THE BELGIAN GEOGRAPHERS DAYS

EDITION 2019 - HOSTED BY GHENT UNIVERSITY

October 18th - 19th

Researchers Day October 18th

BOOK OF ABSTRACTS

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Preface

The Belgian Geographers days 2019 is the latest edition of the series of scientific events that have been bringing together young geographers in Belgium. This years edition is organized by the Department of Geography of Ghent University. The overall theme of this year's conference is "Geography for the Future - The Future of Geography?".
Poverty, famines, political conflicts and cultural contrasts, (in)equality, the quest for clean energy, the limits to economic growth, climate change, untenable mobility systems and air quality, indigenous struggles, responsible resource management,... These are only a few of the crucial and often interconnected issues today, which all bear a strong geographical component. Therefore, the challenges and opportunities are numerous for the discipline of Geography and will also shape the manner in which the field will develop in the future.
In order to consolidate this broad spectrum of critical issues during the Belgian Geographers Days, we chose the Sustainable Development Goals, formulated in 2016 by the United Nations, as framework to structure the presentations at the conference. The SDGs provide a global blueprint for a future-proof society, planet, prosperity, peace and partnerships.

The current volume collects 47 abstracts presented as an oral presentation and 21 abstracts presented as a poster presentation.

Organizing an event as BGD2019 and making it a success is only possible with the help and commitment of many people. Therefore, we would like to thank the people that participated in the organization and all the presenters to present their work at the conference and wanted to be part of the event.

Ghent
October 2019
The organization committee

Abstracts (oral presentations)

Abstracts (poster presentations)

Real time positioning of trucks: new insights in transport geography?

The case of Belgium.

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Keywords: Transport, spatial analyses, Big-Data, GPS

Abstract: Due to the high connectivity of people and places, new gigantic unconventional datasets are now stored and sometimes made available for research. Paired with new algorithms, these data can – among others – potentially renew regional sciences and more particularly the delineation of interaction fields within a territory/country. We here concentrate on a domain for which data have always been lacking: freight transport movements. Thanks to the road taxation system developed in Belgium since 2016, each truck (over 3.5 tons) circulating in the country has to be equipped by an onboard GPS tracker which collects the position every 30 seconds (as well as some additional general characteristics such as nationality or weight of truck). We here divert these tax data for scientific purposes with the objective of analyzing the traces left by these mandatory onboard GPS and see how far they increase the transport geography knowledge.

The paper discusses the many difficulties encountered in getting, cleaning and preprocessing the data and shows a first set of results about the traces left by the trucks and their interrelationships. One of the major problems is to transform the 270 Mio of GPS points into an O-D matrix; the definition of the stop is here capital and no unique solution emerges. A community detection algorithm (the Louvain Method) is further applied in order to detect communities of places that are highly connected in terms of truck/freight movements. Depending on the type of truck (size, international, etc.) different interaction fields are delineated illustrating the diversity/complexity in vehicle movements and their links with economical, urban, infrastructure, logistic and environmental Belgian realities. This contribution illustrates the usefulness but also the limits of this Big-dataset to model the flows between places and its further (risky) introduction in transportation models.

The political uses of flood hazard maps: lessons from residents of the Caño Martín Peña Community Land Trust in Puerto Rico

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Keywords: community land trust; informal settlements; flooding; recovery; participation.

Abstract: Founded in 2004 by the residents of seven informally established neighbourhoods located along the Martín Peña channel, a highly polluted and flood prone channel in San Juan, Puerto Rico, the *Fideicomiso de la Tierra del Caño Martín Peña* (the Caño Martín Peña Community Land Trust or Caño CLT) is the first community land trust in Latin America and the Caribbean, and one of the only two CLTs in informal settlements worldwide. It has become an international reference for other informal and low-income communities across the world, as an instrument to regularise land tenure and protect communities against displacements driven by gentrification, economic decline, neoliberal austerity, and climate change-induced natural risks.

My research explores the Caño CLT from a political ecological perspective, as I aim to identify how the interests, policies and discourse of political and economic elites function to perpetuate the vulnerability of residents in unplanned settlements, particularly in the aftermath of natural disasters, and how the Caño CLT is an effective instrument to counter this process. The Land Trust is a critical piece of the wider comprehensive development ENLACE Caño Martín Peña Project, whose benefits include reducing the risk of flooding and restoring the environmental qualities of the mangrove channel. The CLT facilitates equitable recovery with real participation from residents, through on-site housing rehabilitation and ongoing participatory planning-action-reflection processes, while taking land out of a hostile market and protecting it in a resident-governed Trust.

This presentation examines the significance of the Caño Martín Peña experience in the aftermath of Hurricane Maria that struck the Caribbean region in September 2017 and the ways in which solidarity networks have strengthened the communities' response to the disaster. Considering the political uses of flood risk maps by the Puerto Rican government to not assign recovery funds to flood zones and push through displacements of vulnerable communities, even where on-site risk mitigation is possible, I will address the need for a stronger integration of human and physical geographical sciences when assessing risks. For this I draw on the ways in which the Caño communities have made their voices heard against displacement politics.

Expansion of small-scale irrigation along a dam-regulated river

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Keywords: river regulation, northern Ethiopia, farmer-led irrigation, land tenure, mixed methods, Random Forest, Weighted Factorial Scoring

Abstract: Consistent baseline data of farmer-led small-scale irrigation systems is largely missing in Africa south of the Sahara, although these systems are dominating the irrigation sector in many countries. In this study, we investigated the small-scale irrigation expansion along the Tekeze River after dam regulation and estimated the potential area for irrigation expansion. A mixed-methods approach was adopted. First, semi-structured field interviews (n = 118) were conducted in order to fully understand the current irrigation system regarding its biophysical, socioeconomic and technical context. Second, the irrigated areas were mapped for the pre-dam and post-dam period, and were compared to the potential area for small-scale motorized pump irrigation. This area was calculated using a Random Forest modelling approach with six predictor variables, at a spatial resolution of 1 ha. Third, the likeliness of irrigation expansion within this potential area was estimated using a Weighted Factorial Scoring analysis of fourteen physical and socioeconomic variables, resulting from the field interviews. A quadrupling of the irrigated area was observed between 2009 and 2019 (from 433 ha to 1698 ha), mainly due to dam-induced stabilized baseflows and reduced peak flows. The potential area was estimated at 5743 ha (Out-Of-Bag error rate = 0.05 and Kappa coefficient = 0.90), leaving 4045 ha of unexplored potential. For 3449 ha of this area the expansion was considered (very) likely. Although this area is relatively small when compared to large-scale irrigation projects in the catchment, it can strongly improve the farmers' livelihoods. Many identified hampering factors can be overcome relatively easily through area-specific interventions. Equality among farmers hereby should be safeguarded and good natural resources management should be promoted. Monitoring and evaluating the small-scale irrigation systems along the river is recommended, as is the case for many farmer-led irrigation systems worldwide.

A question of Place! Exploring consumption of green products:

Algerian citizens case study

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Keywords: green orientation; consumption behavior; space living; Algerian consumers; geomarketing.

Abstract: In recent decades, green consumption has become an important trend among people in developed countries. This phenomenon is beginning to spread worldwide, particularly to developing countries. Due to the development gap between developed and developing countries, consumption behavior in these countries remains quite divergent. Another unexplored divergence is the difference in consumption between populations of the same country, according to the living neighborhood and its geographical characteristics. This doctoral research scrutinizes the differences in green consumption between populations in the same emerging country, Algeria, and questions the effect of living place/location (Question of Place) (Johnston, 1991) on consumers' green orientations.

First, the research explores the main ideas relating to green consumption among young Algerian students through focus-groups. The aims is to set up a measurement scale for the new concept of green orientation : an innovative variable of consumer behavior towards green products that expresses a mental inclination including cultural, environmental, social and economic factors, and, supporting consumers in specifying their consumerist beliefs to regulate their consumption behavior (Ayoun et al., 2017). Secondly, an e-survey constructed on the determinants will question a diverse population. The research highlights a new driving variable including a spatial component. The aim of the survey are to assess the new variable in a green consumption behavior model in order to examine its position among the Algerian population; in particular, to analyze the effect of the space living (urbanity, rurality, accessibility, ethnic diversity, economic level of the area) on the green behavior of Algerian consumers with regard to green products.

Characterization of gullies and landslides in Abaya-Chamo Lake Catchments, Southern Ethiopia

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KEYWORDS: Gully erosion; Landslide; Gully density; Sub-catchments.

ABSTRACT: Gully erosion is a process whereby runoff water concentrates over short periods and removes the soil, sometimes to considerable depths (Poesen et al., 2003). Landslides include a range of processes by which slope material is displaced under the force of gravity (Hungr et al., 2014). Gullies and landslides play an essential role in landscape evolution and can be responsible for production of large amount of sediments. Gully and landslide inventory maps are useful to investigate the distribution and types of these sediment sources, and the landscape characteristics associated with these processes in a catchment. Such inventories can thereafter serve as a preliminary step toward gully and landslide susceptibility modelling and estimation of long-term sediment production. Here we focus on 4 moderate size catchments draining to Lake Abaya and Lake Chamo in the southern part of the Ethiopian rift system. Despite the rapid sedimentation of the lakes, the spatial distribution and contribution of landslides and gullies to the sediment budgets of these rift border catchments are poorly known. Therefore, the main aim of this research is to characterize the types and distribution of gullies and landslides in Sile, Elgo, Basso & Shafe catchments, which covers a total area of 1061 km^2. For production of inventory maps, Google Earth imagery, Pléiades images, aerial photographs of 1965/66 and 1975 and field surveys were used. Field validation was conducted in one third of the 77 sub-catchments identified within the study area. More than 7350 gullies and 340 landslides were mapped (and 604 and 110 validated in the field respectively). More than 95% of gullies and landslides validated in the field are correctly mapped using Google Earth images. Of the total gullies mapped, 55% are active. Among the latter, 34% are directly connected to the rivers. According to the classification of Solomon (2009), 46.1% of the sub-catchments are characterized by severe to extremely high gully density, 50.8% are between moderate and moderate to severe, with only 3.2% of the total catchment area being little affected by gully erosion. The landslides are much less frequent than the gullies. The large ones developed on the catchments, can affect an entire hillslope: they appear old, therefore not affecting directly current sediment budget, and are of natural origin. They could however favour the occurrence of gullies (further step of the research). And the largest one cover an area of 12.2 km^2. The recent landslides usually are of limited size and are concentrated along the rivers. Note that some large gullies, once initiated, clearly evolve through landsliding. Our detailed inventory and characterization of these processes in Abaya-Chamo lake catchments is a first step towards understanding the natural and anthropic factors favouring their occurrence, and a first contribution to the long-term objective of favouring sustainable land management practices preserving soils and reducing sediment delivery to Lake Abaya and Chamo.

Shedding light on the Dark Ages: Changes in Belgian river valleys during the first millennium AD

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Keywords: rivers, floodplain, human impact, Dark Ages, Migration Period.

Abstract: Variation in human impact has greatly impacted the processes and intensities of erosion, sediment transport and storage throughout the Late Holocene, and many lowland rivers around the world have responded to these variations. Although this long-term process-response relationship has been established before, the effects of short-term (< 200 y) changes in human impact on lowland rivers are less well studied. To do so, a holistic and integrated approach is needed, and observations on floodplain changes need to be evaluated against detailed data on human impact. In this study, such detailed data were collected for three lowland rivers in the Central Belgian Loess belt: Dijle, Gete and Mombeek River. Pollen data were used to reconstruct changes in local and regional vegetation and to calculate human impact scores. Corings along transects and a database of ca. 100 radiocarbon ages were used to reconstruct geomorphic changes in the river valleys. Our results clearly show that increasing human impact from the Bronze Age onwards caused an increase in overland flow and soil erosion. As a result, changes in floodplain geo-ecology were triggered and changed towards an open floodplain dominated by clastic overbank deposits. However, a clear decrease in human impact can be observed between 200 and 400 AD, which can be related to the decreased population density in Europe during the Dark Ages and the Migration Period. During this period, forests in the studied catchments regenerated, soil erosion decreased, hillslope–floodplain connectivity decreased due to the regeneration of valley-side vegetation barriers, and sediment input in the floodplain decreased. A reaction on this decreased human impact can be observed in the river valleys, with a regrowth of the alder carr forest and an increase in the organic matter content of the alluvial deposits with locally reactivation of peat growth. The results of our study show the trajectories of Belgian river valleys during the first millennium AD and provide more insights in the vulnerability of these river valleys to short term variations in human impact. These results can in turn be used to better estimate the effects of future catchment changes on the fluvial system.

Modelling the impact of urban climate on vector borne malaria in Sub-Saharan Africa using COSMO-CLM – The example of Kampala, Uganda.

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Keywords: Urban climate modelling, Urban malaria, Sub-Saharan Africa, Data scarcity, Remote sensing

Abstract: Malaria is mostly considered to be a rural disease. However, some studies documented its presence in urban areas (Robert et al. 2003, Hay et al. 2005, Castro et al. 2009, Machault et al. 2010) and Sub-Saharan Africa has been experiencing unprecedented rates of urban growth in the last decades (Seto et al. 2012). It is therefore necessary to better understand the impact of rapidly growing African cities on the local urban climate and thereby on climate-dependent diseases. In this work, we quantify the impact of urban climate on the presence of the malaria mosquito in the city of Kampala using the framework proposed by Brousse et al. (2019), which has proven to adequately address local data scarcity and allow for modelling the urban climate in Sub-Saharan Africa.

To this end, Local Climate Zones' information (Stewart and Oke 2012), obtained following the WUDAPT framework (Ching et al. 2018), are fed them into the urban canopy model TERRA-URB (Wouters et al. 2016, Brousse et al. 2019) embedded in the COSMO-CLM model. The COSMO-CLM model is then run at a convection permitting scale of 2.8 km horizontal resolution, forced by ERA5 reanalysis data, before dynamically downscaling at 1 km over Kampala. Model outputs are evaluated against cloud-free land surface temperature, and precipitation measurements from satellite observations for the period 2010-2015.

