HTT29-01   Room:101B   Time:May 24 09:00-09:15

Spatio-temporal variations of AMSR-E Soil Moisture in Shanxi Province, China

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Variability of soil moisture is closely connected to the earth surface conditions and climate change. Satellite remote sensing is an effective measure to know soil moisture in large area for long periods of time. AMSR-E(Advanced Microwave Scanning Radiometer of EOS) is a passive sensor which provides timely, long-term informations on land hydrology. In this study, our purpose is to validate AMSR-E(ver. koi531) soil moisture dataset using ground-based soil moisture data set, and also we analyze the spatio-temporal variations over Shanxi Province in China. The validation results suggested that the quality of AMSR-E soil moisture estimation was good although some region slightly overestimated soil moisture. In space, AMSR-E soil moisture showed increasing tendency from northwest to southeast in this areas. In time, the high soil moisture content mostly were found in summer(July, August, September). We also found timing of APHRODITE's daily precipitation event corresponded to AMSR-E soil moisture variation very well.

Keywords: soil moisture, AMSR-E, validation, ShanXi Province

HTT29-02　　　　　　　Room:101B　　　　　　　Time:May 24 09:15-09:30

Study on variation of farming calendar with agricultural produce

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Introduction

Water cycle process play an important role on agriculture. Irrigation water takes 70%~80% of the world's water consumption. In order to evaluate the volume of agricultural water, farming calendar is variable. Especially in the North China Plain, where the second area plain in China, show 42% of the irrigation area in whole China. On the other hand, water resources for one person is only 15%. So water management is necessary for agriculture in a long time. The object of this study is to clear the farming calendar of the main agricultural produce,and also find variation of crop in the secular change.

Data and method

PAL(Pathfinder?Advanced?Very?High?Resolution?Radiometer?Land?Data?sets) dataset contain the AVHRR channels 1, 2, 4, 5 and NDVI. The space and time resolution are 8km, 10 days. There are 36 seasons data. In this study, we extract winter wheat NDVI pattern by using PAL NDVI from 1982 to 2000.

SPOT vegetation dataset is from Spot 4 and 5 that can observe the land surface vegetation condition. It's 10 days composite maximum NDVI. Space and time resolution are 1km, 10days. We also extract winter wheat NDVI pattern from 1999 to 2012 by using SPOT NDVI.

The meteorologic data of the province of North China Plain can be free downloaded from China Meteorological Data Sharing Service System. which used to discussion the variation of farming calendar.

SRTM(Shuttle?Radar?Topography?Mission) is DEM(Digital?Elevation?Model) data, produced by NASA(National?Aeronautics?and?Sp DLR(Deutsches?Zentrum?fur?Luftund?Raumfahrt) and ISA(Italian?Space?Agency) in 2000. Based on the geography of North China Plain, we validate the distribution of winter wheat.

In the field research, we set 60 training points, through the information we extract the season NDVI pattern of the land use. Depend on season features, we can confirm the farming calendar and winter wheat area.

Result

Sowing and harvest season of winter wheat on farming calendar were changed every years. From 1982 to 2012, space and time variation of winter cheat area is cleared. In recent decades, we also found the area of winter cheat is decreasing.

Discussion

In autumn, average temperature, average precipitation with the change of winter wheat seeding season have positive correlation. In spring, average temperature is increasing but no obvious variation with precipitation. Because of more evaporation in spring, more water was used for agriculture . Most irrigation water is from groundwater in North China Plain, it cause the groundwater level down, ground sinking and so on. Water shortage problem can be thought a main reason on delay of grow and harvest. However Chinese Government start South-to-North Water Diversion Project in 12 Dec 2014. In the future, we will have more research on the influence on farming calendar.

Compared the result of winter cheat area and statistics data, they agree with each other very well. The results obtained by superposing the elevation data, winter cheat area can be found in the plain.

