Development of automatic aquatic macrophytes mapping system in Lake Shinji using Landsat-8 data

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There is a serious problem for aquatic macrophytes expansion in the coastal region at Lake Shinji which is located in the Shimane-Prefecture after 2009. Grasp of the aquatic macrophytes distribution immediately by remote sensing is expected. Therefore the automatic calculation and mapping of aquatic macrophytes using Landsat-8/OLI data (32 scenes from April in 2013 to Nov. in 2015) with sensitive (12bit) and the high spatial resolution (30m) launched in February, 2013 was developed by this research. At first, the NDVI using a method by Sakuno et al. (2013) for the aquatic macrophytes extraction was calculated. The threshold value of NDVI to separate an aquatic macrophytes and non- aquatic macrophytes was set as 0. A median filter was used to eliminate noise of satellite images. Finally, the automatic mapping system was developed via NDVI from OLI data. The characteristic of aquatic macrophytes disributes in high density in the central southern part of Lake Shinji form September to November in particular.

Keywords: lake, monitoring, satellite

Daily Change of the Earth Surface Temperature by Himawari-8/AHI

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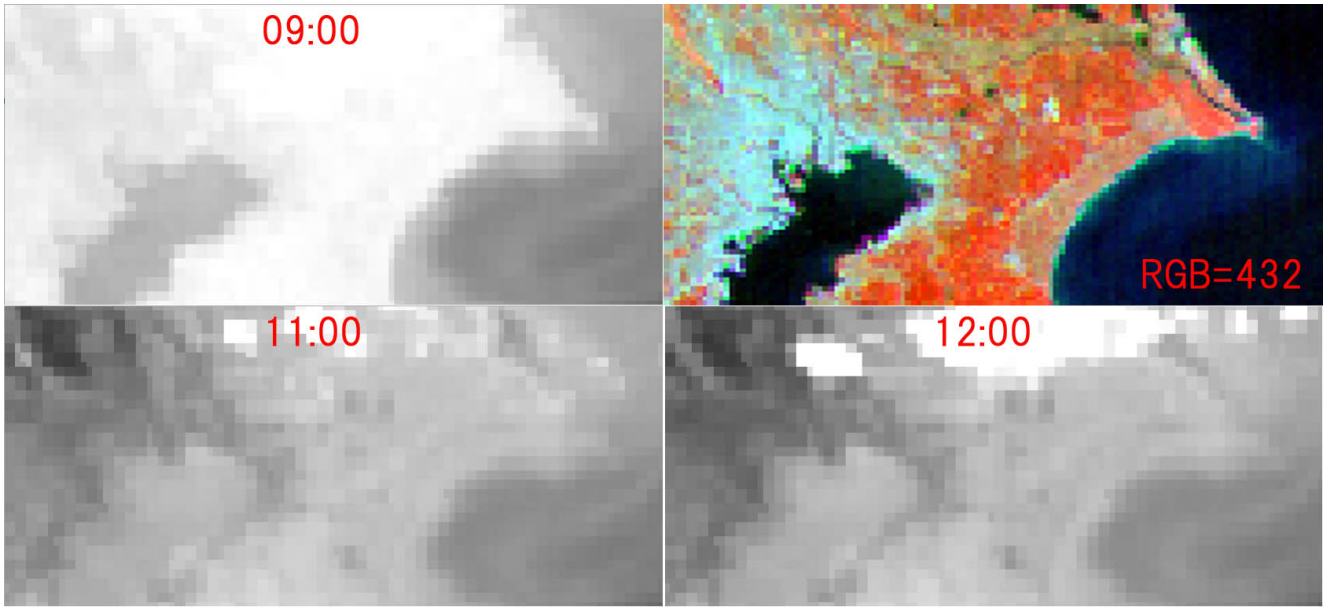
1. Introduction
The Japan Meteorological Agency(JMA) successfully launched Himawari-8 in October 2014 and start its operation in July 2015. JMA is operating Himawari-8 at around 140 degrees east covering the East Asia and Western Pacific regions. A new sensor system called the Advanced Himawari Imager (AHI) is scanning five areas: Full Disk(images of the whole Earth as seen from the satellite), the Japan Area, the Target Area and two Landmark Areas. In each 10-minute period, the AHI is able to scan not only the Full Disk once but also the Japan Area four times. Additionaly the number of bands has increased from 5 (VIS 1, IR 4) to 16 (VIS 3, NIR 3 and IR 10). Therefore AHI is observing the Earth surface temperature of Japan area at every 2.5 minutes continuously.
The purpose of this study is to analyse daily change of the Earth surface temperature observed by Himawari-8/AHI continuously. Land cover information is obtained from AHI visible and near infrared data observed at the same time. It was investigated that daily changes of the Earth surface temperature in artificial land cover (cities), natural land cover (forests and bare fields) and water area are different each other. It is known that the thermal environment of the urban is influenced by the landcover.
2. Data and Methods
AHI data observed in December 4th 0900 to 1500(JST), 2015 were used in this study. Band 14 is used for the analysis because the spectral range is similar to the one of Landsat/TM thermal band. Band 1 to 4, visible and near infrared bads, are used for land cover classification. Using dayly change of the brightness temperature by AHI band 14, curvilinear regression was caried out in each land cover points.
3. Results and Discussion
The following facts are found out.
* Standard errors at a city and a forest were small by a polynomial of the fourth degree.
* A standard error at a water area was small by a polynomial of the second degree.
* They are similar results at a farmland and a bare field by plynomials of the second to the fourth degree.
It could be confirmed that the daily change can be regressed by the second to the fource demensional polynomials. The results of this study should be useful for countermeasurement of urban heat island phenomenan.