Model outputs are used to calculate the dynamic temperature suitability index (TSI) proposed by Gething et al. (2011) to capture the temporal and seasonal evolution of the TSI. Brousse et al. (2019) already demonstrated using the static TSI – which doesn't account for the temporal variability – that the urbanization of Kampala could lead to a 30% increase of the TSI in the city. In fact, this measure calculates the vectorial capacity of an environment for the development of malaria-infected mosquitoes out of air temperature. Thereby, hotter urban areas could have higher vectorial capacities. Hence, we also compute the effect of relative humidity on the survival of mosquitoes following Yamana and Eltahir (2013) in order to see how the dryer city may also influence the TSI. Both results of the suitability modelling are compared temporally and spatially.

Perception of climate change by farmers in Cameroon highlands

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Keywords: Climate change, land use change, perception, highlands, Cameroon

Abstract: Africa is affected by global changes, demographical and economical but also by climate change. This situation is specifically affecting rural areas. This research is focused on Cameroon highland, a low documented area in comparison to other Africans regions like Sahel or East Africa. It aims to draw a comprehensive typology of farm households with regard to their climate change perceptions and strategies of adaptation.

West part of Cameroon is a mountainous area between 700 m and 1500 m high, where climate is characterized by lower temperatures and a transient rainfall regime, between a humid tropical monsoon climate in the south and a tropical humid mountain climate in the north. It is also affected by land use evolution and diversification since the 1980s due to demographic change and the integration of agriculture into the market economy, resulting in the colonization of available land, from summits to low-land along rivers. Most of households are involved in an agricultural activity, like gardening, coffee or cocoa production. Demographic and climate changes reshape the various natural hazards observed for decades: floods, landslides, weather hazards, land-use conflicts. The changes and risks that affect rural dynamics are very complex: changes in rainfall, natural hazards and social risks are closely linked together.

In order to understand the influence of climate or socio-economic changes in the adaptation process of rural populations, this research is based on the study of perceptions to environmental changes from farm households. We used a mixed-method approach including quantitative surveys (with 170 interviews) and qualitative interviews in three different villages, which present a social, economic and agricultural diversity (different ethnic groups, mountainous agroforestery, lowland gardening, livestock farming).

Key findings suggest that even if most households perceive a change in climate, especially an evolution of the rainy season pattern, this perception is not homogeneous, suggesting that perception and therefore adaptation strongly depend on socio-economic factors, as the main activity or the location of their fields between lowlands and slopes.

The historical evolution of flood risk management by rural communities in Uganda: a case of the Rwenzori (Uganda)

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Keywords: community-based risk management, indigenous knowledge

Abstract: Despite recognition that traditional indigenous capacities could guide effective Flood Risk Management (FRM) in developing communities, documenting and validating those capacities remain a challenge. Contributing to addressing this challenge, this study reconstructs flood risk and FRM of rural communities in Uganda over the last decades. The study focuses on two watersheds (Nyamughasana and Nyamwamba), located in the Rwenzori (western Uganda), where various traditional perceptions of floods and FRM practices are reported. Extensive field observations were supplemented by historical literature and local archive reviews. Dating to the 1890s, floods are noted to be influenced by prolonged rainfall, upstream landslide damming and wildfires burning upstream intercepting vegetation for both watersheds. Exposure to floods is noted to be historically influenced by the search for strategic points to support livelihood activities and drought episodes until the 1960s. From the 1960s various other factors are observed: the increased immigrations induced by social strife in the upstream and the drought in downstream zones (for Nyamughasana), and anthropogenic activities of mineral exploration (for Nyamwamba). Three observations are noted: for both watersheds, while in the downstream, floods seem to be cherished for depositing fertile silt, in the midstream floods are viewed as an enemy to be fought; along the Nyamwamba, FRM is based on specialised actors who do it on behalf of the community or influence the community to take action, first by the cultural hydro-meteorologists (until1960), then sophisticated scientific measures by Kilembe mines (until 1980s); along the Nyamughasana, communities-at-risk consort their own resources, through an indigenous approach called *o muhigho* (synonymous to community service) to tackle flood risk. Within the *o muhigho*, the capacity to learn from each flood episode (which is illustrated by the shifts away from degrading practices), could be attributed to the fact that indigenous practices along Nyamughasana watershed were less interrupted. Thus, these findings suggest that, if uninterrupted, indigenous people could question their indigenous knowledge foundations to evolve practices that enable to live with floods.

"Superdiversity in Brussels?" A typology of new immigrants in the Brussels-Capital Region

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Keywords: superdiversity; immigration; Brussels; typology

Abstract:
Migration studies have recently undergone a major renewal with the notion of "super-diversity", introduced by S. Vertovec, referring to the diversification since the early 1990s of migration routes, legal status, nationalities, human capital and demographic structures of migrants. According to this author, the analyses should move away from a focus on nationality and take into account the other characteristics of these foreigners to better understand the interactions between these variables. So, the paper examines how this "super-diversity" is materialized within the Brussels-Capital Region, through a geographical and demographic approach.
In concrete terms, the objective is to design a typology of new immigrants in Brussels based on their socio-demographic characteristics, to describe these different groups and analyze their geography. To do this, I used the individual data of Brussels-Capital Region inhabitants from the National Register. I considered as "new immigrants" foreign-born adult individuals who have settled on Belgian territory after 1979 (350 000 individuals on 2011). The typology was based on multivariate analysis : factor analysis using socio-demographic variables followed by hierarchical clustering.
The first results show the presence in Brussels of various groups of new immigrants, diverging on demographic profile and socio-economic status, confirming hypothesis of the superdiversity theory. For example, we can observe a large group of male foreign workers in construction with intermediate socio-economic status, but also a group of international, wealthy and qualified employees, young and childless. More generally, the results demonstrate the relevance of abandoning nationality or origin as a discriminating criterion for studying migration. However, it shows also the limitations of this approach due to the quality of the data available for the foreign population.

Identification of the multi-airport regions in China：An interaction network perspective between aviation and high-speed railway

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Keywords: Multi-airport regions; Interaction network; Cluster analysis; China.

Abstract: The agglomeration of airports into multi-airport regions has become one of the salient features of the global air-transport system over recent decades, leading to significant interest in regional multi-airport regions (MARs). MARs now play ever more crucial roles in the dynamic evolution of air transport. To date much work has focused on the definition and network properties of MARs within specific regions, yet relatively little of this work comprehensively integrates complimentary transport systems (such as high-speed rail) into the mix. In China, the use and importance of high-speed rail is growing quickly, and maintains both a competitive and cooperative role with the aviation network. The purpose of this paper is to identify the unique nature of MARs in China, accounting for the critical influence of the high-speed rail system. First, indicators involving spatial and temporal distance thresholds, the Herfindahl concentration, and network connectivity will be used to evaluate typical definitions of MARs in the Chinese context. Second, community detection will provide insight into the links between the two networks. Finally, hierarchical cluster analysis produces various combinations of component airports in Chinese MARs. The paper draws on proprietary data from RDC Aviation, the “China Transportation Yearbook”, and other sources. The conclusions provide a more comprehensive assessment of MARs in the unique Chinese context.

On the tragedy of air pollution:

Citizen Science as a commoning practice

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Keywords: air pollution; urban commons; Citizen Science; evidence-based activism; Brussels

Abstract: The politics of air pollution is characterised by two diverging phenomena. On one hand, air pollution is a domain where the overriding presence of technical expertise and scientific knowledge has contributed to distance policy-making from public debate and democratic deliberation. On the other, it is also a domain characterised by the proliferation of alternative forms of knowledge such online platforms and cheap user-friendly monitoring devices, which -inter alia- have opened up the way to post-truth approaches to politics and contestation and often to mistrust for traditional epistemic authorities. In this context, Citizen Science seems to be a promising approach to cope with technocracy's (presumed) lack of democracy, without falling in the populist traps of aprioristic disqualification of science and expertise. Our paper will explore precisely whether Citizen Science is suitable to help democratising the government of air: or, stated differently, whether and how letting lay people measure air pollution translates into more agency in the context of decision-making.
Theoretically we build on the urban commons framework, particularly helpful to illustrate how practices of collaboration between different social groups empowers those who participate and translates into increased citizenship. Empirically, this study is based on the AirCasting Brussels CS project, which and involved a scientific inquiry about air pollution in Brussels, awareness raising and activism campaigns, and a collective reflection on the methods, which is the focus of this study. In particular, our article discusses the narrated experience of the groups who participated in the project, through a content analysis of a series of individual interviews, focus group interviews, and workshops. Different academic and vulgarising publications have reported the analysis of the other socio-political and biophysical data that were collected through the project.
The research is in progress. Our preliminary analysis suggests that the AirCasting project contributed to develop participants' understanding of the complex and intricated aspects of urban air pollution thereby letting them 'appropriate' air pollution knowledge and enters as legitimate participants in the public debate about it. More so, by showing how air pollution was not only an issue for laboratory research but also part of everybody life, the CS approach helped revealing its inherent complexity and socio-political nature. CS, we found, does not only help democratising the way air pollution comes to be known, but also how it is dealt with, particularly, by backing and expanding the political demand for a cleaner environment. This is because -as a counterpart to their fundamental *right* to participate in democracy- Citizen Science allows strengthening communities' *capabilities* to do so in a meaningful manner.

Ecological and geographical considerations of environmental niche modelling

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Keywords: species distribution modelling, ecology, ecological complexity

Abstract: Understanding the causal processes determining a species' environmental niche and, thus, the species' spatial distribution is crucial for several applications in spatial epidemiology, invasive species mapping and nature conservation. In the past years, the availability of new spatial and temporal explicit data has increased. Such data have been used as predictors for Environmental Niche Models (ENMs), thus contributing to the increase in popularity of these methods. But, generally, only the abiotic component of the niche (e.g. temperature, precipitation, etc.) is used to infer the target species' niche, providing a great simplification of the complex niche system. Hence, ENMs' results remain often driven by a wide list of environmental predictors rather than the investigated species' known ecology. Therefore, model outputs are statistically rather than biologically relevant. Moreover, from a geographical perspective, model results are affected by known geographical issues and pitfalls, e.g. spatial autocorrelation and the modifiable areal unit problem. Here, we will review practices and pitfalls with specific attention to geographic issues. We aim at increasing the awareness of the need for a strong epistemological framework - which is ecologically-based - before moving into the modelling section. This would bring a deeper understanding of the system studied and not only a pleasant representation of it, which relies exclusively on regression-based results. We will also focus on the importance of considering the geographical aspect of these products, highlighting how geographical prior choices (e.g. scale, minimal geographical units' shape) could lead to one among the possible representations of the studied phenomenon.

What space for gender in Geographies of the future?

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Keywords: Belgian Geography, Gender, inequality.

Abstract: The latest figures and statistics on personnel in Belgian academic institutions show that academic positions are still more awarded to men than to women (Jonge Academie 2019). Despite Gender Action Plans, who are aiming to close the enduring gender gap, being in place in all universities, the Belgian academy is not even catching up on the historical unevenness. How can we understand this reality in a context of increasing awareness on gender inequalities? The amount of literature, both quantitative and qualitative, demonstrating the causes and consequences of gender bias in academia is huge. Drawing on my and my colleagues' personal experiences with the perpetuating gender bias in academia, more specifically within geography, this presentation will add to this literature by taking a specific angle. It is extremely difficult, maybe even impossible, to attribute an individual experience to gender bias. Gender bias can mostly only be deduced from its systematic character. By including in this paper only cases that triggered common experiences and/or were recognized as significant by other female colleagues, this paper tries to move beyond idiosyncratic experiences, even if these experiences in themselves reveal a lot of what is at stake. Thereby this presentation intends to reveal the structures and power relations behind these everyday experiences.
First, this paper looks at geography as a discipline and shows that everyday academic practices stand in sharp contrast with the critical content geography, as a discipline, aims to study and teach - including its feminist, anti-colonial, and queer understandings. Geography as a field does not seem able to apply its academic insights into its internal organisation. As such, it reproduces the historical 'maleness' of the discipline, both in terms of who embodies it and through the methods and topics it focuses on. Second, the presentation zeroes in on the strategies developed as well as the resistances faced by those trying to denounce and alter these unjust practices. Yet, the strategies being deployed also reveal the double bind these scholars, especially early career women, face, as these very strategies may risk to undermine one's own precarious position, or to give the skewed impression of reproducing the male, disembodied ideal we are fighting.

Modelling gully densities across Africa: a first step towards a continental gully erosion model

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Keywords: soil erosion, spatial modelling, data compilation

Abstract: In many regions of the world, gully erosion is a dominant land degradation process, threatening available soil and water resources. Understanding and quantifying gully erosion rates and their contribution to catchment sediment yields is not only of fundamental scientific importance, but also necessary for the development of strategies that allow to prevent and mitigate the many negative impacts of gully erosion.
Nonetheless, our ability to simulate and predict this process remains currently very limited, especially at the continental scale. We aim to bridge this gap by developing a first spatially explicit and process-oriented model that simulates average gully erosion rates at the continental scale of Africa, building on recently obtained insights, model concepts and databases.
In a first phase, we are developing a model that can simulate the density of gully heads across Africa using a recently constructed database of mapped gully heads. The database currently consists of 44 000 gully heads in 1680 sites across Africa. The exact location of all gully heads was manually mapped by trained experts, using high resolution aerial photos available on Google Earth. On 48% of these mapped sites, at least 1 gully was detected. Observed gully densities ranged between 0 and 1530 gully heads per km² with an average of 22 gully heads per km². Based on this database, we are currently working on a first gully density model following a process-oriented approach that takes into account the threshold dependent character of the gully initiation process. The first results demonstrate that gully density can be modelled at a continental scale to an acceptable extent with the available dataset based on topography, rainfall, vegetation cover and soil texture. By means of these results, we will present a first gully density map of Africa.
In a next phase, this gully density model will be coupled to a recently proposed model simulating the expansion rate of individual gully heads. The integration of these two models will result in the very first assessment of gully erosion rates at a continental scale (at decadal timescales).

