R006-31
A 会場 ：9/27　AM1 （9:00-10:30）
9:30〜9:45

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Statistical analysis of magnetospheric molecular ions from the Arase observations

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In the Earth's magnetosphere, several kinds of ions originate from both the solar wind and the ionosphere. Molecular ions in the magnetosphere are originated in the Earth's ionosphere. The Arase satellite has observed various kinds of ions since 2017, using two ion analyzers, LEPi and MEPi, which cover the energy range from 10 eV/q to 180 keV/q.

Using the data from the MEPi instrument, a previous study has investigated variations of molecular ions in response to magnetic storms and solar wind conditions, and molecular ions have been observed in the inner magnetosphere even during small magnetic disturbances [Seki et al., 2019]. However, observations about molecular ions are still relatively limited in comparison to other ion observations, and mechanisms of molecular ion outflow from the ionosphere as well as the long-term variations in the magnetosphere have not been well known.

In this study, we analyzed the time-of-flight (TOF) data from LEPi [Asamura et al., 2018] onboard Arase to investigate variations of molecular ions in the inner magnetosphere and their correlation with magnetic activity condition as well as the solar cycle. LEPi covers the energy range from 10 eV/q to 25 keV/q and obtains flux as a function of energy and TOF. The TOF measurements of LEPi have been operated in the outbound pass every four revolutions around the Earth. The estimated counts of molecular ions are derived by fitting the empirical function using a non-linear least square method to the TOF profiles. The count data are calibrated with the long-term trend of the MCP efficiency of the LEPi instrument.

Using this data set, we investigate relationships between molecular ion counts and geomagnetic index as well as solar wind parameters. The results indicate that molecular ion counts exhibit a significant correlation with magnetic storms (Sym-H index) as well as solar wind speed. Moreover, we found that molecular ions and oxygen ions have similar responses to these parameters, suggesting that the same mechanisms contribute to outflows of both the oxygen ions and the molecular ions. We found the long-term variations associated with the solar cycle. It is worthwhile to note that counts of the molecular ions have increased significantly after the commencement of the 25th solar cycle, suggesting that the solar EUV largely controls the scaleheight of molecular ions in the ionosphere and counts of the molecular ions in the magnetosphere increase.