

Geospace Exploration Project ERG

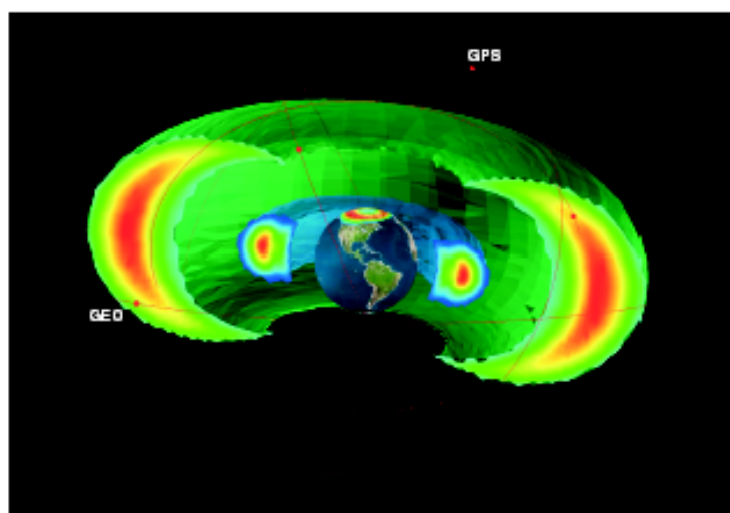
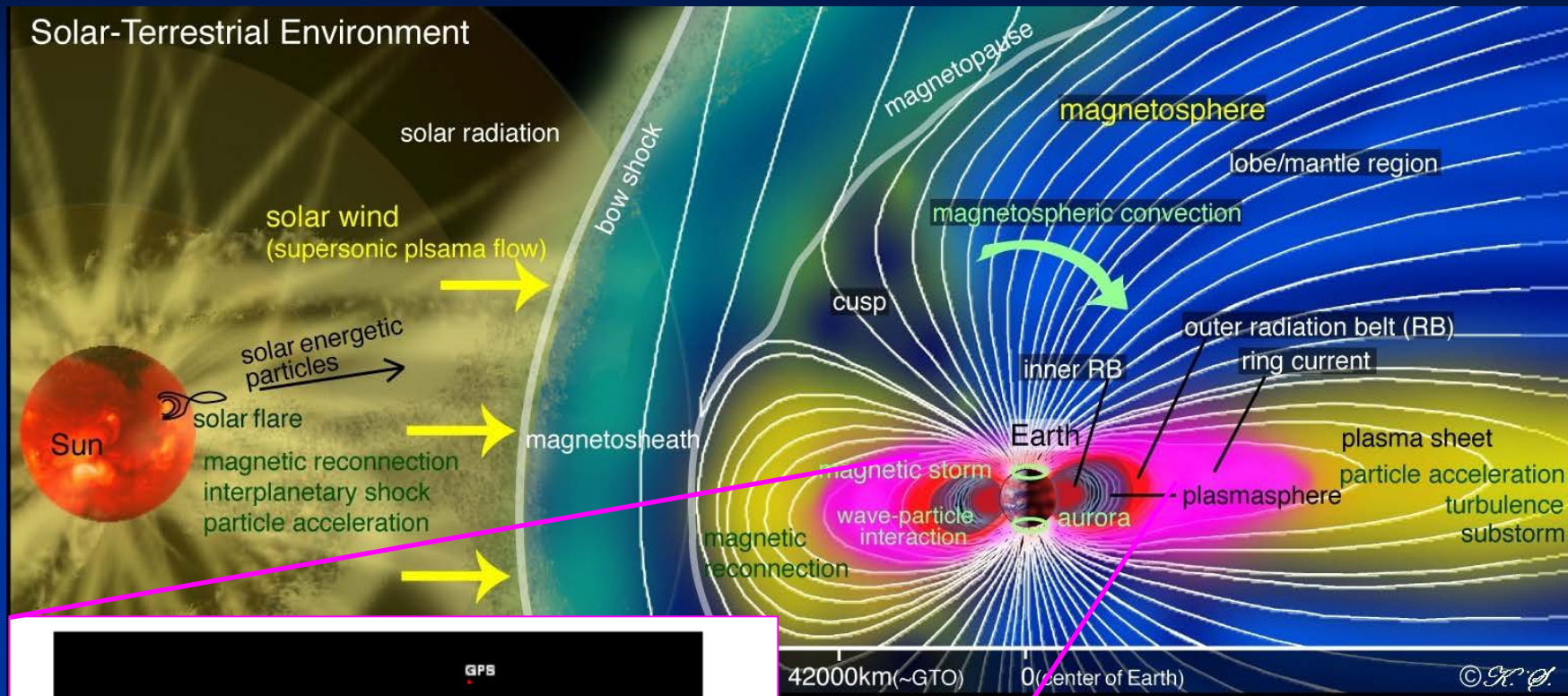
Y. Miyoshi, I. Shinohara, T. Takashima, K. Asamura,
Y. Kazama, S. Kasahara, S. Yokota, T. Mitani, H. Matsumoto,
N. Higashio, M. Hirahara, Y. Kasaba, A. Matsuoka,
H. Kojima, K. Shiokawa, K. Seki, T. Ono,
and ERG Science Team