Acceptance of transport innovations and technologies by vulnerable groups: A literature overview

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Keywords: acceptance; transport innovations; transport technologies; vulnerable groups, social inclusion

Abstract: Something is moving in the mobility landscape. New forms of transport and technologies are improving the way we travel. Transport innovations include among others dockless shared e-scooters, shared (electric) bicycles, car-sharing, ride-sharing, ride-hailing, … and transport technologies include e.g., smartphone applications, advanced driver-assistance systems to autonomous vehicles, … One of the key selling points is that transport innovations and technologies are improving accessibility for all. This means that there is a growing group of non-drivers who are becoming able to travel independently. Currently, the usual target group is the average citizen who owns a car. Research shows that there is a more specific group that uses or intends to use new transport innovations and technologies. This user group tends to be younger, men, highly educated, tech-savvy, and living in an urban environment. But there is no such thing as an average citizen and not everybody can drive a car. There are several vulnerable groups that are underrepresented in research about the use or intention to use transport innovations and technologies like children, women, single parents, people living in rural areas, people living in deprived areas, elderly, people with reduced mobility, low-skilled people, unemployed people, low-income groups, ethnic minorities, migrants, … These groups have specific needs, which means that transport has to be more than accessible, it has to be socially inclusive so that people are able to participate in certain key activities. This presentation tries to give an overview of the sparse results of the acceptance of transport innovations and technologies by vulnerable groups with a focus on elderly people. Acceptance will possibly lead to the use and adoption of these innovations and technologies. The results will differ depending on the vulnerable group, the innovation or technology, the study period, and the study area. This knowledge will help to estimate the impact of similar and future innovations and technologies. Future avenues for research are also being mentioned. This literature overview will be the starting point of a few case studies. The results of these studies will be input for policy recommendations concerning transport and spatial planning.

The impact of forest cover on landslide rates in the Kivu Rift

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Keywords: hillslope evolution, landslide inventory; deforestation; knickpoint, East African Rift

Abstract: Landslides are considered prime mechanisms limiting slope steepness in active mountain ranges. Terrain uplift causes perturbations in river profiles that migrate upstream and lead to a steepening of the relief until hillslopes reach their threshold angle and landsliding occurs. Notwithstanding the dominant role of hillslope slope failure on landscape evolution, this process is often not accounted for when assessing actual landslide hazards. Here, we hypothesize that we can distinguish (1) a landslide rate associated with landscape evolution, and (2) fluctuations of this rate due to land cover disturbances.

We quantified the impact of forest cover on shallow landslide rates in the Kivu Rift, a representative region of the Western Branch of the East African Rift. First, a landslide database of 7944 recent shallow landslides was compiled, necessary for the calculation of the landslide rates. Second, to better characterize long-term landscape evolution, we analyzed (1) the impact of lithology on slope threshold angles by plotting the average hillslope per watershed as a function of the normalized steepness index, and (2) 672 tectonic knickpoints to identify erosional stages in the Rift.

The analyses revealed a threshold angle (TA) which was higher in older (>540Ma) and stronger lithological units consisting mainly of granites and quartzites, compared to more recent weaker volcanic and sedimentary rocks (with TAs of $27.9 \pm 0.3°$ and $19 \pm 2.0°$, respectively). We observed no or little impact of forest cover on landslide rates for slopes < 30°, while for steeper slopes, deforestation increases the rate with 30 to 100%. Within the different erosional stages of the Rift, the average landslide rates outside the rift and on top of the rift shoulder were equally low (± 0.008 LS/km^{-2}year^{-1}), while the highest rate was observed in the transitional zone just below the equilibrium inside of the Rift (0.179 LS/km^{-2}year^{-1}). However, within this zone, deforestation did not increase landslide rates, which suggests that within transition zones, characterized by the presence of migrating knickpoints, human disturbance does not alter landslide rates.

Financial or societal returns? Exploring the ambiguous role of utility company Fluvius in the energy transition in Flanders

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Keywords: energy transition, municipalities, austerity, distribution network, politics

Abstract:
Municipalities are expected to play a key role in energy transitions, but are also experiencing increasing budgetary pressure and a dependence on short-term returns. Our paper explores the tension between financial and societal returns for localities by unravelling the ambiguous role of the public utility company Fluvius in sustainable energy transition in Flanders. Completely owned by municipalities, Fluvius is a large-scale and incumbent actor in the distribution of electricity and gas for the whole Flemish region. As such, Fluvius could potentially facilitate transition in several ways: by investing in sustainable alternatives, stimulating energy democracy through citizen engagement and fight energy precarity through local heating districts. At the moment, however, Fluvius has large sunk investments in natural gas infrastructure, and also faces financial challenges such as attracting private capital, servicing bonds and maintaining its credit rating. Municipalities, and thus local politicians, have a director's role in Fluvius by formulating and implementing energy ambitions, yet struggle with budgetary squeezes and investment demands. Yearly dividends from Fluvius are a welcome addition to their funds, but represent a vested interest in the energy system as it is. Furthermore, Fluvius' opaque and technocratic structure limits municipalities and citizens' say in decision-making over the energy grid. By using in-depth stakeholder interviews, we explore these tensions between sustainable goals and political-economic pressures by building on transition theory, foundational economy and financialization studies. From a policy angle, we reflect on how governance arrangements such as public companies can hamper or advance the sustainable energy transition.

Modelling future social segregation in rapidly expanding cities: a case study in Paramaribo (Suriname)

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Keywords: socioeconomic segregation; agent-based model; urban expansion; Suriname.

Abstract: Over the last 15 years, the urban Greater Paramaribo region (population circa 400.000) in Suriname experienced a population growth of circa 1% per year, resulting in urban expansion. This growth has been caused by natural growth, as well as rural-urban migrations. Each social group (rich, middle, lower, and poor) in Greater Paramaribo is affected differently by the expansion, resulting in spatial socioeconomic segregation patterns. In order to address these undesirable unequal distribution patterns, adequate spatial planning policies are required. This research presents a spatially explicit agent-based model that can simulate both urban expansion and socioeconomic segregation. The model can be used as a support tool for the sustainable development of Greater Paramaribo.
Based on data, collected from ca. 700 interviews conducted at household level, an agent-based model was developed. Under a business as usual scenario, the model shows that urban expansion is expected to continue, through outward expansion of the current urban extent in the form of ribbon development. Overall, the socioeconomic segregation is also simulated well, regarding the spatial pattern and quantity.

Characterizing forest structure with drone photogrammetry in tropical dry forests

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Keywords: Forest structure, drone photogrammetry, UAV, Dry Chaco

Abstract: Forest degradation of tropical dry forests needs advanced monitoring techniques to set up long term monitoring expertise. In contrast to forest conversion or natural disturbances, forest degradation is a gradual process through which the forest's biomass declines, its species composition and vertical complexity change and the soil physico-chemical properties degrade.

Traditionally forest monitoring has been made by forest inventory but requires time; personnel investment and has limitations in the spatial extension. Drones, structure from motion can easily enter into densely vegetated areas and cover larger areas. It give us the 3D structure but is less robust for the qualification of the lower strata.

Using the woodlands of the Argentinean Dry Chaco ecosystem as an example, this study aims to explore the potential of UAV-derived optical images to monitor forests in comparison with traditional forest inventories practices. We collected UAV-imagery in 50 different forest plots (of 4 ha each) in the Argentinean Dry Chaco and compared drone indicators data with forest inventoried data.

Towards an age-friendly future: ageing-in-place and spatial sustainability

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Keywords: ageing in place; spatial sustainability; informal care; distance; spatial analysis.

Abstract: Both the global and the Belgian population are rapidly aging. Globally, the older population is expected to double by 2050. In Belgium, the share of population older than 67 is expected to increase from 16% in 2017 to more than 22% in 2050 although regional differences can be noticed. It is clear that this goes together with several challenges, such as the financial sustainability of the health and pension systems, and questions related to housing, urban planning, infrastructure & transportation et cetera. It is therefore not surprisingly that 'healthy ageing' is highly connected to and incorporated into the 2030 Agenda for Sustainable Development. The WHO calls for multisectoral action on ageing and health, but also concerning the organization of care. Although it is clear that geography can contribute to several of these questions, until today the spatial dimension of care, and more specifically the importance of distance is often lacking, especially in relation to informal care. As there is a trend towards ageing-in-place and a deinstitutionalization of care services, it is expected that informal care is growing in importance, while on the contrary (longitudinal) patterns of both near –residence and co-residence are largely lacking. It can be mentioned that ageing-in-place goes together with some challenges and can even be contradictory to planning policies focusing on (re)concentration for the sake of efficiency and sustainability, while older people often live in suburbs and in relatively bigger detached single family homes. This research aims to disentangle the concept 'geographies of care'. Furthermore, this research presents an innovative quantitative methodology to get more insight in the spatial mobility of elderly people and their children in Flanders by making use of a (retrospective) open cohort design based on the Belgian National Register, coupled with census data of 2001 and 2011. First patterns and insights will be shared.

Urban street landscape and well-being in Brussels

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Keywords: Urban morphometrics ; Green environment ; Urban fabric ; Street segments ; Well-being.

Abstract: Urban landscapes are the backdrop of life in more than half of the world population. The streets and public spaces provide the setting for urban activities, with buildings, gardens and parks as background. The layout of this urban street landscape influences our way of perceiving the city but also, more broadly, affects well-being. To support this assumption, it is necessary to well characterize the urban fabrics in order to link it with well-being. Araldi and Fusco (2017) have developed a new method - Multiple Fabric Assessment method (MFA) - with the idea of characterizing urban fabrics as they are perceived by the pedestrians freely moving on the streets, so from the road network. The original MFA method does not include any vegetation indicator, while the beneficial impacts of urban green spaces on psychological, emotional and mental health has already led to numerous analyses.

The MFA method is applied to Brussels. The basic spatial unit (Proximity Bands) is first defined around each street segment. Each Proximity Bands unit is further described by 21 indicators of urban form as perceived by the city user; three of them are related to vegetation. Geostatistic analyses are then achieved to identify local patterns of urban form features. Finally, Bayesian clustering is carried out to identify and describe family of urban fabrics.

This method makes it possible to highlight twelve family of urban fabrics. These highlights elements specific to the city's history, such as bruxellisation - destruction of part of the historic center to build offices - and garden cities.

This typology of urban fabrics is then linked to mental health and well-being. Two types of analysis are carried out: qualitative and quantitative. The qualitative analysis consist in walking interviews and mapping exercises with forty residents. The typology enabled us to define the interviews places in order to explore a different range of urban fabrics. In the quantitative analysis, Health Interview Survey data are used to investigate the relationships between mental health and the built/non-built environment, while accounting for demographic, socioeconomic factors, lifestyle, pollution. These two analyses are ongoing and the first results will be discussed.

Update from the field: Quantifying the alpine sediment cascade using multi-temporal high-resolution topographical surveys

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Keywords: Point clouds; UAV; TLS; Alpine environment; permafrost

Abstract: Climate change-induced permafrost degradation can affect the frequency and magnitude of mass wasting processes in high alpine environments, potentially altering sediment redistributions. Talus slopes are one of the most common landforms in these environments, collecting debris through rock fall from adjacent rock walls, forming the first step in the alpine sediment cascade and potentially being a source for other geomorphic processes leading to sediment transfers. It is, therefore, important to study both permafrost distribution and geomorphic change in talus slopes and their headwalls to increase our understanding of the driving environmental factors.

The main objective of this research is to contribute to the understanding of the overall sediment cascade in an alpine environment with specific focus on talus slope and rock glaciers as sediment conveyors. Since monitoring of topographic changes is fundamental to study sediment dynamics, multi-temporal high-resolution data (5 ± 2 cm) from Terrestrial Laser Scanning (TLS) and Unmanned Aerial Vehicles (UAV) photogrammetry are gathered, together with data of ground temperature, geophysical data, meteorological data and time-lapsed terrestrial photography.

Geomorphic processes, such as rock fall, channel fill, rock tumbling and rock tilting, can be detected and quantified in a timeframe of two years using UAV- and TLS-based point cloud acquisition. The integration of multi-year datasets will allow to understand the geomorphologic dynamics of the area and the driving environmental factors behind these sediment redistributions.

Towards A Sustainable Climate Change Adaptation:

How Gender Plays a Role?

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Keywords: Coastal socio-ecological system, sustainable adaptation, social innovation, gender, climate change, adaptation

Abstract: Climate change is a crucial global challenge with long-term implications for different places. Coastal socio-ecological systems (CSESs) have been recognized to be particularly vulnerable to climate change challenges due to salinity, water level increase, coastal flooding, storm, erosion and changes in forest and coastal lives. Although a variety of adaptation mechanisms have been employed in the different coastal areas globally, the theoretical conceptualization and practical advancement of "sustainable adaptations" in CSESs (i.e. adaptations that contribute to both social justice and environmental integrity) demand further attention.

Furthermore, both women and nature share the history of oppression and gender is a major determinant of exclusion, particularly in determining resource and need access and control, in interaction with class, caste, race, culture and ethnicity in the process of adaptation. To understand the complex dynamics and nexus between climate change adaptation and gender, in this paper, i) we refine the essence of sustainable adaptations, focusing on the gender parameter within the social-ecological complexities of CSEs, and ii) we provide a socio-politically and gender-sensitive analytical framework on the role of social innovation in enabling sustainable adaptations within CSESs. To do this, we follow an interdisciplinary investigation of climate change vulnerabilities, coastal socio-ecological systems, sustainable adaptations, social innovation and feminist political ecology. Our analysis provides a feminist lens to the sustainable adaptation challenge, connects social innovation to the climate change challenge and provides a so far missing theoretical framework for related empirical research in CSESs.

The paper emphasizes that sustainable adaptations need to be (re)framed through considering gender variables in order to offer a just, equitable and inclusionary mechanism for adaptation. It clarifies how gender makes the difference in understanding climate change vulnerability and adaptation and thereby emphasizes on why gender lens is needed in understanding socio-ecological complexities including climate change vulnerabilities as well as adaptation particularly in the coastal territory. Moreover, this analysis is crucial for policy documentation with the aim at understanding and assessing Sustainable Development Goals action on climate change, gender, inequality and coastal eco-systems (i.e. goal 5, 10, 13, 14 respectively).

