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

HGG01-01 会場:102A 時間:5 月 21 日 09:00-09:15

SLUAS and the Great East Japan Earthquake Disaster
SLUAS and the Great East Japan Earthquake Disaster

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SLUAS (Sustainable Land Use for Asia, 2009-2013) is a research project sponsored by JSPS Science Fund Basic Research (S). It was created in response to the proposal of the Science Council of Japan entitled “ Towards Sustainable Nature-Human Co-existence on the Land and in the Coastal Sea ”. The proposal warned the danger of the coastal area because it is where serious incidences related with global environmental problems are concentrated and where large-scale disasters which threaten sustainable nature-human co-existence are frequent. Therefore, SLUAS from its start in 2009 put high priority on large-scale disasters as major threat to sustainable land use in Asia.

Land Use/Cover Changes are inter-related with various global environmental problems and problems associated with human-induced as well as natural disasters. The damages caused by global changes and those created by disasters have been increasing, and they are often inseparable. The Great East Japan Earthquake Disaster, which includes all sorts of direct and indirect losses generated by the M9.0 earthquake of 11 March 2011 and its aftershocks, the huge tsunami that followed, and the accident of Fukushima Daiichi Nuclear Power Plant, was a reminder of the danger of the coastal lowlands, and the inter-relatedness of global changes and major disasters.

GLP (Global Land Project) is a joint core project of IGBP (International Geosphere-Biosphere Programme) and IHDP (International Human Dimensions Programme), and it has the following three research themes:

Theme 1: dynamics of land systems

Theme 2: consequences of land system change

Theme 3: integrating analysis and modelling for land sustainability

The Great East Japan Disaster was a major blow to the existing land systems and land sustainability, and hence it is a major common concern of entire GLP. Theme 3 in particular claims “ vulnerability and resilience of land systems to hazards and disturbances ” as one of its three main issues, indicating its strong commitment to hazards. It is therefore anticipated that GLP is ready to play a key role in incorporating global change research and disaster research for the sake of realizing sustainable land use in Asia.

The presentation will demonstrate how SLUAS has been involved in the study of the Great East Japan Earthquake Disaster, what it has achieved through its activities, and what roles GLP can play towards sustainable land use in Asia.

キーワード: GLP, 持続可能性, 地球人間圏科学, 土地利用, アジア, 東日本大震災
Keywords: GLP, sustainability, human geoscience, land use, Asia, Great East Japan Earthquake Disaster

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HGG01-02 会場:102A 時間:5 月 21 日 09:15-09:30

土地利用変化と旧河道での災害
Natural disaster toriggered by landuse change on the former river course

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利根川下流平野の干拓地でも緊急干拓事業で陸化した地域は 2011 年 3 月 11 日の地震で液状化被害が発生した。利根川の旧河道および旧河道と砂州の境界部分で多くの液状化がみられる。液状化地区の被災程度は地下水位・地盤状況、地形環境が要因であるが、近年の地形変形と土地利用の変化は液状化地区に差異がもたらしている。そこで、液状化地区の脆弱性を評価してみることにした。液状化発生地域に関わる脆弱性を評価するに当たり、各メッシュマップの重ね合わせに各々5 つの脆弱性評価のレベルを与えた。また、地盤情報、地形分類図のメッシュマップ、土地利用変化図のメッシュマップとの重ね合わせでは、旧河道に当たる地域および旧河道と砂州の境界部分、干拓地における近年の土地利用変化で住宅地に変更された地域でのリスクは大きく表示されることになった。

キーワード: 旧河道, 土地利用変化, 災害, 評価
Keywords: former river course, landuse change, disaster, assessment

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HGG01-03 会場:102A 時間:5 月 21 日 09:30-09:45

Land Use/Cover Changes in Puncak Area (Upstream of Ciliwung River)
Land Use/Cover Changes in Puncak Area (Upstream of Ciliwung River)

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Ciliwung River is one of two major rivers that pass through Jakarta City. The river flows from its source Puncak Area on the highlands of Mount Pangrango, Bogor District, West Java. The Ciliwung river is heavily polluted and very frequently contibuted on flood evidences in Jakarta City as well as other factors such as land subsidence, sea tide, and poor drainage system. The lack of spatial planning systems in this region results on poor land use dynamics control. This study analyze the impact of land use/cover change in Puncak Area as the upstream of Ciliwung River Watershed to the dynamics of floods along the river areas. Satelite images of 1990, 2000 and 2010 have been analyzed to describe the land use/cover changes. Daily precipitation data from three stations located in Puncak area and daily river discharge data recorded at Katulampa station during the period of 1990-2011 were collected. The study shows the impact of land use/cover changes on the increasing of vulnerability to flood, especially due to the increase of settlement areas and the decrease of forest cover and agroforestry activities. This land use/cover changes with one-day extreem precipitation, and one-week continuous high precipitation have significant impacyt on flood evidences.

