

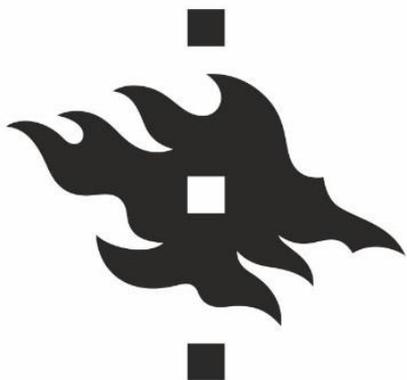


# DENVI 2016

ABSTRACT BOOK

1ST ANNUAL  
DENVI MEETING

Doctoral programme  
in interdisciplinary  
environmental  
sciences



HELSINGIN YLIOPISTO  
HELSINGFORS UNIVERSITET  
UNIVERSITY OF HELSINKI



Doctoral programme in interdisciplinary  
environmental sciences



**DENVI**

**1ST ANNUAL  
DENVI MEETING 2016**

**DENVI – DOCTORAL PROGRAMME IN INTERDISCIPLINARY  
ENVIRONMENTAL SCIENCES**

**1<sup>ST</sup> ANNUAL DENVI MEETING 2016**

**ABSTRACT BOOK**

Layout: Aija Kukkala

Background pictures: Aija Kukkala and Atte Moilanen

University of Helsinki, 2016



Doctoral programme in interdisciplinary  
environmental sciences

## 1ST ANNUAL DENVI MEETING 2016

### **1<sup>ST</sup> ANNUAL DENVI MEETING**

**10-11 March 2016, auditorium PIV (Suomen laki -sali), Porthania, Yliopistonkatu 3**

The first annual DENVI meeting gathers together all DENVI students and supervisors and gives students the opportunity to present their work, get feedback for the talk and meet internationally renowned keynote speakers in DENVI's fields of science. The meeting is multidisciplinary so all DENVI students regardless of their field are encouraged to participate and present their work.

#### **KEYNOTE SPEAKERS**

Dr. Emery Roe, Resilient and Sustainable Infrastructure Networks, UC Berkeley

Dr. Tiina Häyhä, Stockholm Resilience Centre, Stockholm University

#### **ABOUT DENVI**

DENVI doctoral programme in interdisciplinary environmental sciences started in January 2014 and is coordinated by the Helsinki University Centre for Environment, HENVI. DENVI belongs to the Doctoral School in Environmental, Food and Biological Sciences (YEB) and is funded by the University of Helsinki. There are approximately 100 PhD students in DENVI.

The central themes of DENVI are environmental change and sustainable development as well as climate change, land use, and the Baltic Sea and its catchment area. The program gathers together the essential fields of natural and social sciences, law and humanities that are needed to study the complexity of environmental change and pathways to sustainable development. DENVI aims to study environmental change from biological processes to environmental governance – seeking solutions for a more sustainable future. DENVI considers environment broadly from natural habitats to built environments.

## **ABSTRACTS – KEYNOTE SPEAKERS**

### **DR. EMERY ROE**

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Resilient and Sustainable Infrastructure Networks, University of California Berkeley, USA

#### **Reliability & Risk in Ecosystems and Critical infrastructures: High Reliability Management Lessons for Managing Ecosystem Services & Risks under Conditions of Unpredictability**

A conventional wisdom in environmental policymaking and management is that (1) an enemy of ecosystems is the "large critical infrastructure" (think dams and large water supplies or natural gas and hazardous liquids systems), whereas (2) a friend of ecosystems is "managing adaptively" according to best available science. This presentation suggests that the opposite is more often the case than the environmental policymakers and communities suppose. I present material illustrating under what conditions this is the case and why the literature on high reliability management of critical infrastructures provides a viable alternative for improving ecosystem services along with their functions and processes.

