Japan Geoscience Union Meeting 2012
(May 20-25 2012 at Makuhari, Chiba, Japan)

HTT08-01 Room:203 Time:May 20 09:00-09:15

Measurement of VLF sferics to monitor activity of cloud-to-ground lightning discharges in the Maritime Continent

YAMASHITA, Kozo[1*], OHYA, Hiroyo[2], TSUCHIYA, Fuminori[3], TAKAHASHI, Yukihiro[4], MATSUMOTO, Jun[5], KUBOTA, Hisayuki[6], OGINO, Shin-Ya[6], HATTORI, Miki[6]

[1]Dept. Electrical Engineering, Salesian Polytechnic., [2]Graduate School of Engineering, Chiba University, [3]Planetary Plasma and Atmospheric Research Center, Graduate School of Science, Tohoku University, [4]Department of Cosmosciences, Graduate School of Science, Hokkaido University, [5]Deaprtment of Geography, Tokyo Metropolitan University, [6]Japan Agency for Marine-Earth Science and Technology

Electromagnetic wave radiated from lightning discharge is called as sferics. Measurement of sferics is one of the most efficient tools to monitor global activity of lightning discharges. There are mainly two advantages to observe sferics in extremely Low Frequency (ELF: less than 3 kHz) range and Very Low Frequency (VLF: 3-30 kHz) range.

One is a radio propagation characteristic in ELF and VLF range. Attenuation rate of ELF and VLF sferics is quite low. Therefore, radio waves emitted by cloud-to-ground (CG) lightning discharges can propagate long distance. This feature allows us to monitor the activity of CGs on a regional scale or on the globe with single or few observation sites.

The other is that electrical property of individual CGcan be derived based on the observation in ELF and VLF sferics. Methodology to estimate polarities, charge moment, and peak current of CGs has been established in previous works. These techniques make it possible to evaluate not only the activity of CGs but also that of thunderstorm.

We have developed new system to measure ELF and VLF sferics and applied to the observation to monitor the lightning activity in the Maritime Continent. Waveforms of vertical electric fields and horizontal magnetic fields are obtained with vertical dipole antenna and orthogonal loop antennas, respectively. This instrument has been installed at Tainan in Taiwan (23.1^{o}N, 121.1^{o}E), Saraburi in Thailand (14.5^{o}N, 101.0^{o}E) and Pontianak in Indonesia (0.0^{o}N, 109.4^{o}E).Furthermore, we prepare to install new system in the Philippines and Vietnam.

In this presentation, we introduce the speculation of our observation system. Estimated CGs distribution in the Maritime Continent based on our VLF observation is also shown as an initial result.

Keywords: lightning discharge, sferics, ELF, VLF, Maritime Continent

Japan Geoscience Union Meeting 2012
(May 20-25 2012 at Makuhari, Chiba, Japan)

HTT08-02 Room:203 Time:May 20 09:15-09:30

Lightning in Typhoons

PRICE, Colin[1*], Barry Lynn[2], Yoav Yair[3], Naama Reicher[1], Alexander Khain[2]

[1]Department of Geophysical, Atmospheric and Planetary Sciences, Tel Aviv University, Israel, [2]Hebrew University of Jerusalem, [3]The Open University of Israel

We have recently shown that lightning observations in intense typhoons precede the maximum intensity of the storms by approximately 30 hours. In this presentation we further this study by modeling the lightning activity in typhoons using the Weather Research and Forecasting (WRF) meso-meteorological model. The WRF model successfully simulates the growth and decay of typhoons, and accurately forecasts their development, tracks and intensities. The modeled lightning scheme correctly predicts that the maximum lightning activity occurs before the maximum sustained winds of the storms, with a similar lag of 30 hours as shown in the observations. In addition, the model simulations show that the location of the maximum lightning activity migrates from the outer bands of the typhoon toward the eye during intensification, with the maximum lightning activity closest to the eye approximately 12 hours before the maximum intensity of the hurricane. It is suggested that a sharp increase in forecast lightning, and the inward migration of the lightning maximum, can serve as markers from which to gain greater confidence in predictions portending further intensification of typhoons or conversely their decay.

