

## Simple technique of PM<sub>2.5</sub> measurement in Higashi-Hiroshima city using a portable particle counter

OSHIME, Azusa<sup>1\*</sup> ; SAKUNO, Yuji<sup>2</sup>

<sup>1</sup>Graduate School of Engineering, Hiroshima University, <sup>2</sup>Institute of Engineering, Hiroshima University

In recent years, we are anxious about the trans-boundary air pollution by PM<sub>2.5</sub>. Therefore the development of various measurement, monitoring methods is demanded. It was begun the full-time monitoring in Hiroshima from FY.2012. It is only ten places at the end of May, 2013 to measure PM<sub>2.5</sub> among 39 places of atmosphere measurement station in the prefecture. In addition, because there is not the PM<sub>2.5</sub> measurement station in Higashi-Hiroshima city that population continues increasing, we did not understand the situation of PM<sub>2.5</sub>. Therefore, in this study, a technique to measure PM<sub>2.5</sub> with a relatively cheap portable particle counter (PPC) was considered. At first each particle size (the number of each particle more than diameter 0.3, 0.5, 0.7, 1.0, 2.0, 5.0 $\mu$ m) included in the atmosphere was measured using PPC (KR-12A, RION Ltd.) near Inokuchi Elementary School station (34.37268 degrees N, 132.38475 degrees E) that was one of the observation stations of Atmospheric Environmental Regional Observation System (AEROS) in order to estimate PM<sub>2.5</sub> from PPC. All 11 data set measured was used on May 25, June 8, June 22, August 3. The number of the particles less than 2.5 $\mu$ m (C<sub>2.5</sub>) was calculated by the relationship between cumulative particle number (CPN) and particle size. After having aspirated the atmosphere of 1L per 1 measurement, CPN of each particle size is measured by the scattering intensity of the semiconductor laser at 790nm. On the other hand, CPN for 195 days from March, 2013 to April, 2014 were observed to check PM<sub>2.5</sub> in Higashi-Hiroshima. On the other hand, CPN were measured for 195 days (only on weekdays) from March, 2013 to April, 2014 to check PM<sub>2.5</sub> in the city. Statistically high correlation was observed the relationship between CPN (total count of all particle size) and the in-situ PM<sub>2.5</sub> in Inokuchi station. The measurement limit of PM<sub>2.5</sub> and the estimation error (RMSE) were 4.1-12.8 $\mu$ g/m<sup>3</sup>. The environmental standards of PM<sub>2.5</sub> in our country are 35 $\mu$ g/m<sup>3</sup> by one-day average now. Therefore, the measurement limit by this method is judged to be a value quite lower than these standard values. This simple technique can be used enough as how for it to be careful of PM<sub>2.5</sub> at least. Moreover, as a result of creating the time series variation diagram of PM<sub>2.5</sub> in Higashi-Hiroshima using this observation method, the percentage which exceeds environmental standards in Higashi-Hiroshima was about 16%. Moreover, the season when the probability which exceeds the standard is the highest was in August.

Keywords: PM<sub>2.5</sub>, atmosphere, monitoring, particle counter

## Examination of the green space index by using CO<sub>2</sub> concentration at Ibaraki prefecture

ISHII, Kenta<sup>1\*</sup> ; IMAI, Yukako<sup>2</sup> ; KANZAWA, Masanori<sup>3</sup> ; KUWAHARA, Yuji<sup>4</sup>

<sup>1</sup>Department of Urban and Civil Engineering, Ibaraki University, <sup>2</sup>Graduate School of Science and Engineering, Ibaraki University, <sup>3</sup>U-DOM co., Ltd., <sup>4</sup>Center for Water Environment Studies, Ibaraki University

The objective of this study is to propose the correction method and evaluation index of CO<sub>2</sub> concentration data which is observed in human living sphere, Ibaraki prefecture. Since, sensor drift arises in the process of long-term continuous duty, it is important to correct the process by using standard reference gas. However, sensor drift times are different in each sensor and installation location, so, it is conducted the laboratory experiment and observation data analysis to grasp the action of CO<sub>2</sub> sensor. The results of this study were as follows: 1) It was proposed that the correction method for observation data which is combined linear transformation. 2) It was verified of the correction effect focused on the time variation and spatial distribution of CO<sub>2</sub> concentration.