Keywords: Meteorological Satellite, Earth Observation, Earth Surface Temperature, Curvilinear Regression



Environmental Monitoring Using Landsat-8 Data for Water Quality of Upper Mississippi River Basin and Hydrodynamic in the Louisiana Coastal Zone

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For thousands of years the Mississippi River flowed freely in the heart of North America, draining 41% of the continental U.S. and parts of Canada. The Mississippi River is much cleaner today than it was 20 years ago, yet concerns remain over the status of water quality. Nutrient and herbicide problems should continue to be investigated and managed and salinity impacts addressed where diversions are operated. However, these concerns must be weighed against Louisiana’s ongoing problem of coastal land loss and the threatened acceleration of this loss with the recent Brown Marsh crisis.
The "dead zone" off the coast of Louisiana forms every year summer and is the second largest hypoxic zone in the world. Since 2000, as apart of the EPA sponsored Star Grant Research Program, several college based research organization in USA and Nihon University remote sensing research unit have contributed closely with the EPA Gulf Breeze Laboratory to develop a coupled hydrodynamic and biogeochemical model for the northern Gulf of Mexico hypoxia region. In this research, we are integrating satellite ocean color remote sensing imagery, hydrodynamic-water quality-sediment diagnosis modeling, and in situ measurements to assess and predict coastal ocean processes (such as nutrient-enhanced primary production) that regulate the development and size of hypoxic bottom waters in the region. The frequency, extent, and severity of coastal hypoxic events are increasing worldwide due to increasing eutrophication.
As a result, satellite-derived optical water mass classification procedures were well-combine with New Orleans land-use model and a model-derived stratification index to estimate the areal extent of coastal hypoxia in the northern Gulf of Mexico.

Levee extraction method using the global DSM

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According to the IPCC Fifth Assessment Report, it is predicted that such as typhoons and heavy rain to increase in the future. Due to increase of typhoons and heavy rain, it considered the frequency of flooding will increase. We shall create a hazard map in order to suppress the flood. In areas where high-resolution DSM is not developed to be used SRTM and GDEM, but SRTM and GDEM have missing values. In this study, we propose a simple method of correcting the missing values. Using this method, it is possible to correct the missing values in a wide range of global.

Keywords: DSM, Levee, ALOS World 3D

Estimation method of land cover change area for urbanized area by using coherence data of SAR

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The objective of this study is to propose the estimation method of land cover change area that combining optical sensor data and coherence data, and to propose the application scope based on the estimated results of land cover change area caused of landslides and human activities.
Recently, due to the impact of the recent global warming, causing the unexpected torrential downpour and typhoon that increase the possibility of flood disaster and landslides. Therefore, it is very important to grasp the disaster situation immediately. In this situation, synthetic aperture radar (SAR) is not easily affected by weather and time than the optical sensor. It can grasp the disaster situation effectively. Currently, interferometric SAR (InSAR) has been applied to a crustal movement and landslides. InSAR is a surveying technology for measurement of crustal movement and generation of digital surface model by interfering with the SAR data observed in two periods. In this study, we focus on the coherence data that is one of the intermediate data of InSAR. Coherence data is the absolute value of the complex cross-correlation of the two SAR data, while coherence data is related to corresponding land cover changes. From these, we propose the estimation method of land cover change area combining optical sensor data and coherence data. The results of this study is as follows;
(1) The accuracy of the land-cover change region using the proposed method was about 60% to 80% when using a classification map, about 50% to 90% when using the land use. In addition, it was suggested that it is possible to capture the land cover changes involved in the agricultural cycle such as rice and sweet potatoes.
(2) It is available to apply in different purposes such as estimation of the damage area and selection of research candidate by devising the window size of coherence and parameters of the aggregation and sorting.
(3) The proposed method tended to estimate that land cover changes larger than the land cover changes obtained by visually reading, and there is a high possibility of being capture the change that cannot be read visually such as differences in water content.
(4) The estimation accuracy of the land cover changes area was largely affected by the resolution and the number of categories of land cover changes.
(5) It was difficult to estimate the land cover change on the growth of vegetation such as forests, shrub forests and rice.
(6) It was impossible to estimate the land cover changes in some area where data was missing such as the sea.