Summary

As one of the most famous agricultural produce in China, North China Plain have remarkable water shortage problem. In this study, firstly, we used satellite remote sensing to summarize farming calendar in North China Plain. Secondly, we extracted winter wheat area by the season PAL and SPOT NDVI pattern in 30 years.

Keywords: North China Plain, farming calenda, winter wheat, water shortage

HTT29-03 Room:101B Time:May 24 09:30-09:45

Generation of the data selection information for PALSAR focused on the geographic feature

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The objective of this study is to propose the SAR data selection support information using digital elevation model. The synthetic aperture radar (SAR) data is very useful for earth observation at the time of a natural disaster because it's possible to observe without depending on the weather.

At present, analytical data is selected by using the orbit distance and weather condition in an observation date. But the analysis precision falls at the territory a microwave doesn't reach by the topography condition. So, we proposed generation method of the data selection support image using a slope direction and a hill shade image. The results of this study were as follows;

(1)It was generated that new data selection map which is informed the area of shielded and reflected using a slope direction and a hill shade image.

(2)We were found that in the region microwaves is reflected, it can be observed within the range of the nominal elevation value. And in the region microwave is shielded, it existed the area that cannot be observed in a range of nominal elevation.

Keywords: SAR, data selection support information, slope direction map, hillshade map

Flood simulation using SRTM and GDEM in Da Nang and BINDIN province, Viet Nam

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The objective of this study is to propose the correction method of the DEM data used for a flood simulation. SRTM and GDEM are the data which is generally used in the area where high-resolution DEM isn't generated. In this study, we proposed the data interpolation method focused on the data level shift and the data corruption. First, the correction effect was confirmed based on the SD of elevation data and topographic effect. And we simulated Vietnam country Da Nang city and BINDIN Ministry and made sure of influence to a flood simulation.

Keywords: DSM, SRTM, GDEM, Flood simulation, DEM

HTT29-05   Room:101B   Time:May 24 10:00-10:15

Spectral measurement of bamboo grass for identification of damage area by deer

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These days, especially in Hokkaido, the damage of plants by deer is increasing. In Nakagawa research forest of Hokkaido University, from 1998 the number of deer which are found by persons and the nuber of damaged area is increasing. It is difficult to find the damage of plants by walk since usually such damage occurs in deep forest. Even if the damage was found it is often too late to recover. In oder to establish the method of its finding by satellite remote sensing, we measured the spectrum of bamboo grass, main food of deer, under different conditions. In this presentation we introduce the preliminary results of these ground measurements.

Keywords: deer, bamboo grass, remote sensing

Estimation of deer feeding damage area by remote sensing

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The damages to the forests caused by deer has become serious issues all over the Japan. Especially in Hokkaido, the amounts of agricultural damages by deer exceeded more than one hundred million yen in 1976. Deer area is spreading and along with it, its abundances are increasing these years. However, we don't have the specific way to know its exact range of habitats and abundances except for counting the captured number by traps or hunting now. And also, though natural forests account for 68 percent of all forests in Hokkaido, research for its damages is more difficult than artificial forests, so we don't know how the damages become worse. The final goal of this study is to classify forests into damaged or not ones by using the spectral information from image data taken by Landsat.

We did two approaches for that. First, we estimated the feeding damages from the change in each year of the underlying distribution of sasa (bamboo grass). It is because feeding damages occur when deer finish eating all sasa in forests. In this research, we used one mixed pixel which includes both sasa and betula ermanii areas for estimating ratio of sasa area in the pixel.

Second, we distinguished feeding damages directly from spectral change of forests in snow season. In this research, we used the data of area which is damaged or not. The data come from direct investigation of feeding damage of Hokkaido university Nakagawa Experimental Forest and we examined the differences in spectral changes by using the photo data taken by 830 nanometers. In research of sasa, we gauged the spectrum of sasa grasslands, betula ermanii forest, sasa and betula ermanii mixed forest in Teshikaga. Then we estimated the percentage of sasa in sasa and betula manii mixed forest Mixel to be 64% from others. This was almost the same as the percentage that was estimated from a higher resolution of Google earth's three colors image.