キーワード: land use/cover changes, upstream of Ciliwung watershed, flood dynamics, Jakarta City
Keywords: land use/cover changes, upstream of Ciliwung watershed, flood dynamics, Jakarta City

Japan Geoscience Union Meeting 2012
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HGG01-04 会場:102A 時間:5 月 21 日 09:45-10:00

無錫市の都市開発と周辺農村地域の変化
Recent Regional Changes in the Urban and Neighboring Rural Areas of Wuxi City

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経済成長著しい長江下流域，無錫市において，都市計画に関する行政担当者等への聞き取り調査を中心とした現地調査を行い，近年の土地利用変化として，既成市街地の再編，郊外地域のニュータウン建設，周辺農村の工業化および集落再編を明らかにした。また，そのような変化の背景として，グローバル経済下での地域の発展戦略としての都市機能の高度化と多機能化，また特に周辺農村地域において工業開発による収益を活用した居住環境の改善があり，その一方で環境問題あるいは環境意識の高まりが見られることを指摘した。

キーワード: 土地利用変化, 経済成長, 工業化, 環境, 長江下流域
Keywords: land-use change, economic growth, industrialization, environment, lower basin of Changjiang Plain

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HGG01-05 会場:102A 時間:5 月 21 日 10:00-10:15

Climate change and changing glacial landscape in Garhwal Himalaya, India
Climate change and changing glacial landscape in Garhwal Himalaya, India

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Glaciers have reduced all over the world. Many scientists have attributed glacial recession to global warming. However, global warming does not tell anything about varying recession rates of glaciers in different parts of the world. Even in Nanda Devi Biosphere reserve area, the responses of glaciers in the form of retreating snouts to global warming are different. Many local factors such as local physiography, orientation, slope of bed rock, order of stream etc. have important influence on glaciers. Paucity of relevant information related to climatic conditions and glacier parameters renders glaciological studies very difficult. Observation close to glacial environment are rare and of very short duration. It is difficult to tell whether the glacial retreat is due to rise of temperature or decline of snowfall. Conclusive results about causative factors of glacial retreat are far from reach. However, there is no doubt about glaciers over the world have declined significantly. Glaciers are promising indicator of climate change. They have been receding rapidly in the Himalayan region over last few decades. Glacial retreat and mass loss have significant implications on fresh water supply, hydropower and other economic activities in Himalayan highland-lowland interactive system (Indo-Gangetic Plains). Therefore, continuous monitoring of Himalayan glaciers is immediately required. The snout, surface area, volume and elevation change of glacier of Himalaya were examined using Survey of India (SOI) topographical sheets and ASTER images together with intensive field investigation. Snout positions and other glacial feature e.g. moraine and glacial lakes were surveyed using GARMIN Etrex GPS in 2010. Two DEMs generated from SOI and ASTER data were compared for calculating change of volume and surface elevation of Milam, Dunagiri and Tipra glaciers. The study of Tipra glacier reveals that area of glacier decreased from 9.09 sq km (1962) to 8.54 sq km in 2004. The loss of glacial area is estimated to be about 0.55 sq km. The snout retreated about 288, 404 and 600 meters in right, central and left part of the glacier respectively during 1962 to 2010. The Dunagiri and Milam retreated about 60 and 1589 meters along central line respectively during 1962 to 2008 (Dunagiri) and 2009 (Milam). Altitudnal retreat of the snouts of Tipra, Dunagiri and Milam is about 60, 53 and 114 meters respectively. Presently, the snout is located at 3820, 4265 and 3622 meters above msl respectively. The range of elevation of Tipra glacier has significantly changed from 3760-5739 meters to 3820-5532 meters during 1962 to 2004 and the average width reduced by 10.39 meters. The snout retreat rate is of Tipra glacier is not much as it is heavily debris covered. Very low retreat rate of Dunagiri glacier is due to its higher snout position and low altitudnal range. Besides, the Tipra glacier appeared empty during field survey in lower ablation part with many longitudinal cracks and debris cover making its surface more vulnerable to collapse and it also suggests higher melting rate for this glacier.

