Japan Geoscience Union Meeting 2012
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ATT34-P01 Room:Convention Hall Time:May 20 15:20-15:30

Earth observaiton satellites missions by JAXA

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This paper explain the plan and status of JAXA’s earth observation satellite missions.

Keywords: Earth observation

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ATT34-P02 Room:Convention Hall Time:May 20 15:20-15:30

A Study on the earth observation mission for human society

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We began to discuss the future of the earth observation mission along with the JAXA form 2011 FY. This paper is a summary report of the discussion about land area. We hope that this report becomes the beginning of discussion among many people.

In 2011, the world's population has reached 7 billion people. According to the white paper, the world's birth rate is declining, but the population will continue to trend increase in the future. It is estimated that in 2050 the world population will reach 9 billion people, in the year 2090 will reach 10 billion people. In Malthus's population theory (published in 1798), He said that the big problem for human beings will arise, when the balance of food and population collapses remarkably. We thought it would be this problem to arise in 21st century. We began to discuss the earth observation mission involved in food production.

Keywords: earth observation

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ATT34-P03 Room:Convention Hall Time:May 20 15:20-15:30

A proposal for high resolution observations of the ocean surfaces using a large aperture antenna

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Sea surface observations of a high spatial resolution (approximately 5 km) by a passive and active microwave sensor with a large aperture antenna (5-10 m diameter) are proposed. The microwave sensor with the large aperture antenna will provide us with physical parameters of the air-sea boundary with a high spatial resolution of 5 km, which resolves oceanic phenomena of spatial scales greater than the Rossby radius of deformation (approximately 10 ? 30 km in mid latitudes). The sensor carried on a sun-synchronous polar orbit satellite with an orbital altitude of 7-800 km conically scans the earth's surface with a wide swath of approximately 1600 km, achieving a temporal sampling of 2 times/day. The microwave radiometer (passive) utilizes frequency bands of 1.4, 6.9/7.3, 10.6, 18.7, 23.8, 36.5, 89.0, and 160 GHz (V and H pol.), while the scatterometer (active) is operated in the L-, C-, and Ku-band (VV and HH pol.). The radiometer channels other than 1.4 and 160 GHz are identical to AMSR2 on GCOM-W1. The 1.4 GHz channel is added to observe the sea surface salinity, and the 160 GHz channel is added for observation of solid precipitation. The microwave instrument will measure the physical parameter of the ocean surfaces, such as the sea surface temperature (SST), marine surface vector wind, sea surface salinity (SSS), and sea ice concentration. Typical spatial resolution and temporal sampling would be 5 km and 2 times/day for SST, winds, and sea ice, and 25 km and 5 day average for SSS, respectively. The goal of accuracy is 0.5 K for SST, 1 m/s and 20 deg. for vector winds, 0.2 psu for SSS, and 10 % for sea ice concentration. The microwave sensor will be also applicable to observations of the atmosphere (e.g., integrated water vapor, liquid cloud water, and liquid and solid precipitations), and land (e.g., soil moisture, and snow depth). The sea surface observation with the high spatial resolution and high accuracy will allow us to explore the mesoscale and sub-mesoscale oceanic phenomena, which are difficult to observe conventional techniques and previous spaceborne sensors. The observed data will also be directly applicable to the operational oceanic monitoring and prediction, the safety and economical efficiency of ship routes, fishery and conservations of marine environment, especially in the ocean and seas around Japan, together with operational weather forecasts and disaster preventions.

Keywords: Remote sensing, Observation of oceans from space, Microwave radiometer, Microwave scatterometer, Large aperture antenna, Air-sea interactions

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ATT34-P04 Room:Convention Hall Time:May 20 15:20-15:30

Conceptual study on Japanese altimetry mission

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Measurement of sea surface height is important in satellite measurement of ocean as well as sea surface temperature, ocean color, sea surface wind velocity, etc. JAXA has started a conceptual study on a new altimetry mission. In the mission, using a interferometric synthetic aperture radar (In-SAR) with two antennas, wide-swath measurement of sea surface height is aimed. Studies on target specification and system feasibilities are ongoing.