And in snow season research, we search for Landsat-5TM images in February 11th in 1989, March 17th in 1990, March 31st in 1992, March 13th in 1997 ,March 7th in 2004 of the three areas, damaged area in Nakagawa Experimental Forest, non-damaged area in Tomamae, the field covered with snow in Nakagawa. We found that the amount of change in each year of the damaged area is larger than non-damaged one.

Keywords: deer, damage, remote sensing

Development and demonstrations of a new mobile power source: Examination and demonstration of DMFC for remote monitoring

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Abstract

This work explores the potential of direct methanol fuel cell (DMFC) as power source for off-grid remote monitoring site where commonly battery, solar battery, or generator is applied. In direct methanol fuel cell, methanol and oxygen react catalytically to produce electricity. We have developed a mobile DMFC system with a 5/10L methanol cartridge allowing 5/10kWh of power supply at any locations. For instance, continuous 82 days operation without exchanging any fuel cartridge is possible for a 10L cartridge and average 5W power consumption, and 41 days for 10W likewise. This feature enables us to widen possibility of any kind of off-grid observations where currently available electricity is limited. We will report the operational results of the DMFC system at various environments in both laboratory and field, and proved that the system was applicable to wide range of remote monitoring.

Introduction of the DMFC system

Consider the outline of the system shown in **Fig.1**. The DMFC serves as the charger of a lead acid battery that the DMFC always maintaining the battery voltage to be preset range. In this system, the DMFC is activated only the battery voltage reached its lower switching threshold voltage, and then automatically stopped at its higher voltage. Consequently, just the same amount of power consumed by any connected devices is charged up. Therefore, a feature of the DMFC system is quite efficient utilization ratio of fuel, unlike conventional generators, that the fuel is not wasted, elongating operation period. Residual products of the DMFC system are heat and water which are utilized as a means to sustain the system at cold and heat environment.

Experimental and results

In order to investigate usability of the DMFC system in remote region, it should sustain even at quite harsh environments. So the DMFC system was tested at the temperature between -20 and 40 degree C, and also in a decompression chamber of 0.7atmosphere of which oxygen partial pressure is similar to that of 3000m altitude. In addition, the DMFC systems were installed at various remote sites such as Yakushima island, Kiyomizu temple, and Tanakami mountain in Japan. At Kiyomizu temple, the DMFC system was connected to the monitoring system of pore water pressure in soil layer running by RITSUMEIKAN UNIVERSITY. **Fig.2** shows its long term operation result of the battery voltage and temperature around the DMFC system. All the data were corrected every 20 minutes. Blue dot lines indicate switch on and off voltage of automatic battery charging. During the 650 days, the DMFC system stably supplied power to the pore water pressure monitoring system except the timing when a few parts were added or exchanged from necessity.
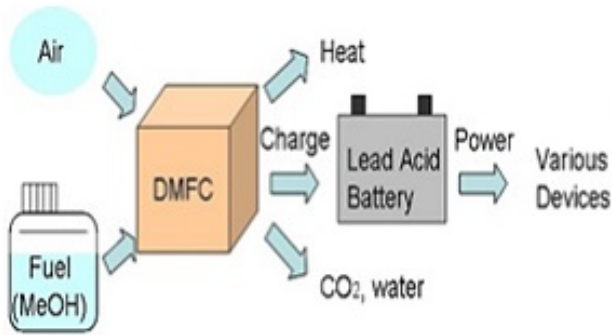
We would discuss more details including other examples of demonstrations. Also, we would discuss potential and limitation of the DMFC system.

