Japan Geoscience Union Meeting 2015
(May 24th - 28th at Makuhari, Chiba, Japan)

HTT33-01 Room:101B Time:May 27 09:00-09:15

Environmental information infrastrucuture strategies in Future Earth

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Future Earth is a new international research platform aiming at providing the knowledge needed to support transformations towards sustainability. It emphasizes interdisciplinarity and transdisciplinarity in which research projects are co-designed, co-produced, and co-delivered by researchers in various disciplines and the stakeholders. To promote such research at the large scale, it is critical that information infrastructure which includes key environmental data and knowledge is established. For example, developing models to integrate environmental and socio-economic data, methods for linking the climate, health, economic data etc. with information on the impacts, developing the large interdisciplinary databases including various forms of knowledge and data, e.g. natural and social science data and indigenous knowledge based on the regional practices, are considered as the priority research agendas for Future Earth.

As a host organization of a regional hub of Future Earth in Asia, Research Institute for Humanity and Nature has started activities to promote Future Earth research in Asia. In this presentation, I summarize the latest developments in Future Earth and the activities of Future Earth regional hub in Asia, with an emphasis on the strategies on environmental information infrastructure.

Keywords: Future Earth, environmental information, information infrastructure

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HTT33-02 Room:101B Time:May 27 09:15-09:30

Activities on establishing the basis of biodiversity science-Japan node of Global Biodiversity Information Facility-

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Biodiversity Science is becoming a global-scale social problem in recent years. In 2010, Convention on Biological Diversity (CDB) the 10th meeting of the Conference of the Parties (COP 10) was held in Nagoya which promoted the social awareness for biodiversity in Japan. The Intergovernmental science-policy Platform on Biodiversity and Ecosystem Services (IPBES) is started to provides a mechanism recognized by both the scientific and policy communities to synthesize, review, assess and critically evaluate relevant information and knowledge generated worldwide by several stakeholders for biodiversity issues. Obviously, biodiversity information is the basis of biodiversity sciences. The accumulation of biodiversity information will make it possible to understand the properties of diverse and complex ecosystems. In order for biodiversity to be maintained in the future, we must understand its underlying mechanisms and work to preserve it.

In this talk I would like to introduce the international activity Global Biodiversity Information Facility (GBIF) which aims to make the world's biodiversity information freely and universally available. JBIF (Japan Node of the Global Biodiversity Information Facility) is the organization carrying out the activities of GBIF in Japan. JBIF has several activities which mainly aim to integrate, promote the use and global dissemination of biodiversity related data. I would like to show some concrete activities on JBIF and future perspective on biodiversity information.

Keywords: Biodiversity Informatics, DataBase, Museum, Open Data, Specimen

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HTT33-03 Room:101B Time:May 27 09:30-09:45

Investigation on water cycles and past climate changes by using water isotopic information

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Recent advancements of measurement and modeling technologies for heavy stable water isotopes (i.e., $H_2{}^{18}O$ and HDO), namely in-situ and remote sensing spectroscopic vapor isotope measurements and isotope-incorporated general circulation models and regional models, have rapidly improved our understanding of the water isotopic behavior in the Earth System. This fact has greatly increased recognition about the usefulness of stable water isotopic information in the geoscience community. In this presentation, such recent advancements are reviewed, and some of new applications of isotopes for hydrological, meteorological, and climatological sciences, including mechanism of seasonal cycle of deuterium excess in precipitation over East Asia and global contribution of vegetation transpiration on total evapotranspiration, are described. Furthermore, as an extension of previous dataset, 20th Century Isotope Reanalysis dataset covering from AD1871 to AD2008 is introduced. First validation exercises with multiple independent isotopic proxy data, i.e., ice core $\delta^{18}O$, tree cellulose $\delta^{18}O$, and coral $\delta^{18}O$ are made, and the results show reasonable agreement for not only the latest period but also the early 20th century and even the late 19th century. Finally, as future direction of the community, the way towards data assimilation of isotopic proxy data, in which the water isotopic information is used as constraint of various hydrological, meteorological, and climatological processes, is introduced. The ideal experiment with vapor isotope data gives us promising results.

Keywords: stable water isotope, data assimilation

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HTT33-04 Room:101B Time:May 27 09:45-10:00

Co-production of water quality map by researchers and societies to establish a traceability system of environment

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Traceability, which can trace the route of a material from its utilization to production area, is a key system based on the precautionary principle of global environmental issues. Stable isotope (SI) ratios of element can be utilized as a traceability index regarding the source and process of the element in the environment. In order to establish a traceability method and its assimilation in the society, Research Institute for Humanity and Nature (RIHN) has been installed elemental and stable isotope (SI) instruments in the laboratory, and started a cooperative study to implement their traceability application. As one application, RIHN started a project of making water quality map, which aims to elucidate the spatial distribution of the concentration and SI ratios of elements in terrestrial water. This is because elements in organisms and agricultural-fishery products are derived ultimately from the ambient water, and the concentrations and SI ratios of elements in the water vary geographically rather than seasonally. This geographical variation of terrestrial water is attributed to the amount and quality of atmospheric precipitation, geology and human activities in the watershed. Accumulating the data of water quality map provides basic information on traceability studies including water-material circulation, biodiversity, and climate change as well as agricultural and fishery products and food. Here I will show one example of this water quality map in Saijo city of Ehime prefecture.

