Ogawa et al., Geophys. Res. Lett., 27, 81, 2000]. The NEIALs are seen not only in the field-aligned direction by the ESR, but also in the oblique direction by the EISCAT VHF radar. Enhancements of the electric field strength, which may cause ion anisotropy [Winser et al., J. Geophys. Res., 94, 1439, 1989], are also observed with the anisotropy of ion temperature in this winter case. No clear correspondence between the enhancements of the electric field strength and the anisotropy of ion temperature was found in the precious study in summer. We will discuss plausible processes of the ion heating associated with the ion upflow based on these observational results.