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Development of 0.1-100eV ion energy mass spectrometer

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Measurements of ions with energies lower than several eV are not easy in the terrestrial magnetosphere, since spacecraft potential is positive in many cases. However, it is indicated that there are significant amount of ions in this energy range, based on, for example, ion observations under eclipse.

On the other hand, applied voltages on electrodes in an electrostatic analyzer should not be so low (i.e., near zero), since it becomes difficult to keep stable enough. This is one of problems on the ion measurements with energies lower than several eV. In order to avoid this, we have tried following points: (1) to apply wider gap between curved electrodes, (2) to apply small inlet and exit, and (3) adjustment of inlet and exit positions. Using numerical calculations, we got a sensor design with energy, angle, and mass resolving capability. Noise level due to EUV photons can be reduced to low enough. Note that an active control of spacecraft potential will be necessary, especially in a low-density region.

The sensor can be used for observations of ions upflowing from the polar ionosphere.

Keywords: suprathermal ion, ion upflow, magnetosphere, instrument