### **DR. TIINA HÄYHÄ**

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Stockholm Resilience Centre, Stockholm University

#### **Bridging the scales: from planetary boundaries to national fair shares of the safe operating space**

The planetary boundaries framework proposes quantitative global limits to anthropogenic perturbation of crucial Earth system processes, and thus marks out a global safe operating space for human activities. However, decisions regarding resource use and emissions are mostly made at much smaller scales, for instance at national level. To operationalize the planetary boundaries, they need to be translated into targets that are relevant at these smaller scales. In this talk, I present a conceptual framework that addresses three dimensions of bridging across the scales: biophysical, socio-economic, and ethical. These three dimensions should be taken into consideration when translating global sustainability criteria to national level context-specific and fair shares of the global safe operating space.

## DENVI STUDENTS' ABSTRACTS IN THE ORDER OF THE PROGRAMME

THURSDAY 10<sup>th</sup> MARCH

### Aino Assmuth

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Faculty of Agriculture and Forestry  
Department of Forest Sciences  
Environmental and Resource Economics

#### **Optimal carbon storage in generalized size-structured forestry**

We study economically optimal carbon storage in size-structured forest stands using a generalized model that allows the choice between clearcuts and continuous cover forestry to be made endogenously. The ecological model applied in the study is a transition matrix model with empirically estimated Scandinavian growth data for Norway spruce. The detailed economic setup includes empirically estimated variable harvesting cost functions, and fixed harvesting costs that necessitate the optimization of thinning intervals. In addition to carbon storage in the stand, we consider carbon both stored in and released from sawlog and pulpwood products. We show that carbon pricing postpones thinnings and increases stand density by targeting harvests to larger trees. Carbon pricing increases rotation age and may imply a regime shift from clearcuts to continuous cover forestry. At continuous cover steady states, the average size of the harvested trees increases with carbon price. Valuing carbon storage is shown to increase the sawlog ratio of timber yields. We show that considerable carbon storage is maintained not only in the stand but also in timber products.

### Karna Dahal

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Department of Environmental Sciences  
Environmental Change and Policy

#### **Visions and initiatives to carbon neutrality in Helsinki Metropolitan area**

Carbon neutrality is one of the pursued climate strategies of many cities. The cities around arctic region including cities in Helsinki Metropolitan area are also responsible for climate change mitigation in this area. My study includes scenarios of the energy associated carbon neutral actions in the Helsinki area reflecting past and present situations of carbon emissions and possibilities for future actions to carbon neutrality. About 96 % emissions produced in the Helsinki Metropolitan area are energy based. Different sectorial energy consumption and carbon emissions from these sectors in the Metropolitan area were analysed. District heating is the major source of emissions following transportation and electricity consumption in the second and third respectively. Helsinki Metropolitan area does not have proper carbon neutrality goals and other cities except the city of Helsinki have such ambitious goals. The city of Helsinki has been working progressively towards its climate roadmap to be a carbon neutral by 2050 but it also needs rapid actions to meet the goals. However, entire metropolitan area needs to do a lot more than Helsinki if it wants to be carbon neutral by 2050. Technological advancement for clean and renewable energy, smart policies and awareness for behavioural changes are the factors that affect greatly to improvements of carbon reductions. Strong political commitments are also required to formulate and implement stringent climate actions.

**Farid Karimi**

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Social Sciences  
Social Research  
Social and Public Policy

**The Role of Socio-cultural factors in Risk  
Perceptions Concerning Carbon Capture and  
Storage**

There is a consensus that the current trend of energy consumption growth and CO<sub>2</sub> emissions cannot continue in the future if global warming is to be prevented. Recently, Carbon Capture and Storage (CCS) has become the centre of attention in many countries. However, there is considerable opposition to and adopting different perception of the technology among experts, politicians and laypeople. Therefore, it is important to understand the diverse adoption and its roots. I develop a way toward such an understanding. I show that both laypeople and expert perceptions are influenced by national culture in a systematic manner and this cultural orientation affects the other factors such as trust. Also, I show that although current research and literature consider experts as unbiased and rational stakeholders, both laypeople and experts have similar underlying cultural features and thus surprisingly their models of thinking follows a similar trend in a society. This research contributes to the risk governance of CCS by developing a new framework that can be used as a tool by policy makers and authorities to consider the unheeded issue of culture in their planning. In other words, I demonstrate who concern what and why with respect to the technology.