Keywords: CO<sub>2</sub> concentration, fixed point observation, living environment sphere, the green space index

## Estimation for water surface temperature distribution in Lake Shinji and Lake Nakaumi using Landsat-8 TIRS data

SAKUNO, Yuji<sup>1\*</sup>

<sup>1</sup>Institute of Engineering, Hiroshima University

Lake Shinji and Lake Nakaumi are brackish water lakes with the rich biological resources represented by *Corbicula japonica*. However, the abrupt increase of blue-green algae or the spontaneous expand of aquatic macrophytes are anxious about the influence on such a biological resources of the lake in recent years. Therefore, various monitoring methodology for the elucidation of those generating mechanisms is examined. The satellite remote sensing is expected as a leading monitoring tool. Especially water temperature is important as most fundamental physical parameter. On the other hand, the Landsat-8 in the field of satellite remote sensing on February 11, 2013 was launched by NASA/USGS. This satellite has been continuing observation with 16 diurnal periodicity. The thermal infrared sensor (spatial resolution of 100 m) called TIRS (Thermal Infrared Sensor) with the multiple-spectrum sensor at visible and near- infrared bands with a spatial resolution of 30 m called OLI is carried in this satellite. Since high quantization (12 bits) and 2 band of TIR are realized as compared with conventional Landsat-7, more highly precise WT distribution estimation is expected. So, in this paper, to develop the surface water temperature (SWT) estimation by MCSST (Multi Channel Sea Surface Temperature) algorithm in these lakes using TIRS sensor and the accuracy was checked. Moreover, the SWT distribution characteristic in these lakes was considered using the proposed algorithm. The satellite data used is ten scenes from April to December, 2013. The Landsat-8 TIRS Level 1 product data was downloaded through the Internet site "Earth Explorer." The average value of 3x3 pixels of Band10 (10.6 - 11.2  $\mu\text{m}$ ) and Band11 (11.5 - 12.5  $\mu\text{m}$ ) in these lakes was extracted from the obtained satellite data. The data was changed into brightness temperature (BT). On the other hand, the SWT data at 1.0 meters under water was obtained from the Water Information System of Ministry of Land, Infrastructure and Transport. Moreover, MCSST (Multi Channel Sea Surface Temperature) which can reduce the air effect using two bands at thermal infrared for WST estimation from TIRS data was adopted. 19 datasets in the center of these lakes were used for development of MCSST. Three datasets acquired to the Yonago Bay were used for validation. WST estimation accuracy is expressed by average (bias) and standard deviation (error) of the residual substance of in-situ WST and satellite estimation WST. The WST accuracy using the single band algorithm of TIRS Band 10 and Band 11 was [bias: 1.3 oC, error: 1.7 oC] and [bias: 0.9 oC and error: 2.4 oC], respectively. On the other hand, the WST accuracy by the MC method was calculated with [bias: 1.3 oC, error: 0.6 oC]. The WST difference of the 3 data validated in Yonago Bay was an average of 1oC. Noise Equivalent Differential Temperature (NE $\Delta$ T) of TIRS sensor, The estimation accuracy of NOAA AVHRR in Mutsu Bay using the MCSST method is considered that this result is an appropriate numerical value from their being 0.4K (= 0.4 oC) (Irons et al, 2012) and about 0.5 $\pm$ 0.2oC, respectively. The WST map in these lakes was created using the proposed MCSST type. As for the WST in Lake Shinji lake in this period, it was checked through every year from these figures that a surface water temperature difference is about 3-5oC in the range of 5-30oC. Moreover, in the mouth of a river of Hii River and Shintate River which are located in the Shinji Kosai shore especially in a summer, the low-wash temperature pattern resulting from inflow of river water was observed.

