Science and Engineering

Title of Project : Solar-Terrestrial Environment Prediction as Science and Social Infrastructure

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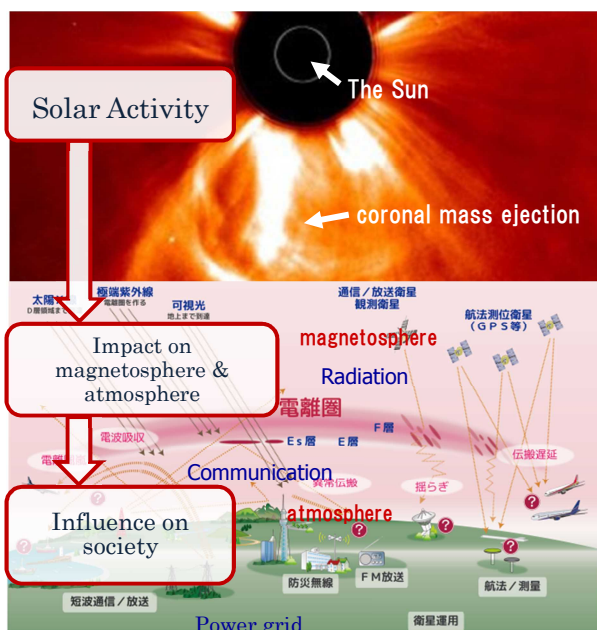(Nagoya University, Solar-Terrestrial Environment Laboratory, Professor)

【Purpose of the Research Project】

Over the last 50 years, space exploration and space utilization has seen a rapid spread. As a result, the dynamics of the sun and space has been found to have a significant impact on the global environment as well as human society. However, the mechanisms of solar explosion and the subsequent processes have not yet been fully elucidated. Therefore, the advanced information society will have potential risk to severe space weather disturbance caused by giant solar explosion.

On the other hand, the sunspot activity that causes the solar-terrestrial environment variability will be activated with a period of about 11 year cycle. However, the current solar cycle (Cycle 24) manifests as the lowest solar cycle in the past 100 years. Although many data suggested that the solar cycle variation may affect the weather and climate of the Earth, the causality between the solar activity and the variation of global environment is not yet clearly explained. Therefore, the role of solar activity in climate change is still greatly ambiguous.

This project aims to develop the synergistic interaction between the prediction research and the scientific research of the solar-terrestrial environment variation to establish the base of next-generation space weather forecast.

【Content of the Research Project】

This project coordinates the interdisciplinary research on the following subjects.

(1) Next Generation Space Weather Forecast: To develop a new space weather forecast system that may be utilized as a social infrastructure.

(2) Prediction of solar storms: To establish the prediction system of solar explosion based on the state-of-the-art observations and the physics-based models.

(3) Prediction of magnetosphere and ionosphere dynamics: To understand and predict the disturbance of space radiation, ionospheric storm, and geo-magnetically induced current.

(4) Prediction and understanding of solar cycle activity and the impact on climate: To elucidate the cause of solar cycle and the climate impact.

(5) Mathematical sciences for solar-terrestrial environment variability.

【Expected Research Achievements and Scientific Significance】

This study solves many scientific important issues of the solar-terrestrial environment, and achieves the following developments.

①The quantitative assessment of the severe space weather disasters.

② The contribution to the future space exploration and the guidelines of the heliospheric science mission

③ The development of prediction algorithm, which contributes also to the climate change projection.

【Key Words】

The sun, solar flare, coronal mass ejection, CME, solar cycle, magnetosphere, ionosphere, space weather, space climate, climate change, space radiation, geo-magnetic storm

Various impacts of solar explosion on the social systems.

【Term of Project】　FY2015-2019

【Budget Allocation】　649,400 Thousand Yen

【Homepage Address and Other Contact Information】

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