Integration of multiple sensor data into a 3D GIS for cities monitoring

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Keywords: Smart City, Internet of Things, Sensor Observation Service, SensorThings API, Spatial Database

Abstract: This research is part of a larger project, called "Ecocity Tools", which aims to establish environment and energy diagnostics for cities at the neighborhood scale. Experts in different fields provide information based on both scientific models (climatology, pollutant dispersions) and sensor data (energetic cadaster, air quality) to a 3D GIS for decision support in urban planning. This paper focuses on two interconnected problematics about the use of GIS in a "Smart City" approach: an appropriate 3D geometric model and the integration of sensor data into this model.

As buildings can be equipped by several sensors in multiples locations (rooms, floors, walls, etc), information should be attachable to specific geometric parts (like walls). It is thus important for 3D city models to be adapted to detailed scale levels. Thanks to the consideration of different levels of details (LoD), from buildings footprints (LoD 0) to interiors (LoD 4), the CityGML standard (OGC) can theoretically fit any 3D application. Nevertheless, these data are not always available at very detailed levels. For example, Belgian authorities deliver open data in CityGML LoD 2 (representing buildings as volumes with simplified roof shapes) for important cities like Brussels or Namur. Therefore, this paper proposes a PostGIS data model able to attach information to specific building parts even in poorly detailed city models (LoD 1 or 2).

The second part of this research is the implementation of other OGC standards specifically for the visualization of sensor data into a GIS: Sensor Observation Service (SOS) and SensorThings API (STA). As Web Feature Service (WFS) does for geographical features, SOS allows any compatible GIS client to import georeferenced sensor data and metadata through a simple http request (including filters on space, time and other attributes). More recently, STA, in addition to SOS functions, supports JSON format for data exchanges and also provides a "Tasking Part": the STA server is able to ask sensors and actuators to do specific tasks like "start/stop measurements". In this research, a SOS server, able to communicate with the 3D GIS, is implemented thanks to the open source tool provided by 52North.

Quantifying the future sea level rise amplification using full representation of the interactions between ice sheet dynamics and atmospheric circulation changes

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Keywords: Greenland; Ice sheet; Atmosphere; Warming; Coupling.

Abstract: The evolution of the Greenland ice sheet results from complex feedbacks between components of the Earth System. More and more studies are showing an amplification of the Greenland melting contribution to sea level rise under a future warming climate when interactions between ice sheet dynamics and atmospheric circulation are considered. The higher the complexity used to represent interactions between the Greenland ice sheet and the atmosphere component, the higher the amplification is. Using a full coupling between the GISM-VUB ice sheet model and the MAR atmospheric regional climate model we quantified the impact of interactions over a century time scale. We first initialized the ice sheet model over a glacial-interglacial time scale and then optimized the simulated present-day ice sheet with data assimilation to fit as closely as possible the observations. From this, the regional atmospheric model is initialized with the simulated ice sheet topography over a decadal time scale before starting the fully coupled experiment. The results exhibit strong atmospheric circulation and ice dynamic changes along the ice sheet margins which propagate inwards. Increasing Greenland ice sheet surface slopes cause increasing winds impacting on the surface energy balance. This margin melting amplification contributes to a higher sea level rise compared to uncoupled model experiments. In turn, higher runoff impacts both the ice dynamics (e.g. by enhanced basal hydrology) and the atmospheric heat and water content (e.g. by surface albedo changes) to cause a further positive feedback loop.

Urban Climate informatics - and emerging research field

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Keywords: urban climate; big data; crowdsourcing;

Abstract:
The scientific field of "urban climate" has long investigated the two-way interactions between urbanized areas and their overlying atmosphere. A city's composition, configuration, and morphology are important drivers of urban climate, and an accurate, fine-scale description of the built-up environment is required for climate modelling and observational studies. Recent advancements in sensing technologies coupled with rapid growth in computing power have produced novel data products that can augment traditional urban climate data and provide unprecedented insights into urban atmospheric dynamics. Urban climate informatics is a newly evolving research field that uses artificial intelligence, e.g., machine learning or deep learning, to process non-traditional big data sources such as Street View imagery for urban climate applications. This work reviews current developments in urban climate informatics in the context of urban form parameterization, highlighting big data-driven crowdsourcing and image processing approaches to inform urban heat island research, biometeorological modeling, climate-sensitive urban design, and heat exposure assessments.

Using mobile data to study location and spatial expansion schemes of informal tourist accommodation in Wallonia

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Keywords: Tourism; Sharing Economy; Big Data; Informal accommodation; Spatial Analysis.

Abstract: Tourism development is transforming the face and the organization of many cities and countryside. The number of tourists increases, generating huge concentrations in some places and a spread of places visited and accommodation. Tourism is undergoing major changes because of the volume of innovations that are intended for it. Approach as a vector of development, tourism sets off many questions as to how it is redesigned and decided. The sharing economy is part of these innovations.

This research focuses on the implications of the sharing economy for tourism and destinations. While several research highlight the economic and social impacts related to the "new" accommodation, the knowledge of the distribution of overnights stays is currently falsified because national organisms fail to take into account the huge diversity of less formal accommodation. Wallonia, as case study, allows us to analyse informal tourist accommodation in cities of various sizes as well as in rural areas that are considered tourist or not.

To understand the influences of the development of "new" accommodation on host communities, a first step should to study their location and spatial expansion schemes. First, we develop with the mobile operator, Proximus, the definitions required to generate the algorithm to obtain tourists' overnight stays and arrivals data. The query was constructed in accordance with the General Data Protection Regulations. Secondly, we conceptualize and give the green light to the data. Thirdly, databases relating to exchange platforms (Housetrip, AirDNA, HomeAway...) are consulted as well as official statistics of tourism. These data are compared with the location data from mobile telephony.

The paper shows the methodology used to analyse tourist accommodation in its entirety from mobile data and the first results from the comparison with official and exchange platforms databases.

The Zeyi cave in north Ethiopia and potential for geotourism

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Keywords: Antalo Limestone; karst; *Chiroptera: Hipposideridae*; geoconservation; cave burials

Abstract: Northern Ethiopia's largest cave at Zeyi in the Dogu'a Tembien district (13°34'N, 39°09'E) has received little attention so far, despite the high geoheritage value of caves and karst. We have studied its geological, geomorphic, socio-cultural and historical dimensions in a holistic way. The basal member of the Antalo Sequence, in which the Zeyi cave is located, is made of grainstone and wackestone, with subordinate marly interlayers. Over a length of 364 metres, the oval-shaped gallery displays stalagmites, stalactites, five decametre-high columns, dissolution holes ("bell-holes") following joints, stalagmitic floors, as well as concretions or speleothems. In absence of any dating of the cave, we contrasted its elevation above the current local base level with known average incision rates of the northern Ethiopian highlands to reconstruct its age and calculated an approximate age of 2 to 5 million years old. The palaeo-environmental information that is archived in the Zeyi cave sediment would hence cover the Pleistocene. The graves in the sediment at the bottom of Zeyi cave further indicate that the place could be an ancient burial site, what gives scope for palaeontological research. Zeyi boosts a unique combination of abiotic, biotic and cultural components: the 19th C. monumental church under the overhanging cliff; the unique cave, the speleothems, cliffs and gorges; and the cave's bat colony which has been genetically confirmed to be composed of three sympatrically roosting species. Accounting for a good balance between cave research, community-based geotourism, geoconservation and biodiversity conservation, the Zeyi cave has strong credentials to become a top geotouristic site in Ethiopia. However, major work needs to be done, including granting access for women, and organising community-based geotourism.

Tourist gentrification: the case of housing withdrawn from the residential rental market and put on Airbnb in Brussels

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Keywords: tourism, gentrification, housing, urban studies

Abstract: As in other European capitals and cities, the use of Airbnb in Brussels has changed rapidly in recent years, raising concerns among residents' associations and the hotel sector and giving rise to new forms of regulation. To understand its evolution and its effects on housing and employment, we base our work on AirDNA data, which includes attendance on Airbnb. We aim to understand the organizational methods within Airbnb, its impacts on housing and employment. The analyses show a significant weight of professional hosts who cover different realities: companies that acquire properties in certain districts, fake hotel forms and agencies that rent properties on behalf of owners. We are therefore trying to determine more specifically the extent to which the properties put on Airbnb are removed from the residential rental market and contribute to the tourism gentrification in Brussels.

Residential geography of the economic elites in Belgium

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Keywords: elites, bourgeoisie, rich, residential

Abstract: So far, the subject matter of 'economic elites' has been little studied in the field of geography. In this study, economic elites are defined as the group that owns the means of production (i.e : the bourgeoisie) and that considers itself a social class. To address the topic of economic elites, the study is based on a list of the 200 richest families in Belgium and the BelFirst database (to locate their place of residence). As economic elites represent a very small percentage of the population, our analysis of residential geography is based on a comparison with two close social groups with a higher number of people: the nobility, which serves as a reference point in the choice of elite spaces and the the high incomes (the tenth decile of taxable income). These three variables, i.e. economic elites, nobility and tenth income decile were gathered in a principal component analysis (PCA) to establish the typology of the dominant class's residential spaces.

Firstly, although the nobility and the bourgeoisie are close social groups, their residential spaces are partly different. Indeed, the nobility is more concentrated throughout the territory (60% of households are in the Brussels Urban Region). Secondly, The places of residence of high incomes have a spatial proximity with the economic elites even if high incomes live more on the periphery of the cities. Finally, the comparison of those three geography suggest that distinct economic elites coexist within the country, with divergent interests in the national framework. Albeit distinct, these bourgeoisie use the national framework to accumulate capital and develop. Thus, the political and economic control of the State apparatus by Brussels elites explains both the importance of Brussels as an elite space but also the absence of Charleroi and Liège as epicentres of Belgian capitalism. In the same way, it was when the Flemish Catholic bourgeoisie was able to take control of the Belgian state apparatus after the Second World War that it was able to promote the Flemish economy. It worked with endogenous capital in the Courtraisis and exogenous capital in Limburg.

The potential impact of climate variability on siltation of Andean reservoirs.

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Keywords: Erosion; Sediment transport; Climate change; Andes; Storage dams.

Abstract: Recent changes in global climate, and especially changes in precipitation patterns, may impact negatively on silting of Andean storage reservoirs, thereby putting at risk the provision of resources to the local population. The extent to which this may happen is poorly understood. We therefore studied the catchment of the Cañete River in the western Peruvian Coastal Range as it plays an important role in the socioeconomic development of the region. It houses the 220MW El Platanal hydroelectric plant and the Capillucas reservoir that provide the surrounding areas with water and energy. We used a hydrological model (HEC-HSM) coupled with a sediment transport model (HEC-RAS) to simulate future changes in river discharge and sediment load. This information was then used to calculate the siltation of the Capillucas storage reservoir. Ten scenarios were developed, a combination of two different precipitation patterns and five different precipitation rates. The precipitation patterns differed in the distribution of the precipitation change during the rainfall season, and the precipitation rates differed in the extent of change in precipitation amounts. The average sediment load of the Cañete River was estimated at 981 kTon/yr upstream of the Capillucas reservoir and showed that the calculated life span of the Capillucas reservoir is about 17 years. The most pessimistic scenario suggested a reduction in the life span of the reservoir to 7 years and the most optimistic scenario to 31 years. Even under the most optimistic scenario, the life span of the reservoir is shorter than its officially expected functionality of 50 years. As such, our results demonstrated the vulnerability of Andean hydroelectric reservoirs against future climate change.

Identification of the environmental characteristics of pastures that influence the risk to harbor herds infected with a tick-borne disease in Wallonia.

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Keywords: Ticks, tick-borne disease, pastures, GLM, kernel density.

Abstract: Ticks constitute a threat for human and animal health, as they are vectors of different pathogens. *Anaplasma phagocytophilum* is a bacterium that causes bovine ehrlichiosis in cattle, an infection associated with fevers, drops in milk production and abortions. In Wallonia, the first case was identified in 2005, but the disease is still poorly known. Nevertheless, the high seroprevalence found in Walloon herds suggests that the disease is endemic and that some pastures, where the herds graze, constitute environments at risk.

In 2011, ARSIA (*Association Régionale de Santé et d'Identification Animales*) tested the presence of IgG class antibodies to *Anaplasma phagocytophilum* in one cow selected in each one of the 1445 herds. Those herds are geolocated according to the pastures used by the farmers. However, the precise location of the herds is uncertain. Due to these limitations, the seroprevalence data cannot be considered as a classical presence/absence dataset. Instead, these data were pretreated using a Kernel Density estimation allowing the creation of a continuous surface describing the local intensity of the presence of infected animals.

The elements describing the environments of relevant pastures were identified with a conceptual framework based on the resources needed for *Anaplasma phagocytophilum*'s transmission cycle. The results showed that the presence of wild hosts as well as the composition and configuration of the neighboring landscape of the pasture influence the capacity of the pasture to be a spot for the presence of bovine ehrlichiosis in Walloon herds. The results also highlighted that the effects of these variables vary between the agro-geographic regions of Wallonia, which present contrasted landscapes.

This study was not able to identify the influence of the local characteristics of the pastures, such as the size or the Shape Index or the cattle density, on the intensity of presence of infected animal. It is probably due to the characteristics of the dependent variable that was created at a broader scale. However, the research highlighted challenges for spatial analyses based on disease surveillance data.

Is Gaia an anticipatory system that minimizes free energy?

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Keywords: Autopoiesis, (M,R)-system, cognition, active inference.

Abstract: All systems, whether they are living or not are structured determined systems, i.e. their present states depends of past states. However it has been suggested that living systems are cognitive systems capable of anticipation and active inference. The underlying principle is that the changes in living systems are best modelled as a function of past and future states. The reason for this is that living systems contain a predictive model of themselves and of their ambiance. They appear to model themselves and their ambiance to preserve physiological bounds within homeorhetic trajectories. We therefore extend the formulation of the Gaia hypothesis: can the Earth system be an anticipatory system that minimizes free energy? Can climate variability (catastrophe, bifurcation and/or tipping points) be interpreted in terms of active inference and anticipation changes? Here we present a biological-centered mathematical formulation of the Earth system that suggest cognition, active inference and anticipation at planetary-scale. Some implications in the climate modeling and future predictions are of interest.