キーワード: climate change, vulnerability, glaciers, snout retreat, Garhwal Himalaya, India
Keywords: climate change, vulnerability, glaciers, snout retreat, Garhwal Himalaya, India

Japan Geoscience Union Meeting 2012
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HGG01-06 会場:102A 時間:5 月 21 日 10:15-10:30

東アジアにおける黄沙の発生と地表面状態の関係に関する研究
The Relationship between Outbreak of Asian Dust and Ground Condition in East Asia

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東アジアにおけるダストは黄沙と呼ばれ、特に春季に発生が多い。黄沙は自然現象であるが、その発生には人間活動も関係していると考えられている。また、黄沙は災害ともなり、その発生要因の検討は理学的な観点だけでなく、環境問題の立場からも重要な課題である。

気象庁が公表している日本における黄沙の観測延べ日数によると、観測日数は年によって大きく異なる。近年では、2000 年から 2002 年にかけ て黄沙発生頻度が高く、2003 年に一転して急減した。このような急激な変動には必ず要因があり、大気側と地表面側の双方の要因が組み合わさって発生にいたると考えられる。本研究では地表面の状態に焦点をあてて、黄沙観測のべ日数の変動に対応する地表面の変化を検討した。そのために、衛星データによる地表面状態のモニタリング、および気象データによる変動解析を行い、黄沙の発生と地表面の状態の関係について検討した。

衛星データとして http://free.vgt.vito.be/からダウンロードできる SPOT/VEGETATION の 10 日 MVC コン ポジットデータを利用した。このデータは地上分解能約 1km で、可視（青、赤）の 2 バンドに加えて、近赤外（NIR)、中間赤外（MIR) の４バ ンドを持つ。このバンドデータから積雪および植生に関する情報を抽出した。

積雪分布に関する情報として NDSI(Normalized Difference Vegetation Index) を次式によって求めた。

NDSI=(MIR-R)/(MIR+R)

積雪域と非積雪域の識別には近藤・鈴木（2005) に基づき、0.2 を閾値として使用した。各旬ごとに NDSI を画像化することにより、各年の積 雪域マップから消雪の時期を求めた。

植生に関する情報として NDVI(Normalized Difference Vegetation Index) を次式により求めた。

NDVI=(NIR-R)/(NIR+R)

植生の展葉は閾値として NDVI=0.1 を便宜的に使用し、各年ごとに展葉時期の地図化を行った。

以上の作業で求めた消雪時期マップと展葉時期マップの差分をとることにより、東アジアの半乾燥地域において春季の消雪後、植生が繁茂するまでの裸地期間を各年ごとに地図化することができた。

黄沙発生の統計量として SYNOP データを用い、年ごとに裸地期間の長さと黄砂観測のべ日数を比較すると、両者の間には良い相関があるように見えた。そこで、中国、内蒙古自治区における代表的な気象観測所を選択して、その位置の裸地期間の長さと黄砂発生頻度を比較すると良い相関が得られた。すなわち、裸地期間が長い年は黄砂の発生頻度が高いといえる。

裸地期間が長い年の消雪時期は平年より早く、春季の平均気温が高かった。よって、消雪の早期化は融雪期の気温が関係していると考えられる。一方、消雪の早かった年の展葉の時期は遅い傾向が求められた。東アジアでは春季は降水が少ない乾期に相当する。半乾燥地域の草本の成長は水分条件に依存するため（近藤ほか、2005)、消雪の早い年は乾燥が草本植生の発芽、成長を抑制している可能性がある。

ここまでは昨年度の成果と同様であるが、さらに詳細な検討を加えた結果、地域ごとの黄沙発生に関わる地表面特性が異なること、また、年々変動も大きいことが明らかになってきた。そこで、今回は地形条件の検討、生態ゾーンの考慮を加え、時間と空間の視点から黄沙発生条件の再検討を試みた結果を報告する。

近藤昭彦・鈴木力英 (2005)：ユーラシア大陸北部の積雪域マッピングと積雪域の
年々変動．水文・水資源学会誌,18(6),696-703.
近藤昭彦・開發一郎・平田昌弘・アザヤドルゴスレン (2005)：モンゴル草本植物のフェノロジーとバイオマスの年々変動．沙漠研究,14(4),209 -218.

