**MIDLANDS POSTGRADUATE CONSORTIUM**

**Held at the University of Leicester 14.12.11**

**Bennett LT 4 & Attenborough ATT 002**

**1000 hrs – 1415 hrs**

**Programme**

Location - Bennett LT4

1000-1015 hrs: Ghizayel Al Muhammadi (University of Leicester)

1015-1030 hrs: Laura Graham (University of Nottingham)

1030-1045 hrs: Heather Moorhouse (University of Nottingham)

1045-1100 hrs: James Wheeler (University of Leicester)

1100-1115 hrs: Pedro Rodriguez Veiga (University of Leicester)

1115-1130 hrs: Bashir Adamu (University of Leicester)

Short break

1145-1200 hrs: Gong Pan (University of Leicester)

1200-1215 hrs: Moh Fifik Syafiudin (University of Nottingham)

1215-1230 hrs: Narissara Nuthammachot (University of Leicester)

1230-1245 hrs: Katie Anne Smith (University of Nottingham)

Location – ATT 002 Attenborough Seminar Block Ground Floor LR 002

1315-1330 hrs: Prem Pandy (University of Leicester)

1330-1345 hrs: Xiao Feng (University of Nottingham)

1345-1400 hrs: Nayef al sharari (University of Leicester)

1400-1415 hrs: Matt Hill (University of Loughborough)

Close

**Abstracts**

**Quaternary Environmental Changes in the Wadi systems of the Al-Madina Al-Munawwarah Basin**

Ghizayel Al Muhammadi (University of Leicester)

Unfortunately, in terms of past Quaternary environmental changes, much of Saudi Arabia remains unstudied. This is particularly the case around the Al-Madina Al-Munawwarah basin, in the west of the Kingdom. The study area covers Al-Madina Al-Munawwarah province but is limited in the west by the scarp mountains that lead down to the Red Sea rift basin and in the north by An Nafud Desert. The province lies on the Arabian shield and incorporates the extensive Harrats or lava fields. The drainage patterns are predominantly dendritic and their distribution is largely controlled by the area’s geology and structure. Within the wadi channels are cut-and-fill sequences of alluvium of various Quaternary ages. This research focuses on reconstructing past environments through studying the geomorphology and the sediments preserved in and around the wadis systems, in an attempt to understand the spatial and temporal patterns of environmental change that have resulted from climatic variation over thousands of years. This research involves obtaining satellite images for the study area to show its geological, geomorphological and sedimentological properties. Field studies and the collection of Quaternary sediments will allow an analysis of the chemical, physical and mineralogical properties of the deposits in the laboratory. Establishing ages by OSL techniques will be crucial for identifying a geochronological timeframe of past events.

**Urban Ecology: Policy and Theory**

Laura Graham (University of Nottingham)

Conservation of wildlife in urban areas is gaining attention both with policy makers and in ecological theory. The Lawton report and the Natural Environment White paper both highlight the importance of urban green space within the larger habitat networks. It is recognised by ecological theorists that traditional principles and models cannot be applied directly to urban systems without adjustment. This research programme aims to refine metapopulation models and their parameters to be suitable for use for urban ecology and to use this model to answer some important policy and theoretical questions.

**Using Lake Sediments to Establish Restoration Targets for the Windermere Catchment, Lake District, UK**

Heather Moorhouse (University of Nottingham)

The EU Water Framework Directive (WFD) demands all surface water bodies to achieve “Good” ecological status by 2015 with the option to defer until 2027. Palaeolimnological techniques have been identified as one of the most useful tools to help determine reference conditions or restoration targets in order to reach the aims of the WFD. My research will use such techniques in particular the use of algal pigments to assess the drivers and timing of change to the ecological integrity throughout many of the satellite lakes and tarns of the Windermere catchment. The results of this research will help the Windermere Catchment Restoration Programme to determine the direction of their programme of measures and thus, the future management of the catchment.

**Forest Monitoring of the Congo Basin using Synthetic Aperture Radar (SAR)**

James Wheeler (University of Leicester)

The Congo Basin contains the second largest area of rainforest in the world. Despite its global importance for stabilising the climate system, knowledge of its carbon stocks is subject to large uncertainty.