The End of the Sense of Local Heritage among Rural People?

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Keywords: heritage, countryside, Wallonia, sense of place, community

Abstract: Since 1976, the NGO "Qualité village Wallonie" works on safeguarding and highlighting local rural heritage. The NGO helped to realize 2.500 project in 850 villages in Wallonia. Yet, the workers of the NGO have noticed important changes in rural communities including other perspectives on the common heritage. This could be linked with rapidly changes of demography, including aging and decline of native population and arrivals of commuters. Another hypothesis is that the Belgian society has lost the sense of local heritage. Factors like the rejection of Catholicism, the increase of mobility, social media, the increase of consumerism, including frequent leisure travels, could contribute to the explanation. Based on interviews with the workers and administrators of the NGO and on an e-survey of rural people, the research describes and suggests explanations of this apparently loss of sense of local heritage. The first results show a shift of attention away from the religious and farming heritage to places and buildings that make the village unique. There is also a reluctance to commit oneself to a long period. Therefore, fellow citizens are more selective and want to see fast results. Indeed, local heritage gains in importance when it helps distinguishing the village from the others. More than a loss of the sense of heritage, the notion of heritage is evolving. It increasingly shifts from something from the past that requires protection to things, sometime intangible, that could be useful for the present and future generations. Moreover the signified, often totally reshaped, gains in importance at the expenses of the material thing.

Effects of physical and virtual accessibility on the geography of e-shopping usage in China

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Keywords: e-shopping; physical accessibility; virtual accessibility; urban system.

Abstract: The increasing importance of information and communication technologies has resulted in increasingly widespread e-shopping. As an alternative to in-store shopping, e-shopping is leading to changes in consumers' travel patterns, thus imposing pressures on the traditional retailing industry as well as altering the needs within the urban transportation system. A number of empirical studies have used survey data to explore the spatial distribution of e-shopping usage and its determinants at the level of individual cities. Results indicate that e-shopping is not uniformly distributed within a city, identifying various spatial attributes such as the level of accessibility to in-store shopping opportunities (physical accessibility) and online shopping opportunities (virtual accessibility) as key factors influencing e-shopping. However, to date, few studies have researched the geography of e-shopping across the urban system. Whether and how the use of e-shopping varies among cities, and how this relates to differential levels of accessibility, has therefore not yet been systematically analyzed in the literature. The purpose of this paper is to do so for the case of China.

In recent years, China has become the largest e-retailing market in the world. Alibaba Group, China's biggest e-retailing company, launched the Online Shopping Index (OSI) for Chinese prefecture-level cities in 2014. The OSI combines the percentage of e-shoppers in total population and the percentage of e-shoppers with annual online consumption above RMB 10,000 in total e-shoppers. Based on the OSI, this study uses spatial regression models to reveal the role of virtual and physical accessibility in the spatial distribution of e-shopping usage across 276 prefecture-level cities in China. Our results suggest that physical accessibility (proxy-ed by the density of shopping centers and the average number of public buses per person) and virtual accessibility (proxy-ed by the percentage of the Internet users and the density of delivery service stations) have positive impacts on e-shopping usage in Chinese cities. We furthermore find that both effects are complementary to each other. We discuss how these findings can contribute to our understandings of the geographies of e-shopping and of urban systems more generally, and spell out some of the main implications for the retail industry and urban planners alike.

Reconstructing Holocene sediment and carbon storage in Flemish river systems.

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Keywords: Sediment storage, Soil organic carbon, river dynamics, river management

Abstract: River floodplains store large amounts of mineral sediment and soil organic carbon, but unfortunately, the long-term sediment and carbon dynamics in relation to climatic and land cover changes remain poorly understood. This study aims to study the Holocene evolution of floodplains in Belgian river systems and to quantify their role in sediment and carbon storage. More specific, four medium-sized river catchments were studied, covering a range of environmental gradients and varying in degree and timing of human impact. Specifically, the sites were selected in Belgium, in the loess belt (Dijle and Mombeek catchment) and the sandy Campine region (Grote Nete and Zwarte Beek catchment). To make a detailed reconstruction of the floodplain architecture, soil corings were made along floodplain cross-sections. Combined with soil samples and radiocarbon dating, the Holocene geomorphic evolution could be reconstructed.

Overall, the results indicate that the long-term evolution of the fluvial system and the sediment and carbon storage trajectories differ strongly between the four studied rivers, which indicates that a variety of case studies is needed to study the long-term evolution of floodplains in detail. Additionally, the Belgian river floodplains appear to store large amounts of organic carbon, making them very important elements in the regional carbon budget. These findings have important implications for river restoration and management plans. The differential evolution of the four rivers shows that a reconstruction of the past evolution of a river system is necessary to identify the natural state of the system, which can vary significantly between individual rivers and to guide potential management or restoration activities.

Late Eocene Antarctic glaciations: an emulator-based approach

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Keywords: ice sheet, paleoclimate, modelling

Abstract: The Antarctic ice sheet history dates back to the late Eocene-early Oligocene, a time when carbon dioxide concentrations were declining from values around 1000 ppm towards values below 600 ppm. The continental position of Antarctica was different than today and the Drake Passage and the Tasman Seaway started to open. A large oxygen isotope excursion in deep-sea foraminifera, known as the Oi-1 event (33.9 Myr), is interpreted as a global cooling and major ice sheet formation event. At this time, it is thought that small ephemeral ice sheets grew into a continental scale ice sheet on the Antarctic continent.

Oxygen isotope excursions during the late Eocene (38-33 Myr) and geomorphic evidence of glacial erosion suggest that there were ephemeral continental scale glaciations before the Oi-1 event. Here we present the Antarctic ice sheet evolution over a multi-million year timescale during the late Eocene with the most recent estimates of carbon dioxide evolution over this time period. A novel ice sheet-climate modelling approach is used where the Antarctic ice sheet model VUB-AISMPALEO is coupled to the emulated climate from HadSM3. Our modelling results show that short-lived continental scale Antarctic glaciation might have occurred during the late Eocene when austral summer insolation reached a minimum in a narrow range of carbon dioxide concentrations.

Performative participation in envisioning future geographies

A case study on Environmental Strategy design in Brabant

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Keywords: performativity; futures; participation; visioning

Abstract: Much research has been conducted over the last decades into the functioning of participation in planning and governance practice, examining the intended and unintended consequences of participation, and scrutinizing whether the various ideals of participation, including consensus, better decisions, legitimacy, and support are actually met. Yet very few studies have explicitly questioned the performative role of 'the future' in participatory visioning processes on spatial development. Visions provide a discourse of future-orientation which render real and material consequences in the present. The tacit promise of public participation reaffirms the belief in a future which is open to human shaping and transformation and for which we need to take collective human responsibility to anticipate the future geographies we want. In this presentation we present findings of a case study conducted into the extensive participatory design process adopted by the provincial government of Brabant, the Netherlands, for the development of the Environmental Strategy [*Omgevingsvisie*]. The Environmental Strategy is a key strategic and integral instrument under the new Dutch Environment and Planning Act [*Omgevingswet*], directing policy and program development on the physical environment. Within this case we examine how the explicit participatory approach contributed to the construction, articulation and legitimation of particular future geographies. We found that the participatory processes contributed to a shift in emphasis, from a vision as a distant desired future image to a vision as a mobilizing strategy. Yet, this shift surfaced an interesting dialectic in future-orientation. As a mobilizing strategy the vision 'opens up' the future explicitly urging for situational and deliberative strategies and action in both time and space. However, as a distant image or a future cause, it renders and justifies the future as more or less inevitable and unquestionable, radically closing down on alternative future geographies to emerge over time and direct the course of action.

Implementation of blowing snow and improvement of albedo and surface mass balance in cosmo-clm over Antarctica

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Keywords: climate modeling, atmospheric modeling, antarctica

Abstract:
Surface mass balance (SMB) strongly controls spatial and temporal variations in the Antarctic Ice Sheet (AIS) and its contribution to sea level rise. The current scarcity of observational data and the challenges of climate modeling over the ice sheet limit our understanding of the processes controlling AIS SMB. Particularly, the impact of blowing snow on local SMB is not yet constrained and is subject to large uncertainties. Drifting snow is crucial for ice sheet mass balance through the displacement and relocation of snow particles but also through drifting snow sublimation. We implement the simple bulk model from Déry and Yau (2001) for blowing snow in the regional atmospheric COSMO-CLM model coupled to the land component of CESM, the Community Land Model. The coupled COSMO-CLM² model was adapted to accurately represent the Antarctic conditions and includes snowpack adaptations for a better representation of perennial snow surface and mass balance representation over the ice sheets and glaciers. As such, we optimized the representation of albedo in the model, by adapting the albedo parameterization scheme to the conditions over the AIS, compliant to the MODIS albedo product. A realistic representation of albedo is of great importance, as variations in the ice albedo can have a large influence on melt through melt-albedo feedback processes.

Spatio-temporal exposure patterns to air pollution during commute and deriving guidelines to implement air pollution model data in routing applications from that

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When pedestrians and cyclists commute or recreate, they are often exposed to high levels of invisible air pollution. Especially in urban and suburban areas, air pollution concentrations can be strongly elevated near emission sources such as traffic. Often, there is a very high gradient in air pollution concentrations of black carbon and nitrogen dioxide away from the traffic pollution source. Often, cyclists and pedestrians can reduce their exposure to air pollution by choosing an alternative route with a similar distance. Spatio-temporal exposure patterns (e.g. distance to road and temporal patterns such as diurnal variations, seasonal variations, …) of air pollution during commute are investigated in-depth based on high-resolution air pollution models (nitrogen dioxide, black carbon) and high-resolution trajectory measurements of Black Carbon.

The research also investigates the requirements for adding air pollution model data to routing applications. General model requirements and guidelines for implementation are formulated (e.g. use of seasonal-hourly raster data, equidistant 5-meter-point method to extract values from continuous raster data)

Adding air pollution (model) data to routing programs for cyclists and pedestrians can be beneficial for the health and well-being of these active-road users during commute or recreation. When combined with other useful tools, such as bike-friendliness of roads, routing applications can be very beneficial for the comfort and well-being of cyclists. Through developing a demo application we investigate practical possibilities and limitations to explore the most suitable way to implement air pollution model data maximizing societal benefits.

The availability of air pollution model data as open data can also increase awareness regarding the causes and spatio-temporal patterns of air pollution and this way contribute to realizing smarter and more sustainable cities.

Constraining the aggradation mode of fluvial sequences using forward modelling of $^{10}Be/^{26}Al$ concentration depth profiles

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Keywords: fluvial sediments, aggradation mode, cosmogenic radionuclides, depth profile

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Abstract: The Campine Plateau (CP, NE Belgium) is a low-altitude plateau (100-30 m a.s.l.) made of fluvial deposits and gently dipping towards the north. It is primarily a result of relief inversion due to differential erosion and thus is a prominent geomorphological marker in the European lowlands. Nonetheless, the development (aggradation mode) and post depositional evolution of this erosion resistant fluvial deposit remains poorly constrained. The cosmogenic radionuclide (CRN) technique in general, and depth profiling in particular, has proven useful to constrain the absolute age and average denudation rate of preserved fluvial structures. The objective of this study is to explore the potential of CRN depth profiles to unravel complex aggradation histories, and to determine the duration (and amount of) intra-formational stabilization and erosion phases in the Zutendaal gravels, a major lithostratigraphical unit in the region.

To this end, an in-situ depth-profile was sampled in the Zutendaal gravels at regular intervals, containing 15 ^{10}Be samples and 3 ^{26}Al samples over a sediment column of 7 m. The CRN concentration of the sediments was measured at the AMS facility of ETH-Zurich.

Forward modelling was used to simulate the concentration of ^{10}Be and ^{26}Al over a 100 m depth column at centimeter resolution. The model encompasses three production pathways (spallation, fast muons and negative muons), and predicts the CRN concentration depth profile as a function of time-variable aggradation and erosion, CRN concentration inherited from previous episodes, and total exposure duration. Based on geological evidence, a wide range of scenarios was developed that vary in duration and timing of the aggradation, erosion and steady episodes. The diagnostic scenario parameters for the observed CRN concentrations and their variability with depth in the Zutendaal gravels were determined from optimization of the reduced Chi-squared statistic.

The first results show that a sedimentation hiatus of 30Kyrs to 80kyrs represented by a buried depth profile, is constrained at 5.30m depth, and that another depth profile anomaly exists in the first meter of fluvial sediments, consistently to a significant change in grain size in the profile.

UAV acquired photography and structure from motion (SfM) algorithms in Pix4D to study (small-scale) ice dynamics of the Morteratsch and Pers glacier (Switzerland)

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Keywords: Glacier monitoring, UAV, Ice velocity, Ice dynamics, Climate Change,

Abstract: Glacier variations are key indicators of climate change and are therefore well-studied. Monitoring of glacier activity is mostly based on ground-based measurements and on satellite observations. However, these measurements lack the spatial and/or temporal resolution that is required for accurate interpretations of local and small-scale ice dynamics. Therefore, drones are increasingly used to study glacier dynamics, bridging the gap between direct field observations and satellite images. Here, the usability of unmanned aerial vehicles (UAVs) and structure from motion (SfM) algorithms was assessed to reconstruct high-resolution digital elevation models (DEMs) of the ablation area of the Morteratsch-Pers glacier complex in Switzerland. The drone imagery was acquired from successive campaigns on the glacier between 2014 and 2018. We assessed in detail the accuracy of the DEMs as a function of ground control point (GCP) density, GCP distribution, flight direction, visual content and RTK positioning. We also compared the different reconstructed DEMs with each other and with DEMs created by SwissTopo in 2015 and 1991. We show that annual elevation differences at the front of the Morteratsch glacier reach up to -15 meters and that the Pers glacier thins more rapidly at equal altitude due to its orientation. In addition, the DEM elevation differences were compared with the geodetic method based on a stake network that was annually monitored since 2001. We found a strong agreement between the stake measurements and the reconstructed elevation differences. Subsequently, different glacier features like ogives, moulins, surface melt channels and crevasses were detected and used for feature recognition. This allowed us to calculate surface velocities that appear to be very heterogeneous for the glacier complex. The highest values were found for the upper part of the ablation area of the Morteratsch glacier with ice velocities up to 120 m/year just below a large ice fall. The DEMs and orthophotos with a resolution of 5 centimeters permitted to study the (small-scale) glacier dynamics of one of the largest Alpine glaciers with an unprecedented detail.