Keywords: satellite, remote sensing, water temperature, lake

## Feasibility Study for the Estimation of the Chlorophyll-a Using ASTER Data in an Eutrophic Lake, Sri Lanka

DAHANAYAKA, D.d.g.l.<sup>1\*</sup> ; TONOOKA, Hideyuki<sup>1</sup> ; WIJEYARATNE, M.j.s.<sup>2</sup> ; MINATO, Atsushi<sup>1</sup> ; OZAWA, Satoru<sup>1</sup>

<sup>1</sup>Graduate School of Science & Engineering, Ibaraki University, <sup>2</sup>Department of Zoology, University of Kelaniya

The objective of this study is to evaluate the performance of the previously proposed band ratio approach in estimating Chl-a in Bolgoda Lake, Sri Lanka as a representative example of Case II waters. Lake is located at western province in an area with lot of industries and also with some agricultural activities. Considerable amount of industrial effluents are discharged into it. Illegal filling and also encroachment has occurred in the recent past. This study focused on to determine the trends in eutrophication via Chl-a changes during the recent past, make predictions and recommend mitigatory measures and suggest precautionary measures to restore the environment. From March to December 2013, water samples at 5 points of Lake were collected once per month parallel to ASTER overpass and Chl-a of each sample was measured using a laboratory spectrophotometer. Cloud-free ASTER scenes acquired over Lake under clear sky conditions were selected during 2000 to 2013 for Chl-a estimation and trend analysis. All the ASTER images were atmospherically corrected using FLAASH and in-situ Chl-a data on Lake were regressively analyzed with atmospherically corrected three ASTER VNIR band ratios such as B1/B2 of the same date. Finally, the regression equation of the band ratio with highest correlation (B1/B2;  $R^2 = 0.78$ ) was used to develop algorithm for generation of 15-m resolution Chl-a distribution maps using atmospherically corrected time series satellite imageries in day by day basis. This method applied for ASTER band 1/2 ratio due to Chl-a is positively correlated with the green band reflectance and negatively correlated with the red band reflectance. Therefore, the reflectance ratio of green and red bands becomes a robust parameter to estimate the Chl-a content. According to the ASTER based Chl-a distribution maps it is clearly evident that eutrophication of the Bolgoda Lake has been gradually increased from 2005-2011. Further, results showed that there were significant eutrophic conditions throughout the year 2013 in several parts of the Lake and considerable spatial heterogeneity with higher concentrations being recorded water stagnant areas and in water adjacent to freshwater outlets. It is clear that Bolgoda Lake is apparently a disposal site of various discharges of factories in addition to poor drainage and sewage systems present in this area. Highly unplanned urbanization and absolutely lack of adequate waste disposal management facilities in industries close to Lake have resulted in pollution of water. If the present trend of waste disposal and unplanned urbanization continue, they would create enormous environmental problems in future. Results of the present study showed that information from satellite remote sensing can play a useful role in determining the changes in Chl-a related to eutrophication in Bolgoda Lake and in the development of time series Chl-a distribution maps. Such information is important for the future predictions, development and management of this area as well as in the conservation of biodiversity. Therefore we recommend incorporation with this technique for routine monitoring of water quality using multi satellite data such as ASTER in inland water bodies like Bolgoda Lake in the future.

Keywords: Chlorophyll-a, Remote Sensing, ASTER, Sri Lanka, Bolgoda Lake

## Study on the information visualization aimed at maintenance and utilization of local resources

ISHIUCHI, Teppei<sup>1\*</sup>

<sup>1</sup>Akashi National College of Technology

In recent years, the problems of loss of sense of community and increase of indifferent residents, dilution of human relationships in the neighborhood, by dilution of a sense of belonging to the community, such as the moral decline is happening at local areas. Therefore, It become difficult for precisely corresponds to such changes alone to public administration ? driven. Target area of this study is Akashi city. This area has many rich rural environment and ponds, wooded area, waterway as remnant of village forest. And half of the residents of the town Uozumi-cho are a migrant.