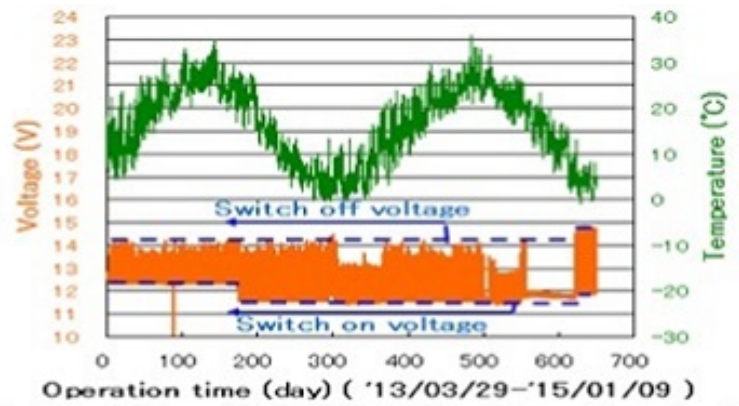Keywords: power supply, fuel cell, remot monitoring, DMFC

Fig.1 Outline of the DMFC system

Fig.2 Long Term DMFC Operation Test

Research on the extent of lead pollution in Kabwe, Zambia

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The lead pollution in Zambia is becoming serious. The research for the extent of the pollution has been carried out only in the limited area by walk. The purpose of this study is to identify the polluted area broadly with satellite remote sensing. We compare the spectrum of polluted plants in laboratory with the spectral information around Kabwe, Zambia taken by satellites, Landsat-7 and 9. Here we show the results of laboratory experiment and the preliminary analysis of satellite data.

Keywords: Zambia, lead pollution, remote sensing

Extraction of Mangrove distribution area on Ayeyarwady Delta, Myanmar

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The objective of this study is to improve of the extraction accuracy of mangrove area on Ayeyarwady Delta, Myanmar. Global warming and sea-level rise are projected to affect seriously on low-land area. Recently, the mangrove forest is important to decrease the damage which is received from storm surge and sea-level rise. Therefore, in this study, it was proposed that the mangrove extraction process which is combined geographic analysis and growing characteristics.

Keywords: Short Wavelength Infrared Region, multi band data, myanmar, mangrove

Tests of Acoustic Tomography in Lake Biwa, Japan

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We report results from early tests in a lake of Coastal Acoustic Tomography (CAT), a form of remote sensing that characterizes average sound velocity along the paths of sound transmission between acoustic transducers. The tests were perfomed at water depths of 12 m or less, near Nagahama in the North Basin of Lake Biwa, Japan. Two 5kHz omnidirectional transducers were deployed, with three acoustic cycles per bit of a randomized M-sequence of various order. A first successful test was achieved at a transducer separation of 7km under stratified conditions on Sept 24, 2014. Water depths were 8 and 6.3 m at the two transducers, which were positioned 2m above the bottom. SNR between 5 and 15 was observed for the first peak of the correlation waveform for "arrival time", and no clear secondary peak was observed. At this depth, the water temperature varied rapidly with depth at the tranducer positions. A second successful test was performed on Jan 30 2015 under unstratified conditions, at transducer separations of 3.8 and 6.2 km and water depths around 10m. The latter tests obtained SNR around 30 for the main correlation peak, with clear secondary and, sometimes, tertiary peaks. At the conference, we hope to present results from further tests that aim to characterize the minimum depth that permits an acceptable SNR. To our knowledge, these are the first reported tests to demonstrate the applicability of CAT in a Lake.

Keywords: Acoustic Tomography, Lake Biwa

Application of satellite data to identification of water-bloom area

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In order to monitor plague of water-bloom we plan to establish the methodology of its identification using spectral image data obtained by satellites. We succeeded in estimating the ratio of water-bloom area within a pixel. Also we make measurement of spectrum of water-bloom in laboratory and compare them with satellite data.