Keywords: Coherence, Land cover, Classification map

Using Down-hole Electrical Resistivity Tomography for Detecting the Growing of Jet Grouting

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Jumbo-jet Special Grouting, called JSG, is one method of ground improvement. For sites with soft soils, the JSG method is mostly effective and quick to provide soils reinforcement. It forms as a column, so that it can be serve as a pile. Arranged JSG piles also can be taken as a diaphragm wall. Traditional quality inspecting method for those underground construction often adopt taking cores in the edges of improved material and compress it. According to actual experience, the drilled core sometimes takes uncomplete samples or non-representative. It's also difficult to determine the outer edge of the grouted column by core-drilling. Therefore a subsurface geophysical method should be adopted herein. Electrical resistivity tomography method is widely used for detecting the interlayers, groundwater levels, or cavities in underground layers. Requiring long-length span for deeper detecting is an in-situ issue for earning straight and horizontal space to operate. Down-hole electrical resistivity tomography method is first proposed in this study in Taiwan. The result shows that this vertical arrangement can acquire more clear images due to be close and parallel to the grouted pile more than previously mentioned horizontal one. The form and growing of the grouting taken from this method can provide more credible parameter for future usage.

Keywords: JSG, Soft soils, Electrical resistivity tomography, subsurface geophysical method

Multi Satellites Monitoring of Land Use/Cover Change and Its Driving Forces in Kashgar Region, China

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The spatio-temporal changes of Land Use/Cover (LUCC) and its driving forces in Kashgar region, Xinjiang Province, China, are investigated by using satellite remote sensing and a geographical information system (GIS). Main goal of this paper is to quantify the drivers of LUCC. First, considering lack of the Land Cover (LC) map in whole study area, we produced LC map by using Landsat images. Land use information from Landsat data was collected using maximum likelihood classification method. Land use change was studied based on the change detection method of land use types. Second, because the snow provides a key water resources for stream flow, agricultural production and drinking water for sustaining large population in Kashgar region, snow cover are estimated by Spot Vegetation data. Normalized Difference Snow Index (NDSI) algorithm are applied to make snow cover map, which is used to screen the LUCC and climate change. The best agreement is found with threshold value of NDSI≥0.2 to generate multi-temporal snow cover and snowmelt maps. Third, driving forces are systematically identified by LC maps and statistical data such as climate and socio-economic data, regarding to i) the climate changes and ii) socioeconomic development that the spatial correlation among LUCC, snow cover change, climate and socioeconomic changes are quantified by using liner regression model and negative / positive trend analysis. Our results showed that water bodies, bare land and grass land have decreasing notably. By contrast, crop land and urban area have continually increasing significantly, which are dominated in study area. The area of snow/ice have fluctuated and has strong seasonal trends, total annual snow cover has two peaks in 2005 and 2009. With increasing population from 2,324,375 in 1984 to 4,228,200 in 2014 and crop land reclamation from 6031.4 km^2 in 1972 to 16549km^2 in 2014 at the study area. Water resources consumption increased with support to large population and irrigate whole crop land area, caused the water shortages that the surface water bodies decreased from 2531.43km^2 in the 1972s to 1067.05km^2 in the 2014. The grass land with an acreage larger than 6749km^2 in 1972 decreased to 922.6 km^2 in 2014. The transformations between water bodies, garss land and bare land are remarkbale. The results also suggested high linearity between the LUCC and socioeconomic changes that specific land cover change be cause of the fact that socioeconomic development. In the recent 42 years, average annual temperature have been increasing significantly, although, precipitation have increased but partly weaken effect of the rising temperature, in addition snow cover more sensitive to precipitation than temperature.The change of climate showed a nagitive relationship between snow cover with decreased and climate with increasing of the tempreature. Morover, the relationship between the LUCC and snow cover recorded higher linearity, because the temperature have increased, consequence influence on snow cover that provides melt water for study area which expanding crop land.