キーワード: 黄沙, リモートセンシング, 東アジア, 地表面被覆, 年々変動
Keywords: Asian dust, remote sensing, East Asia, landcover, interannual variation

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HGG01-07 会場:102A 時間:5 月 21 日 10:45-11:00

Land degradation in the Alai region, the Kyrgyz Republic, before and after the 1991 independence

Land degradation in the Alai region, the Kyrgyz Republic, before and after the 1991 independence

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LIU, Jie[1*], TEIJI, Watanabe[1], SHIGERU, Shirasaka[1], IKUKO,Miyahara[1]

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The Kyrgyz Republic has experienced the great changes of social system and economic system since 1991 when the Soviet Union collapsed. These changes also led to the transformation of a grazing style especially in the high mountain areas. The aim of this study is to verify the land degradation changes before and after 1991 in the Alai area, southern Kyrgyz Republic.

In August 2011, we conducted field survey on 43 grazing slopes (19 slopes without grazing terraces and 24 slopes with grazing terraces) to examine the degree of grazing intensity: observation of vegetation coverage, terrace measurement, and slope measurement. Further, 20 local families were interviewed.

The grazing model of Howard and Higgins (1987) was used to understand the degree of grazing intensity on the 24 slopes with terraces. The result suggested that 13 slopes were overgrazed and other 11 can accept use by more livestock in the future.

The interview survey shows that most local people account for the occurrence of the land degradation before their settlement and even before 1991.

The interview survey showed that six families live in the study area all year around. Five of them (83.3%) have moved there before 1991, and have located in the west part of the study area, which is close to the river.

Twelve families stay in the study area only in summer, and 11 of them (91.7%) are located in the east part of the study area, where rivers dried up and 2 families stay here only in winter.

From the slope measurement and the interviews, it can be concluded that both the grazing slopes with no terraces and the overgrazed slopes are located close to the families who live there all the year, which corresponds to the west part of the study area. On the other hand, the grazing slopes that can accept more livestock are located around the families, who stay there in the summer time only, which corresponds to the east part of the study area.

キーワード: land degradation, Alai area, transhumance, terrace, vegetation coverage
Keywords: land degradation, Alai area, transhumance, terrace, vegetation coverage

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HGG01-08 会場:102A 時間:5 月 21 日 11:00-11:15

東アジアにおける樹木の多様性および生態系機能へ人間活動が与える影響　毎木調査データベースを用いた評価
Evaluating human impacts on tree diversity and ecosystem functions in East Asia from forest inventory database

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Forests hold the majority of the world’s terrestrial species. Human activities have caused and will cause species diversity loss, which leads to changes in ecosystem functions that provide various ecosystem services for human well-being. However, the relationship between species diversity and forest ecosystem functions is still unclear and we cannot predict the impacts of biodiversity loss on the ecosystem functions, one of the core research questions of Global Land Project. In this presentation, we introduce a new research program aiming to evaluate how the loss of tree species diversity affects functions and services of forest ecosystem in East Asia. We developed forest inventory database which has already archived more than 700 plots covering all over Japan. Model to predict forest ecosystem functions will incorporate drivers such as land use change, environmental changes and global climate change. By using the forest inventory database, we tested human impacts on tree species diversity in Japan.

キーワード: 森林, 生態系機能, 生態系サービス, GLP, 生物多様性
Keywords: forest, ecosystem functions, ecosystem services, GLP, biodiversity

Japan Geoscience Union Meeting 2012
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HGG01-09 会場:102A 時間:5 月 21 日 11:15-11:30

生態系サービス評価のための土地利用シナリオ分析－釧路川流域の事例－
Land use scenarios for evaluation of ecosystem services - A case study in the Kushiro watershed -

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SHOYAMA, kikuko[1*], Yoshiki Yamagata[1]

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For appropriate decision making in ecosystem management for global warming prevention and biodiversity conservation, a reliable and practical method to evaluate ecosystem services is necessary. The research objectives are (1)integration of biophysical and socio-economic data related to ecosystem services, (2)development of a practical evaluation method of ecosystem services and (3)contribution to mitigate conflicts between environmental mitigation options such as climate change prevention and biodiversity conservation.