Keywords: water-bloom, remote sensing

HTT29-12   Room:101B   Time:May 24 12:00-12:15

Development of trophic state index monitoring method in the lakes using Landsat-8 data

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An economical and a simple method is desired as a presentation tool of water quality information in lakes for public people from administration in recent years. Water quality monitoring using satellite data is expected as such tool. But the example for which satellite data is used continually is very little as a water quality monitoring tool in lakes of our country. There were problems of the spatial resolution, the repeat cycle and the sensitivity to the water as this reason. The nutritional state of the lakes in our country is generally estimated by environmental index of the total nitrogen (TN) and total phosphorus (TP) etc., but the water quality parameter which can be estimated from a satellite is limited to chlorophyll a (Chl.a) and suspending substance (SS) etc. On the one hand, there is a method called the modified trophic state index (M-TSI) from Chl.a, TN, and TP in the lakes (Aizaki et al., 1981).

So the method by which automatic calculation and mapping of TSI using Landsat-8/OLI data with sensitive (12bit) and the high spatial resolution (30m) launched in February, 2013 was developed by this research. Lake Shinji and Lake Nakaumi (Shimane and Tottori prefectures in Japan) as test sites, were chosen. The 15 scenes from April, 2013 to July, 2014 were used for satellite data. At first, LCI (Linear Combination Index) method (Frouin et al., 2007) known as a simple atmospheric correction algorithm for ocean color sensor was used for Chl.a estimation from OLI data easily. The OLI band 2 , band 3. and band 5 were selected as the bands of LCI method. The -1 and 0.3 were set as the Angstrom index which indicates wavelength-dependence of aerosol. On the other hand, M-TSI was calculated from a relationship between Chl.a, TN, and TP in our country made separately. After the simple Rayleigh scattering correction was conducted, a target area was extracted from header information on Landsat-8 data using the programming function of the Matlab software (MathWorks Inc.). Finally, the automatic mapping system that TSI is estimated via Chl-a from LCI was developed. The characteristic of TSI distribution indicates the very high value in the western part of Lake Shinji in particular.

Keywords: satellite, Landsat, eutrophication, lake, monitoring

HTT29-P01   Room:Convention Hall   Time:May 24 18:15-19:30

Preliminary study on detection limits of abandoned farmlands using NDVI and NDWI time-series data

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Increase of abandoned farmlands is gaining attention in Japan as a problem causing difficulties such as: expansion of breeding habitat potentially preferred by vermin; increase of small parcels where illegal dumping occurs; and deterioration of rural land-scapes. To address this problem, it is important to periodically survey the extent and distribution of abandoned farmlands over a broad spatial range. However, conventional surveying methods are labor intensive and time-consuming, requiring surveyors to cover every parcel often situated in hostile locations.

Remote sensing provides us with a low cost, repeatable alternative means for broad-scale mapping of abandoned farmlands. A previous study suggested that Normalized Difference Vegetation Index (NDVI) derived from remotely-sensed data could have potential to discriminate an abandoned paddy from a paddy area since the difference in NDVI becomes significant at the periods of one month after planting and two months after harvesting. Normalized Difference Water Index (NDWI) was also applied successfully to detecting changes in agricultural activity in a paddy area. However, the success of previous studies depends on acquiring data not affected by cloud contamination at the suitable timing in terms of crop calendar.

The objective of this study is to assess the detection limit of an abandoned paddy using the time-series data derived from MODIS surface-reflectance products. Firstly we refined the time-series reflectance data by removing the effects of cloud contamination based on the Savitzky-Golay filter. Secondly a simple linear mixture model was adopted to estimate temporal signatures of underlying end-member landcover types and simulate mixed signatures at different end-member compositions. Thirdly we calculated NDVI and NDWI time series using the simulated signatures and explored the minimum fraction of abandoned paddy potentially including the signal relevant to cessation of agricultural activity. Preliminary results showed that successful detection is limited to the pixel dominated by abandoned paddy areas.

