

# Social Implementation of Space Weather Forecasting in NICT for Promotion of Private-sector Use



Naoto Nishizuka, Chihiro Tao, Takuya Tsugawa, Yuki Kubo (contact: nishizuka.naoto@nict.go.jp)  
National Institute of Information and Communications Technology, Japan

**ABSTRACT:** NICT provides daily space weather forecasts in Japan. The private-sector use of space weather forecasts has been an issue, and NICT has been studying ways to create private-sector businesses. NICT interviewed more than 80 companies last year and found that there is a high need (interest) from the private sector for the provision of space weather information data through APIs. In this R&D, an API data provision platform for space weather information will be established, while selecting fields where space weather forecasts is expected to be commercialized. While preparing to provide data, we will conduct research by directly interviewing companies to determine which data has high demand interest and high potential for commercialization, and which format is preferred. This summer, we aim to begin providing data with a private company, and will conduct a survey of usability, needs, and other requests.

## 1. Introduction

Space weather forecasts protect social infrastructure from the risks of space weather economic impacts. While undertaking the social implementation of space weather forecasting, NICT aims to bolster linkages to social infrastructure, in an effort to encourage private sector use and commercialization.

At NICT, we are conducting **surveys of impacts on individual companies**, while also undertaking **needs-based research and development**, formulating new alert standards, and preparing usage guidelines.

The commercialization of space weather forecasts is a key topic in NICT's current Mid-term Plan, with discussions taking place in such forums as the **Space Weather Users Council** and the **Ministry of Internal Affairs and Communications' Study Group** on the Advancement of Space Weather Forecasting.

The difficulty in social implementation of space weather forecasting is to shape the results of basic research into business operations. The impact on social infrastructure cannot be known without asking each company.

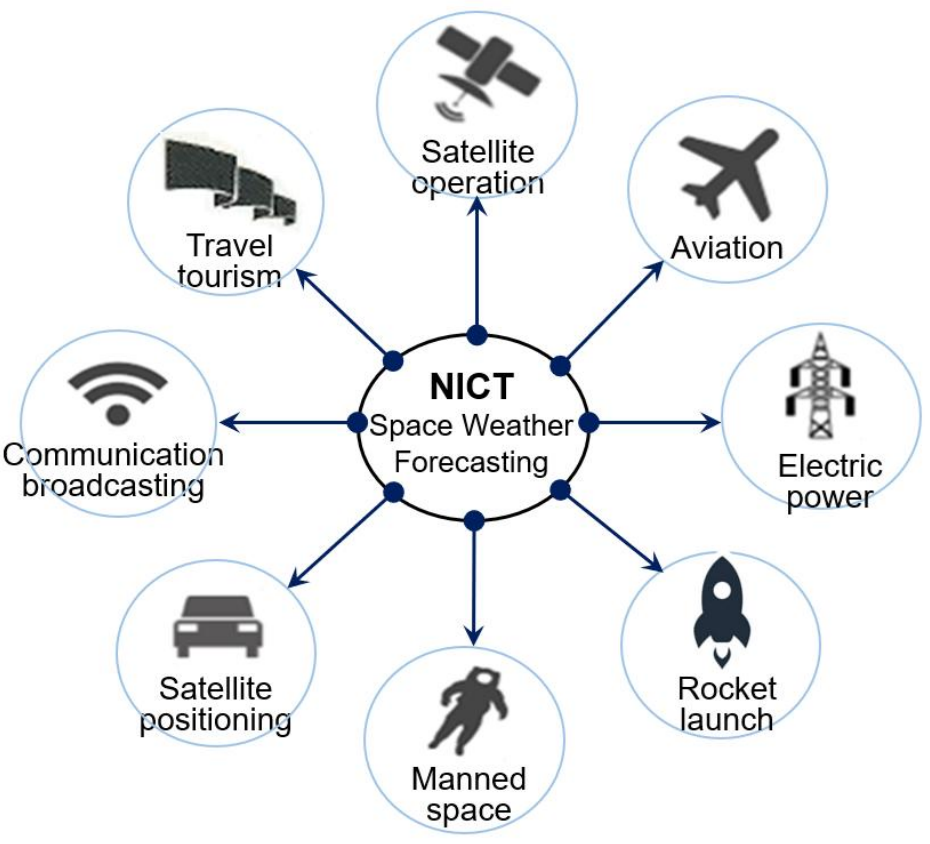


Figure 3: Fields in which space weather forecasts are used.



Figure 1: NICT homepage of space weather forecasts.