The quantitative distribution of forest biomass in the region is a major source of uncertainty. Satellite based SAR datasets suitable for forest monitoring will be used, principally from the completed Japanese Aerospace Exploration Agency (JAXA) missions, the Japanese Earth Resources Satellite 1 (JERS-1) and the Advanced Land Observation Satellite (ALOS), both of which had active microwave sensors, JERS-1 SAR and ALOS-Phased Array L-band SAR (PALSAR), operating at L-band frequencies (~1.27 GHz). Temporal forest change will be mapped from JERS-1 and ALOS-PALSAR data over the Congo Basin to derive a more accurate map of the spatial distribution of deforestation and areas of intact tropical forest between 1991 and the present. The retrieval of forest biomass at a selected site from SAR, using polarimetric SAR interferometry and dual-wavelength interferometry, will be investigated. Improved carbon stock and deforestation rate estimates will be calculated and validated with field data from CARBOAFRICA and field work conducted in the Republic of Congo.

**Global Biomass Information System**

Pedro Rodriguez Veiga (University of Leicester)

The United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol addressed the importance of reducing and monitoring greenhouse gases (GHG), with CO2 being the most significant. However, terrestrial carbon pools and fluxes are still one of the major remaining uncertainties in climate science. Global forests store circa 45% of terrestrial carbon, and are one of the main carbon sinks in the planet. Forest accumulates carbon primarily in the form of living above-ground biomass (AGB) of trees. Biomass is also an Essential Climate Variable (ECV) required by the Global Climate Observing System.

Additionally the REDD+ mechanism, which will provide economic incentives to forest-rich developing countries that reduce emissions from deforestation and forest degradation, is demanding more accurate approaches for monitoring biomass at different scales.

Currently, there is no sensor that can measure AGB directly and accurately at a large scale, either due to limitations in signal saturation, or due to cloud cover persistence. However, other biophysical parameters more accurately measured through remote sensing techniques can be used to estimate AGB using allometric equations.

There is therefore a need for a global biomass information system, which synthesises the best available remote sensing datasets with a comprehensive geographical database of spatially referenced allometric equations and field data of tree species, tree height and other biomass-related parameters. The Global Biomass Information System research will synthesise existing geospatial data products from the developing GMES land monitoring core service and GSE Forest Monitoring and overlay them in a global multilayer database.

**Pipeline environmental monitoring: measuring environmental impacts using remote sensing and GIS – a case study of Niger Delta, Nigeria**

Bashir Adamu (University of Leicester)

Pipelines are currently the most effective method of transporting oil and gas products over long distances, and across hostile environments or borders. The method is seem to be the most environmentally friendly with lots of financial benefits derivable in product transport and sale across ecological and political borders. However, these benefits can easily be overshadowed by the impacts of pipeline construction and operations have on vegetation and other ecological components of an ecosystem e.g. upsetting the stability of ecological systems through dredging, vegetation clearance, oil leakages/spills etc. Several thousand kilometers of oil and gas pipeline networks have been constructed worldwide across sensitive natural environments in Alaska, different economic blocks in Europe and swampy vegetated/wet lands of the Niger Delta of Nigeria.

Hence for a sustainable and cost effective oil and gas transportation in sensitive environments, determining the potential environmental impacts on the land cover of ecological diverse rich regions is very important. Most pipeline constructions involve vegetation clearance, felling of trees, dredging and alteration of natural water course that induce erosion, siltation, species displacement etc. or in some extreme cases stimulate human induced pipeline destruction, rupture and vandalism causing further environmental degradation. As a result, while pipeline transportation seems to be highly beneficial in other societies, the same cannot be said of some as pipeline operation is responsible for most environmental degradation and poverty prevalent in such areas (study area).

In order to investigate the land cover information and the potential environmental impacts from this method of transport operations, the study will focus on the use of integrated LIDAR/RADAR remote sensing and Geographic Information Systems techniques to detect and monitor oil spill/leakages, map and analyses land cover changes resulting from the pipeline operations over a period of 30 years in areas where they operate. This method offers an efficient and non-destructive investigation to the environmental (Van der Werff et al 2008\*).

*Key words*

*LIDAR remote sensing, GIS, Land Cover, pipeline, environmental monitoring, change detection, environmental impact*

\* Van der Werff, H., Van der Meijde, M., Jansma, M. and Van der Meer, F. (2008): *A Spatial-Spectral Approach for Visualization of Vegetation Stress Resulting from Pipeline Leakage. Sensors Vol. 8 ISSN 1424-8220 pp 3733-3743*

**FENFLUX: The short-term climate response of carbon dioxide, methane and water fluxes from a regenerating fen in East Anglia, UK**

Gong Pan (University of Leicester)

Peatlands store approximately 30% of global soil carbon stocks. At the same time, they are a source of methane because of the slow peat accumulation by anaerobic decomposition in waterlogged conditions. Hence, the role of peatlands in influencing radiative forcing and the global climate system is complex. We have measured CO2, H2O, CH4 and energy fluxes using Eddy Covariance (EC) and micrometeorology at our monitoring sites in a regenerating fen and a semi-natural fen in the Wicken Fen Nature Reserve, Cambridgeshire, UK. We present an investigation of the magnitude of the impacts of restoration and their response to climate variability by comparing the two different fen ecosystems. This research will lead to a better quantitative understanding of the relationships between fen peatland and global change.