Saijo city in the Setouchi-region is rich in groundwater with good quality. As a water-capital in Shikoku, Saijo aims to develop a water circulation law to the sustainable use of groundwater. To obtain the fundamental information for this law, we collected water samples at 150 sites in two seasons, groundwater samples at 1032 sites, monthly precipitations over 6 years, and rice products, and analyzed their concentrations for 50 elements and four SI ratios. Their result is summarized as follows:

The δD and δ^{18}O ratios of river water decrease with elevation, while the excess-deuterium value (d-value) increases. The d-value of rainwater is high in winter and low in summer, but the seasonal variation is not clear in the δD and δ^{18}O ratios. The slope on δ^{18}O-δD diagram is 8 for precipitation but is 7 for surface and ground waters, indicating latter waters experience evapotranspiration. Rainwater at high elevation has high d-value in spring to summer when plant growth is active, suggesting a contribution of re-evaporated water. The altitudinal increase of d-value of surface water is ascribed to the increasing contribution of winter rainwater and re-evaporated water vapor. The d-excess value of groundwater is high along a river channel, indicating its potential as a water traceability index from surface to underground.

The distribution of Ca in water is similar to that of Sr, while the Sr isotope ratio varies in accordance with the watershed geology. The Sr isotope ratio of rice is correspondent to that of water. This similarity is also extended to the concentration of SO_4 and its sulfur isotope ratio. These isotopes in the water can be utilized as geological traceability indices of agricultural products.

Based on the water-quality map, surface- and ground-water monitoring started at 10 sites This result shows that the flow rate of groundwater in the basin of Kamo river is evaluated to be 10 m per day. Further, the concentration of nitrogen increased gradually, showing the increase of human impacts. Rainwater becomes enriched in Asian dust in spring, and heavy metals in winter. However, the heavy metal concentrations become low with elevation, suggesting their source to be within Saijo city such as refuse incinerator. This is supported from the SI ratio of Pb in the rain and rice. These data are useful for water-circulation law, showing the potential of water quality map for the co-monitoring of environments between researchers and societies.

Keywords: traceability, water quality map, coproduction, environment, Saijo

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HTT33-05 Room:101B Time:May 27 10:00-10:15

Detecting of Mangrove Damaged Area caused by Super Typhoon ”Heian” from High Resolution Satellite Images

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The Republic of the Philippines is well known as typhoon passing route. One of the largest typhoon in the history has passed Philippines at the beginning of November 2013. This typhoon called ”Haiyan” or ”Yolanda” in Philippine, has gave massive damage not only to the human’s life and infrastructures but also ecological system.

Because of Philippines has long coastal line, ecosystems in the coastal area is very important for people’s livelihood. So that, urgent damage assessment of natural resources in the coastal area is very essential once disaster occurred. This study assessed the mangrove destructive situation after super typhoon ”Haiyan” in Batan Bay, Panay Island in Philippine by using high resolution satellite image.

Fortunately, we have took the image of QuickBird in 6th September 2012 (before typhoon), and we also have captured ground situation after Haiyan attack by WorldView-2 in 3rd February 2014. The density of mangrove in this area is so sparse that middle and low resolution satellite image cannot detect each mangrove composition. The image resolution of these two images, meanwhile, is approximately 2.0 m and therefore very suitable for recognizing detail of mangrove tree structure. On the other hand, spectrum resolution of these images is much remitted and cannot identify between on land vegetation and mangrove. To solve this limitation, we used topography map, which scale is 1/50,000 (1954), in order to eliminate on land vegetation before the start of image processing. Mangrove area before the typhoon was identified from the image year 2012 using supervised classification method. Then, the image year 2014 (after typhoon) of the same location was extracted for image comparison. The NDVI (Normalized Difference Vegetation Index), which indicates vegetation activity and biomass density, of two images were calculated and used for recognizing mangrove damaged area. Differences of two temporal images were computed by ”Change Detection Method”, which is provided by ENVI software, and we could detect significant value decrease for the whole target area.

Results showed that mangrove trees were damaged widely, especially those at the edges and along fish pond dikes. We concluded that this image analysis method is suitable for the mangrove damage assessment. Understanding damage level or spatial distribution of damaged areas can support decision making for the recovery and protection of the mangrove area.

Keywords: High resolution satellite image, Mangrove, Typhoon, Philippines

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HTT33-06 Room:101B Time:May 27 10:18-10:33

To realize the integration and interoperability of environmental data from diverse disciplines

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Thanks to the development of observation tecniques and networks concerning global environmental issues, the accumulation of observtion data in each scientific disciplines is getting faster. To understand the causality to tackle the problems and find the wayout of them, however, the integration of the data from different disciplines is cruicially important as the next step. I try to moderate a sound and constructive discussion toward the integration and iteroperability of databases constructed indipendently, by taking example cases of climate system and biodiversity at the global scale that are presented in the session.

Keywords: integration, interoperability, diverse environmental data

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HTT33-07 Room:101B Time:May 27 10:33-10:45

Designing a new data information infrastructure for future global environment and societies: a General discussion

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Current global environmental research involves diverse stakeholders together with various branches of academia such as the natural sciences, social sciences and humanities, and frequently adopts interdisciplinary and transdisciplinary approaches. These approaches have been successfully utilized in macro-scale global climate models and micro-scale local field observations. Information derived from such multi-scalar analyses includes formatted earth observation data, and unformatted data such as interview records in which questions may differ from case to case. In light of the above, how can we create scientific knowledge from diverse data that contributes to the future protection of the global environment? How can we encourage academic communities in Japan and worldwide to participate in the task of integrating information? These are the main issues we will discuss (but not limit to) in the time allowed.

Commentators: Tetsuya Hiyama (Nagoya University), Yasuhiro Murayama (National Institute of Information and Communications Technology), and Ichiro Tayasu (Research Institute for Humanity and Nature)

Keywords: global environment, information integration, interdisciplinary research, transdisciplinary research, multi-scalar approach