



**University of
Nottingham**
UK | CHINA | MALAYSIA



UNNC-IGSNRR, CAS Doctoral Training Partnership

Available PhD topics

Formal applications should follow the instructions in the '[How to apply](#)' section.

PhD topic 1	Agricultural land use change monitoring
IGSNRR Supervisor	Prof Jinwei Dong
UNNC Supervisor(s)	Dr Ping Fu
Short introduction & description of PhD project	Agricultural lands account for nearly half of the global land area, and changes in agricultural land use directly affect food security, water security, ecological security, and climate change. Nowadays, agriculture lands are challenged by a context of environmental sustainability and climate change, combined with an unprecedented and still-expanding human population size. Remote sensing technology provides unprecedented opportunities for monitoring agricultural lands to assist the adaptive evolution of agricultural practices in order to face a series of global challenges like climate change, population growth, and the rising demand for agricultural products. This project will focus on the fine-scale characterisation of the spatial and temporal characteristics of agricultural lands and the evaluation of the processes and effects of agricultural land change.
Contact points	Informal inquiries may be addressed to Prof Jinwei Dong (dongjw@igsnr.ac.cn) and Dr Ping Fu (ping.fu@nottingham.edu.cn).
PhD topic 2	Change detection of ecosystem services on the Qinghai-Tibet Plateau based on geospatial data integration
IGSNRR Supervisor	Prof Erfu DAI
UNNC Supervisor(s)	Dr Heshan Du
Short introduction & description of the PhD project	Ecosystem services are the natural environmental conditions and effects formed by the ecosystem to maintain the survival and development of human beings. As the basic resources of human sustainable development, the change of ecosystem will directly or indirectly affect human welfare. Since the beginning of the 21st century, global climate change, rapid economic development, the intensity of human activities and the increasing demand for natural resources have severely damaged global ecosystem services, and natural ecosystems have been in a state of imbalance for a long time. How to reduce the negative impact of climate change and human activities on the ecosystem, improve the ecosystem service function, and promote its coordinated development with human welfare, has become a hot topic of global concern. The Qinghai-Tibet Plateau is

	<p>the roof of the world and the water tower of Asia, with a unique ecosystem. The Qinghai-Tibet Plateau, as a sensitive and ecologically fragile zone of climate change, has significantly changed its ecosystem services under the influence of global change.</p> <p>Therefore, it is of scientific significance to study the quantification and influence mechanism of ecosystem services for the promotion and sustainable development of regional integrated ecosystem. The detailed research contents are as follows: (1) quantitative assessment of typical ecosystem service supply with geospatial data integration method in the Qinghai-Tibet Plateau; (2) quantitative analysis of spatial and temporal variability in ecosystem services and trade-offs and synergistic relationships; (3) relevant models are used to reveal the impact of land use, climate change and human activities on key ecosystem services.</p>
Contact points	Informal inquiries may be addressed to Dr Heshan Du (heshan.du@nottingham.edu.cn) and Prof Erfu DAI (daief@igsnr.ac.cn).
PhD topic 3	Evaluation of effects of the “Sponge City” program for urban water disasters control in China
IGSNRR Supervisor	Prof Yanfang Sang
UNNC Supervisor(s)	Dr Faith CHAN
Short introduction & description of PhD project	<p>How to evaluate the risks of urban water disasters and further mitigate them is one key topic for urban stormwater management, which is also the foremost challenge for sustainable urban developments. The Chinese government proposed the concept of “Sponge City” in 2013 to handle the aggravating urban water disasters (i.e. urban surface water floods/waterlogging) over China. Over the last decade, many measures and technologies have been developed for guiding the designs and implementation of the “Sponge City” program (SCP) in the 30 pilot cities and also many other cities. However, there still have many challenges that prevent the positive feedback of the SCP, questioning its functions and effects. This project will focus on three major dimensions on (i) solve the key hydrology-related issues (e.g. estimation of proper rainfall threshold in the various magnitude of rainfall) for guiding the design of the SCP; (ii) evaluate the effects of SCP by considering the trade-off between the investment and its potential benefits and (iii) explore the projected changes of the SCP effects by considering the climate change impacts.</p>
Contact points	Informal inquiries may be addressed to Dr Faith Chan (Faith.Chan@nottingham.edu.cn) and Prof Yanfang SANG (sangyf@igsnr.ac.cn).
PhD topic 4	Multi-scale habitat suitability modelling and predicting with geo-big data
IGSNRR Supervisor	Prof Yong Ge
UNNC Supervisor(s)	Dr Faith CHAN
Short introduction & description of PhD project	<p>Habitat is the general term for the physical space in which organisms live and the applicable resources, which is essential for maintaining biodiversity and sustainable development. Existing studies on habitat mostly ignore the scale effects in geographic patterns and processes, which may bias the effects of driving factors in habitat suitability modelling and increase the uncertainty of results. This involves traditional</p>