Using a citizen science network to study the local climate in Flanders and Brussels.

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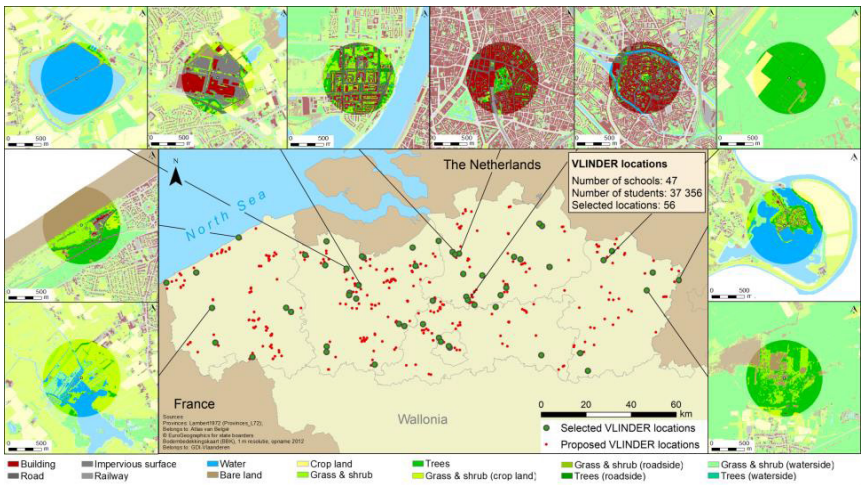
Keywords: local climate; observations; weather stations; citizen science, urban heat island.

Abstract: VLINDER (VLaanderen IN DE weeR) is a citizen science project that will study the impact of the local land cover on weather observations. After a call through regional media channels, 444 locations were proposed by 160 secondary schools over Flanders and Brussels. Out of these locations 56 were retained based on the risk for vandalism, surrounding land cover, diverse environments and proximity of one or more other proposed locations that had a good score based on the previous selection criteria. In October and November 2019 the weather stations will be installed by pupils of the schools that were selected. Events and prepared lessons about weather and climate should increase the involvement of the schools and should make it possible to let students analyze the data of the weather stations in their region.
A first scientific application of the VLINDER network is to study the urban heat island (UHI) effect in cities and villages in Flanders and Brussels. Since the network contains diverse environments (Fig. 1) we can study the effect of local vegetation and urbanization on the weather. These local effects are becoming more and more important in the current evolutions of numerical weather prediction (NWP) models because higher resolutions are reached. The weather stations that are currently used in NWP models are typically located at open rural sites. These observations do not include the impact of the local land cover that is relevant for high resolution NWP models. The VLINDER network could fill this gap.

Fig. 1: Overview of the proposed and selected locations of the VLINDER network and some examples of the diverse environments that the network encompasses.



Optimization of water allocation in Uzbekistan supplied by the Amudarya River

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Keywords: Uzbekistan; Amudarya River; optimization of water allocation; improved ITSP method.

Abstract: Uzbekistan is suffering from a serious water use challenge related to Amudarya River, which threatens the ecosystem seriously (with a well-known example of the Aral Sea catastrophe). Aimed at this mismanagement, this study will provide water-allocation suggestions for the policy-makers on under both the basin and provincial level. The improved ITSP method (an inexact two-stage stochastic programming method), incorporated into the multi-object programming, is applied to generate optimized results under uncertainties and various water-use policies. The result, is shown, whereby the water distribution is expressed by intervals among 5 departments (Irrigation, Livestock, Industry, Municipality, Ecology) and 6 provinces (Kashkadarya, Samarkand, Navoi, Bukhara, Khorezm, Karakalpakstan), under 5 different levels of incoming water and under 3 different targets (considering both the economic and social benefits). The main conclusions are as follows: (1) Maximization of the economic benefit: The allocation would firstly be ensured for the Livestock, Industry and Municipality with deterministic values corresponding to the upper bound, secondly to the Irrigation, and lastly to the Ecology; (2) Maximization of the social benefit: The allocation would firstly be guaranteed for to the Livestock, Industry and Municipality with deterministic values corresponding to the lower bound, secondly to the Irrigation, and finally to the Ecology; (3) Maximization of both the economic benefit and social benefits: The priority order will not change among various departments but the interval values of each province vary according to the change of the weight coefficient.

Analysis of drivers and controlling factors of urban sprawl: theoretical and empirical evidences from Africa's diplomatic capital, Addis Ababa, Ethiopia.

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Keywords: Urban sprawl, drivers, controlling factors, socio-spatial configuration, urban planning, Addis Ababa, Ethiopia

Abstract: In the 21st century, urbanization had a great contributions for helping urban residents to improve their livelihood in various aspects. On the other hand it had also put negative repercussions over millions' life and their environ. Currently, circa 30% of the population in the Global South resides in cities, and this figure is expected to double in 2040. In Ethiopia, Addis Ababa (the seat of African union and world diplomatic community), the rapid urbanization results in both positive and negative societal impacts attributed to appropriate planning. The growth of Addis Ababa is driving the economic growth of the country and offering a better livelihood for many, but on the other hand it is the cause of mobility problems, population displacements, socioeconomic stresses, city pollution and loss of biodiversity. Urban planning is therefore, the major challenge for a sustainable development of Ethiopia in the coming decades. However, at present, there is no reliable information on the extent of urban sprawl, its socioeconomic and physical drivers, and its consequences on the settlement patterns (socio-spatial configuration). Therefore, this study aimed to contribute to this information gap, by (1) mapping the extent of the urban expansion, (2) identifying the major urbanization drivers (3) detection of the socioeconomic and physical controlling factors and (4), mapping of the socio-spatial configuration through urban geologic metaphor. The study has covered different (the imperialist, socialist, and the contemporary globalization) periods of mode of productions. An urbanization theoretical framework resulted from critical review of urbanization theories pertaining to the developing countries context was used to analyze urbanization drivers, and the socio-spatial configuration (1886-2018). Further, this has been supported with empirical evidences through detection the extent of urban dynamics across the respective historical periods. Urban sprawl over the past 4 decades in the study area was detected using the LANDSAT-archives. Retrospective analysis of these time-series was carried out to detect the controlling factors of the urbanization pattern using the logistic regression model. The results depict that government regimes change brought major macro policies in general and urban land policies in particular, along with all the urbanization process mediating factors has caused an urban dynamics across historical periods of time. This has actually altered the patterns of social settlement in a range of geographies at different times (socio-spatial configuration). In additions the qualitative findings were also consistent with the empirical results, which depicts the extent of urban sprawl with in different periods of mode of production.

Slow and too big: quantifying the unhealthy lifestyle of Alpine glaciers

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Keywords: glaciers; Alps; response time; committed loss; global warming

Abstract: Glaciers respond to changing climatic conditions by adapting their geometry. This adaptation is slow and occurs over time scales ranging from years to decades, referred to as the 'glacier response time'. As a consequence of this slow response, most glaciers are too big for present-day climatic conditions and will lose a considerable part of their mass in the future, even for cases without additional warming.

In the literature, various analyses of glacier response time have been performed based on theoretical considerations, by utilizing observed glacier changes, and by relying on numerical model simulations of idealized glacier geometries and individual glaciers. In this contribution, we aim at better characterising the response time of all glaciers in the European Alps through numerical modelling. For this, we use the regional glacier evolution model GloGEMflow, which is a recently developed coupled surface mass balance – ice flow model that was calibrated and extensively evaluated against ground-truth data.

With this regional setup, we examine the glacier characteristics (e.g. length, area, surface slope,…) that best describe the glacier response time by considering the e-folding time scales over which glacier characteristics evolve in numerical steady state simulations. We furthermore analyse the imbalance between the glacier geometry and the climatic conditions ('how unhealthy glaciers are at present'), and examine how this relationship has evolved over the past two decades. To characterise the evolution of the climate-geometry imbalance, we among others consider how the committed loss has recently evolved and determine which climatic forcing is needed for preserving certain glacier characteristics (e.g. its volume) at a given moment in time.

Assessing hydrologic ecosystem services in the Brussels Capital Region

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Keywords: Ecosystem services; urban remote sensing; urban hydrology

Abstract: The projected increase in urban population and global warming will put a high pressure on the ecosystem functions and services provided by urban green infrastructure. Insights into the present-day and future evolution of urban environments and their associated ecosystem functions and services are crucial to move towards more sustainable cities and to improve the quality of life in urban areas. The aim of this research is to assess the hydrologic ecosystem functions and services provided by urban green infrastructure in the Brussels Capital Region, and to gain insights into the future hydrological response of the region under a set of plausible urban development and climate change scenarios. The potential of new generation remote sensing data provided by the combined use of PlanetScope and Sentinel 2 imagery will be investigated with the aim of characterizing at a high spatial and temporal resolution urban land cover and vegetation dynamics. The combined use of multi-temporal high- and medium resolution imagery provides opportunities to better characterise the temporal dynamics of the urban environment but also increases the challenges associated with the presence of shadow. Detailed land cover and vegetation characterization will subsequently be used as input in the distributed and physically based hydrological model WetSpa. A metric-based approach will be applied to estimate various water balance components over the entire region. The latter will be used as a basis for the assessment of the hydrological functions and services provided by urban green infrastructure. Approaches will be investigated in relation to policy relevant evaluation of ecosystem services with explicit consideration of ecosystem services beneficiaries, which is not straight-forward in the case of regulating ecosystem services. Subsequently, (sustainable) urbanisation and climate change scenarios will be developed based on the results of previous studies. The impact of these scenarios on the hydrological response of the Brussels Capital Region and hydrologic ecosystem services will be assessed.

Integrating geomatics in cultural heritage conservation, the case study of Edzna (Mexico)

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Keywords: geomatics; cultural heritage; management; monitoring; detection

Abstract: Cultural heritage is very vulnerable as historical monuments and buildings can be damaged by earthquakes, fires, the weather and human conflicts. This is why it is essential to capture and monitor cultural heritage, in order to protect it from destruction or neglect. Integrating geomatics in heritage conservation has a lot of advantages, because geomatics techniques provide scalable solutions and are non-invasive (i.e. not harming the materials). Because of these benefits, Instituto Nacional de Antropología e Historia (INAH) works together with the department of geography for conservation of cultural heritage in Mexico. The archeological Maya site of Edzna has been 3D-registered during annual campaigns, starting in 2014. During four field campaigns 3D-data of the temples and surrounding forest has been collected, using varies geomatics techniques. The resulting data has been used for three aspects of cultural heritage conservation. First of all cultural heritage management, by visualizing 3D-models on an interactive website of the archeological site. Second of all cultural heritage monitoring, by developing an interactive webviewer which enables the comparison of two 3D-models of different campaigns. And finally cultural heritage detection, by localizing several unexcavated temples in the surrounding forests on imagery taken by multiple sensors mounted on a UAV. The close cooperation with the local archeologists makes this project a good example of a successful integration of geomatics in cultural heritage conservation.

Habitat characteristics for health assessment in Dakar, Senegal

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Keywords: Dakar; health risks; census data

Abstract: Population and health status are both critically determined by standard of living. Urban dwellers with higher standard of living enjoy better health and live in formal settlements whilst urban poor with lower standard of living are health disadvantaged and live in slums. Habitat characteristics are useful for assessing household's standard of living. Mortality is also an objective measurable indicator of the relative health status and mortality levels are undoubtedly affected by differences in living conditions. Using census and remote sensing data, this study characterized habitat in Dakar and its impacts on health. A neighborhood typology was carried out based on household's occupancy status, building materials type and households goods. This typology also includes health risk factors such as access to sanitation and safe water source, proximity of wetlands like natural vegetation and agricultural areas. It opposes well – equipped neighborhoods, whose houses are built with solid materials, to neighborhoods' homeowners with poor sanitation and lack of comfort. A hierarchical clustering then identified four neighborhood profiles, ranging from spontaneous housing to planned residential neighborhoods. Mortality differences are very significant between neighborhood profiles. And the incidence of crude death rate is lower in residential planned neighborhoods. Socio – economic and environmental factors are important determinants of geographical distribution of mortality in Dakar. Because variations of mortality across space are driven by variations of neighbourhood characteristics, public health policies must necessarily rely on residential area characteristics to ensure efficient and reality-based health planning.

Removal of Tides and Inverse Barometer Effect Component for Ice-Shelves Horizontal Velocity Estimation

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Keywords: DInSAR; Tides; Inverse Barometer Effect; Ice Shelves.

Abstract: Ice shelves are key drivers of the Antarctic ice sheet. Thanks to their buttressing effect, they are controlling the upward ice flow and *in fine* the ice dynamics. Studying these ice shelves requires to precisely estimates their velocity. In that sense, SAR techniques such as pixel offset tracking (PO) and differential SAR interferometry (DInSAR) proved to bring valuable information.

Whenever you are using DInSAR or PO to estimate displacements, these movements are computed in the line of sight of the satellite. Because SAR sensors are side-looking, the displacements are thus obtained in an oblique direction. Without any prior knowledge, we cannot distinguish the contribution of vertical and horizontal displacements. Since we are mostly interesting in the motion of ice, we desire to obtain the horizontal velocity. The vertical component of ice-shelves displacements is rather related to short-term vertical variations of the sea level, related to tides and changes in the atmospheric pressure (IBE). This vertical bias has a significant effect on the estimation of horizontal surface velocity on the ice-shelf.

Using regional climate (MAR) and tides models (Padman), we managed to remove tides and IBE component or ice-shelves horizontal velocity estimation.

STORISSTRAUMEN GLACIER, SVALBARD - UNDERNEATH THE SURGE

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Keywords: glacial surge, crevasse, basal water, Svalbard

Abstract: Storisstraumen Glacier in Austfonna ice-cap, Svalbard has been accelerating since the mid-1990s. Step-wise multiannual acceleration associated with seasonal summer speed-up events was observed before the outlet entered the basin-wide surge in autumn 2012. Multiple numerical models are used to explore hydrologic activation mechanisms for the surge behavior (sudden acceleration) in this study.