**Radar Interferometry for Land Subsidence Monitoring**

**in Bandung Basin, Indonesia and Comparison with Piezometric Data**

Moh Fifik Syafiudin (University of Nottingham)

The objective of this project is to measure and map land subsidence phenomenon in Bandung Basin, Indonesia with high precision and accuracy level using PSI technique.

Among the various space-borne techniques available to-date for measuring ground deformation, Differential Interferometric SAR (DInSAR) and Persistent Scatterer InSAR (PSI) is considered to be the most efficient technique for measuring spatially-continuous ground deformation over a large area.

An integrated approach for land subsidence measurement, namely by spaceborne (DInSAR & PSI) technique, piezometry-based estimation of confining layer compression will be attempted in this work and GPS-based point measurements will also be used for validation.

The archive ENVISAT ASAR data has been searched in SLC (ASA\_IMS\_1P) format. A search of the archive has identified 57 images have been acquired of the site between 2002 and 2010 in both ascending (30 images) and descending (27 images) mode, and there will be utilised to generate linear and non-linear deformation profiles. The ENVISAT ASAR data acquired in both ascending and descending mode are required in order to resolve the deformation vector in 2D rather than 1D.

The data will be processed using the PUNNET software, which is PSI software developed in-house by the University of Nottingham. It is based on the SBAS algorithm and has been successfully used to process ENVISAT data at low- and full-resolution scales. The results of this project will be a 2D-deformation map of Bandung Basin, Indonesia. Linear and non-linear results will be included.

***Keywords:*** Interferometric Synthetic Aperture Radar (InSAR), Differential InSAR (DInSAR), Persistent Scatterer InSAR (PSI), Piezometric, GPS, linear and non-linear deformation, ENVISAT ASAR.

**Monitoring and detecting deforestation and degradation in tropical forest in Thailand using Earth observation satellites.**

Narissara Nuthammachot (University of Leicester)

Forests are one of the earth's most valuable resources. However, there has been a rapid reduction in forest area over the last 50 years. Tropical forest area in Thailand has decreased from 53% of the total land area in 1961 to 31% in 2009 (Anuchit, 2011). There appear to be many causes of forest change such as logging, agriculture, plantation, fuel wood, tourism, and the creation of dams. The UNFCCC REDD+ initiative currently being discussed at government level has put forests firmly back on the map because of their role on the storage of Carbon. Therefore, it is necessary to monitor and detect forest change for the effective management and protection of this important resource. In this study, we will use the latest Earth observation satellites for monitoring and detecting deforestation and degradation in tropical forest in Thailand and develop novel multi-sensor methods to reduce uncertainty in the quantification of forest degradation.

Rattanasuwan, A. (2011). Tropical forest area in Thailand, Proceedings of International Year of

Forests 2011, Bangkok, Thailand, May 23-24, 2011, 2-3. Available at

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**Global Hydrology Modelling and Uncertainty: Climate Change and Hydrological Extremes**

Katie Anne Smith (University of Nottingham)

This PhD research aims to tackle the issue of the uncertainties that are inherent in climate change modelling. Paying particular attention to the effects of climate change on hydrological extremes, this project will rigorously test the global hydrological model Mac-PDM.09 before applying of a suite of projected climate change scenarios. Sensitivity analysis and uncertainty estimation techniques including MMGSA, GLUE and BMA will be used to create an ensemble of model realisations that will encompass the full range of potential hydrological futures. Adaptations to the model will likely be necessary, such as the development of an up to date land cover map, as well as the integration of an additional topographic model for flow routing.

