

Special-time observations for SuperDARN-Arase satellite conjunction

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Mission extended

through March, 2022!

- Satellite launch: Dec. 20, 2016
- Perigee/Apogee: > 400 km / 32246 km (~6 Re)
- Inclination: ~31 deg
- Spin period: ~8 sec
- Orbital period: ~560 min
- Mission life: longer than 1 year after initial operation
 - Science instruments: electron, ions with mass discrimination, E/B-field, and plasma waves

Achievement of the ERG (Arase) project



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Geospace Exploration by the ERG mission

Book

The ERG project (Exploration of energization and Radiation in Geospace project to elucidate acceleration, transportation and loss of energetic elecand dynamics of geospace storms. The projects consist of JAXA's satelli observations and simulation and modeling studies and provide a compre dynamical evolutions of the inner magnetosphere. The ERG project cont fleet of geospace satellites as well as ground-based network observation

21 papers in Arase special issue of EPS

ERG satellite focuses on or

ed in FY 2016

observations, simulation studies, and science center activities of the ERC

Edited by: Tsugunobu Nagai, Barry Mauk, Ondrej Santolik, Takashi Kubo

Full Paper

The extremely high-energy electron experiment (XEP) onboard the The extremely high-energy electron experiment (XEP) onboard the Arase (ERG) satellite energy electrons in the Earth's radiation belts. The XEP was developed by taking advanta

Nana Higashio, Takeshi Takashima, Iku Shinohara and Haruhisa Matsumote

Earth, Planets and Space 2018 70:134 Published on: 16 August 2018

> Full Text > PDF

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Geophysical Research Letters

AN AGU JOURNAL

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Geophysical Research Letters publishes high-impact, innovative, and timely communications-length articles on major advances spanning all of the major geoscience disciplines. Papers should have broad and immediate implications meriting rapid decisions and high visibility.

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HIGHLIGHTS COLLECT

COLLECTIONS V

ABOUT 🗸

Initial results of the ERG (Arase) project and multi-point observations in geospace

Space Sciences | First published: Dec 18, 2017 | Last updated: 28 August 2018

The Arase (ERG) mission has been exploring the Earth's inner magnetosphere, in particularly, the Van Allen radiation belts with six sets of onboard particle analyzers and two sets of onboard electromagnetic field measurements since its launch on December 20, 2016. The major purpose of the Arase mission is to study acceleration, transport, and loss processes of radiation belt particles and dynamics of the inner magnetosphere. One major characteristic of the Arase's

23 papers in Arase special issue of GRL, including 2 papers using SuperDARN data.

expands upon new findings from these observations of Arase and ground-based networks as well as interplay among different missions. Results from related observations and modeling/simulation studies on the inner magnetosphere are also welcome.

SuperDARN-Arase campaign 2018/19 Fall-Winter





Target:

 SAPS, ULF-ring current interaction, ..., in midnight–dusk sector

Method:

- SD-Arase-RBSP conjunction
- interleavedscan by SD radars near the s/c footprints

Campaign observation for 2018-2019 fall to winter season [edit]

Scheduled operations for the Arase-Van Allen Probes-SuperDARN conjunctions aiming at satellite-ground multipoint observations of SAPS

DD1:HH1 DD2:HH2 schedule category [radars by which the special obs. is made] { Name of scan program }

e.g., 22 UT, May 4 to 4 UT, May 5 --> 04:22 05:04

September, 2018 [edit]