Keywords: lightning, typhoon, VLF, model

Japan Geoscience Union Meeting 2012
(May 20-25 2012 at Makuhari, Chiba, Japan)

HTT08-03 Room:203 Time:May 20 09:30-09:45

Color of glaciers observed from satellites

TAKEUCHI, Nozomu[1*]

[1]Chiba University

Color of glaciers is not always blue or white. It shows variety of color, such as brown, black, red, green, and yellow. These colors are usually due to impurities in snow and ice. Mineral dust blown from desert could change the color to brown, and black carbon from fuel or biomass burning could change to black. Microbes growing on snow and ice could change the color to red, green, yellow and black. Color of glaciers is glaciologically important since change of surface color results in reduction of surface albedo and accelerating glacier melting. However, we still do not exactly know geographical distribution of color of glaciers in the world. Sattelite remote sensing could be useful for investigating the spatial distribution of impurities of snow and ice over a large area of snowfields and glaciers.

Keywords: glacier, albedo, snow algae, cryoconite

Japan Geoscience Union Meeting 2012
(May 20-25 2012 at Makuhari, Chiba, Japan)

HTT08-04 Room:203 Time:May 20 09:45-10:00

A new potential in the Ocean Color Observation by Micro-Satellites

HIRATA, Takafumi[1*], SAITOH, Sei-Ichi[2], KURIHARA, Junichi[3], TAKAHASHI, Yukihiro[4]

[1]Graduate School of Environmental Science, Hokkaido University, [2]Graduate School of Fisheries Sciences, Hokkaido University, [3]Graduate School of Science, Hokkaido University, [4]Graduate School of Science, Hokkaido University

Since the launch of the Coastal Zone Color Scanner (CZCS) onboard Nimbus-7 in 1978, many ocean colour sensors, mostly in sun-synchronous orbit, have been launched into space by space agencies worldwide to observe biological and biogeochemical variables in the coastal and global oceans. These ocean color missions by the space agencies tend to be independent, providing separate data sets. However, a recent activity includes a merge of the satellite data set obtained from different sensors or missions, and shows an advantage to utilize many satellites for an increased data coverage and observation frequency. To put the advantage forward in the future ocean colour missions, practical issues, such as economic cost of launching many satellites, have to be solved. Meanwhile, technologies have also been evolving to result in manufacturing low-cost and small satellites (i.e. micro-satellites). Thus, we are now in a position to move forward from the classical observation style using an independent and single satellite to a new style using multi-satellite observation. In this presentation, we propose a utilization of multiple micro-satellites in the field of ocean colour observation as an example, showing some practical applications potentially useful for Asia.

Keywords: micro satellite, ocean colour

Japan Geoscience Union Meeting 2012
(May 20-25 2012 at Makuhari, Chiba, Japan)

HTT08-05 Room:203 Time:May 20 10:00-10:15

Robust Monitoring Techniques on Large Scale Carbon Dynamics for REDD+ in Tropical Peatland-Forest

OSAKI, Mitsuru[1*], Kazuyo Hirose[2], Farhan Helmy[3]

[1]Research Faculty of Agriculture, Hokkaido University, [2]Center for Sustainability Science, Hokkaido University, [3]National Council for Climate Change (DNPI) , Indonesia

The Earth remaining tropical forests are found mainly in the peatlands and lowland of the Amazon, Central Africa, and Southeast Asia, especially in regions of Kalimantan, Sumatra, and Papua New Guinea, where rich biodiversity can still be found and large amounts of carbon are stored in peat soils (UNDP, UNEP, WB, and WRI, 2000). Indonesia, for example, has a peatland area and carbon stocks of about 20Mha and 45-55GtC respectively, and a forest area and carbon stocks of about 88Mha and 10-26GtC respectively, indicating that more than half the amount of carbon in tropical peat is stored in the peat of Indonesia (Maria Strack ed., 2008, J. Jaenicke et al., 2008, J.O. Rieley et al., 2008, H. K. Gibbs et al., 2007). It is estimated that the Indonesian peat contains between 7.5-24.2 times more carbon below-ground than above-ground.