Keywords: LUCC, Driving forces, Snow Index, SPOT vegetation, Kashgar Region

AMSR-E soil moisture evaluation over Shanxi Province of China and spatio-temporal characteristics of soil moisture distribution in East Asia

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Soil moisture is a crucial hydrological element that is closely connected to the earth's surface heat budget and climate change in semi-arid and arid regions. Recently, satellite remote sensing has been shown to be an effective way to determine soil moisture in large areas for long periods of time. AMSR-E soil moisture derived from passive microwave of time series data are available. In this study, one of the objective is to validate AMSR-E soil moisture using in situ soil moisture in Shanxi Province of China. The other is to clear the spatio-temporal distribution of soil moisture in East Asia. The results show that 64 of 108 in situ stations have good correspondences between AMSR-E soil moisture and in situ soil moisture. High correlation coefficients are confirmed during the following 3 conditions. 1) Sufficient density of in situ observations area. 2) Uniform land use type region and 3) relatively flat terrain area. AMSR-E soil moisture can be estimated more accurately over large regions according to these factors. In addition, characteristics of soil moisture distribution and variation are different depend on various environmental conditions in East Asia from 2003 to 2009. In Middle and lower Yangtze River plain, rainy season is suggested as a key factor that affects soil moisture changes. AMSR-E soil moisture can capture flood records at Bengbu near Huaihe River in 2003. In Sichuan basin, soil moisture obviously represents high value through a whole year due to flat terrain, and it is influenced by human activity when compared with farming calendar of paddy.

Keywords: AMSR-E, soil moisture, precipitation

Land cover change mapping in some mining area of Mongolia

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Remote Sensing and GIS were used to monitor interactions and relationships between land use and land cover changes in the regional ecology area of Umnugobi province (South Gobi).This study aims at determining the land degradation conditions in 15 soums (administrative units) of the study area, Umnugobi province. Using GIS processing of data climate drivers (precipitation, air temperature) vegetation data and socio-economic drivers (livestock numbers, population figures, mining activities) were analyzed. We focused on developing a modeling approach for monitoring land degradation using GIS and Remote Sensing tools by integrating natural and socio-economic data. The Moderated Soil Adjusted Vegetation Index (MSAVI) from SPOT/VEGETATION was used to determine vegetation cover change for the period 2000 to 2013. Landsat data for the years 2000, 2010 and 2013 were analyzed to derive and classify “hot spot” areas of land degradation. GIS conditional functions were used for mapping and analyzing climate and socio-economic driving factors, both of which affect land degradation. Conditional functions such as MAP-Algebra from ArcGIS were developed using ground truth data and data from National Statistics. Our study documents that 60 percent of the study area is affected by land degradation caused by human and climate drivers.

Keywords: socio-economic change,, mineral resources, land degradation monitoring, grassland degradation

A new forest map of South America using MODIS data 2013

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Forests cover approximately 4 billion hectare (ha) of the earth, not only to provide a place and resource of habitat to life on Earth, but also play a major role in global environmental conservation through such as CO2 absorption and evapotranspiration action. In recent years, anthropogenic CO2 emissions, the reduction and deterioration of forests due to deforestation is happening. This loss of biodiversity is serious environmental problem. In order to solve these problems, it is necessary to capture the forest change on a global scale and to create a forest maps using remote sensing as one of the means. The study area is South America (63 °S, 60 °W from longitude 90 °W from latitude 14 °S). The land surface area is about 1.7 billion ha in 2008 and the population are about 385 million people. Amazon is the largest tropical rainforest at continental scale, and has about 21 percent of the world's forests. The proportion of forest in the continent at the time in 2005 is reported about 50% -47%. The objective of the study is forest mapping of S.A. with six forest types; evergreen needleleaved forest, evergreen broadleaved forest, deciduous needleleaved forest, deciduous broadleaved forest, mixed forest and open forest. MODIS 500m (2013) data and PALSAR global mosaic data were used for the classification. Original MODIS data were converted into indexes like NDVI, GRVI and LSWI, and predictor variables were produced. To create training data, high resolution images in Google Earth and the data that was used for the global mapping of 2008 year were used as reference. Mapping was done by the supervised classification method using decision trees. After creating a forest map, validation was done by random sampling method for each class.