The results support a hydrothermodynamic feedback to summer melt to explain the seasonal speed-up in Basin 3 and the initiation of the acceleration of the southern flow unit in 2012. We propose that basal meltwater production caused the speed up from the quiescent phase of Storisstraumen Glacier during the last part of the 20th century and early 21st century. Then, the hydrothermodynamic feedback initiated during 2011 or early 2012 caused the activation of the southern flow unit and the expansion of the surge across the entire basin.

The Tourism-Peace Nexus.

Analyzing tourism and peacebuilding processes from a spatial perspective.

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Keywords: Peacebuilding; tourism; territoriality; local agency; post-conflict.

Abstract: Tourism has been more recently presented as a contributor to peace. Critics rightly argue that research on the tourism conflict-nexus has been mostly exploratory, and a causal relationship between tourism and peace has still not been proved. And yet, neither has it been disproved.

The present thesis proposes to analyze tourism development and peacebuilding processes from a spatial perspective, opening a dialogue between tourism studies, political science and human geography. It aims to contribute with a spatial approach to the field of conflict and peace research by studying local agency and spatial production. It gives particular attention to how different local agents relate to, interpret and transform the territory where they operate and how, in turn, these spatial configurations might influence broader peacebuilding processes.

The focus is given to the actors of the private tourism sector who operate in Montes de Maria, a Colombian region that has been for decades the scenario of the most severe violence derived from the internal armed conflict and that now is opening its doors to tourists. The specific question that wants to answer this research is how the different actors of the private sector relate to and transform spaces of conflict into spaces of tourism, and to what extent these new territorial configurations influence broader peacebuilding processes. Priority is given to ethnographic research methods such as participant observation, semi-structured interviews and focus-group discussions.

The central thesis posits that the way in which space is organized matters to peacebuilding, as it may enable or constraint agency of different actors. Certain spatial configuration can influence mobility patterns, can shape people's emotions and memories, can help to remember or to forget, can create or reinforce power relations, and can include or exclude individuals or groups within certain geographic borders, allowing them to interact or not. Thus, the thesis proposes geography as a science than can contribute not only to the understanding of conflict but also to the understanding of peace, with the power of producing knowledge that can drive social change in war-torn societies.

Impacts of land use/cover change on regional climate: a case study in Aral Sea Basin

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Keywords: Land use/cover change; Aral Sea Basin; regional climate; ALARO-SURFEX.

Abstract: The human-induced desiccation of the Aral Sea has posed a great threaten to regional local environment and human health. Assessing the impacts of such land use/cover change on regional climate is essential understanding land-atmosphere interaction and for designing climate adaption and mitigation strategies. Summer climate of arid region is characterized by strong interactions between the atmosphere and land surface. Therefore, we recommend to use actual land surface parameters with downscaling approach of daily reinitialized atmosphere while the land surface kept continuous to run regional climate model ALARO coupled to land surface scheme SURFEX at 4km resolution, which can improve ability to accurately simulate weather and climate conditions in central Asia. We simulate climate condition of Aral Sea basin from 1980 to 2015 with two land cover scenarios to examined the impacts of land use/cover changes on regional climate. One simulation used the constant land cover in 1970s, the other used 1970s, 2005 and 2015 land cover to represent the surface condition of 1980-1995, 1996-2008 and 2009-2015,respectively. Our simulations show that in the region of exposed dry bottom of Aral Sea led to local summer daily minimum temperature reduce 0.87±0.63℃, increase the daily maximum and mean temperature and daily temperature range in magnitude of 2.37±1.01℃,0.94±0.56℃, 3.14±1.3℃, respectively. Desiccation of Aral Sea led decrease in summer total precipitation with an average value of 2.97±1.54mm in east region of Aral Sea. Shrinking of this water surface has a greater effect on summer convective precipitation which accounts for 88% of total precipitation. Our findings demonstrate that land cover change in Aral Sea Basin has alternated the regional climate over the past 36 years. The magnitude and spatial distribution of temperature and precipitation changes quantified by our simulations provide useful information for understanding the impacts of land cover change on regional climate and for developing mitigation and adaption strategies in arid and semiarid regions.

Holocene alluvial peatland dynamics in Flanders, Belgium

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Keywords: Holocene, Flanders, floodplain, peatland, palaeoenvironment

Abstract: Rivers and alluvial floodplains are dynamic environments that experience natural and anthropogenic impacts. Most floodplains in NW Europe were stable environments with limited floodplain aggradation during the Early and Middle Holocene. This resulted in marshy areas where peat accumulated and river channels were absent or small. During the Late Holocene, these areas changed towards single channel meandering rivers with overbank deposits, and peat accumulation ceased. Although this general framework of Holocene alluvial peatland evolution has been well established in previous research, it is still uncertain how these peatlands are controlled by internal and external drivers (such as topography, climate and human impact) and how the initiation date, growth rate and end date of peat growth are influenced by these drivers. However, a thorough understanding of the functioning of floodplains and their sensitivity to changes in these drivers is needed for sustainable management of these ecosystems.

Based on their varying characteristics regarding soil properties, topography, and duration and intensity of human impact, four river catchments in Flanders were selected for this study. The Dijle catchment (750 km²) is located in the central Belgian loess belt, the Mombeek catchment (90 km²) in the sandy loam region, and the Grote Nete (525 km²) and Zwarte Beek catchments (50 km²) are both located in the sandy Campine region. To reconstruct peatland evolution and changes in external drivers, a multi-proxy approach, including sedimentological proxies, pollen, macrobotanical remains and testate amoebae was conducted. A database containing 179 radiocarbon dates of the four catchments was used to provide a chronostratigraphic framework.

Radiocarbon dating results show that alluvial peat growth started at the beginning of the Holocene. End dates are highly variable both within and between different catchments, ranging from 6000 cal. BP to present-day. This variability can be explained by differences in floodplain connectivity and local differences in initiation and intensity of anthropogenic impact in the catchment. Peat accumulation rates are controlled by local variations though.

Overall, this study clearly illustrates that a multi-study site and multi-proxy approach are needed to completely understand the Holocene evolution of alluvial peatlands and all driving forces involved.

The Dogu'a Tembien geo-trekking map at 1:50,000 (Tigray, Ethiopia)

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Keywords: geotourism; rock churches; viewpoints; geosites; birdwatching.

Abstract: The importance of Dogu'a Tembien in North Ethiopia for geotourism and its mountainous character warrant the elaboration of a geo-trekking map at a scale of 1:50,000. This map will contribute to (a) a better understanding of the spatial relations between lithology, topography, geomorphology, land use, natural vegetation and human activities, (b) location of geosites, geomorphosites, bird watching sites, (c) facilitating access to geosites, and (d) the overall development of the district through touristic activities.
The geo-trekking map (1189 mm wide and 841 mm high, or A0 size) was prepared from intensive fieldwork campaigns as well as remote sensing analysis, and constructed in a GIS environment (Esri ArcGIS 10.4). For the spatial analyses the ArcToolbox was extensively used, while for conducting the supervised classification of the Landsat images the ArcGIS Image Analyst extension was used. Numerous factual inputs were provided by local residents; Amaury Frankl and Ronald Ykema strongly contributed to fine-tuning the graphic quality.
It is recommended to use the map in conjunction with: Nyssen, J., Jacob, M., Frankl, A. (eds.), 2019. "Geo-Trekking in Ethiopia's Tropical Mountains, the Dogu'a Tembien District". Springer GeoGuide. Map users will particularly consider the Chapter on "Logistics for the trekker and trek descriptions".

The map has been published as:
Jacob, M., Nyssen, J., 2019. Dogu'a Tembien geo-trekking map at 1:50,000. In: Nyssen, J., Jacob, M., Frankl, A. (eds), Geo-Trekking in Ethiopia's Tropical Mountains, the Dogu'a Tembien District. Springer GeoGuide. ISBN 978-3-030-04954-6

Comparing Airborne LiDAR and Multibeam Echo Sounding on Different Beach Types – a Case Study for the Belgian Coast

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Keywords: coastal mapping; Belgian beach; airborne LiDAR, multibeam; shallow water

Abstract: With sea level rise, climate change and increasing coastal populations, it has become essential to have a good understanding of coastal morphodynamics. Modelling beach dynamics is commonly done through digital surface modelling, requiring accurate and high resolution spatial data. Many topographic measurement methods are available to do so, but not all are eligible for modelling the beach. Since the early 2000s, the entire Belgian shoreline has been mapped on a bi-annual basis using non-acoustic airborne LiDAR. With vertical accuracy of decimeter-order and a spatial resolution of 10 cm, including the capability of shallow-water seabed modelling, airborne LiDAR has proven to be an effective technique for coastal data acquisition. While LiDAR beach surveys take place at low-tide, high-tide conditions offer the possibility of performing acoustic multibeam in the same intertidal zone, yielding vertical accuracies of ca. 20 cm at a point density of > 100 points/m². Even if the aforementioned altimetric accuracies are generally agreed upon, the effect of local beach topography needs to be studied further. In this case study, two different beach types were considered. One is a 400 m wide artificial beach in Ostend (Belgium), characterized by a groin field, seawall and an average slope of 2%. Another is a 600 m wide natural beach in Oostduinkerke (Belgium) with intertidal bars and runnels, sloping at 1%. Both beaches are situated in a macro tidal regime. This study aimed to examine differences in altimetry on different beach types between simultaneous LiDAR and multibeam surveys. The data showed there is a mean vertical difference between both techniques of (7.7 ± 5.1) cm on the artificial beach and a mean difference of (8.9 ± 2.1) cm on the natural beach. A possible reason for the larger difference between the two techniques on the natural beach is the existence of inundated runnels which prevent the airborne LiDAR to measure the real beach surface. It is noteworthy that there are higher waves in the surf zone of the artificial beach due to the comparatively steep terrain. In the zone around the submerged groins, waves break earlier. This could influence the multibeam vessel's calibration Euler angles, increasing the standard deviation of difference between the two techniques. In conclusion, the vertical difference of two techniques used in this study is very close for surveying artificial and natural beaches. Airborne LiDAR is a more suited technique to accurately measure the terrain on the artificial beach with steeper waves.

Eye tracking, electroencephalogram and sketch maps to study spatial memory abilities of map users

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Keywords: cartography, eye tracking, EEG, spatial cognition, experimental design.

Abstract: This study deals with the cartographic user experiment design employing sketch maps, eye tracking (ET) and electroencephalogram (EEG) (as data collection methods) in collaboration for spatial memory tasks on maps. In this context, we introduce two user experiments both aiming to explore the (cognitive) strategies of expert and novice map users through cognitive load measurements when they are asked to memorize and then remember a (part of) map content with varying levels of complexity. Both experiments involved simultaneous and synchronized data recording of ET and EEG. The first experiment consists of single trials but of long recordings due to the absence of time constraints and free-hand drawing part in each trial. Next to the evaluation of the drawn elements in the sketch maps and their drawing order, fixation related and AOI-based eye tracking metrics were analyzed mostly to explore participants' recalling strategies. To extract the cognitive load from EEG data, we averaged alpha power, which is inversely proportional to the cognitive load, for all recording channels, and calculated Frontal Alpha Asymmetry (FAA), an indicator of memory & attentional performance, more or less focused task performance. Overall, we observed no statistically significant difference between two groups regarding to the sketch evaluation, ET and EEG metrics of interest. Certain limitations in the design of the first experiment and the technical capability of the recording system (e.g. synchronization accuracy of ET and EEG, temporal resolution of EEG device, etc.) led us to conduct a second experiment that was organized in a more structured way. We increased the number of stimuli of interest and the reference stimuli (e.g. fixation cross), presented them as randomized blocks, added more levels of task difficulty, put time constraints, allowed participants to select from multiple choices instead of drawing themselves. Cognitive load was extracted from behavioral data (reaction times, correct answers), ET data (i.e. number of fixations per second, average fixation duration, EEG data (i.e. spectral power changes at alpha and theta frequency bands. When cognitive processing occurs, an increase in theta power (i.e. event-related synchronization), and a decrease in alpha (i.e. event-related synchronization) are observed. Since it is an on-going research, some preliminary results will be presented.

Spatial and financial simulation of the ban on land consumption in the Flemish Region (Betonstop), 2020-2040

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Keywords: land consumption; plan compensation; property valuation; GIS.

Abstract: In the context of its spatial policy, the Flemish Government has proposed the principle of land neutrality by 2040. Specifically, the Government has formulated the ambiguous objective to gradually reduce the daily land take by our modern society to 0 ha by 2040. This stand-still in additional land consumption is also called 'Betonstop' in Dutch, which literally refers to the ban of (new) concrete in open space. In order to be able to realize this space neutrality in more specific terms, an absolute reduction of land take is required, where it currently amounts to 6 ha per day. This implies a gradual reduction of legally recognized building plots on greenfields, especially when these plots are unused or superfluous. Within the framework of the legal recognition of these plots, it is expected that this neutralization will entail considerable claims for plan compensation.

Although studies have been carried out on this topic by the government and research institutes, this research focuses mainly on the current situation and the negative effects of the Flemish disorder. To date, no spatial, nor financial models exists, covering for the transition on the level of an individual plot. However, the wide range of the estimated cost, from 13 to 31 billion euros, jeopardizes the feasibility of and the support for this policy. These figures heavily endanger the feasibility of and the support for this policy.

Testing the practical feasibility of land neutrality requires a high level of detail in terms of spatial impact and financial implications. More in-depth research will be used to deduce which areas should no longer be used or reserved for new constructions, how much financial compensation should be considered for these parcels.

With this project, the authors want to test the principle of land neutrality in time phases between 2020 and 2040 and to coordinate spatial desirability and financial feasibility. The first results of this research indicate the large potential of spatial analysis in GIS for the simulation of this challenge.

Using meteoric ^{10}Be isotopes to constrain rock weathering and erosion along a climo-lithosequence in the Galapagos Archipelago, Ecuador.