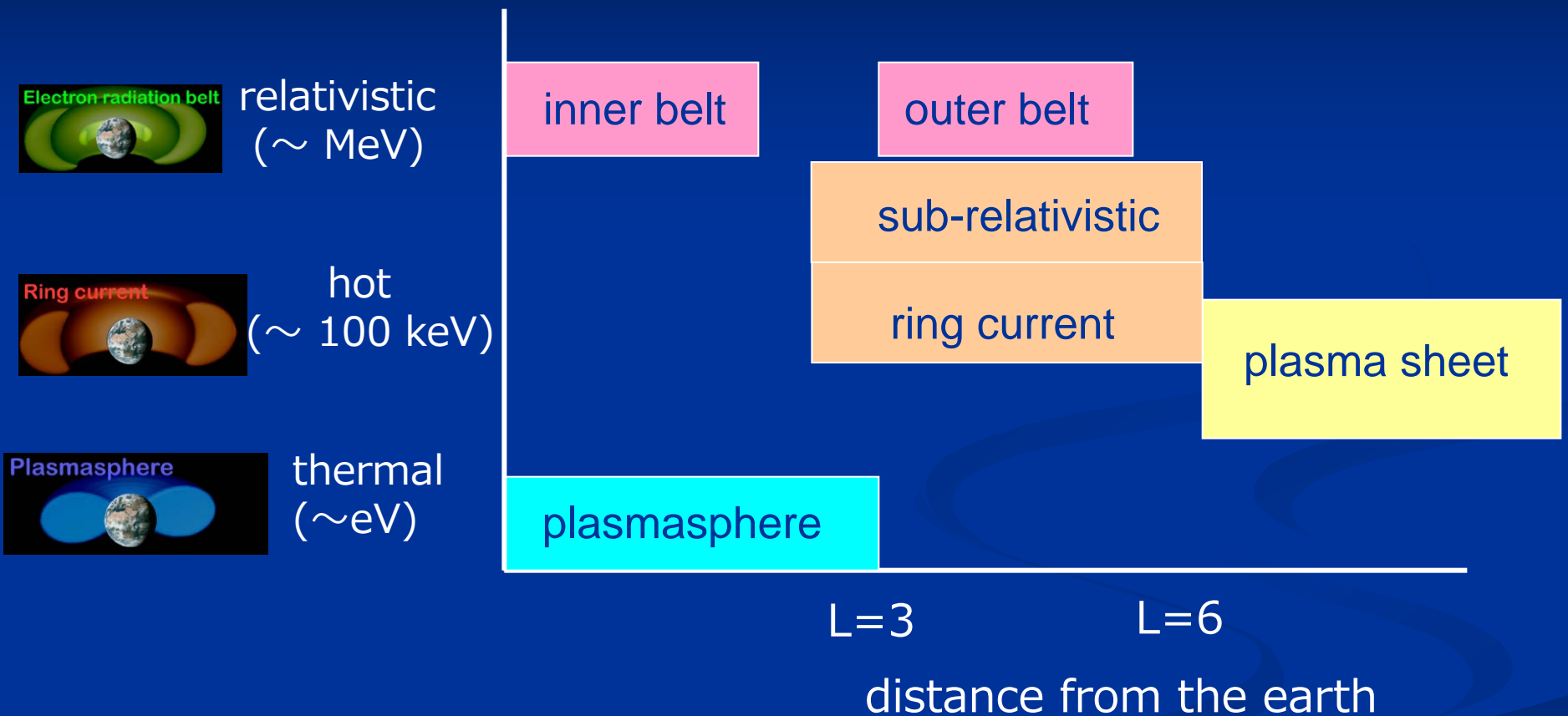
OUTLINE

1. Introduction
2. ERG project
3. International collaboration
4. Summary

1. Introduction ··· Geospace



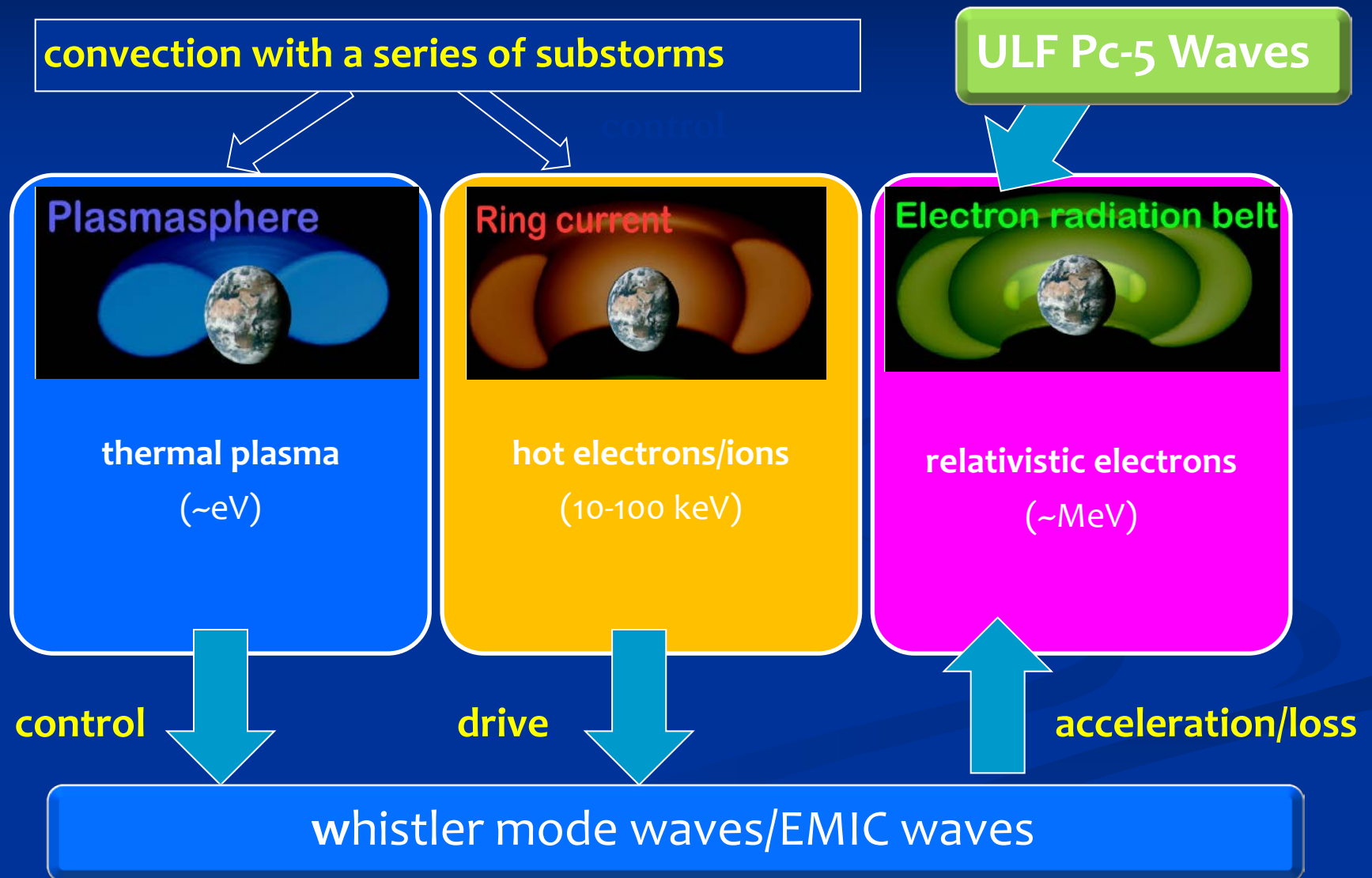
Plasma/particle environment



In the inner magnetosphere, widely differing energies over 6 orders coexist same region.

Cross-energy coupling

Interplay of thermal/hot plasma for MeV electron accelerations



2. The *ERG* project

Target 1: Dynamics of the **radiation belts**