09/01 04:00-09/01 12:00 Special Time (ARASE) (see Note A) [HKW HOK ADW ADE KSR KOD CVW CVE FHW FHE BKS WAL PGR SAS] {interleaved nor 09/03 02:00-09/03 12:00 Special Time (ARASE) (see Note A) [HKW HOK ADW ADE KSR KOD CVW CVE FHW FHE BKS WAL PGR SAS] {interleaved nor 09/08 06:00-09/09 14:00 Special Time (ARASE) (see Note A) [HKW HOK ADW ADE KSR KOD CVW CVE FHW FHE BKS WAL PGR SAS] {interleaved nor 09/12 04:00-09:12 14:00 Special Time (ARASE) (see Note A) [HKW HOK ADW ADE KSR KOD CVW CVE FHW FHE BKS WAL PGR SAS] {interleaved nor 09/14 04:00-09/14 12:00 Special Time (ARASE) (see Note A) [HKW HOK ADW ADE KSR KOD CVW CVE FHW FHE BKS WAL PGR SAS] {interleaved nor 09/14 04:00-09/14 12:00 Special Time (ARASE) (see Note A) [HKW HOK ADW ADE KSR KOD CVW CVE FHW FHE BKS WAL PGR SAS] {interleaved nor 09/20 02:00-09/20 10:00 Special Time (ARASE) (see Note A) [HKW HOK ADW ADE KSR KOD CVW CVE FHW FHE BKS WAL PGR SAS] {interleaved nor 09/21 06:00-09/21 14:00 Special Time (ARASE) (see Note A) [HKW HOK ADW ADE KSR KOD CVW CVE FHW FHE BKS WAL PGR SAS] {interleaved nor 09/23 04:00-09/23 14:00 Special Time (ARASE) (see Note A) [HKW HOK ADW ADE KSR KOD CVW CVE FHW FHE BKS WAL PGR SAS] {interleaved nor 09/23 04:00-09/23 14:00 Special Time (ARASE) (see Note A) [HKW HOK ADW ADE KSR KOD CVW CVE FHW FHE BKS WAL PGR SAS] {interleaved nor 09/27 04:00-09/27 12:00 Special Time (ARASE) (see Note A) [HKW HOK ADW ADE KSR KOD CVW CVE FHW FHE BKS WAL PGR SAS] {interleaved nor 09/29 02:00-09/27 12:00 Special Time (ARASE) (see Note A) [HKW HOK ADW ADE KSR KOD CVW CVE FHW FHE BKS WAL PGR SAS] {interleaved nor 09/29 02:00-09/27 12:00 Special Time (ARASE) (see Note A) [HKW HOK ADW ADE KSR KOD CVW CVE FHW FHE BKS WAL PGR SAS] {interleaved nor 09/29 02:00-09/27 12:00 Special Time (ARASE) (see Note A) [HKW HOK ADW ADE KSR KOD CVW CVE FHW FHE BKS WAL PGR SAS] {interleaved nor 09/29 02:00-09/29 12:00 Special Time (ARASE) (see Note A) [HKW HOK ADW ADE KSR KOD CVW CVE FHW FHE BKS WAL PGR SAS] {interleaved nor 09/29 02:00-09/29 12:

https://ergsc.isee.nagoya-u.ac.jp/mw/index.php/ErgGround/ErgSd

An example of the Arase-RBSP-SD conjunctions



 Possibly the footprints of all the three satellites could be in the fields-of-view of SD radars.

The footprint trajectories of Arase, RBSP-A, RBSP-B during ~1–7 UT.

SuperDARN-Arase-RBSPs campaign 2018/19 Fall-Winter







A short summary of the campaign...

- INscan (of mid-lat. radars) aiming at SAPS with SD-Arase-RBSP conjunction missed the main target unfortunately.
 - Geomagnetically quiet throughout the season.
 - only 4 very weak storms, which the scheduled INscan missed all.
- However..., still there are some interesting observations made during the special time operation.
 - A high-lat. SAPS(?) event with the SD-Arase-RBSP conjunction.



60400–0600 UT on Nov. 21, 2018





mapped with Tsyganenko 1996 model

Hori+, Arase-SuperDARN ST obs., SD2019 @Fujiyoshida, Japan Jun. 4, 2019



SAPS evolution during a small substorm



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AFASC

SAPS and injection fine structure

A dispersionless injection of energetic ions was observed by the three satellites.

But SAPS did not appear clearly at the same time. [c.f., Wang+2019]

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SAPS and injection fine structure



Westward extension of SAPS coincided with fresh, more structured injections

SAS



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RB-A

04:33

UT

Arase satellite data are now available

- The quick-look plot site is open to everybody, where plots up to very recent dates are available.
 - https://ergsc.isee.nagoya-u.ac.jp/cef/test/erg_test.cgi
- Most of the data are publicly available after the 1-year latency.
 - Check the ERG-SC website!
- Data within the 1-year latency (under some calibrations) are also available upon request.
 - Please contact the following persons:
 - Yoshi Miyoshi, project scientist (miyoshi@isee.nagoya-u.ac.jp)
 - Iku Shinohara, project manager (iku@stp.isas.jaxa.jp)

- Thank you very much for scheduling many hours of the ST observation for the SD-Arase-RBSP campaign!
- The ST observation with INscan in conjunction with Arase and RBSPs did not obtain SAPS events very much during 2018/19 Fall-Winter season, sadly enough.
- However, there are still some interesting events which are worth looking into. Actually T. Hori and collaborators are working on one of the events.
- Arase satellite data have been available, more to come up in near future.

Backup slides

Arase orbit for 2019/20 Fall-Winter season