Therefore, REDD+ is very important for storage of carbon as well as the conservation of biodiversity. To establish REDD+, an MRV system that is coupled with two components ? satellite sensing and grand tools - is urgently required. Presently, our JST-JICA Project on ”Wild Fire and Carbon Management in Peat-Forest in Indonesia” is the only project in the world to propose all aspects of MRV in tropical peatlands, enabling it to contribute significantly to biodiversity estimation.

REDD+ itself is only considerd as one of Carbon Credit Mechanisms. However as MRV for REDD+ is composed of integrated system of satellite sensing and grand tools, REDD+ and MRV system contribute to develop new scientific fields and advance forest research in various tropical forest ecosystems, including forest management and social activity research. Thus, this JST-JICA project intends finally to establish REDD+ system in tropical peatland.

References

Gibbs, K. H., Brown, B., Niles, O. J. and Foley, A. J. (2007) Monitoring and estimating tropical forest carbon stocks: making REDD a reality. Environ. Res. Lett: 2 045023: 13.

Jaenicke, J., Rieley, J.O., Mott, C., Kimman, P. and F. Siegert (2008) Determination of the amount of carbon stored in Indonesian peatlands. Geoderma: 147: 151?158.

Maria Strack ed. (2008) Peatland and Climate Change, International Peat Society, 223.

Rieley, J.O., Wust, R.A.J., Jauhiainen, J., Page, S.E., Wosten, H., Hooijer, A., Siegert, F., Limin, S. H., Vasander H. and Stahlhut, M. (2008) Chapter 6: Tropical peatlands: carbon stress, carbon gas emissions and contribution to climate change process, Maria Strack ed. Peatlands and climate change, International Peat Society, Finland: 148-181

UNDP, UNEP, WB, and WRI (2000) In: C. Rosen (ed.) World Resources 2000-2001: People and Ecosystems: The Fraying Web of Life, illustrated edition, Elsevier Science, Amsterdam, Lausanne, New York, Oxford, Shannon, Singapore, Tokyo.

Keywords: Biodiversity, Carbon Flux Model, Grand Tools, MRV, REDD+, Satellite Sensing

Japan Geoscience Union Meeting 2012
(May 20-25 2012 at Makuhari, Chiba, Japan)

HTT08-06 Room:203 Time:May 20 10:45-11:00

Assessment of Field and Airborne Hyperspectral to Detect Peat Forest Degradation in Central Kalimantan, Indonesia

EVRI, Muhammad[1*]

[1]3Agency for the Assessment and Application of Technology (BPPT), Indonesia

Microsatellite is a new paradigm in Remote Sensing technology. Toward a new paradigm to attach the hyperspectral sensor on board microsatellite in the very new future, it need some more efforts to assess the sensors performance for operational use. Integration field, airborne or current space-based hyperspectral sensors is still important to reveal the physical and biophysical correlation with spectral reflectance for environmental issue such as peat forest degradation.

Colored Dissolved Organic Matter (CDOM) of peatland water in canal and forest canopy were measured by using ground-based spectroradiometer and HyMap sensor onboard an airplane, which ranged from 350 nm up to 2500 nm, respectively.Coinciding with the duration of airborne hyperspectral measurement, the physical and biophysical parameters such as soil moisture, underground water level, tree species, tree height, trees diameter of breast height (DBH), and crown cover were measured on the ground.