particle acceleration, transportation and loss

Target 2: Dynamics of the **geospace storms**
*ring current and electro-magnetic field
variation associated with M-I coupling*

Target 3: Dynamics of the **plasmasphere**

Contribution to the Space Weather/Space Radiation Environment

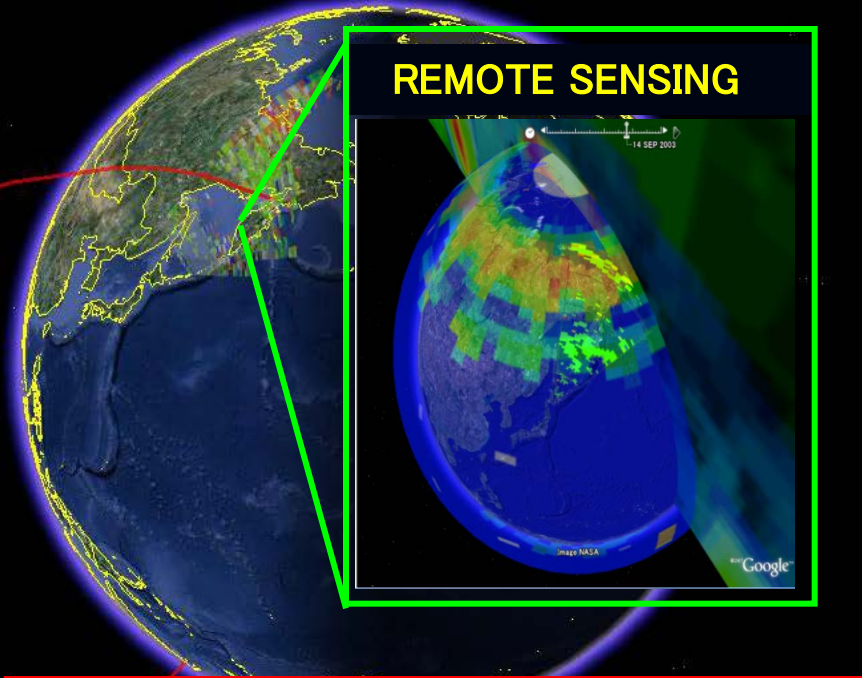
ERG Project Group

ERG-satellite



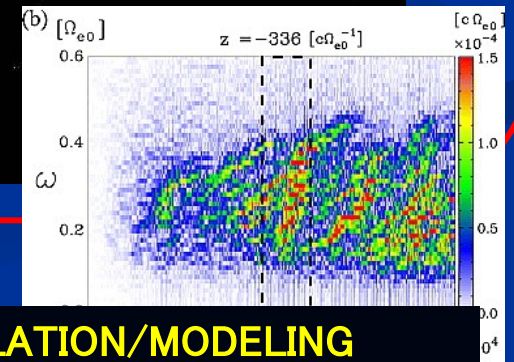
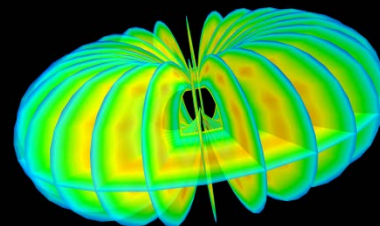
IN-SITU OBSERVATION