	<p>habitat change analysis of plants and animals as well as further extension to sustainability and evaluation of human activity areas.</p> <p>In recent years, advances in earth observation technology and the popularity of volunteered geographic information have provided vast amounts of geographic data for habitat studies. And the development of machine learning, and deep learning technology has also facilitated the processing of geo-big data. However, current studies have not yet fully exploited these advantages and facilities in the service of habitat modeling and prediction.</p> <p>This project will therefore focus on two major aspects: (i) Analyzing the driving factors of habitat suitability and studying the scale effects. Including multi-scale effects of land use change, human activities and other factors on habitat sustainability (e.g. sponge city construction); (ii) Applying geo-big data and deep learning techniques to habitat suitability modelling and future change prediction.</p>
Contact points	Informal inquiries may be addressed to Dr Faith Chan (Faith.Chan@nottingham.edu.cn) and Prof Yong Ge (gey@lreis.ac.cn).
PhD topic 5	Multi-sourced Cross-modal Geographic Change Detection based on Deep Learning
IGSNRR Supervisor	Prof. Hua Wu
UNNC Supervisor(s)	Dr Heshan Du
Short introduction & description of PhD project	<p>Geographic change detection aims to identify differences between representations of the same geographic area at different times. A geographic area can be represented using data in different formats, with different structures and semantics, and at different levels of details. Geographic change detection is a fundamental task in remote sensing and geospatial information systems which attracts many researchers in artificial intelligence. Geographic change detection has wide applications in urbanization monitoring, resource and environment monitoring, disaster assessment, etc.</p> <p>It is challenging to develop effective, efficient, reliable, and explainable methods for geographic change detection. Consider an example change detection process which takes images obtained at different times as input, and outputs pixel-wise change maps. Due to the limitations of weather conditions (e.g., cloud cover, rainfall, etc.), and the temporal resolution of the satellite, it is difficult to obtain effective repeated observations of a specific area from the same sensor. This means that we must use the multi-sourced and multi-modal remote sensing data with different imaging mechanisms (such as optical and synthetic aperture radar) for change detection within the desired time range.</p> <p>The project will focus on two main aspects (1) deep learning-based change detection and (2) multi-sourced cross-modal change detection (e.g., different spatial resolution sensors, different types of sensors).</p>
Contact points	Informal inquiries may be addressed to Dr Heshan Du (heshan.du@nottingham.edu.cn) and Prof Hua Wu (wuhua@igsnrr.ac.cn).
PhD topic 6	Transboundary flood risk assessment and control measures under the Belt and Road Initiative: the case of the China-Pakistan Economic Corridor
IGSNRR Supervisor	Professor Juanle Wang

UNNC Supervisor(s)	Dr Faith Chan
Short introduction & description of PhD project	<p>Flood risk is increasing owing to human-induced and climatic factors. In recent years, large floods that occurred in the Belt and Road countries are emerging. The case of Pakistan is significantly causing severe impacts from the evidence of the large flood in 2022 August and previously in 2010.</p> <p>The alarm raised by the flood preparations, responses and recovery practices that have been concern by the Asian neighbourhood on these serious hazards due to 1. The sources and pathways of the flood extremes; 2. The reasons for flood impacts are still severely damaged even the climate change adaptation practices and policies obliged and enacted; 3. The future BRI strategies under these influential factors of climatic extremes and developmental pressure.</p> <p>These issues severely affected future developments among BRI countries not only in the case of Pakistan.</p> <p>In this proposed study, the candidate should think about the latest IPCC strategies and international practices (i.e. COP27) and how to use the latest geographical and environmental techniques to reduce flood impacts (e.g. food security issues) and improve disaster preparation and resilience.</p>
Contact points	Informal inquiries may be addressed to Dr Faith Chan (faith.chan@nottingham.edu.cn) and Prof Juanle Wang (wangjl@igsnrr.ac.cn).
PhD topic 7	Vegetation responses to climate change in different vegetation regions of China over the past half century
IGSNRR Supervisor	Prof Junhu Dai
UNNC Supervisor(s)	Dr Tengwen Long
Short introduction & description of PhD project	<p>Vegetation is very sensitive to climate change. This project aims to examine the responses of zonal vegetation in China to climate change over the past few decades. One possible focus is the vegetation phenology. Vegetation phenology is a sensitive indicator of climate change and is crucial for evaluating the responses of ecosystems to climate change in recent years. Whereas phenological studies in the past mainly discussed the relationship between changes in plant seasonality with climatic factors in temperate regions, current phenology has greatly broadened its scope in studying the shifts of plant and vegetation phenophases in various types of biomes, such as evergreen forests, rainforests, as well as mountain and alpine vegetations.</p> <p>In this study, the PhD candidate is expected to apply multi-source data, e.g. ground observation network data, phenological camera data and satellite remotely sensed material, to reconstruct phenological shifts in China on different spatial scales. Moreover, different climatic factors that might affect these phenological changes and the phenological processes will be examined.</p> <p>Based on multi-source phenological data, the project will focus on the following two aspects: i) comparing and contrasting phenological shifts in difference biomes of China, and ii) identifying main factors that influence the above phenological shifts and possible mechanisms for such influences.</p>
Contact points	Informal inquiries may be addressed to Dr Tengwen LONG (Tengwen.Long@nottingham.edu.cn) and Prof Junhu DAI (daijh@igsnrr.ac.cn).