**Synergistic use of Hyperspectral and LiDAR data for coastal sand dune vegetation mapping in Portugal**

Prem Pandy (University of Leicester)

Abstract:

Over the past decades, passive remote sensing provided much useful information regarding forestry applications and vegetation mapping. With the introduction of active remote sensing, microwave, LiDAR etc. the capabilities have evolved, resulting in higher accuracy than the previous remote sensors. Sand dune vegetation mapping with hyperspectral remote sensing and LiDAR data were in use earlier, but here, integrated use of both data together has been taken into consideration. Hyperspectral data use spectral characteristics for mapping and LiDAR data is harnessed for its height and intensity characteristics to map sand dune vegetation. The applicability of integrated data will result in achieving higher accuracies than individually. The study comprises of data processing, data integration, than mapping vegetation with and without the LiDAR dataset. The first return and last return intensity of LiDAR will be used software like eCognition, ENVI and Arc GIS. This will result in sand dune mapping with higher accuracy.

Keywords: LiDAR, sand dune vegetation, hyperspectral

**Urban growth monitoring by using remote sensing technology**

Xiao Feng (University of Nottingham)

Urban areas are currently the most rapidly changing types of land covers, even though they represent only a low percentage of the global land surface. Their monitoring is one of the most relevant issues concerning the evaluation of the human impact on the environment. For this purpose, remotely sensed data can provide a timely and synoptic view of urban land covers as well as a tool to monitor changes in urbanizing landscapes. Sub pixel mapping has a great potential on mapping more accurate thematic map with medium spatial resolution imagery. It can provide much more detailed information compared with traditional classification methods. Using sub-pixel mapping to derive the thematic information would be one of the efficient and accurate methods in the future.

**The role of protected areas in biodiversity conservation in North of the Kingdom of Saudi Arabia *(Harrat Al Harrah Natural Reserve)***

Nayef al sharari (University of Leicester)

The Losses in biological diversity are increasingly worldwide. Therefore, the establishing of protected areas has been a cornerstone of biodiversity conservation and plays a main part of conservation efforts at the landscape scale. As elsewhere in the world, the loss of biological diversity in the Kingdom of Saudi Arabia is due primary to the economic factors. Through the last 50 years, significant changes have occurred in the landscape, natural habitat and the wildlife of the Kingdom of Saudi Arabia. The flora of Saudi Arabia reflects the geographical position of the Arabian Peninsula between Africa, Asia and Europe. There are 2250 species which belong to 132 families and 837 genera of which some 246 species are considered endemic and about 450 species have direct benefits to human beings that can be used in folk medicine. The fauna in Saudi Arabia comprise mainly of 76 mammals species, about 444 bird species, including 10 endemic species and 9 freshwater species. About 158 of these species are known to breed in the Kingdom. Some major threats to biodiversity include: habitat degredation and fragmentation, overhunting, over grazing, unsustainable agricultural practices, pollution, expansion of urban areas and recreational activities. Therefore, it was an argent demand to establish a system in Saudi Arabia Kingdom to protect and develop its biodiversity. A major component of the system was the establishment of the National Commission for the Wildlife Conservation and Development (NCWCD) which established a network of 15 protected areas, covering almost 4% of the country`s surface. Conservation biodiversity is a delicate balancing act that many local authorities, government department and public body are starting to achieve it to conserve flora and fauna. Therefore, it is important to address the role of establishing national protected areas in conserving and maintaining biodiversity in the Kingdom of Saudi Arabia from the first establishment of a protected area in 1987 which has been declared from the commission. This is looking to investigate the of protected areas, through assessing positive and negative aspects of the protection and related measures taken in Harrat Al Harrah Reserve **on biodiversity** and to address what is being done about the threat to the biodiversity at a national level in the Kingdom of Saudi Arabia.

**Aquatic macroinvertebrate and microcrustacea biodiversity in ephemeral and perennial ponds within the Lower River Soar Valley**

Matt Hill (University of Loughborough)

Quantifying the invertebrate biodiversity of ephemeral and perennial ponds is vital for their future conservation and management, and enables greater understanding of the dynamic invertebrate communities which exists within pond landscapes. However, there is a paucity of research on the ecology of pond ecosystems compared to rivers and lakes. The ecology and biodiversity of ephemeral ponds, in particular, has been poorly studied historically due to their small size and lack of formal protection. This research gap has been recognised and highlighted at the national and local level by conservation agencies. This project aims to quantify aquatic macroinvertebrate and microcrustacea biodiversity in ephemeral and perennial ponds and their wider conservation value within the Lower River Soar Valley. This presentation will provide an overview of the proposed project in relation to key literature, definitions / terms and will provide an overview of knowledge in relation to the ecological importance of ephemeral and perennial ponds in the contemporary landscape. In addition, the thesis aims, objectives and hypothesis will be outlined and an overview of the proposed methodology presented.