ERG-ground networks



Project Science Center

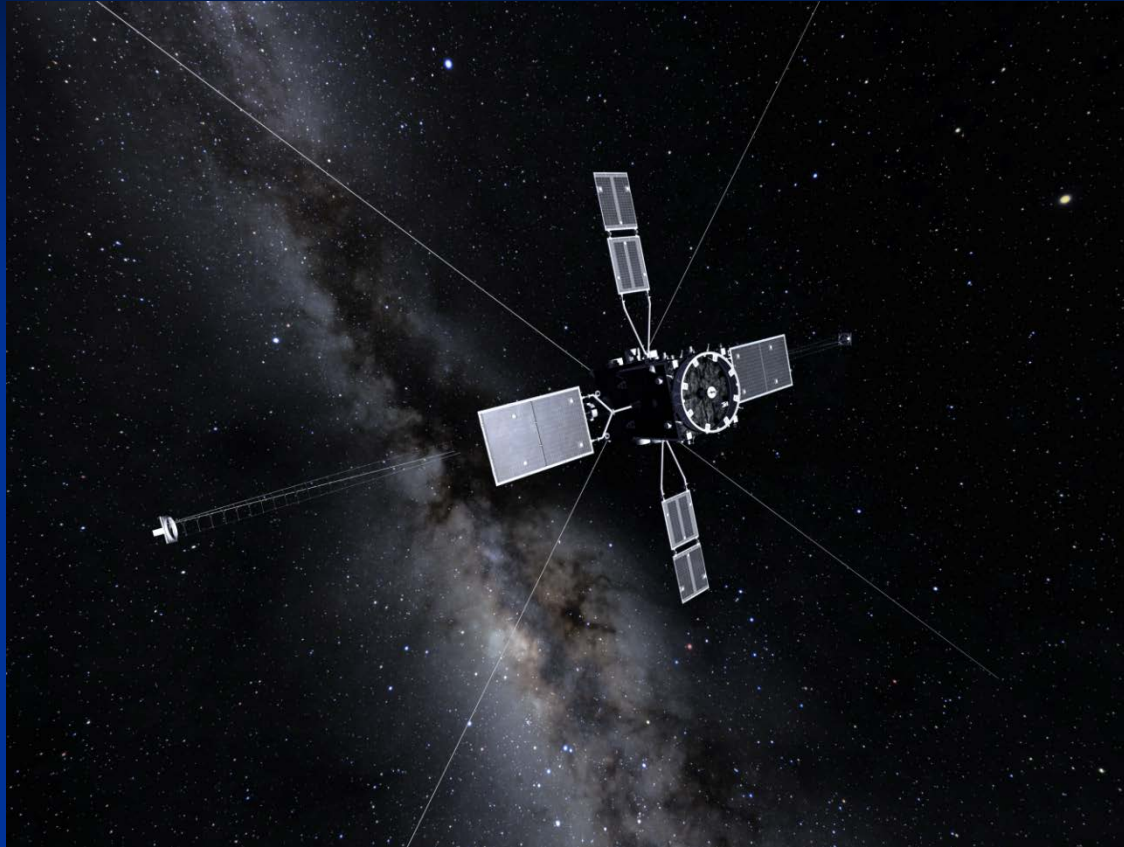
ERG-simulation/integrated studies



NUMERICAL SIMULATION/MODELING

~100 researchers in Japan join this project.

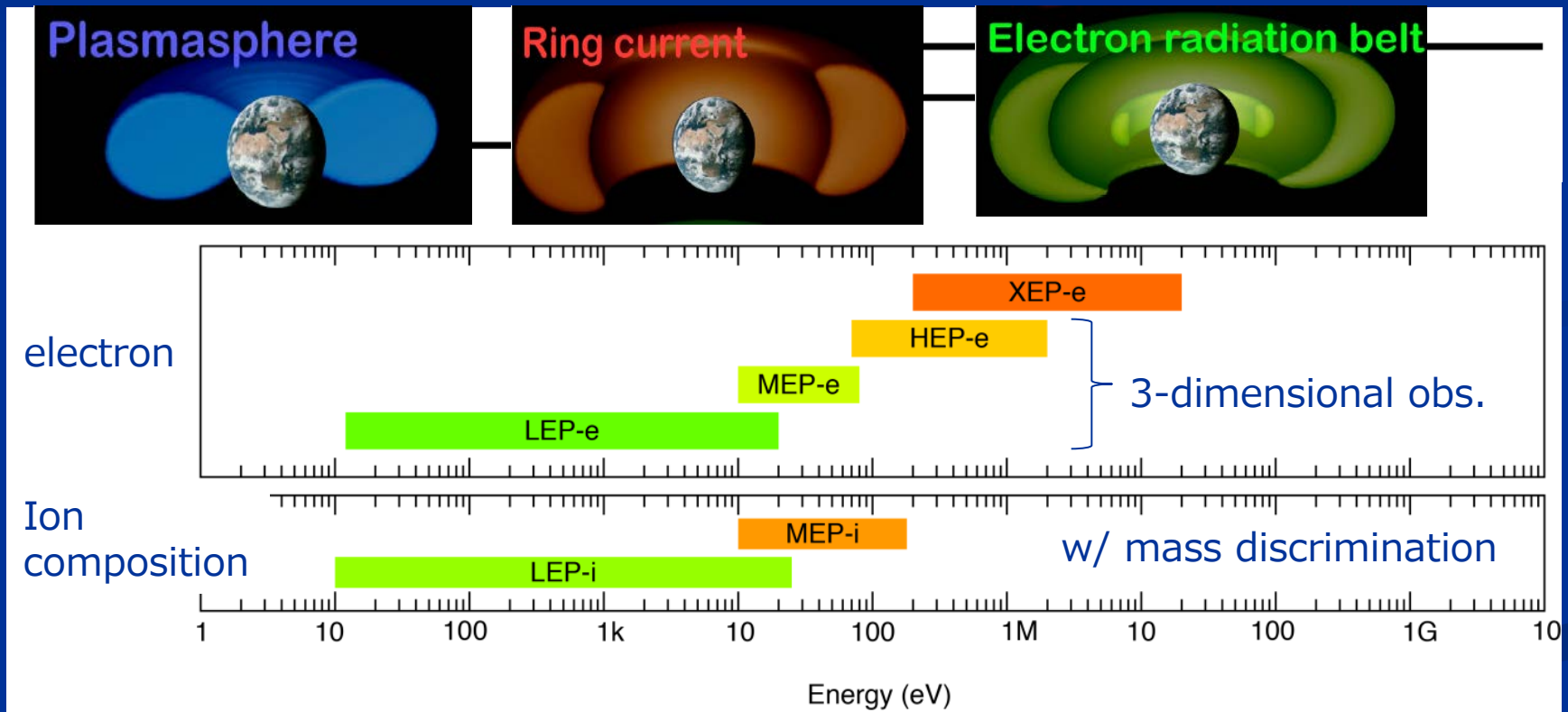
ERG satellite (ISAS/JAXA)