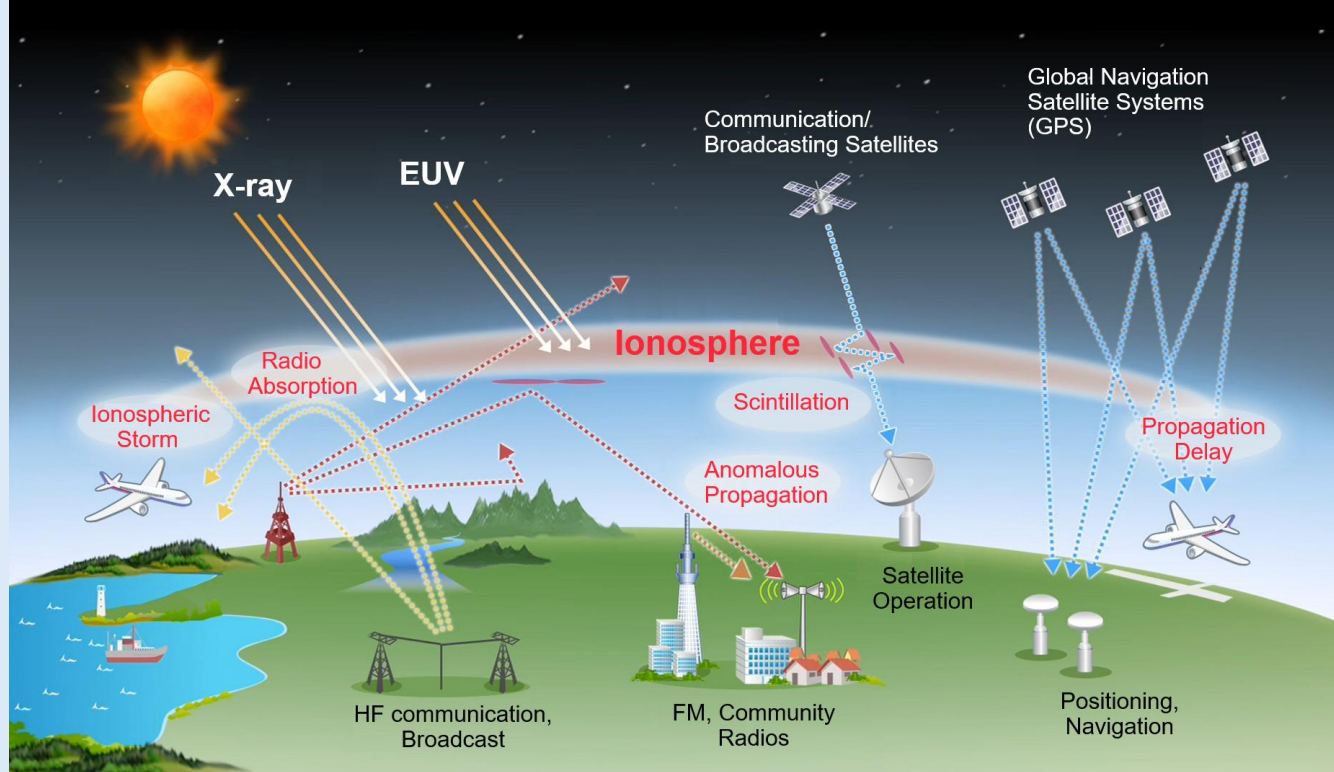


Figure 2: Social impacts of space weather.

Space weather impacts differ according to each country's latitude and industries, but the economic impacts are presumed to be greatest in the fields of **communications and broadcasting, satellite operation, aviation, satellite positioning, and electric power**. Consideration is also given to the perspectives of **deep space exploration, national defense & disaster prevention**.

## 2. Survey of Market Needs for SWx forecasts

Since the previous fiscal year, NICT has been undertaking **market research aimed at commercialization**, and empirical research focused on the production of a **concept video**.

We have interviewed **more than 80 companies** to investigate **market needs** for space weather forecasts. The companies can be categorized into **satellite-related companies / insurance companies / trading companies / human spaceflight / lunar surface exploration / server-operating companies / travel company / rocket-launching / companies / airlines / GPS usage companies / communications and broadcasting companies / and new business services companies**.