Keywords: MODIS, South America , forest map

Elucidation of reindeer travel-route by satellite remote sensing

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There are nomads who hunt reindeers for a living in the Arctic Circle of Siberia. The trade of the meat and the fur has become one of the most important industries. Recently, the reindeer, which has an animal behavior going along the conventional route for pasture, has been changing the travel-route. Thus, the livelihood of nomads who lives by hunting them has been menaced. The reason of changing the travel-route must be a global warming resulting from the vegetation change of the pasture. To track the travel-route, some reindeers were installed GPS devices in Sakha Republic in Russia. Almost all positions of reindeer groups, however, remain unclear, because Siberia is a vast field.
The aim of this study is to elucidate changes of wild reindeer travel-route in Siberia by satellite remote sensing; 1) through the seasonal change of vegetation of the pasture, and 2) through the direct survey of reindeer groups by satellite image analyses. The study area was selected around Lena River and Olenyok valley in Sakha Republic, Russia. This work focused on 1).
First, investigated the effects of climate change on vegetation around Lena River where the travel-route of wild reindeer was observed. Although there is a report that the annual difference of vegetation in Siberia discussed using MODIS data, we use Landsat 7,8 images to discuss the travel-route in higher special resolutions. We have calculated the normalized difference vegetation index (NDVI) from satellite images of the corresponding area of 2010-2015. From the result, only in 2010 and 2015, the period that NDVI value becomes a peak, had clearly shifted by about one month. It is reported that El Niño occurred during these years, leading to abnormal summer weather in the region. This result supports that the change of the wild reindeer travel-route frequently occurs due to the change in activation timing.

Keywords: Remote Sensing, Reindeer, Siberia, Penguin

Influence on climate change caused by aerosol released from forest fires in Sumatra Island

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Aerosols in the atmosphere, by blocking the sunlight, can have a direct influence on the climate (direct effect). When the number of aerosols increases in the atmosphere, the size of cloud particles can be reduced because the water content in the atmosphere is finite: aerosols can be a core of clouds. The finite amount of moisture leads to the large lifetime of clouds and the increase of cloud density, allowing increasing the reflection efficiency of the sunlight. This effect called as indirect effect. Both of the effects work to cool the Earth. On the other hand, the aerosol, the specific fine particles such as black carbon, absorbs sunlight. Thus, There is a large significance to quantitatively clarify the influence of aerosols on the climate, since it depends on the sources and the types.

This study aims to clarify the influence of aerosols on the climate, which the aerosol released from forest fires in Sumatra Island. MODIS and Landsat8 satellite data were used.

In the previous work, there is a report that quantitative estimation of the influence of aerosols on the climate was performed. The aerosols were released by the Kilauea volcano in Hawaii Island. They showed that the size of cloud particles with increasing aerosol decreases (indirect effect). The present study was also as the same manner.

Keywords: Aerosol, Cloud core, Remore sensing

Estimation of snow water equivalent by satellite images in Hokkaido

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In Hokkaido, there are 119 AMeDAS points that can observe the amount of snowfall. Many of those are located around urban areas. The number of AMeDAS points is not enough to observe the amount of snowfall in Hokkaido Main Island 77984km^2. Remote sensing is one of the best means to measure it. Satellite images in microwave range have been used to know it so far, although there is a large error in the case of wet snow. In addition, as long as synthetic aperture radar (SAR) is used, the spatial resolution is not high satellite images in microwave range. On the other hand, satellite images in the range of visible and inferred have been not suitable for observing the snow depth, although the presence of the covered snow can be measured. If almost all of optical satellite images, having high spatial resolutions, were used for two-dimensional mappings of the amount of snowfall, we will have a great advantage for applying to the drone in the near future.
This study aims to estimate the snow water equivalent through the amount of snowmelt in Hokkaido using satellite images in the range of visible and inferred, as the first step of area estimation of the amount of snowfall.
First, we have researched the correlation between the river inflow to Chubetsu Dam in Northern Hokkaido and the seasonal change of the average brightness of Landsat-8 images. We found that the both have a strong correlation. The river's basin was calculated from topographic maps and Digital Elevation Model (DEM). The area of basin is 230.5km^2, which is ~3.5% error compared to the officially announced at 238.9km^2. Since clouds and vegetation in the area make the amount of snowfall unclear, we discussed the influence.

Keywords: Remote Sensing, snow water equivalent

The Creation of Ultraviolet Distribution Map using Satellite images and Digital Terrain Model

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Recently, there has been a growing interest in environmental issues in the world. Japan Meteorological Agency publish the UV forecast distribution map. However, it cannot show clearly the situation of ultraviolet amount at local areas. Therefore, this study proposed the method of creating localized ultraviolet distribution map using a high resolution satellite image and digital terrain model. This ultraviolet distribution map is in consideration of the state of the land cover and the shade by trees. In addition, questionnaire survey was conducted about the interest in ultraviolet and Evaluation of ultraviolet distribution map created in this study. As a result, it was indicated that ultraviolet distribution map is effective in promoting of ultraviolet protect.

Keywords: Ultraviolet, Satellite image, Digital terrain model