- apogee geocentric distance : 5.5 Re
- inclination angle: 31 deg (Lmax ~ 9)
- spin period: 8 sec
- planned launch date: FY 2016 (Summer)
- nominal mission life: > 1yr
- perigee altitude: 300 km
- initial apogee MLT: 09:00

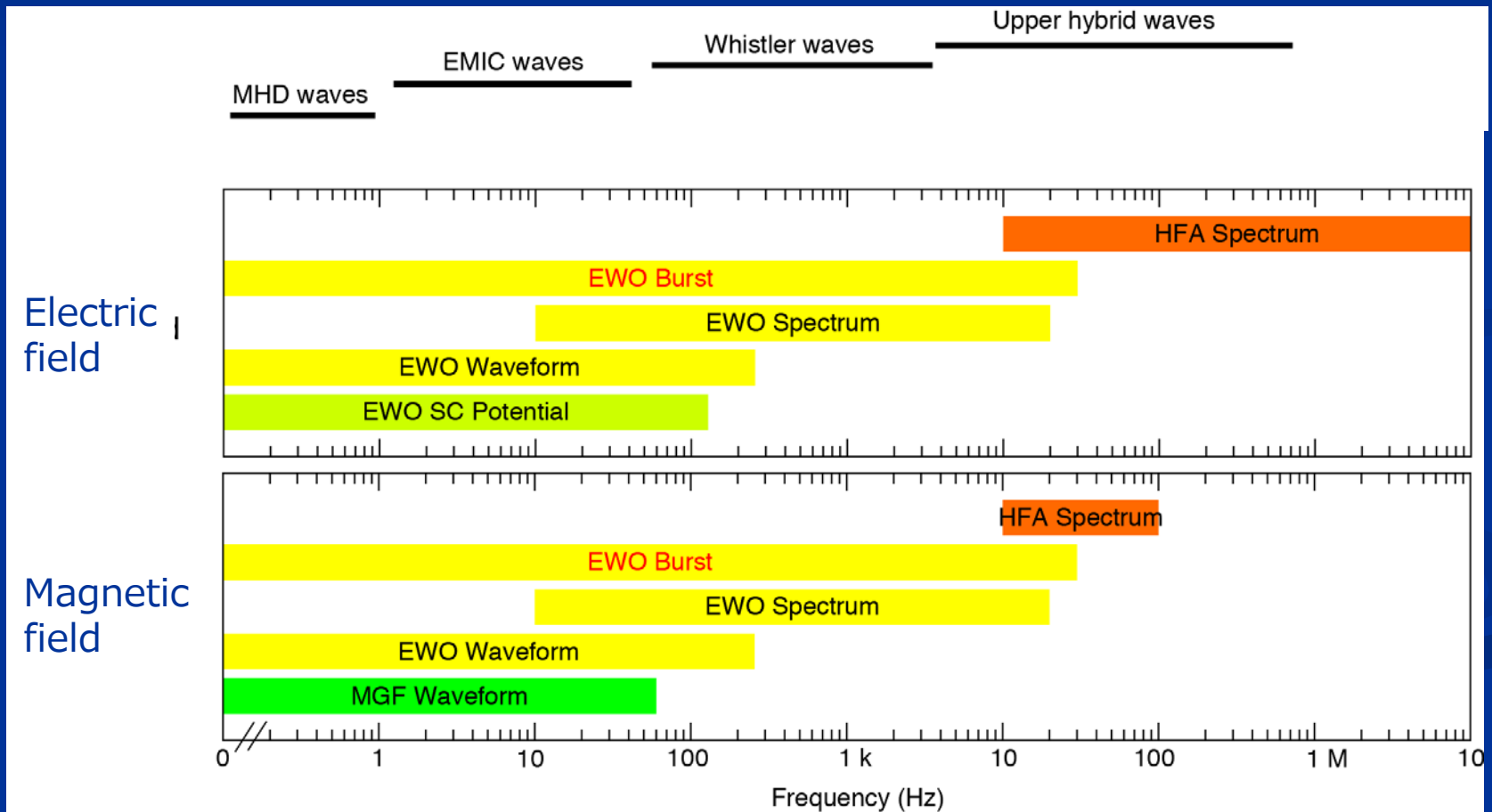
ERG: plasma & particles

PPE: Plasma and Particle Experiment Suite



ERG: Field and Waves

PWE: Plasma Wave and Electric Field Experiment
MGF: Measurement of Geomagnetic Field



Mission Status & Schedule

- FY 2009 - Mission Definition Review.
System Requirement Review.
- FY 2011 - System Definition Review
- FY 2012 - Preliminary Design Review
- FY. 2014 - Critical Design Review
- FY 2015 - Development of the flight model
- FY 2016 - Launch of the satellite

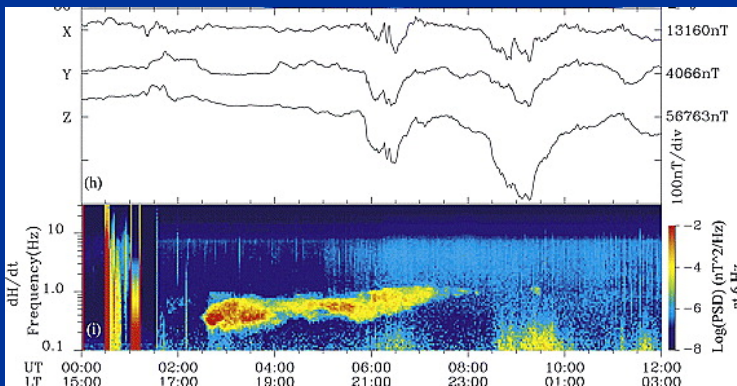
The *ERG* ground networks : waves

• Radar Network: SuperDARN network (NIPR, NICT, STEL)