For the purpose, the pre-evaluation of ecosystem services was conducted relating to climate regulation and reservoir of biodiversity. The study area, Kushiro watershed was preliminarily mapped using the InVEST, which is the mapping tool of ecosystem services developed by Natural Capital Project. The change in ecosystem services was spatial-explicitly quantified based on the land cover maps in 1970s and 2000s. The climate regulating service and the biodiversity reserving service were totally degraded, and the change was depends on location due to various land use change happened in the area. Furthermore, the scenario analysis was applied to provide more practical evaluation to communicate with stakeholders. Four scenarios were developed to evaluate ecosystem services: BAU scenario, biodiversity conservation scenario, agriculture and forestry scenario and climate adaptation scenario. The trade-off analysis based on the scenarios will improve understanding of the ramifications of land management choices.

Keywords: land use change, ecosystem services, scenario analysis, biodiversity conservation, climate mitigation and adaptation

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HGG01-10 会場:102A 時間:5 月 21 日 11:30-11:45

Discussion on GLP
Discussion on GLP

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HIMIYAMA, Yukio[1*]

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To discuss the issues related with GLP, or Global Land Project, namely dynamics of land systems, consequences of land system change,integrating analysis and modelling for land sustainability, and disasters.

キーワード: GLP, IHDP, IGBP, land use, sustainability, disaster
Keywords: GLP, IHDP, IGBP, land use, sustainability, disaster

Japan Geoscience Union Meeting 2012
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HGG01-P01 会場:コンベンションホール 時間:5 月 21 日 12:10-12:15

DNDC モデルを用いた熱帯アジア水田の GHG 排出の定量化におけるパラメータ選択とその検討
Parameter selection and its strategy for quantifying GHG emissions from Asian tropical paddy fields using a DNDC model

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Agricultural activities highly contribute to greenhouse gas (GHG) emissions, particularly in Asia. Rice paddy fields are a major and increasing source of entire methane (CH_4) and nitrous oxide (N_2O) emissions. According to a report of IPCC, rice paddies account for 11% of all global methane emissions. Previous studies have shown that water management has a significant effect on methane emission in the period of rice cropping season. Consequently, paddy water management has become a target scenario for GHG mitigations over rice-producing districts and it is expected to have accurate grasp of GHG fluxes in Asian tropical paddy regions.

The Mekong Delta is one of the most important rice producing regions in Viet Nam. However, in this area, quantification of the GHG emissions is still not very clear, and studies related to the mitigation potential remain limited, and we hence set up an experimental site in farmers' fields in Can Tho City, Viet Nam, the rice in which site is cropped 3 times a year. Two different methods in field water management were adopted in the experimental field in order to evaluate their effects on GHG emissions. Two kinds of irrigation technologies are applied to the fields as; 1) a continuously flooding condition (CF), and 2) an alternate wetting and drying (AWD) condition. It will require a great deal of labor and time to measure and monitor GHG emissions in situ due to the varieties in environmental and agronomic conditions. In this aspect, numerical modeling is a superior approach to estimate GHG emissions at various spatial and temporal scales. A dynamic, flexible and robust model is possible to predict the changes in GHG flux under different agricultural management scenarios, and a process-based model can take account of inter-relationships among various input factors (e.g. climate, soil types, water management, farming practices). The de-nitrification and de-composition model (DNDC) has been used extensively to predict GHG emissions for a wide range of agricultural activities in many countries around the world (Li et al., 1992; Li, 2000). In recent years, a revised DNDC model called DNDC-Rice has been developed and was successfully used to estimate CH_4 and N_2O emissions in Eastern Asian countries, in particular in Japan and China (Fumoto et. al., 2008; 2010).

In this study, we applied the DNDC-Rice model to rice paddies in the Mekong Delta Region. DNDC-Rice model requires parameters dealing with soil characteristics, daily climate, and agricultural management strategies, such as tillage, fertilization, irrigation, flood, manure amendments, and weeding. Because individual input datasets are obtained from various sources in different format and levels of spatial resolutions, and that quite a number of missing observed data occur, parameter tuning is a matter of great importance. We laid stress on parameter selection strategies and have tested the functionality in response to input parameters by using the DNDC-Rice interface under a set of scenarios that reflect AWD and CF water management. Currently, we are carrying out a simulating program to quantify GHG emissions based on the DNDC-Rice model and constructing a local and semi-regional DNDC database specific to this area. The predicted values of CH_4 and N_2O emissions vary in a large range in proportion to the changes in water management of CF and divisions. It is clear that CH_4 and N_2O emitted from the paddy rice fields are characterized by the periods of flooding in the Mekong Delta Region. Further simulations discussing these issues are currently underway.

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