In finding the best correlation among physical and biophysical parameters with hyperspectral reflectance, waveband ranged from 350 to 2500 nm explored to find the optimal wavebands against physical, biophysical parameters and water index. Meanwhile, several indices such as Water Band Index (WBI) and Normalized Difference Water Index (NDWI) were applied from spectral transformations (obtained from selected optimal waveband) to improve sensitivity of ground water analysis. The present study is directed (1) to analyze the empirical correlation between spectral characteristic and forest degradation condition, (2) to find the appropriate indices (vegetation or water), (3) to find the correlation between forest degradation and underground water level. The initial results of study will contribute to develop a monitoring system for forest degradation, and to build a new approach to assess the carbon emission from peatland soil to the river as an optional tool of MRV to reach REDD+ monitoring target.

Keywords: remote-sensing, satellite, hyperspectral, airborne, peat forest

Japan Geoscience Union Meeting 2012
(May 20-25 2012 at Makuhari, Chiba, Japan)

HTT08-07 Room:203 Time:May 20 11:00-11:15

Remote sensing of forest condition — estimation of foliar chemical components by using hyperspectral reflectance data

NAKAJI, Tatsuro[1*], Masahiro Nakamura[1], Hiroyuki Oguma[2], Tsutom Hiura[1]

[1]Field Science Center for Northern Biosphere, Hokkaido University, [2]National Institute for Environmental Studies

Hyperspectral remote sensing is one of the strong tools for the detection of chemical/structural characteristics of plant tissue. Although several researchers have reported the potential of multiband reflectance-based indices (*ex*. NDVI) for the monitoring of leaf phenology and productivity of forest, new monitoring method using hyperspectral reflectance data and spectroscopic analyze technique is recently spotlighted for the detection of more detail biological characteristics such as leaf thickness and leaf concentrations in photosynthetic pigments, carbohydrates and nutrients (they are generally called 'leaf traits') (Asner and Martin, 2008; Asner *et al*., 2011). In this presentation, we summarize the current studies on the remote estimation of leaf traits of forest tree species briefly, and introduce our field studies about hyperspectral remote sensing of tree leaf traits under warming environment.

In some deciduous forests in Hokkaido region, we have carried out warming experiments to study the potential effects of global warming on forests. For example, in the Tomakomai Experimental Forest of Hokkaido University, soil temperature in 5 x 5 m area around mature oak (*Quercus crispula*, approx. 20 m height) has been elevated to 5 degC above control soil temperature from 2007 by heating cables dug into the soil (Nakamura *et al*., 2010). Several parameters have been monitored such as photosynthesis, herbivory, leaf traits and phenology. We measured the reflectance of intact leaf at visible-shortwave infrared spectral region (350-2500 nm) using a portable spectrometer (FieldSpec FR, ASD) after the monitoring of herbivory in July and September of each year. Hyperspectral images at the visible-near infrared region (400-1000nm, 150bands) of the oak canopy were captured at daily interval using the spectral camera system (ImSpector V10, Specim).

In 2009, the ratio of herbivory in summer and autumn was lower in soil warmed trees than control trees significantly. The leaf concentrations of total N and lignin were reduced and the concentrations in total phenol and tannin were increased in canopy leaves by soil warming. This result suggests that the soil warmed oak tree increased chemical materials rather than structural materials to protect against herbivory. To estimate the chemical defensive materials from hyperspectral reflectance data, we tested the utility of (1) simple regression model using Normalized Difference Spectral Index (NDSI) and (2) Partial Least Square (PLS) regression model. Root mean square error of cross validation (RMSECV) was smaller in PLS model than NDSI simple regression model. When the spatial variation of phenol concentration in the canopy top leaves was predicted by calculating the PLS regression in each pixel of hyperspectral canopy images, higher phenol concentration in the warmed trees was visualized successfully. Although future studies on validity of this method are needed, our results indicate that the monitoring of hyperspectral reflectance is an useful method in estimating specific canopy leaf traits in a cool temperature forest. We believe that such methods are essential to help us understand how forest will respond to future climate conditions.

Asner G P. and Martin R E. (2008) *Remote Sens. Environ*. 112, 3958-3970.
Asner G P. *et al*.(2011) *Remote Sens. Environ*. 115, 3587-3598
Nakamura, M. *et al*. (2010) *Agr. For. Meteorol*. 150, 1026-1029.