In these areas, in order to promote community development befitting UOZUMI town, on an understanding of the digging up the history and culture of various regions, it is possible to stare life in the current region is important in the future. And, it is leading to a chance to foster protect the charm of a familiar town to residents themselves living in the town. Further, in order to form a hometown, it is necessary to dig the local resources, reaffirming residents share a town appeal. In this study, we dug up local resources existing in Uozumi-cho, and visualized as maps using the GPS positioning system. Finally, in order to convey to posterity the presence of valuable community resources, this study is proposed that the residents to re-recognize the appeal of the region by using a map.

Keywords: local resources, hometown, GPS, visualization

## Examination of land cover change region presumption method by using coherence value

SEKINE, Daiki<sup>1\*</sup> ; YUKI, Sohei<sup>2</sup> ; KUWAHARA, Yuji<sup>3</sup>

<sup>1</sup>Department of Urban and Civil Engineering, Ibaraki University, <sup>2</sup>Graduate School of Science and Engineering, Ibaraki University, <sup>3</sup>Center for Water Environment Studies, Ibaraki University

In recent years, many natural disasters have occurred because of abnormal climate. In a time like this, use of satellite data is advantageous to observation of the disaster region for a wide area. However, in order that photo sensor data may tend to be subject to the influence of atmospheric, synthetic opening data attracts attention. And, this research examined coherence data among the information generated from the Synthetic Aperture Radar data. The results of the research are as follows: 1)The coherence value of a vegetation region is low. This result is expressing that the growth environment of vegetation differs for every year. 2)The coherence value of a city area is high.

Keywords: land cover change, SAR, coherence value, land cover classification map, PALSAR

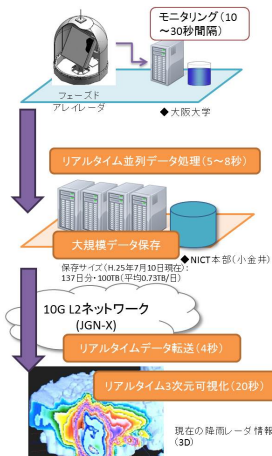
## A Technique for High-performance Data Processing of Satellite Observation Data via NICT Science Cloud

MURATA, Ken T.<sup>1\*</sup> ; KASAI, Yasuko<sup>1</sup> ; SATO, Shinsuke<sup>1</sup> ; ISHII, Shoken<sup>1</sup> ; WATANABE, Hidenobu<sup>1</sup> ; UKAWA, Kentaro<sup>2</sup> ; MURANAGA, Kazuya<sup>2</sup> ; YUTAKA, Suzuki<sup>2</sup> ; YAMAMOTO, Kazunori<sup>1</sup> ; TATEBE, Osamu<sup>3</sup> ; TANAKA, Masahiro<sup>3</sup> ; KIMURA, Eizen<sup>4</sup>

<sup>1</sup>Natl. Inst. of Info. and Communications Technology, <sup>2</sup>Systems Engineering Consultants Co., LTD., <sup>3</sup>University of Tsukuba, <sup>4</sup>Ehime University

It is said that data-intensive/data-centric science is the fourth paradigm of science after observation/experiment, theory and computer simulation. The NICT science cloud is one of the cloud systems for scientists who are going to carry out their research works for their big-data science. The science cloud is not for simple uses: Many functions are expected to the science cloud; such as data standardization, data collection and crawling, large and distributed data storage system, security and reliability, database and meta-database, data stewardship, long-term data preservation, data rescue and preservation, data mining, parallel processing, data publication and provision, semantic web, 3D and 4D visualization, out-reach and in-reach, and capacity buildings.

The present talk is focused on the topics of applications of the NICT Science Cloud to environment sensing research works. There are three applications to be introduced: (1) real-time data processing and visualization of 3D Doppler radar, (2) GOSAT CH4 data processing for global mapping, and (3) high-performance simulation of the ISOSIM-L (Integrated Satellite Observation SIMulator for a spaceborne coherent Doppler lidar) for wind measurement from space. These three projects are started and carried out in the NICT. With help of the NICT Science Cloud, they show progressive development to either larger-scale studies or more practical uses.