Keywords: abandoned farmland, spatial resolution, temporal resolution, time-series analysis, mixed pixel

Evaluation of land cover classification methods targeting unmanaged farmland

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In order to reveal the impact of evacuation on biota, National Institute for Environmental Studies is monitoring biota in areas evacuated as a result of nuclear disaster, and the surrounding areas in Fukushima Prefecture, Japan. It includes the monitoring of "land cover" in the study area. This involves regular observation of areas that contain "residential area" and "arable land", where humans have historically performed regular maintenance. These are fundamental elements to discuss the change of local ecosystems due to abandonment. Areas of arable land in the study area are much greater than the residential areas. For this reason, priority should be given to the analysis of arable land. Environmental change in unattended farmland associated with evacuation is relatively quick. And the physical environment of arable land typified by moisture condition is different for each paddy and upland field plot. Therefore, it is necessary to monitor field plots with distinguishable spatial resolution in short cycles. This study evaluated land cover classification methods for arable land considering these requirements. Spaceborne satellite imagery was used with revisit time and spatial resolution matched to these conditions. Arable land in the study area was first defined by aerial photo interpretation. Then, using multi-temporal, multispectral imagery (RapidEye, spatial resolution = 5 m) and single polarization of L-band SAR imagery (PALSAR-2, spatial resolution = 3 m), land cover was categorized based on the machine learning classification methods with training data. Comparison of multiple methods and datasets revealed a classification technique that combines SAR data and multispectral imagery provided improved classification accuracy.

Keywords: unmanaged farmland, land cover, remote sensing, machine learning, SAR

Monitoring and Analysis of Land use/cover change in Kashigar region Based on Landsat and Spot vegetation Data

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The spatio-temporal changes of land use / cover (LUCC)and its driving forces in Kashigar region, Xinjiang Province were analysed by satellite remote singing data. Main goal of this paper was to quantify drivers of LUCC using long term Landsat and Spot Vegetation data from 1972 to 2014. First ,we produced LUCC map by using Landsat images in 1972,1990,2000and 2014. Land use information from Landsat data was collected using maximum likelihood classification method.A hierarchical classification system of 16 land cover subclasses was applied to the Landsat data.The 16 subclasses of land cover were further grouped into 6 aggregated classes of land cover: urban,cropland, water,grass,bare land and glacier.Land use change was studied based on the change detection method of land use types.Second, Normalised Difference Snow Index(NDSI) values was calculated by Spot Vegetation data from 1999 to 2014. According to the snow index confirmed snow conditions of study area which is used to screen the LUCC and climate changes after snow cover map drawn.Third, driving forces were analysed according to climate changes and socioeconomic development.The climate data was obtained from CRU TS 3.21 about temperature and precipitation data. According to these data climate changes were compared with NDSI value,while the socioeconomic data was from the Xinjiang Statistical Yearbook(1984-2014). The study indicates that the increase of land use benefits was given more attention.The study suggests that the land use should be based on the sustainable protection of arid environment on the Kashigar region.

Keywords: Land use /cover change, driving force, snow index, Kashigar region

The Relationship between the Food production and Water Resources of Xinjiang Provence

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In this study, To identify the relevance of snow cover and food production which is the main snow-ice malted water resources for an arid and semi-arid region of Xinjiang province, by Spot Vegetation data(1999-2012years).First,calculated Normalised Difference Snow Index(NDSI) by Spot Vegetation data. Second, according to the NDSI value snow cover map of study area drown. Third, examined and analyzed spatiotemporal changes of snow cover area of study area. In addition from the Xinjiang statistical yearbook extracted cultivated land area and effective irrigation area data further digitized by GIS making map and analyzed spatial variations of food production stouts in Xinjiang province.

The result of the spatiotemporal changes of snow cover area was that the snow caver area is increased from 9636.5000km to 13957.2000km from 1999 to 2012. it has been increasing approximately by 4320.5000km in the recent 14 years.Remarkable increasing has happened that the snow cover area at

Kulun mountains side of North Xinjiang. Tianshan Mountain's snow cover areas also has increased but shows fluctuated trend.It was confirmed that Xinjiang statistic yearbook shows that cultivated land area and effective irrigation areas are increased same results that snow cover area are increased especially in fan-like area around at Kunlun Moutian side of North Xinjiang.

Keywords: Xinjiang uyghur autonomous region, Food production, Snow area, Water, SPOT/VEGETATION, NDSI