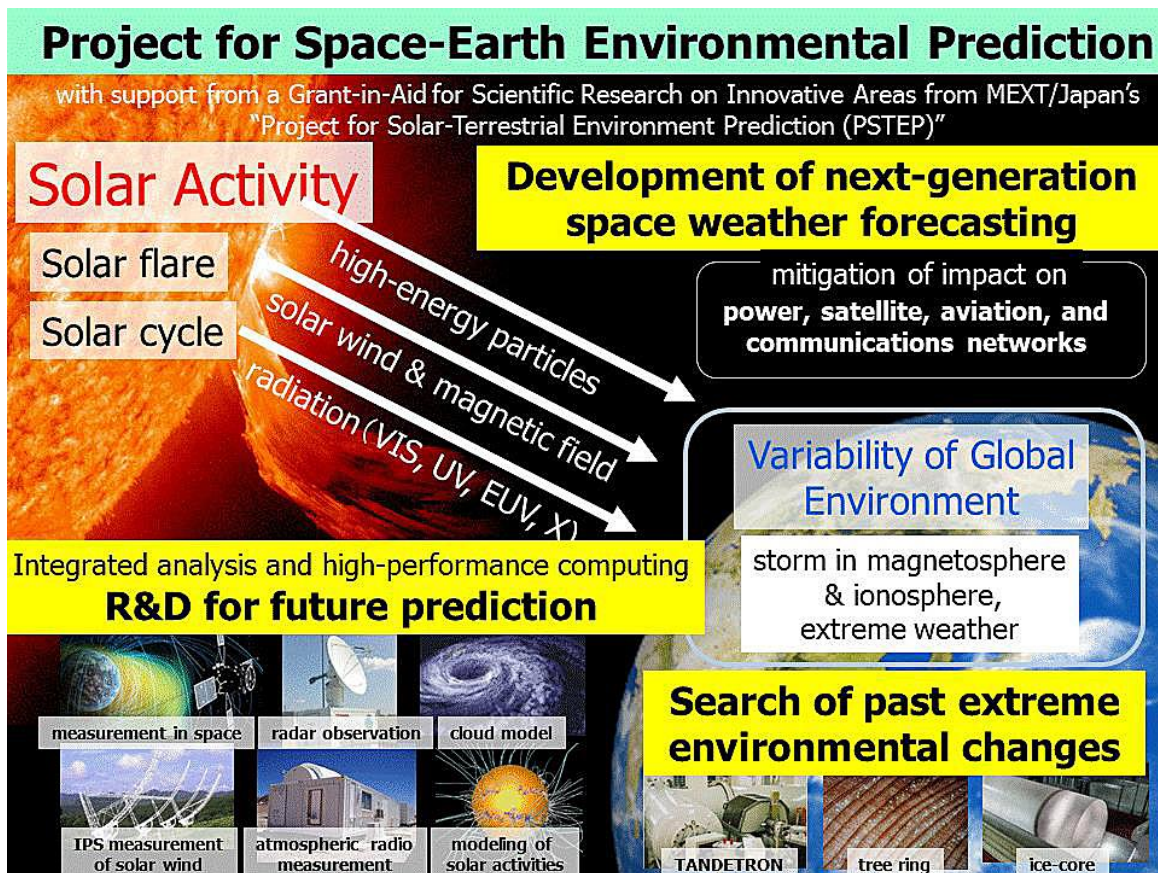


# 9-3. Interdisciplinary Researches

## Project for Space–Earth Environment Prediction

### Introduction to Project for Space–Earth Environment Prediction

Over the past 50 years, space exploration has expanded rapidly and has now gone past the edge of the heliosphere. Consequently, it is known that solar activity and the dynamics of the space environment can significantly impact human socio-economic systems as well as the global environment. For example, the giant solar flare observed by the British astronomer Richard Carrington in 1859 caused powerful magnetic storms, called the Carrington Event. If such an event occurred in the modern era, power, satellite, aviation, and communication networks could possibly be damaged, on a global scale. Moreover, analyses of the latest stellar observations and of cosmogenic isotopes in tree rings suggest the possibility of even larger solar flares. However, the mechanisms of the onset of solar flares and their subsequent processes have not yet been fully explained. Thus, modern society is at a risk from severe space-weather disturbances, caused by just such solar explosions, and understanding and predicting variations in the space–Earth environment is both an important scientific subject and a crucial issue for modern society. Furthermore, because the accurate prediction of complex phenomena is a common problem in science, the prediction is also a crucial subject for various scientific disciplines. The Project for Space–Earth Environmental Prediction is a new joint research project aimed at synergistically developing our predictive capability for the space–Earth environment through the cooperation and interaction of solar physics, geomagnetism and space sciences, meteorology, climatology, space engineering, and other related fields. This project addresses the various issues shown in the figure below, based on ISEE Collaborative Research Programs and the support of a Grant-in-Aid for Scientific Research on Innovative Areas from the Ministry of Education, Culture, Sports, Science and Technology (MEXT) Japan “Project for Solar-Terrestrial Environment Prediction (PSTEP)”.



The objectives and subjects of the Project for Space–Earth Environmental Prediction.

## Main Achievements in FY2017

### 1. PSTEP Summer School 2017

The ISEE co-hosted the PSTEP Summer School 2017 in Rikubetsu in cooperation with the Project for Solar-Terrestrial Environment Prediction (PSTEP) supported by the MEXT Grant-in-Aid for Scientific Research on Innovative Areas, in collaboration with Rikubetsu-cho, Hokkaido and the Rikubetsu Observatory of ISEE from July 30 to August 4, 2017. During this summer school, more than 100 graduate students and young researchers from all over Japan participated in learning the fundamentals and state-of-the-art predictive schemes for space weather and space climate phenomena.



The participants of PSTEP Summer School 2017 in Rikubetsu.

### 2. ISEE/PSTEP International Workshop on the Benchmarks for Operational Solar Flare Forecasts

The ISEE conducted the International Workshop on the Benchmarks for Operational Solar Flare Forecasts in cooperation with the MEXT Project for Solar-Terrestrial Environment Prediction (PSTEP) from October 31 to November 2, 2017. Twenty researchers from research institutes around the world (including three researchers from Australia via the network) participated in the workshop. Forecast schemes of solar flares used for space weather operation in each country's space weather forecast agencies were compared quantitatively from various viewpoints. The results from this workshop will be applied to further development of solar flare prediction models.



The participants of International Workshop on the benchmarks for Operational Solar Flare Forecasts.

### 3. ISEE/PSTEP International Workshop on Solar Cycle 25 Prediction

The ISEE conducted the International Workshop on Solar Cycle 25 Prediction in Nagoya in cooperation with the MEXT Project for Solar-Terrestrial Environment Prediction (PSTEP) from November 27 to December 2, 2017. The activity of the next solar cycle (Cycle 25) is an important issue for solar-terrestrial environmental study, because various predictions suggest that Cycle 25 will be more active or less active than the current cycle. Twelve researchers from around the world participated in the workshop. They compared prediction results of solar cycles based on various factors including the physical processes for prediction, the initial and boundary conditions, and numerical schemes used for prediction. The results from this workshop will be summarized and applied in future research to improve prediction accuracy and understanding of solar cycle activity.



The participants of International Workshop on the Solar Cycle 25 Prediction.