Japan Geoscience Union Meeting 2012
(May 20-25 2012 at Makuhari, Chiba, Japan)

HTT08-08 Room:203 Time:May 20 11:15-11:30

Climatological lightning frequency over Asian-Australian monsoon region observed by TRMM-LIS

MATSUMOTO, Jun[1*], Shingo Uchiyama[1], Hiroshi Takahashi[1], Yamane Yusuke[2], Hideo Takahashi[1], Hironari Kanamori[3]

[1]Tokyo Metropolitan University, [2]Tokoha-Gaku-in University, [3]Nagoya University

We explored regional and seasonal variations of climatological lightning frequency over Asian-Australian monsoon region in monthly and 10-day basis by utilizing 10-year (1998-2007) product of TRMM Lightning Imaging Sensor (LIS) data and precipitation data. Several high frequency lightning regions are detected in northeastern Pakistan and northern Bangladesh, and on the Malacca Strait. The last place is a peculiar place, since most of other high frequency areas are located over the land. There are some secondary peaks in the eastern Indochina Peninsular, southern India, and northwestern Australia. Although they are, in general, located in the relatively high precipitation areas, their peak locations and period are not exactly coincide.

Keywords: lightning, TRMM-LIS, monsoon, pre-monsoon

Japan Geoscience Union Meeting 2012
(May 20-25 2012 at Makuhari, Chiba, Japan)

HTT08-09 Room:203 Time:May 20 11:30-11:45

Wildfire detection using imagery from small satellites

KIMURA, Keiji[1*]

[1]Graduate School of Information Science and Technology, Hokkaido University

1. Introduction

During the months of August and September, wildfires are common in and near Indonesia when El Nino occurs because of a decrease in precipitation. The Indonesian wildfires that occurred during El Nino discharged a large amount of carbon dioxide in a very short period of time. Usually, when wildfires occur in Indonesia, they are extinguished by local firefighters, but extinguishing wildfires spanning large areas still remains a difficult task. The correct locations are not detected when wildfires occur in Indonesia.

The purpose of this study is to examine whether it is more feasible to use imagery offered by small artificial satellites for wildfire detection in Southeast Asia, including Indonesia, instead of using the present satellite imagery.

2. Present satellite wildfire observations

The detection of wildfires using NOAA/AVHRR has been performed since the 1990's via satellite observations. In recent years, wildfire detection has been performed mainly using MODIS on TERRA/AQUA platforms. The MOD14 algorithm using MODIS data is used worldwide, and there have been recent advances in fire detection algorithms, because AVHRR and MODIS can make observations once or twice per day. Furthermore, their time resolution is also high. The space resolution for wildfire detection averages about 1 km. MTSAT has a higher time resolution of approximately 30 min, but the spatial resolution is low and is of approximately 4 km. Because the resolution is low in the data collected from these satellites, field work is necessary to observe exact locations.

On the contrary, the infrared Band6 of the ETM+ sensor on LANDSAT7 has a resolution of 60 m, but has a low time resolution of one pass every 16 days. The thermal bands of ASTER sensors on TERRA platforms have a resolution of 90 m, and the returning cycle is of 16 days.

The imagery of the high space and low time resolution satellites is effective for future analysis, but in real time, the time would have already passed for extinguishing the fire.

3. Example of wildfire observations using a small satellite

Wildfire observations using small satellites have been made by the German satellite BIRD. It was launched in 2001 by the German Aerospace Center. It comprises three bands used for observing wildfires with a resolution of 350 m. The length of these bands is as follows: 0.84-0.90, 3.4-4.2, and 8.5-9.3 micrometers. Observations were completed in 2004, and it was shown that better detection of wildfires was possible experimentally; however, it was not used in extinguishing actual fires. For this satellite, the detection of wildfires was observed primarily using the band with a length of 4 micrometer and secondarily using the band with a length of 9 micrometer.