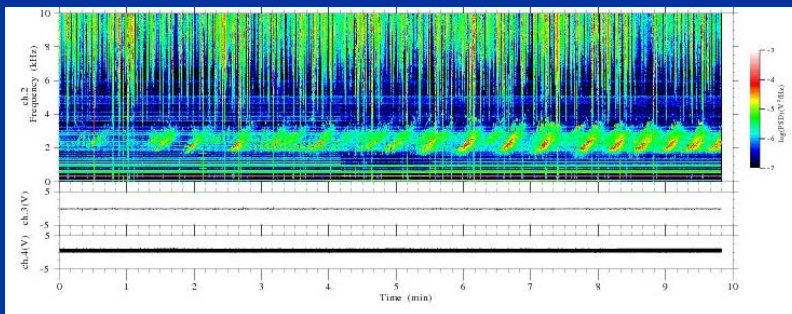
- global convective electric field
- **ULF pulsation (Pc5)**
- Electric field penetration

• Magnetometer Network : MAGDAS (Kyushu Univ.) 210MM, Antarctica Network (NIPR)



- ionospheric current / ring current.
- **ULF pulsation (Pc5).**
- **EMIC (Pc1).**
- diagnostics of plasmasphere

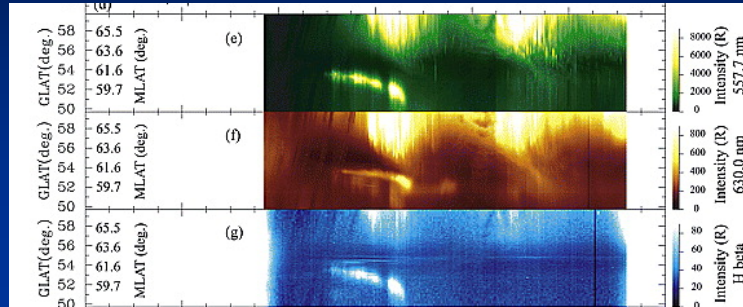
• VLF Network : Canada, Antarctica (STEL, NIPR)



- **whistler (chorus, hiss).**

The *ERG* ground networks : precipitation

• **Optical Imager Network** : Canada, Norway, Siberia, Antarctica (STEL, NIPR)



-Imaging of precipitation of \sim keV electrons/ions.

• **Riometer Observations** : Antarctica/Canada (NIPR, STEL)

- Imaging of precipitation of tens keV electrons

• **LF-Radio Wave Network** : Svalbard/Canada (Tohoku U.)

- Monitoring of D-layer disturbance
Estimation of MeV electron precipitations

• **Balloon Gamma-ray Observations** : Norway

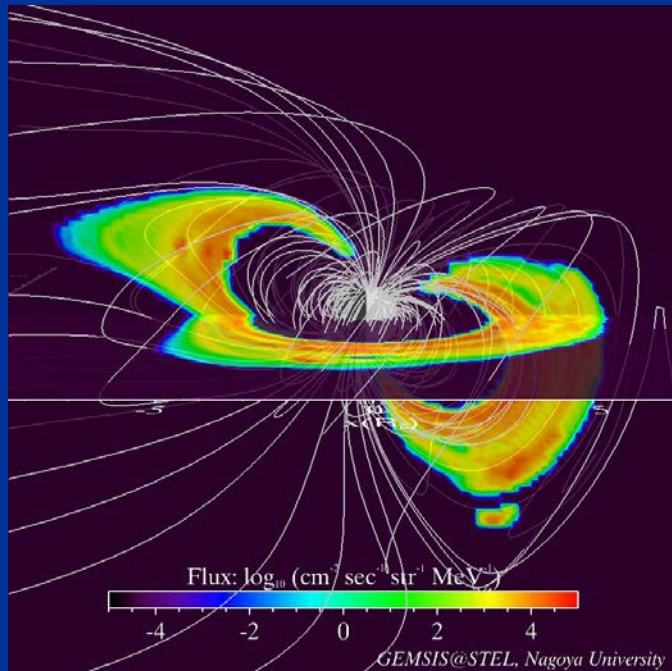
- Imaging of precipitation of
tens keV \sim MeV electrons.

The *ERG* simulation/integrated studies

Comprehensive simulations which can be compared with the observations are necessary for the *ERG* project.

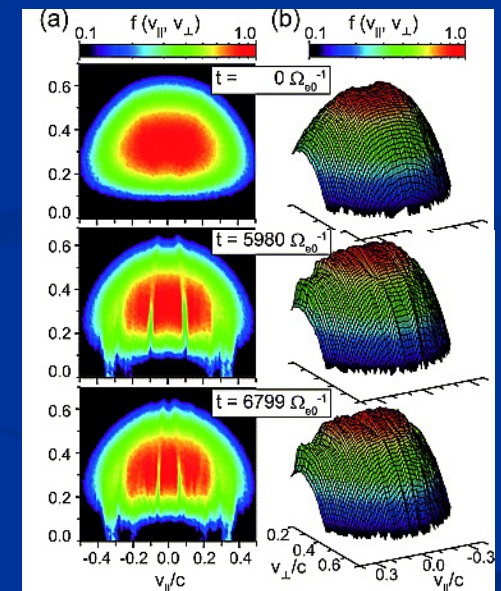
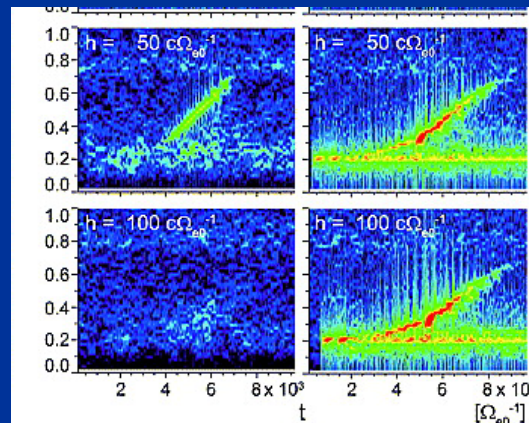
GEMSIS project is one of core activities of the ERG simulation/integrated study group.