**Mohammad Mozumder**

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Faculty of Biological and Environmental Sciences  
Department of Environmental Sciences  
Aquatic Science

**Enhancing resilience of Hilsa fishery through co-  
management in the context of climate change –  
A case study of Bangladesh**

Climate changes have distressing impacts on fishery-based livelihoods and the fisheries species. Fisheries are critical for poverty alleviation, food security, and employment in Bangladesh. Hilsa (*Tenualosa ilisha*) is the national fish of Bangladesh, has economic and cultural significance. The Hilsa fishery is an important source of livelihood and seafood in Bangladesh and the whole Southern Asia, but the stocks are seriously depleted due to diverse stressors including climate change. This decline ultimately threatens the livelihoods of the people dependent upon the Hilsa fishery. The present study is viewing the Hilsa fishery as a social-ecological system and examining the potential of an ecosystem-based management approach to enhancing the resiliency and sustainable use of the fishery. The project utilizes participatory research methods that enable fishers to work alongside researchers to identify problems and use their skills and local resources to find solutions.

**Paula Kajankari**

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Department of Environmental Sciences  
Environmental Ecology

**Cypermethrin - analytics and ecotoxicology**

Cypermethrin is a pesticide that belongs to pyrethroids. European Parliament has Cypermethrin in the Water Framework Directive's priority substance list. Finland has allowed its use as pesticide but there are strict safety instructions how to handle it to prevent it spreading to water bodies. Cypermethrin is hydrophobic compound ( $\log K_{ow}$  6,41) and the highest allowable concentration of it in water according to Water Framework Directive is 0,6 ng/L. Both trades makes the analytics of Cypermethrin hard from water samples. The alternative for active water sampling is to use passive samplers. Passive sampler is a device that is placed in water for a longer time (weeks) and it collects passively chemicals from the water. Different chemicals have different rates to accumulate in passive samplers. The rate depends also on the type of the passive sampler. To calculate the concentrations of chemical in water from passive sampler results, the uptake rate needs to be calculated by calibrating the passive samplers. Cypermethrin is a neurotoxin which affects the axons. Birds and mammals have mechanisms to remove Cypermethrin from the body and are not sensitive to it. The insects and water organisms lack these methods and are very sensitive to Cypermethrin. Water flea (*Daphnia magna*) is commonly used in ecotoxicological studies. They are easy to grow at laboratory and are also a native species to Finnish lakes. The aim is to find a concentration where half of the water fleas stop moving.

**Sajan Raju**

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Department of Biosciences  
General microbiology

**Insights into the microbial functional diversity in hydrocarbon polluted soils**

Anthropogenic activities such as oil extraction, refinement and transportation cause the contamination of environment with petroleum hydrocarbons. Oil pollution disturbs the ecological balance, threatens ecosystem services, creates environmental stress and poses a risk to human health. Phytoremediation, a process where microorganisms in association with the plant degrade soil contaminants, has been applied as a sustainable option for the removal of organic pollutants. With the advent of next-generation sequencing (NGS) techniques marker genes of microorganisms can easily be sequenced in huge amount. The bioinformatics tools for their analysis are not yet fully developed and handling the catabolic enzyme sequence data produced in NGS is quite demanding. Phytoremediation (using aspen) of petroleum contaminated soil from an oil tanker car accident was started at the Haapastensyrjä research station of METLA (2009). The sequencing of aspen rhizosphere oil polluted soil was carried out for the *alkB* and *edo* genes using the 454 GS FLX Titanium protocols which yields read lengths of ~400bp. A new pipeline was developed using the Perl and open source softwares to analyse the functional genes. As functional genes have diverse sequence composition due to codon usage, it is essential to study both supervised and unsupervised based sequence annotation. This developed pipeline will give better insight into microbial functional diversity of key genes involved in important ecological processes.