4. Discussion

Identification of the current position is possible in the daytime if multiple visible sensors are placed on the same satellite and synchronized with a thermal sensor. The visible sensor should have a spatial resolution that is higher than that of the thermal sensor, hence, supplementing the detection of wildfires.

It is very difficult to compare satellite imagery and general observations because there is almost no absolute data available. Furthermore, there is a possibility that small satellites do not provide a sufficiently precise position. Although the distribution of heat islands in a city might be observed using the same sensor, there are certain limits such as the images cannot be taken simultaneously for each observation and diurnal changes cannot be followed.

5. Integrating wildfire prediction with meteorological indices

The integration of wildfire prediction data with meteorological data, such as FFMC and FWI, has been developed in Canada, and an attempt to apply this to Southeast Asia is currently being made. Observation opportunities from the satellite will increase if such information is integrated with wildfire detection data obtained from satellite imagery by intensively managing the satellite observation.

Keywords: wildfire, detection, small satellite

Japan Geoscience Union Meeting 2012
(May 20-25 2012 at Makuhari, Chiba, Japan)

HTT08-10 Room:203 Time:May 20 11:45-12:00

Application to Earth observation satellite of Uncooled micro bolometer camera

FUKUHARA, Tetsuya[1*], TAKAHASHI, Yukihiro[1]

[1]Hokkaido University

The 50 kg class satellite that detect a radiance of forest fire of 10 um band by a micro bolometer camera at an early stage for contributing to digestive activities is developed in the UNIFORM (UNiversity International FORmation Mission). It realizes low cost, quick fabrication, and on-demand operation, and the constellation operation of 3 satellites are planned in the mission. The heritage of Akatsuki Venus climate orbiter has been applied to the developing of the micro bolometer camera in the mission, and this application to Mars, asteroid, and lunar missions are also expected. Application to Earth observation satellites and the future view of Uncooled micro bolometer camera are shown in the presentation.

Japan Geoscience Union Meeting 2012
(May 20-25 2012 at Makuhari, Chiba, Japan)

HTT08-11 Room:203 Time:May 20 12:00-12:15

Advanced remote-sensing sensors using a liquid crystal tunable filter and their applications

KURIHARA, Junichi[1*], TAKAHASHI, Yukihiro[1]

[1]Graduate School of Science, Hokkaido University

New types of remote-sensing sensors for 50-kg class macro-satellites have been developed at Hokkaido University, a member of UNIFORM and Hodoyoshi projects promoted by the Japanese government. In those sensors, a liquid crystal tunable filter (LCTF) is applied to a space borne sensor for the first time. The LCTF is a kind of optical band pass filter that electrically controls the center wavelength in the visible (420-700 nm) and near infrared (650-1050 nm). Compared to conventional multispectral sensors using a rotating filter wheel with (normally less than 20) selected spectral bands, the advanced sensor using the LCTF has the great advantage of enabling multispectral observations with hundreds of bands. The LCTF can also reduce size, weight, and power consumption of multispectral sensors. In this presentation, applications of the advanced sensor using the LCTF to Earth observations by microsatellites are introduced.

Japan Geoscience Union Meeting 2012
(May 20-25 2012 at Makuhari, Chiba, Japan)

HTT08-12 Room:203 Time:May 20 13:45-14:00

Microsatellite as a new remote-sensing tool in Asia

TAKAHASHI, Yukihiro[1*]

[1]Dept. Cosmosciences, Hokkaido University

50-kg class micro-satellite has following great advantages compared to 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. Here we show a sample application to thunderstorm monitoring which may contribute to the prediction of torrential rainfall and flood, combining a ground-based lightning detection network in SE Asia operated by Asian consortium on micro-satellite, which will involve experts in various research fields, especially with them in SE Asian countries.

