# Automatic Estimation of Dispersion Curves of Lightning Whistlers observed by Akebono

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It is well known that electron density profile in the geospace changes day by day and thus remote sensing techniques using electromagnetic waves are recently highlighted as a powerful tool, because they are useful for obtaining the global electron density profile in the earth's plasmasphere with high time resolution. Especially, whistler mode wave originated from lightning discharge has a unique spectrum characterized by so-called dispersion curve. Lightning whistlers are sometimes observed by Akebono and their dispersion curves depend on the electron density profile in the plasmasphere, then we can estimate the electron density profile from the trend of dispersion curve along the satellite trajectory by solving the inverse problem. In the present paper, we introduce estimation techniques of dispersion curves of lightning whistlers.

It is noted that conventional methods were applied for the detection of whistlers observed on the ground, which are ducted whistler in general. But most whistler observed in the geospace is non-ducted and its dispersion curve is not represented by a simple dispersion parameter. In order to represent the features of non-ducted whistlers quantitatively, we developed a new technique in which the higher frequency part of non-ducted whistler spectrum is quantified as a set of relative delay time at each frequency point.

The proposed techniques are applicable to detecting and estimating important properties of lightning whistlers automatically so as to derive three dimensional electron density profiles with tomographic method in the near future.