**Mari Joensuu**

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Department of Environmental Sciences  
Aquatic sciences

**ROLE OF MACROFAUNA ON SEDIMENT  
STABILITY AND NUTRIENT DYNAMICS IN  
COASTAL ENVIRONMENTS**

Sediment resuspension due to waves and currents are common in shallow coastal environments, but remain poorly quantified. Resuspension occurs when critical shear stress is exceeded at the seafloor and sediment particles are resuspended into the near-bottom water. Concurrently nutrients are released from pore-water to the water column and become available to primary producers. Biogeochemical and biological features of the sediment play a key role in modifying sediment erodibility. Benthic macrofauna modify the sedimentary environment, for example, through feeding and bioturbation. The effect of macrofauna on sediment stability might differ, depending on the animal size, species or population density. Microbially produced extracellular polymeric substances and biogenic structure such as macrophyte roots and rhizomes may also play a significant role in sediment stability. We measured critical bed shear stresses across 18 locations in the Hanko archipelago encompassing sediment types from mud to sand to determine the main physical and biological factors influencing sediment stability. Critical bed shear stress was determined using a core-based erosion device (EROMES). After erosion measurements macrofauna and the roots and rhizomes of macrophytes were quantified and analysed together with sediment characteristics. The results of the study highlight the importance of accounting for habitat-specific resuspension in coastal environments.

**Jukka-Pekka Myllykangas**

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Department of Environmental Sciences  
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**Effects of a saltwater inflow on CH<sub>4</sub> and N<sub>2</sub>O  
dynamics in the water column of the Baltic Sea**

Methane (CH<sub>4</sub>) and nitrous oxide (N<sub>2</sub>O) are extremely potent greenhouse gases which occur in aquatic systems tightly coupled to ambient oxygen concentrations that regulate microbial processes. Under typical conditions the water in the Baltic Sea is anoxic below 100 meters depth and contains high amounts of CH<sub>4</sub>, whereas the oxygenated surface waters contain more N<sub>2</sub>O. In late December 2014 a large, oxygen rich salt water inflow entered the Baltic Sea from the North Sea, causing considerable changes in the oxygen conditions throughout the Southern and central Baltic Sea. In this study we investigated the effects of this inflow on the CH<sub>4</sub> and N<sub>2</sub>O concentrations of the Baltic, by collecting gas samples, and measuring the oxygen, salinity and temperature profiles of the water column in the Gotland basin during six cruises in 2015. Over the course of the year, the inflow progressed northwards through the eastern Gotland Basin, causing distinct changes in the vertical profiles of oxygen, salinity, CH<sub>4</sub> and N<sub>2</sub>O. Initially the introduction of oxygen to the bottom caused the formation of an anoxic midwater layer rich in CH<sub>4</sub>, but that was later consumed as well. By the end of the year, CH<sub>4</sub> started accumulating in the bottom water again and extremely high N<sub>2</sub>O concentrations were measured. The surface concentrations for both gases remained relatively low, making it unlikely that the inflow caused increased flux of gases to the atmosphere, but delayed effects are possible.

**Sari Uusheimo**

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Environmental Sciences  
Environmental Ecology

**In situ diurnal denitrification activity of stream  
sediments measured by  $^{15}\text{N}$  technique**

Denitrification is a process where nitrate-nitrogen ( $\text{NO}_3\text{-N}$ ) is reduced to nitrogen gas ( $\text{N}_2$ ) and it is regarded as the most important pathway removing nitrogen permanently from inland waters. Previous studies have shown, that diurnal light:dark cycle affects sediment oxygen ( $\text{O}_2$ ) conditions. Only few studies have been performed, however, to show how diurnal variation in oxygen concentration and illumination affects denitrification in stream sediments. In August 2014 and 2015, we investigated diurnal denitrification rates of a second-order boreal stream. We used  $^{15}\text{N}$  isotope-pairing technique and in situ incubations for the measurements. In addition to the denitrification measurements,  $\text{O}_2$  profiles of the upper sediments were measured by a microelectrode. The results showed, that denitrification rates more than doubled during the night in comparison to the day. The lowest denitrification rates were measured right after noon, at time of high illumination. A negative correlation was found between denitrification rate and  $\text{O}_2$  penetration depth and between denitrification rate and oxygen concentration in sediment-water interface. In sediments colonized by primary producers, photosynthetically active radiation is controlling photosynthesis, which through water and sediment  $\text{O}_2$  conditions may, in turn, affect denitrification activity of the sediment. Therefore, sediment denitrification rates measured only during daytime may be underestimations in shallow waters with benthic algae.