Keywords: micro-satellite, Asia, remote-sensing

Japan Geoscience Union Meeting 2012
(May 20-25 2012 at Makuhari, Chiba, Japan)

HTT08-13 Room:203 Time:May 20 14:00-14:15

Micro satellite development in Indonesia

ROSWINTIARTI, ORBITA[1*]

[1]Remote Sensing Technology and Data Center Indonesian National Institute of Aeronautics and Space

The micro satellite development in Indonesia, which is mainly conducted at the Indonesian National Institute of Aeronautics and Space (LAPAN), has been initiated after the applications of the remote sensing data result in significant contributions in various sectors (forestry, agriculture, meteorology, hidrology, disaster management, etc.).

The polar orbiting LAPAN TUBSAT (LAPAN A1) launched in 2007 is the first experimental micro satellite (57 kg weight) as the result of join cooperation between TU Berlin and LAPAN. Its payload carries two color video cameras for aerial surveillance monitoring. The LAPAN A2 micro satellite (70 kg weight) planned to be lauched in 2012 will have the similar characteristics with the LAPAN A1 except the LAPAN A2 is in the equatorial orbit. Next, the polar orbiting LAPAN A3 micro satellite (70 kg weight) will carry the multi-spectral imager payload and be lauched in 2013. Moreover, research analyses of the spectral performa, the geometric and radiometric correction algorithms, the camera band splitter design will be also explained.

Keywords: micro-satellite, remote-sensing, Indonesia, LAPAN

Japan Geoscience Union Meeting 2012
(May 20-25 2012 at Makuhari, Chiba, Japan)

HTT08-14 Room:203 Time:May 20 14:15-14:30

Micro-satellite User Community in Vietnam: roadmap and challenges

NGO-DUC, Thanh[1*]

[1]Department of Meteorology, Hanoi University of Science

Located in the eastern part of the Indochina Peninsula, Vietnam is a region with complex topography, land surface conditions, coastlines. Under such geological conditions and largely influenced by monsoon, Vietnam is prone to natural disasters, such as typhoons, floods and droughts. Annual losses from natural disasters are nearly 1.5 percent of Vietnamese GDP. Given such circumstances, it is important to take measures for disaster damage mitigation and prevention in Vietnam. Thus a dense ground-based observation network as well as reliable remote sensing data are essential.

Recently, space technology in Vietnam has been strongly being supported by Vietnamese Government. The Space Technology Insitute was established in Nov 2006. The VINASAT-1 with weight of about 2800kg was launched in 2008. The Vietnam National Satellite Center, VNSC, was established in Sep 2011. VNSC is also implementing a project funded from the Japanese ODA loans, about USD 600 million, which aims to build a modern space center by 2018. Besides, several other satellites are under preparation phase. Since the current missions/projects mainly focus on large-size satellites, it appears that micro-satellites have not been sufficiently recognized inside the research community in Vietnam. Therefore, this presentation will discuss about potential vietnamese users and propose a roadmap in order to succesfully create an effective micro-satellite user community in Vietnam.

Keywords: micro-satellite, Vietnam

Japan Geoscience Union Meeting 2012
(May 20-25 2012 at Makuhari, Chiba, Japan)

HTT08-P01 Room:Convention Hall Time:May 20 14:45-15:45

Comparing of lightning activities and climatic reanalysis parameters

SANMIYA, Yusuke[1*], TAKAHASHI, Yukihiro[1], SATO, Mitsuteru[1], YAMASHITA, Kozo[2]

[1]Department of Cosmosciences, Hokkaido University, [2]Dept.Electrical Engineering, Salesian Polytechnic

The atmospheric convection is activated by the updraft associated with the heating of the surface by solar insolation. This activity carries water vapor and heat to higher altitudes. Maritime Continent (MC) is one of the most important regions for convection and lightning activity in the world, which is related to the global climatic phenomena including El Nino, Madden-Julian oscillation (MJO) and Asian monsoon. Therefore, detail research in this area leads to better understandings of the global climate change.

