

## 8. Research Topics

The mission of the ISEE is to understand the mechanisms and interactions of diverse processes occurring in the integrated space–Sun–Earth system to deal with global environmental problems and to contribute to human society in the space age. To develop this new research field, four projects of Interdisciplinary Research were studied with seven research divisions: Divisions for Integrated Studies, Cosmic Ray Research, Heliospheric Research, Ionospheric and Magnetospheric Research, Meteorological and Atmospheric Research, Land–Ocean Ecosystem Research, and Chronological Research.

- 1) **The Project for Space–Earth Environmental Prediction** aims to develop our understanding and predictive capabilities of the influence of solar dynamics and atmosphere–ocean activities on the global environment.
- 2) **The Project for the Interaction of Neutral and Plasma Atmospheres** aims to improve our understanding of the relationship between Earth’s atmosphere and space using a global observation network of interactions between the upper plasma and middle atmosphere.
- 3) **The Project for Solar–Terrestrial Climate Research** aims to observe the long-term variability in solar activity over more than several thousands of years through radioisotopes and to examine the influence of solar activity on the atmosphere using observations and models to understand the influence of solar activity on global climate variability.
- 4) **The Project for Aerosol and Cloud Formation** aims to understand the processes that form cloud and precipitation particles by considering the influence of cosmic rays and the processes of scattering and absorption of radiation by clouds and aerosol particles using experiments, field observations, and simulations.

The main results of these interdisciplinary studies carried out during the period of the 3rd medium-term goal period (six years from 2016 to 2021) are summarized in “8.3 Interdisciplinary Research.”

In addition, to develop new interdisciplinary research, in 2021, the Institute started the following research projects based on proposals from faculty members, using the Director’s Leadership Funds.

- 1) **Energetic Particle Chain -Effects on the middle/lower atmosphere from energetic particle precipitations-**
- 2) **Direct Search for Dark Matter with Paleo-detector**
- 3) **Data Rescues of the Analog Observational Records for the Past Solar–Terrestrial Environment**
- 4) **Changes in Surface Temperature at Dome-Fuji in East Antarctica from the Mid-Twentieth Century and the Impact of Solar Activity**

More information on these research projects can be found in “8.4 FY2021 Interdisciplinary Research Projects”.

The ISEE also has three research centers that contribute to national and international research development of the relevant disciplines in cooperation with the research divisions. The Center for International Collaborative Research (CICR) conducts extensive observations with four domestic observatories (Moshiri, Rikubetsu, Fuji, and Kagoshima) and a global observation network to enhance collaboration and joint research between domestic and international researchers and institutions. The Center for Integrated Data Science (CIDAS) develops infrastructure and research for intensive studies of the space–Sun–Earth system through the analysis of big data and advanced computer simulations. The Center for Orbital and Suborbital Observation (COSO) conducts planning and technological research using orbital and suborbital observation vehicles, such as aircraft, balloons, rockets, and satellites, with domestic and international networks. More information on these research centers can be found in “8.2 Research Centers.”