Global Radiation Belt Model



Saito et al., 2010

PIC simulation (waves/distribution function)

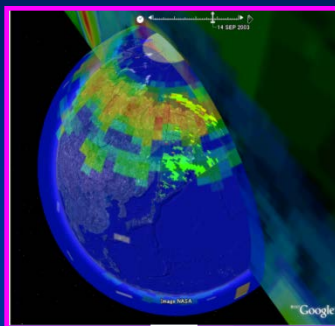


Hikishima et al., 2010

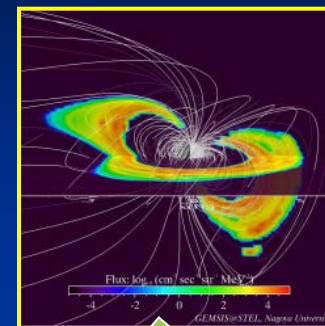
ERG-satellite data



ERG-ground data



ERG-modeling data



***ERG*-science center**
(operation by JAXA and Nagoya Univ.)



All science data
are archived with CDF

SPEDAS is a project
data analysis software

SPEDAS v1.0 includes the ERG-plugin tools.
(210MM/MAGDAS magnetometer, SuperDARN radars etc)



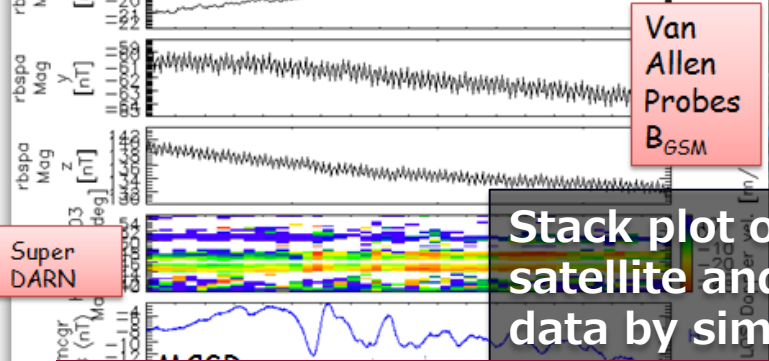
users

collaborations

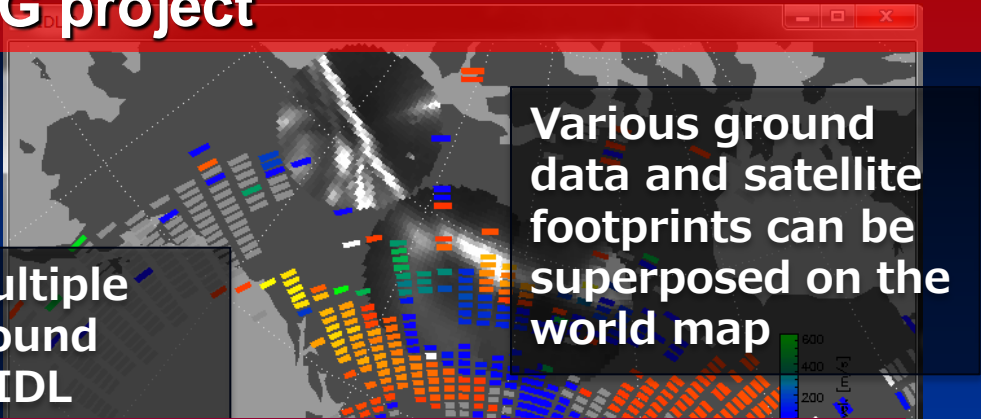


- Level-2 (3, 4) science data will be opened to the public via ERG-science center.