Until now only a few statistical studies on the lightning activity with energy information of individual discharge have been made for global scale since there have been no lightning observation network with uniform sensitivity. GEON, Global ELF observation Network, constructed and operated by Hokkaido University, provides information including energy of individual lightning stroke which occur anywhere in the world. GEON consists of four observation sites and detects electromagnetic waves in the frequency range of 1-100 Hz, radiated from cloud-to-ground lightning discharges, with a detection threshold of 950 C-km. The estimated average error in geolocation is about 600 km.

We compared GEON data with Outgoing Longwave Radiation (OLR) as a kind of proxy of cloud amount or strength of atmospheric convection. In the initial analysis areas of MC, Western Pacific Warm Pool (WPWP) and Eastern Indian Ocean (EIO) are examined from August 2003 to July 2004. It is found based on frequency analysis that lightning activities shows ˜30 day periodicity while convective activities ˜40 day periodicity. And cross spectrum of these data have ˜30 day periodicity. At the presentation, we will show these results.

Keywords: lightning, Maritime Continent, climate change, ELF, reanalysis data

Japan Geoscience Union Meeting 2012
(May 20-25 2012 at Makuhari, Chiba, Japan)

HTT08-P02 Room:Convention Hall Time:May 20 14:45-15:45

Estimation of Lightning stroke locations and Charge Moment Changes in Tohoku region, Japan

TSURUSHIMA, Daiki[1*], SAKAIDA, Kiyotaka[1], Noriyasu Honma[2], TAKAHASHI, Yukihiro[3], SATO, Mitsuteru[3]

[1]Tohoku University, [2]Tohoku Electric Power Co., Inc., [3]Hokkaido University

Recent studies have offered some practical ways to use lightning data as an index of heavy convective rainfall and in-cloud convective activities. For example, Price and Federmesser (2006) investigated the relationships among lightning and several meteorological elements using the datasets obtained by TRMM satellite. They found a strong positive correlation (R=0.81-0.98) between lightning and convective rainfall, which strongly indicates that lightning can be used as a good proxy to measure heavy rainfall, especially over regions where meteorological radar observations are difficult to perform. Unlike rainfall observations, lightning observations can be implemented from greater distances by using low frequency electromagnetic waves emitted from lightning discharges. Other recent studies, such as Pessi and Businger(2009), have tried to assimilate lightning data into meteorological forecast models in order to improve the accuracy of heavy rainfall predictions over ocean areas.

As lightning data is expected to have a great impact on severe weather forecasts, it is extremely important to understand the relationships among lightning discharges, in-cloud structures and local meteorological fields. However, many studies concerning the relationships between lightning and meteorological fields have mainly focused on the ”frequency” of lightning, while the ”magnitude” of each lightning discharge has not been taken into consideration.

In this report, a newly developed method will be introduced to estimate the lightning locations (frequency) and charge moment change (CMC; equivalent to the magnitude of lightning) of each lightning stroke. This technique is based on the combination of two different lightning observation networks; Lightning Location System (LLS) operated by Tohoku Electric Power Company Inc. and Global ELF Observation Network (GEON) operated by Tohoku University and Hokkaido University.

LLS consists of 9 IMPACT sensors in Tohoku region of Japan that have been continuously monitoring lightning discharges in Tohoku, Kanto and surrounding ocean areas (parts of North Pacific Ocean and Sea of Japan). Although LLS has the lightning location accuracy of several kilometers (Honma et al., 1998), the estimation of CMC based on LLS data is still considerably difficult.

On the other hand, GEON consists of 4 observation sites across the globe (Syowa, Onagawa, Esrange and Santa Cruz), which have been measuring horizontal magnetic fields in the frequency range of 1-100Hz. According to past research, while CMC can easily be calculated from ELF transients detected by GEON (Sato et al., 2008, Yamashita et al., 2011), GEON systems cannot determine the lightning location as accurately as LLS.

By combining these two observation networks, we are able to determine the accurate lightning location using LLS and estimate CMC from ELF transients recorded at GEON.

Keywords: Lightning, Electromagnetic wave obserbation, Meteorology