**FRIDAY 11th MARCH**

**Anna Salomaa**

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Environmental change and policy

**Ecological knowledge in science-policy interface  
– a case of mire conservation policy conflict**

In science-policy interface of biodiversity conservation not only ecological knowledge, but also power and values are essential. In Finland this has been especially visible in mire conservation. We will study how knowledge about biodiversity, climate change and ecosystem services have been included in decision-making. Benefiting content analysis, we will analyse following policy documents: Peatland strategy, Government resolution, Environment protection act and Proposal of mire conservation group. In a previous study, we performed a qualitative analysis on how ecosystem services and voluntariness concepts were used in the Government resolution, an expert group discussion on mire conservation, and a public discussion via web service. The web-discussion was more contradictory than other discussions. Peat, timber and recreation were the most frequently discussed ecosystem services. Discussion of more abstract regulating and supporting services played a minor role. Interestingly, ecosystem services were used as a basis for defending strict conservation rules against the introduction of voluntariness. Our preliminary results show that values and power had a remarkable effect on science-policy interface, especially spatial allocation of mire conservation and used policy instruments. During the mire conservation policy development process, expert power has changed to political power, with highly relevant implications to conservation policy and practice.

**Susanne Suvanto**

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Faculty of Science  
Geosciences and Geography  
Geography

**Forest damage risk in severe wind storms: what are the roles of forest management, environmental factors and storm type?**

Wind storms are a major natural disturbance causing forest damage in Europe, and changes in climate are expected to further increase the amount of damage. The aim of this study was to identify the effects of different factors on forest storm damage risk in Finland, focusing especially on the effects of forest management. In addition, we compared two different types of storm events (autumn storms and thunder storms) to find out whether the risk factors are similar for storms with different meteorological characteristics. We used two data sets that were collected after autumn storms in 2001 and after thunder storms in summer 2010. The damage caused by these storms was documented on the plots of the Finnish National Forest Inventory. We used generalized linear mixed models to study the risk of storm damage in different types of forest stands. Explanatory variables in the models described the stand characteristics, recent forest management operations and abiotic environment. The models were able to recognize important risk factors and discriminate between the damaged and non-damaged plots (AUC=0.72). The storm damage risk was driven by similar factors in the two different types of storms. The autumn storm model performed relatively well also for predicting the storm damage in the thunder storm data set (AUC=0.69). The potential utilization of the models was demonstrated by calculating storm damage risks for stand simulations and creating a risk map for South Finland.

**Jon McEwan**

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Department of Geosciences and Geography  
Economic Geography

**The Future of Polar-Class Ships to 2035 - a Foresight Assessment by using Policy Delphi**

The Policy Delphi study is employed to investigate the future of polar-class ships in a foresight assessment to 2035. The utilised method engages experts in an international study, using multi-disciplinary approaches to Arctic marine technology and inter-related themes. What are implications of Finland's shipping sector? The technological advancements are more sustainable and environmental to the topic field. Round 1 consists of conducting pilot interviews from experts possessing an in-depth knowledge, including broader themes on the Arctic, Antarctic and the main topic. The snowball method and nominations are used to create each panel. Feedback is provided in the form of executive summaries between rounds to ensure panellist motivation. The method allows for dissent, rather than force a consensus, which is useful in exploiting differences by interest-groups. Rounds 2 and 3 utilise an online real-time Policy Delphi allowing for in-depth queries that are iterative relating to innovations that are environmental and sustainable for Arctic and Baltic use. Round 3 is to highlight differences using argument Delphi. Interpretation of results is accomplished by using content analysis and coding systematically. The Polar Code adoption by the International Maritime Organisation will require compliance of all polar ships entering these waters by 1 January 2017. To sum, the improvements are considerably more sustainable and environmental enhancing Finland's marine cluster.