The main four purposes of the mission are as follows;

Forecasting of the ocean current;
The aim is to improve the tidal model and forecasting of the ocean current especially in coastal regions and marginal seas using four-dimensional assimilation. Improvement of ocean current forecasting is expected for estimation of current drift caused by ocean accidents, efficiency of marine navigation, and diffusion of radioactive material.

Fishery;
The aim is to observe ocean phenomena related to fishery places, such as Kuroshio-front and ocean surface topography from mesoscale to submesoscale.

Disaster;
The aim is to improve Tsunami forecast model using inversion method through the observation of Tsunami waves caused by an earthquake in far region.

Geoid and seafloor topography;
The aim is to improve sea floor topography model through improvement of geoid model.

We will present current status of the conceptual study.

Keywords: altimetry, ocean current, fishery, disaster, geoid, interferometric synthetic aperture radar

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Satellite Remote Sensing of the Atmosphere: Past and Future

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The observation of the Earth from space started in 1959 by the satellite Explorer 6 launched in the United States of America, which took the picture and measured the radiation budget although the orbit was highly elliptical. Since then, NASA and NOAA of USA have continued to develop and launch the Earth observing satellite. Various types of sensor have been developed to observe the atmosphere up to now. Radiometers on board satellite cover the wavelength from UV to microwave spectral region to observe the air temperature, water vapor profile, clouds, aerosols, and so on. In addition to the radiometers, active sensors such as lidar and radar were launched and used to observe vertical profiles of cloud and aerosol, and precipitation from space. Japanese geostationary meteorological satellite so called Himawari was launched in 1977 for the first time and it continued the present MTSAT series.

The algorithm to retrieve atmospheric properties has also been developed and advanced as well as hardware development. However, it looks almost completed at present except for a few special sensors such as hyper-spectral radiometer active sensors, and a new algorithm development is difficult for visible and infrared imagers since the standard products obtained from them are already highly sophisticated. Atmospheric parameters related to climate change, for example, water vapor, cloud microphysics and aerosols properties are available like objective analysis meteorological data. Data assimilation analysis is also being carried out recently by using satellite observation data and GCMs. A limited number of scientists are concerned with basic hardware and algorithm developments in Japan.

With the above background, the future of satellite observation of the atmosphere has been discussed in a research community in Japan. The new frontier of satellite remote sensing of atmosphere will be limited to a few fields, that is, hardware and algorithm developments for active sensors, more sophisticated combinations of active and passive sensors, utilization of geostationary satellite to observe cloud, water vapor, and chemical properties of atmosphere with a high temporal resolution. Based on the above preliminary discussion, I will discuss more about the perspective of satellite remote sensing of atmosphere in the future.

Keywords: Atmosphere, Satellite remote sensing

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Possibility of Microsatellite

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As a remote-seising tool, 50-kg class micro-satellite has following great potentials compared to existing big satellite, namely, 1) Low cost fabrication compared to middle- or large sized satellite, namely, few M EUR including bus and mission payloads. The launch cost will be 1+ M EUR as piggyback, 2) quick fabrication: about one year for flight model, enabling application of the latest technologies, 3) Constellation flight, enabling frequent monitoring from low altitude, 4) On-demand operation, taking detail information at point of focus, according to requirement of users. Here we introduce the latest technologies for remote sensing, which will be launched onboard micro-satellites developed in universities, including high functional 5-m resolution telescopic camera, which can select any colors from 400-700 nm or 650-1050 nm at 1 nm step, and a bolometer array camera. We would suggest applications of micro-satellite and its constellation in order to monitor every subject which has dynamical variations, such as, cloud structure, hydrology including CO2 flow, lightning, vegetation, agriculture, forest fire and smoke detection, dust, atmospheric and oceanic pollution, biology in ocean, glacier, and natural disasters. We should consider the best mix of micro and big satellites as a strategy of all Japan community.

Keywords: micro-satellite, remote-sensing, on-demand, constellation

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A Propsal of the ELMOS Constellation

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The outline of the ELMOS small satellite constellation will be presented.

Keywords: GPS ocultation, Electron Density, Electron Temperature, Weather Forecast, Atmosphere, Ionosphere