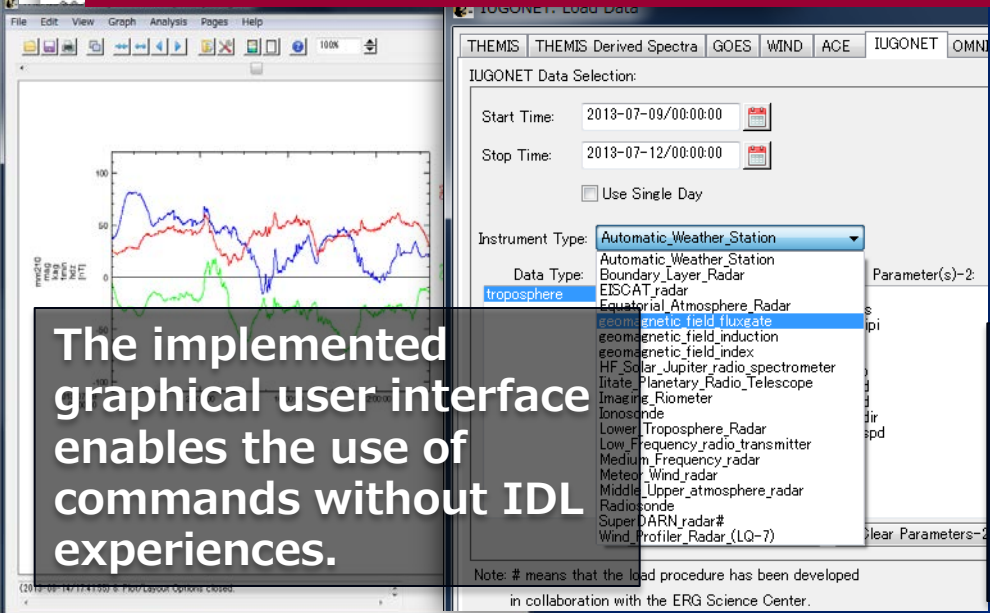
Software resources on the ERG project



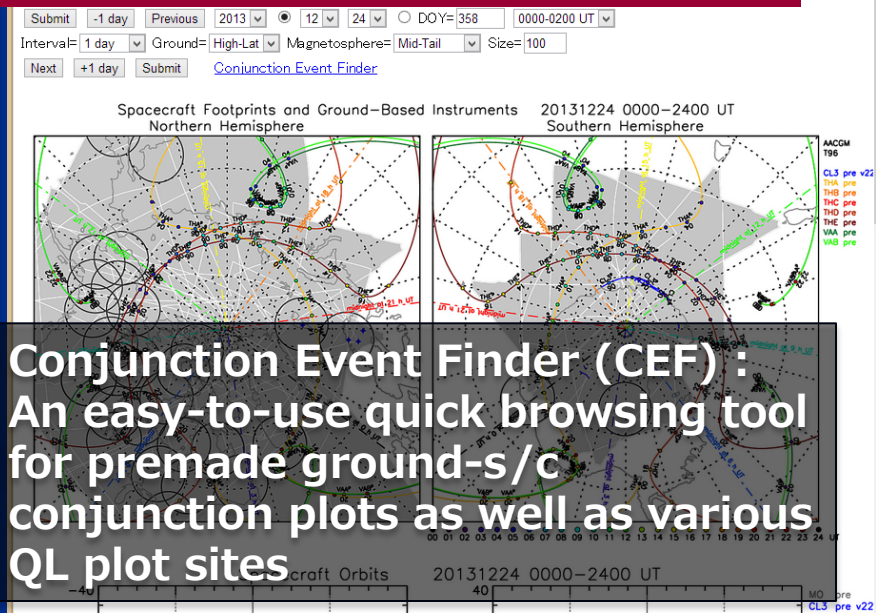
Stack plot of multiple satellite and ground data by simple IDL



These software tools will be helpful for integrated studies using various kind of data. If you are interested in the SPEDAS software, please join at tomorrow workshop.



The implemented graphical user interface enables the use of commands without IDL experiences.



Conjunction Event Finder (CEF) : An easy-to-use quick browsing tool for premade ground-s/c conjunction plots as well as various QL plot sites

3. International Collaboration: A golden era for geospace

US/THEMIS

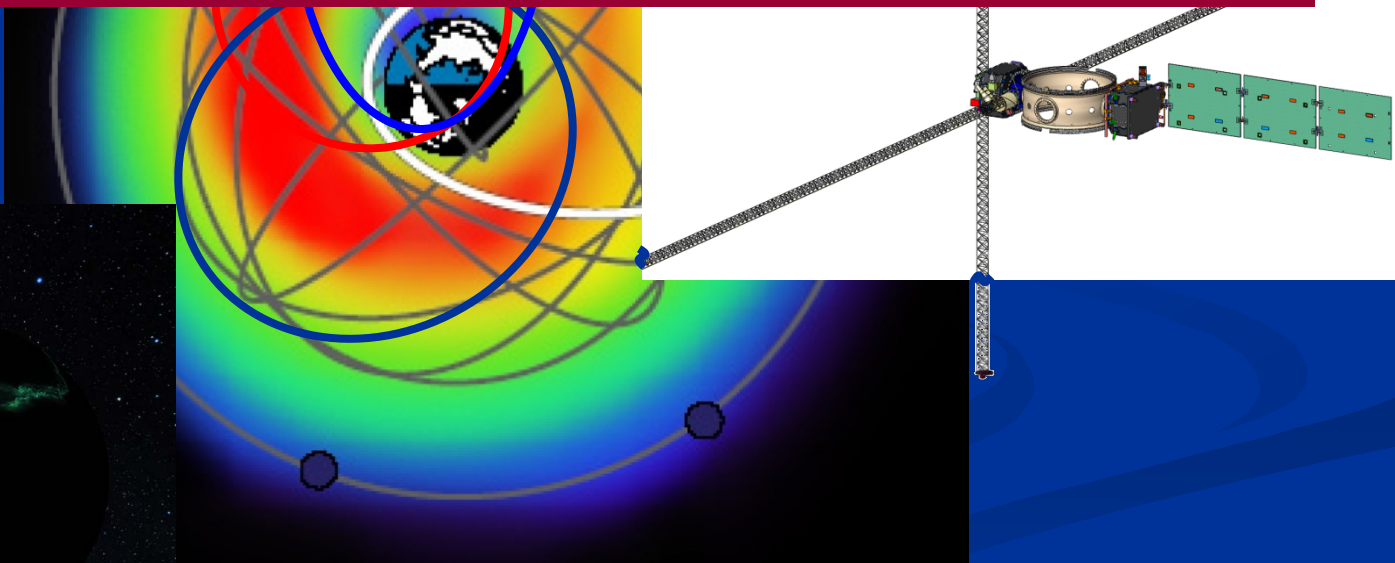
US/Van Allen Probes



International Fleet of Geospace Satellites, ground-based network observations, and modeling simulations contribute to the ISWI activities.



Japan/*ERG*



Low-altitude satellites
Ground-based observations

4. Concluding Remarks

- The development of **ERG** satellite is now going. The planned launch will be FY 2016.
- The ground network observations/integrated studies/science center have started their activity.
- International collaborations ; satellite, ground-based observations, analysis/simulations are very essential during **this golden era for geospace studies**. Ground-network observations are essential.

If you are interested in the ERG project, please contact us.
We are very happy to collaborate with you and
contribute to the ISWI activities.