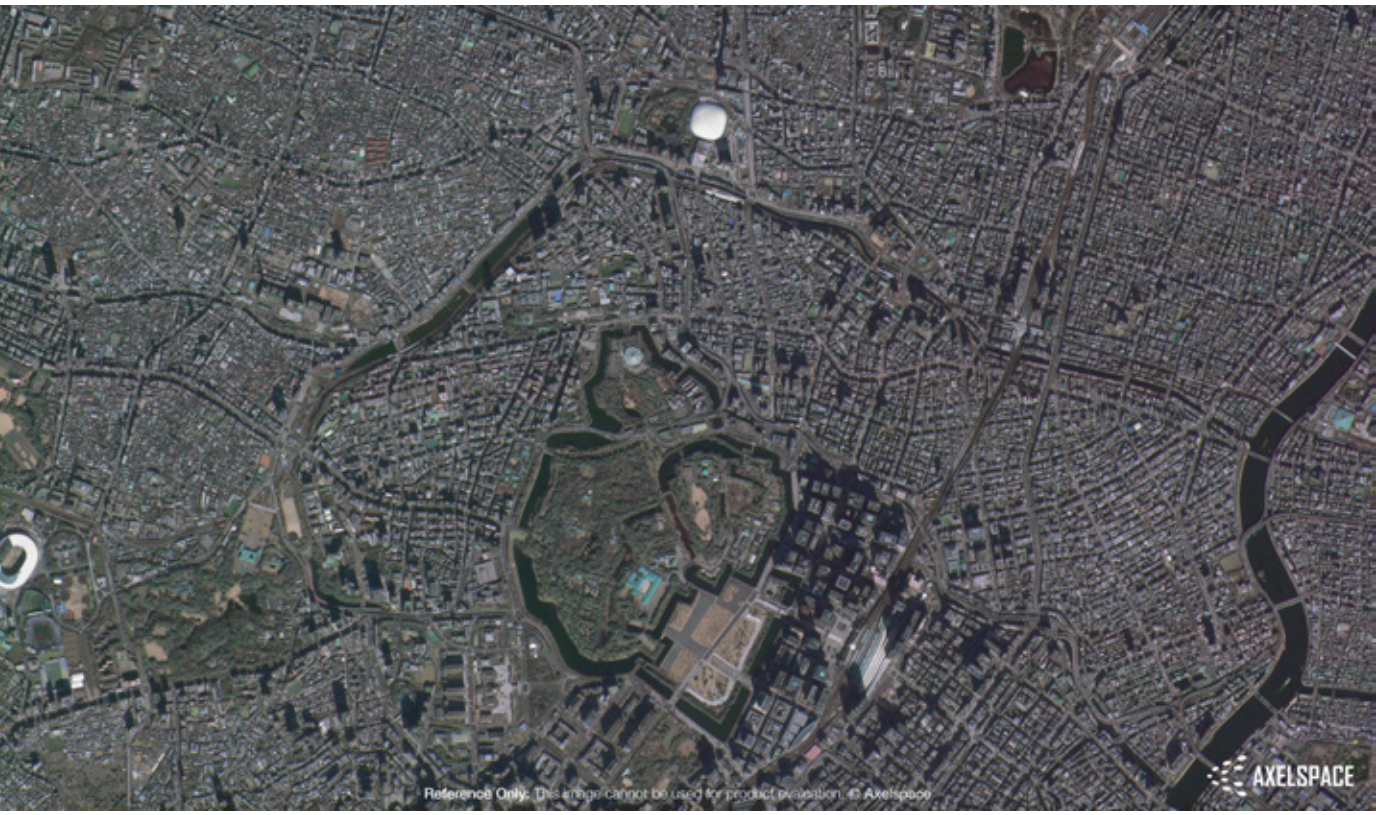

Central Tokyo as captured by a GRUS microsatellite in the AxelGlobe Earth observation network

Microsatellites as Social Infrastructure

A Japanese startup company is developing businesses that utilize microsatellites with the aim of making a contribution in areas such as the global environment, agriculture and infrastructure.

UMEZAWA AKIRA

AXELSPACE Corporation, a startup company working on the development of commercial microsatellites, was founded in 2008 by Nakamura Yuya and two of his colleagues. The idea for the start-up originated when Nakamura was a university student involved in a project to develop "CubeSat," a microsatellite, being a cube with 10 centimeter sides and weighing around 1 kilogram. The CubeSat was launched in 2003, successfully capturing images of Earth from orbit. Nakamura went on to work on three microsatellite projects during his time at university, which heightened his passion for satellite development.

"I was a student, but as a beginner engineer, I was really impressed by the thrill of seeing something I had created travel into space and work as it was designed to do. At the same time, I felt a strong desire to create something useful for the world using microsatellite technology," says Nakamura.

All photos: Courtesy of Axelspace Corporation

In 2013, the company developed and successfully launched WNISAT-1, weighing 10 kilograms and equipped with optical cameras for the purpose of monitoring sea ice in the Arctic Sea. WNISAT-1 became the world's first commercial microsatellite owned by a private company. 2014 saw the launch of Hodoyoshi-1, weighing 60 kilograms and equipped with optical cameras capable of identifying objects with a ground resolution of approximately 6.7 meters. So far, it has captured more than 4,000 images. In 2017, WNISAT-1R, weighing 43 kilograms, was launched as the successor to WNISAT-1.

The company is currently working on the construction of the next-generation Earth observation network named "AxelGlobe," consisting of more than ten microsatellites called "GRUS," weighing 100 kilograms each. GRUS is capable of identifying objects with 2.5 meters ground resolution.

"Until now, satellite imagery was costly and its capture intervals were too long to be satisfactory for most users. Therefore, we aimed to build a system that was capable of high-frequency, timely monitoring by placing dozens of low-cost microsatellites in orbit," says Nakamura.

The first GRUS satellite was launched in 2018, followed by the start in May 2019 of a service that provides the captured images. By mid-2020, four more satellites will be launched, and in 2022 the company aims to have a satellite network comprising more than ten satellites.

Nakamura Yuya holds a 1:2 scale model of a GRUS microsatellite

"The launch in 2020 will give us a total of five observation systems, enabling images of most of the planet's surface to be captured on an almost daily basis. This will enable us to empirically demonstrate applications that require frequent observations using actual data," says Nakamura.

Examples of applications include the monitoring of conditions for growing crops, early detection of illegal logging, and the monitoring of infrastructure. According to Nakamura, in addition to these conventional applications, he is receiving many requests for applications he hadn't even imagined from all over the world.

"The major advantage to starting AxelGlobe's services is that clients themselves have found ways to use them. This allows us to ascertain the needs of such clients in real time, and feed that back into the satellite development process. Going forward, comparing real-time data to data accumulated in the past will enable us to identify the kinds of changes currently taking place as well as predict what will happen in the future. I would like to establish microsatellites as the new social infrastructure," says Nakamura, his eyes lighting up.

Haneda airport as captured by a GRUS microsatellite in the AxelGlobe Earth observation network