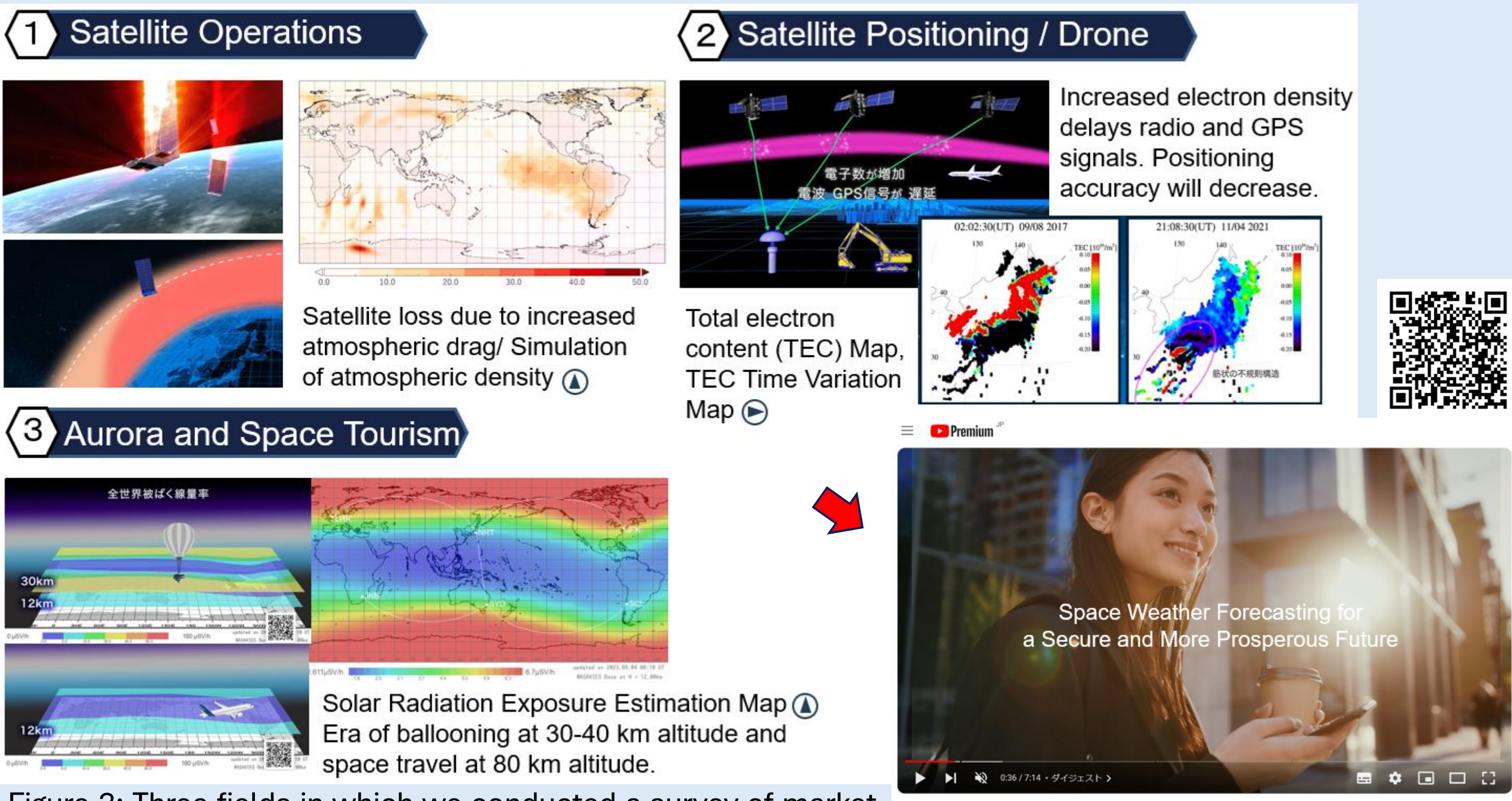
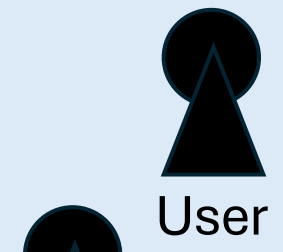
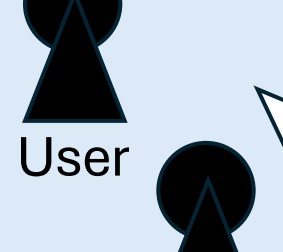


Figure 3: Three fields in which we conducted a survey of market needs and associated space weather forecasting solutions.

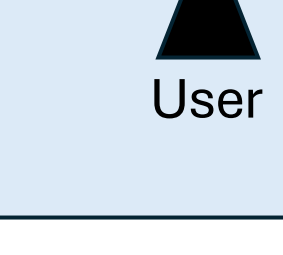
Based on the results, we produced a **concept video** focused on fields with high needs. The video highlights the fields of **(1) satellite operation, (2) satellite positioning and drones, and (3) aurora and space tourism**.



User



User

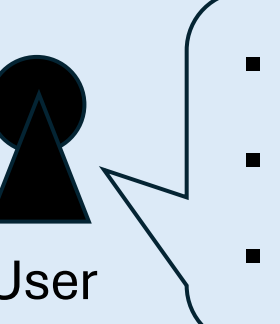


User

- We could ascertain the **issues** faced by each company and identify **latent needs** relating to space weather.
- Few companies want to pay money to use space weather forecast information at the current stage.
- Many respondents expressed **a wish for a space weather data API**.
- An increasing number of companies are interested in the commercialization of space weather services.