## Investigation of geographical feature and vegetation using for planting plan of the coastal zone at Tuvalu

KUWAHARA, Yuji<sup>1\*</sup> ; SATO, Daisaku<sup>2</sup> ; HIROMUNE, Yokoki<sup>3</sup> ; FUJITA, Masafumi<sup>4</sup>

<sup>1</sup>Center for Water Environment Studies, Ibaraki University, <sup>2</sup>Dept. of Architectural, Civil and Environmental Engineering, Tokyo Denki University, <sup>3</sup>Dept. of Urban and Civil Engineering, Ibaraki University, <sup>4</sup>Dept. of Urban and Civil Engineering, Ibaraki University

The objective of this study is to investigate the geographical feature of coastal vegetation growing in Funafuti Atoll, Tuvalu. In order to maintain the living environment of the South Pacific islands countries, sea-level rise is a serious problem. Thus, in this study, analyzed was the relation of land cover of shoreline area and hinterland by using aerial photograph (1984) and satellite image (2004). Then, geographical feature conditions of the coastal vegetation growing under natural condition were surveyed, and it was found that the coastal vegetation was growing in the altitude between 1.1m - 2.2m at Fongafale-island, Funafuti atoll.



## Factor analysis and vegetation change in China Inner Mongolia through Satellite Remote Sensing

BUHE, Baoyin<sup>1\*</sup> ; KONDOH, Akihiko<sup>1</sup>

<sup>1</sup>Center for Environmental Remote Sensing, Chiba University

In this study, the spatial and temporal vegetation cover change of the Inner Mongolia Autonomous Region was analyzed by using the time series satellite SPOT VEGETATION dataset from 1999 to 2012. The vegetation change trend was analyzed by the Normalized Difference Vegetation Index (NDVI), and the result was estimated by the Mann-Kendall rank statistic method. Annual maximum vegetation biomass can respond well with maximum NDVI change trend and annual vegetation product approximately similar with total amount of NDVI trend. Vegetation index has closely correlation with annual precipitation. The results revealed that the vegetation status of Inner Mongolia was affected significantly by the precipitation. Due to the benefit of return farmland to grassland and forestry policy such as forestation, cultivation of the arable land and increase the irrigation area, the vegetation in the southeast and middle south of Inner Mongolia significantly increased. In the northeast of Inner Mongolia, due to the global warming and wetland development the forestry growing period become longer that exactly reflect the vegetation cover increasing phenomenon . The vegetation distributed in middle-west of Inner Mongolia has decreasing trend and desert area was continuously extending within 14 years.

Keywords: Inner Mongolia, Desertification, Vegetation change, Mann-Kendall rank statistic, SPOT VEGETATION

## Study on the Spatial Analysis of River Flooding in the Amur River Basin

YOU, Qin<sup>1\*</sup> ; KONDOH, Akihiko<sup>2</sup> ; HARADA, Ippei<sup>3</sup>

<sup>1</sup>Graduate School of Science, Chiba University, <sup>2</sup>Center for Environmental Remote Sensing, Chiba University, <sup>3</sup>GIS Laboratory, Tokyo University of Information Sciences

Amur River is flowing through the border of China and Russia, and pour into the sea of Okhotsk. There are three plains in the Amur River basin, China famous commercialized food producing area of the Sanjiang Plain and the Songneng Plain are two of them. In order to develop the arable land in recent years, the land cover change and destroyed natural environment made the floods to be easily happened which be concerned. On the other hand, the drainage area of Amur River is 2.05 millions km<sup>2</sup>, it is a problem for satellite observation in spatial, and for extracting the flood information when there are clouds in the sky, the microwave image is used, but it will be expensive in the area of Amur River basin. So the analysis of river flooding will be the challenge. In this study, in order to understand the flooded situation of the Amur River basin, we used high temporal resolution satellite image to extract the two big floods of 1998 and 2013 by the spectral absorption characteristics of the water. We understood that there are different courses in twice flooded, and at the downstream of Amur River where is well to flooding, because of the wetland be changed and topography relief bring about drain off water difficulty.

Keywords: Near-infrared, MODIS, AVHRR, SRTM, Spectrum Character