Arase : mission overview and initial results

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Geospace Exploration Project; ERG addresses what mechanisms cause acceleration, transport and loss of MeV electrons of the radiation belts and evolutions of space storms. Cross-energy and cross-regional coupling is a key concept for the project. In order to address the above questions, the project has been organized as three research teams; satellite observations, ground-based observations, and modeling/data-analysis studies, and interdisciplinary research are realized truly comprehensive research is realized for total understanding of geospace. The Arase (ERG) satellite was developed with nine science instruments which were developed and provided by JAXA, universities and d institutes in Japan and Taiwan. The Arase satellite was successfully launched on December 20, 2016. After the initial operation including maneuvers, Arase has started its normal observations since March, 2017. Since then, Arase has observed several geomagnetic storms driven by coronal hole streams and CMEs, and many interesting features are observed in association with the geomagnetic disturbances. The six particle instruments (LEP-e/LEP-i/MEP-e/MEP-i/HEP/XEP) have shown large enhancement as well as loss of electrons and ions of wide energy ranges and variations /changes of pitch angle and energy spectrum. The two field/wave instruments (PWE and MGF) observed several kinds of plasma waves such as chorus, hiss, EMIC as well as large scale electric and magnetic field variations. And newly developed S-WPIA has been operated to identify micro-scale processes of wave-particle interactions. Since conjugate observations between Arase and ground-based observations are essential for comprehensive understanding of geospace, we have conducted several campaign observations involving both the satellite and ground-based observations. The project has collaborated with the other domestic/international projects such as EISCAT, SuperDARN and other ground-based observations, and various data are obtained from such inter-project efforts. Moreover, multi-point satellite observations enaged by the international satellite fleet (Arase, Van Allen Probes, THEMIS, MMS, and more) are realized at present. In this presentation, we report the overview and initial highlights for the first year of the Arase exploration and discuss the importance of the synergy of multi-satellites and ground-based observations that are realized by international collaborations.