## 3. SWx Information API platform

With a primary focus on fields identified by our market research as having high needs, we are working on development for a space weather information sharing platform.



User

- It's hard to imagine the change in behavior and services if it's just an indicator.
- If it's an API, it's easy for users to incorporate into systems and products.
- Users want to see the data ourselves and to compare with our own system.

➡ There is a high need for private-sectors to provide space weather information via API.

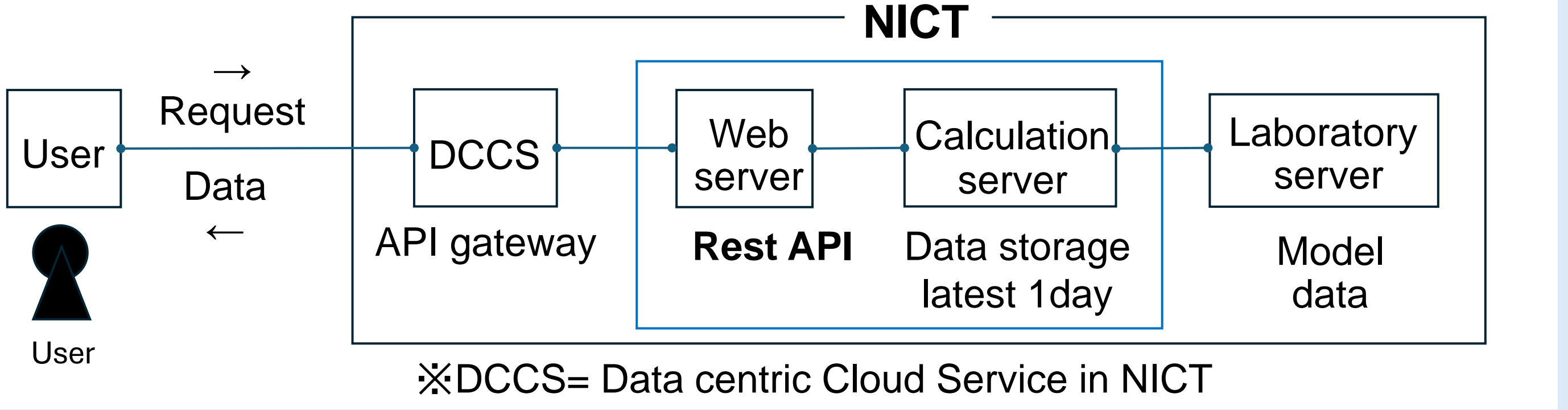
### I. Development of Space Weather Information API Platform

- Selecting fields where business potential exists and developing data.
- Establishing an environment to provide space weather data through APIs.
- Providing API data and creating provision policy.

### II. Creation of the guideline for the use of space weather information

- Providing API data through joint research with private companies
- Hearing from companies on **usability** and **impact** of space weather
- Feedback for space weather guideline development

### Overview of API platform system



### Provided data and Target

#### [1] Space Weather Indicators:

solar flare/protons/geomagnetic storms/Ionospheric disturbances/sporadic-E

➡ All the field: Aviation, Satellite, Navigation, Communications

#### [2] Deep Flare Net:

Solar flare prediction (X-ray) for each active regions using DNN.

➡ System Engineers considering license

#### [3] WASAVIES:

Warning system for Aviation exposure to Solar energetic particle (protons).

➡ Aviation, Space craft, Balloon

#### [4] SECURES:

Global Magnetosphere simulation and Spacecraft Surface Charge Analysis Model

➡ Satellite operators (GEO/MEO, PEO of LEO satellites)

#### [5] Aurora Alert:

Aurora prediction map by simulations and Forecast calendar

➡ Travel company, Aviation, Satellite operators

#### [6] TEC/ROTI maps:

Positive/negative storms in the ionosphere over Japan.

➡ GNSS service providers, Drone Agriculture/Construction companies

A full-scale system for commercial use will be considered again, either by NICT or outsourced to the private sector.

## 4. Summary

Space weather startups have begun to emerge in recent years, and efforts to encourage the private sector use of space weather information are progressing. In Japan, too, efforts to commercialize space weather forecasts are gaining momentum through cooperation between NICT and private sector companies. With a primary focus on fields identified by our market research as having high needs, we are working on research and development for a space weather information sharing platform, as well as user guideline. We are also considering a space weather forecaster system to ensure that space weather forecasts are used appropriately. We hope you will continue to keep an eye on NICT's space weather forecasts.