**Suvi Ignatius**

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Biological and Environmental Sciences  
Environmental Sciences  
Aquatic Sciences

**Addressing socio-cultural values in the use and management of Baltic herring**

The sustainable use of fisheries is pressurised by an increasing protein demand to feed the world's growing population. Despite the recommendation of the Food and Agriculture Organization of the United Nations (FAO) to use fish resources to human food, particularly small pelagic fish species are often used for industrial purposes. This concerns Baltic herring, one of the most important commercial catches of the Baltic Sea. Its human consumption has decreased to a low level, and most of the catches are used for fur animal feed and processed into fish meal and oil. Focusing on the Baltic herring case, we examine how socio-cultural values affect the use and management of fish resources. By applying the justification theory of Boltanski and Thévenot and the sociology of regimes of engagement of Thévenot we examine how the value of herring is perceived in the food choices of consumers as well as in the accounts of fisheries stakeholders pursuing political objectives. Furthermore, we analyse what values eventually determine policy performance and what do not materialise in decision making. The research material includes an extensive literature review, as well as stakeholder interviews and a consumer questionnaire conducted in Sweden, Finland, Denmark and Estonia, allowing for cross-cultural comparisons. Our objective is to discuss the potential of a value-informed approach in natural resource management, to enhance the legitimacy and overall acceptability of decisions.

**Anita Heim**

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Faculty of Agriculture and Forestry  
Department of Agricultural Sciences  
Agroecology

**Drivers of food and nutrition security in an African Indigenous group- Research Design**

The concept of nutrition security reaches beyond the traditional notion of food security and emphasizes the importance of environmental, economic, social and cultural variables affecting nutritional status. In my PhD project I aim to unfold drivers of food and nutrition insecurity among a historically hunter-gatherer Namibian indigenous community. The Khwe San people live inside a National Park with several restrictions on the usage of natural resources. In addition to these environmental restrictions, also social, economic and cultural factors may have drastically shaped the food plate of the severely malnourished community. Understanding the present perceptions, preferences and practices related to food, nutrition and land use will affect the success, ownership and therefore sustainability of community based future solution models. In the first field work season I concentrate on: (1) What constitutes the present diet of the Khwe San, and what are the sources of their food? (2) What are the drivers of their food choices? These research questions will be addressed by using key informant interviews, simplified dietary assessment surveys, KAP surveys and focus group discussions. The results of the first data collection will assist in addressing my third research question: "Which food system models embedded in the local landscape and culture would contribute to improved food and nutrition security?", which will be studied using participatory methods in the next field season.

**Johanna Hohenthal**

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Department of Geosciences and Geography  
Geography

**Mapping meaning: towards participatory  
approach in water resource management in  
Taita Hills, Kenya**

Planning and implementation of water resource management require participation of local water users. This is often neglected by management authorities who focus on large spatial scales, lack tools to facilitate community participation and fail to understand the social aspects and historical construction of water-related problems. This study analyses the potential to enhance local agency in water resource management through a

participatory mapping process consisting of various qualitative methods. The process is relevant not only for providing spatial data or locating problems, but it is also about history, culture, knowledge and all that constitutes the meaning of spatial attributes and a sense of place. The case study focuses on the Taita Hills, South-East Kenya, where people have experienced environmental deterioration and decrease in available water resources for decades. The study confirms participatory mapping as a knowledge coproduction process that can reveal multiple water-related problems and their historical social and political drivers. The process provides also a deliberative space for the participants and has a potential to facilitate sharing of responsibilities and even trigger 'light' forms of activism that can possibly expand the political agency of the community members beyond the institutional governance structure.

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**SPECIAL GUEST TALK****Victor Maus**

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Institute of Geoinformatics

**Big Earth observation data analytics for land use and land cover change in the Brazilian Amazon**

Earth Observation satellites are the only source that provides a continuous and consistent set of information for land use monitoring. These satellites produce massive amounts of data but only a fraction of that data is effectively used for scientific research and operational applications. This presentation focuses on sharing experience on Big Earth Observation Data analytics for land use and land cover change in the Brazilian Amazon. Using the available satellite datasets and developing a new method for satellite image time series analysis, we have improved land use and land cover information in Brazil. These results can help better understand and monitor land use changes in Brazil.

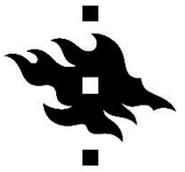
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