

ロケット GPS-TEC トモグラフィ法の高度分解能評価

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Evaluation of the altitude resolution in Rocket GPS-TEC Tomography method

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As an approach to observe an electron density profile in the ionosphere, there is the remote sensing method called GPS-TEC method, which calculates the total electron counts (TEC) on the transmission path of GPS wave, from its propagation delay time. By applying tomography analysis on TEC values in multiple paths, which have one dimensional information, the electron distribution profile can be earned as two dimensional data, and this method is called GPS-TEC tomography method. However, this method has a defect, that it has nothing more than low resolution in the altitude direction because the paths of TEC values are biased in altitude direction.

In order to enhance the altitude resolution, we have proposed “Rocket GPS-TEC Tomography method”, which applies tomography analysis on the TEC values earned by the GPS-TEC receiver on the sounding rocket. Compared to the conventional GPS-TEC tomography, this method can observe TEC values in horizontal paths, as the sounding rocket navigates around the lower ionosphere except the underside of it. By this approach, we assumed that altitude resolution of the tomography result will improve.

In this paper, we verify the efficacy of the proposed method through simulation experiment. In particular, we calculate the observed TEC value based on the predicted rocket trajectory and an assumption ionosphere model. The sinogram, which is necessary for tomographic analysis, is built with the observed TEC value. The reconstruction ionosphere model can be obtained by analyzing the sinogram. And we evaluate the efficacy of the proposed method with comparing the assumption and the reconstruction ionosphere model.