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Keywords: Geomorphology, Volcanic soils, ^{10}Be isotopes, climate, lithology

Abstract: Understanding soil processes is important for soil survey, ecological and biogeochemical modelling, agronomy, soil fertility and land-use management. At the Earth's surface, mechanical disaggregation and chemical weathering transform bedrock into saprolite and soil. Understanding the spatial variation of rock-derived weathering products across heterogeneous landscapes is important to constrain those processes. Cosmogenic radionuclides are increasingly being used to constrain soil processes and erosion at timescales of 1000 to 100.000 years. Despite its large potential for soilscape studies, the use of meteoric ^{10}Be in volcanic soils is not yet well constrained. The potential use of this isotope is limited by a lack of information on the tracer translocation during weathering processes. Furthermore, there are few quantitative field-based studies that isolated the effect of climate or lithology on soil geochemistry. Therefore the objective of this project is twofold: (1) to test the use of meteoric ^{10}Beryllium isotopes as a tracer of pedogenetic processes in volcanic materials and (2) to gain insight in the climatic and lithological control on weathering and soil losses by erosion in volcanic soils at long time scale (> 1000 years). Santa Cruz Island, Galapagos, will be at the core of this project, where soilscapes along a climo-lithosequence will be studied.

Supply-demand-benefit interactions and social inequalities in cultural ecosystem service assessment: the case of public green spaces in Brussels

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Keywords: Cultural ecosystem services; urban green spaces; nature based solutions

Abstract: Green infrastructure and the ecosystem services it supplies heighten urban resilience to pressures related to demographic growth and environmental change. Much research has focused on assessing the supply and monetary valuation of provisioning and regulating ecosystem services. Cultural ecosystem services have been studied to a lesser extent, though they are essential for understanding the relationship between urban green and human well-being. The interactions between supply, demand, and benefits of cultural ecosystem services for urban citizens are complex and depend on multiple factors, including physical characteristics and housing conditions in the neighbourhood of residence, as well as the size, layout and amenities of public green spaces that are within reach. Adding to this complexity are the social practices and cultural context in which urban citizens use, experience, and value their contact with nature. It is through this unique lens that the individual perceives and assigns value to green space. Although challenging, it is critical for sustainable urban design and planning that the non-monetary value of urban green spaces is understood. This knowledge is useful for designing urban spaces that are able to fulfil the diversity of demands for urban green and its related benefits. This research will therefore focus on deepening our understanding of the complex relationships between ecosystem service supply and benefits and how this relationship is mediated by social inequalities, and people's use, perception, and valuation of urban green spaces. Online and on-site surveys will be implemented in the Brussels Capital Region to determine how different socio-cultural groups use large and small urban green spaces, what they like and dislike about these spaces, whether these spaces fulfil their needs for urban green, and if there are conflicts of use in these green spaces. Insights from the survey will be combined with a typology of the physical and social characteristics of the urban landscape to define which nature-based solutions are needed in Brussels and where these interventions would be most beneficial.

Does e-shopping attenuate the association between the built environment and shopping travel distance and duration? a focus on shopping behavior for intangible services

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Keywords: built environment; e-shopping behavior; intangible services; shopping travel distance; shopping travel duration.

Abstract: It is rather evident that geographic context has relevant effects on travel distances and durations in traditional circumstance. In the information era, e-shopping has been widely used, resulting in changes in shopping travel distances and durations. In this context, an interesting question of whether the association between the built environment and shopping travel distances and durations is attenuated by online shopping need to be addressed. Using data drawn from 714 valid face-to-face interviews in Beijing, China, and focusing on e-shopping behavior for intangible services (e.g., leisure services, eating out services), this study aims to answer this question. Results show that, due to e-shopping for intangible services, the role of the built environment (indicated by urban forms) in the average distance and duration per single shopping trip (i.e., from origin to destination) becomes weaker to a significant extent, even though other factors such as socio-demographics, internet experiences, and e-shopping frequency are controlled for. Therefore, urban planners and policy-makers need to rethink the role of the built environment in shopping travel behavior. The land-use policy (e.g., redesigning urban form) aiming to reduce non-active shopping travel, fuel consumption, and emissions may not be an effective strategy in the path toward a sustainable society as before.

Beyond financial incentives to foster enduring forest conservation. Lessons learned from the San Martin case-study in the Peruvian Amazon

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Keywords: Climate Change, Forest Conservation, Well-being, Payment for Ecosystem Services

Abstract: Forests are widely recognised as an effective measure for mitigating climate change. Their conservation both avoids additional carbon dioxide emissions and enhances carbon storage capacity. As a result, more funds are directed towards forest conservation efforts with the establishment of the UN-REDD program as ultimate example. An increasingly popular practice for these forest conservation efforts is the Payment for Ecosystem Services (PES) scheme. In such schemes, ecosystem service providers are remunerated by those who benefit from these services. The financial incentive is thereby supposed to guide local land-use behaviour towards activities compatible with forest conservation. The PES-paradigm however is not undisputed. It is unrealistic to assume that PES-schemes and the associated financial incentives will go on eternally. Once land-users no longer receive financial incentives, they might revert to their former deforesting land-use practices. A narrow financial approach to stimulate conservation-friendly land-use behaviour has therefore no lasting impact on forest conservation. Hence, this paper argues that the design of PES-schemes should incorporate initiatives that continue to stimulate participants' conservation behaviour, even after the scheme has been formally concluded. A potent driver for human behaviour is the pursuit of well-being. Connecting well-being to forest conservation is therefore key to establish enduring conservation behaviour. Well-being has an obvious material and economic component, yet its social and psychological component is often overlooked. To include both components of well-being in the analysis, a theoretical framework was established that combines the political ecology approach of Blaikie (1985) and the social-psychology approach proposed by Ezzine-de-Blas et al. (2019) to describe the relation between the political economic context, livelihood, socio-psychological satisfaction and land-use. The framework was applied to the case of the indigenous communities of Chunchiwi and Chiriyacu in the Peruvian region of San Martin, who are involved in a specific PES-program called *Transferencias Directas Condicionadas* (TDC). From the analysis of the experiences of these indigenous land-users with the TDC program, social and environmental relatedness emerged as key determinants for establishing a link between well-being and forest conservation. The fit of the program's initiatives with the social and landscape characteristics of the local context therefore contributes to the endurance of land-users' forest conservation behaviour after the financial incentives have been concluded.

Implementation of Basal Hydrology in a 3D model of the Greenland Ice Sheet

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Keywords: Greenland ice sheet, basal hydrology, outlet glacier variability

Abstract: Subglacial hydrology plays an important role in the evolution of ice dynamics related to basal processes such as basal sliding. Knowledge of it is therefore crucial towards the development and improvement of ice sheet models. We implement a model representing the routing of subglacial water below the Greenland ice sheet. Subglacial water is routed in all eight possible directions. Due to its computational efficiency, the model is suited for coupling with continental scale ice sheet models on very high resolutions (e.g. 150 m). We conduct a synthetic sensitivity analysis of the resolution in terms of outgoing subglacial freshwater fluxes and prove that the resolution can have an impact on subglacial hydrological pathways. We demonstrate that the main assumption of a laminar water flow may not hold well on high resolutions if the gradients are only considered over the distance of a single grid cell. We overcome this by incorporating a smoothing procedure. With the basal water model in place and input of the basal melt rate from the Greenland Ice Sheet Model (GISM) as well as runoff input from the Modèle Athmospherique Régional (MAR), we calculate the inflow of freshwater to several reference fjords for the last thirty years and investigate the temporal and spatial patterns. Jakobshavn Isbrae experiences by far the most freshwater inflow compared to the other reference fjords. Despite limited runoff in the north-east of Greenland, high basal melt rates and a significant catchment area provide the outlets of the North-Eastern Greenland Ice Stream (NEGIS) with substantial inflow too. Further, we discuss the existence of potential subglacial lakes and their context within subglacial pathways. We expose that these potential lakes form an integral part of the subglacial hydrology on Greenland and conclude that they may be one of the driving forces behind the variability and unpredictability of ice stream velocities due to consecutive drainage and accumulation events.

Beach Runnel Volumetrics using Mobile Terrestrial LiDAR: Case Study of the Groenendijk Beach (Koksijde, Belgium)

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Keywords: kinematic terrestrial laser scanning; intertidal runnels; Belgian beach; volume measurements; altimetric accuracy

Abstract:
In 2011, the Flemish Government implemented the Master Plan for Coastal Safety to define the measures required for a sufficient protection of the Belgian coast against a 1000-year storm surge. Sustainable management of the coast requires precise modelling of the natural processes and the effects resulting from human measures. Determining volumes of sediment added or removed from specific parts of the coastal system is an accepted practice to examine beach behaviour and changes in coastal landforms. This requires accurate 3D spatial data of the terrain. It is widely recognised that mobile terrestrial LiDAR (MTL) is a go-to technique for mapping the beach with vertical accuracies in the order of a few centimetres. However, some parts of these beaches face difficulties in mapping because of local topographic anomalies. Inundated beach gullies or runnels are dynamic, ever-changing phenomena and are inherent to the topography of some natural beaches along the Belgian coast. Airborne LiDAR bathymetry (ALB) or multibeam echo sounding (MBES) have proven to be effective decimeter-accurate techniques when mapping the intertidal zone including its shallow-water runnels, but come at a high cost. This research assessed the extent to which MTL offers an accurate alternative for mapping shallow-water beach runnels. As a case study, the depth of several intertidal runnels on the natural beach of Groenendijk were measured. The study examined differences in both altimetry and volumes, using sample MTL data and a comparison group of total station measurements. Vertical differences were determined using the Hausdorff distance, while volumes were calculated by means of Simpson's rule. We find a vertical accuracy of (–3.1 ± 4.6) cm when comparing LiDAR to total station reference measurements. The volume calculations reveal a difference in runnel volumes between both techniques of 5.6% or 0.010 m^3/m^2. This seems to indicate that beach modelling with mobile LiDAR in shallow-water runnels is not as accurate as on the dry beach surface. However, MTL yields overall better results than ALB or MBES for shallow-water surveying.

Ice thickness, volume and subglacial relief of Kara-Batkak and Bordu glacier (Western Tien Shan - Kyrgyzstan) derived from GPR measurements

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Keywords: Glacier monitoring, Ice volume, Kyrgyzstan, Climate Change, Water availability

Abstract: Glaciers in the western Tien Shan (Kyrgyzstan - Central-Asia) contribute a considerable part of the freshwater used for irrigation and households in the dry lowland areas of Kyrgyzstan and its neighboring countries. Since the Little Ice Age, the total ice mass in this region has been decreasing significantly. However, accurate measurements of the current ice volume and ice thickness distribution in the western Tien Shan remain scarce, especially at the local scale. In 2016 and 2017, 1-month field campaigns were organized to sound the ice thickness of the Kara-Batkak and Bordu glacier with a Mala ground penetrating radar (GPR) system. We interpolated the GPR measurements using two different methods to obtain the ice thickness distribution and the ice volume of the entire glaciers. We showed that the ice thickness of the Bordu glacier reaches more than 120 meters along the central flowline with a total volume of approximately 0.3 km^3. We found for Kara-Batkak a slightly thinner ice thickness with a maximum of 100 meters and volume of almost 0.1 km^3. The outlines of the two glaciers derived from the Randolph Glacier Inventory (RGI) were updated using drone photography and satellite images. We obtained bed topography from subtracting ice thickness from an up-to-date Digital Elevation Model (DEM) derived from drone imagery and SRTM data. The reconstructed ice thickness distribution of the two glaciers was subsequently compared with different approaching techniques that are based on the mass balance gradient or surface characteristics and do not require ice thickness measurements. With this project, we obtained a better understanding of the quality of the approximation methods to derive ice volumes without measurements which guides us to optimize these techniques to better predict the total amount of glacier ice in the entire western Tien Shan mountains.

Modeling the evolution of Djankuat glacier, Caucasus, Russian Federation from 1752 until 2100 AD

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Keywords: glacier, climate change, modeling.

Abstract: We modelled the past and future evolution of Djankuat glacier, a northwest-facing temperate valley glacier near the border of the Russian Federation and Georgia, which has been selected as a 'reference glacier' for the Caucasus region by the WGMS. A 1.5D coupled ice flow-mass balance model was constructed and calibrated to simulate its past evolution since 1752 AD. The model is forced by reconstructed temperature and precipitation data from surrounding meteorological stations and proxy data. Future projections under different RCP scenarios were carried out until 2100 AD. Supraglacial debris cover was included as well as it influences the glacier evolution depending on its thickness, properties and spatial/temporal distribution. The main results show that, since 1752 AD, the Djankuat glacier has lost a surface area of 1.5 km², while it retreated by 1.5 km until 2017. Some minor stabilization and/or readvancements of the glacier have occurred, but the general trend shows an almost continuous retreat since the 1850s. Future projections exhibit a further decline of the glacier, even under constant present-day climatic conditions. The presence of an increasingly widespread supraglacial debris cover is shown to significantly delay glacier retreat, depending on the future climatic conditions, debris input location, debris flux magnitude and the time of release of the debris source from the surrounding topography.

Simulating vapor and energy fluxes in a typical oasis agroecosystem with drip irrigation under plastic mulch in China

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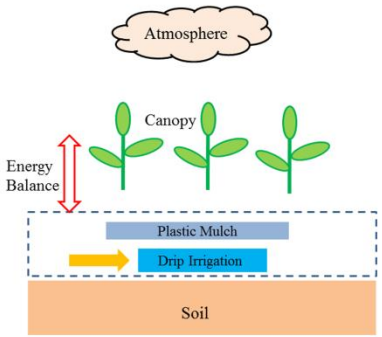
Keywords: oasis agroecosystem; agricultural practice; drip irrigation.

Abstract: Oasis agroecosystems have expanded rapidly since the 21st century to support rapid population growth and economic development in the extensive arid regions of northwest China. In order to improve the efficiency of water usage, drip irrigation under plastic mulch is widely implemented in such agroecosystems by suppressing soil evaporation, which has also obviously altered land characteristics and, thus, altered the partitioning of vapor and energy between the surface and the atmosphere. Today, these physical processes generated by this kind of agricultural management have not been considered comprehensively in land surface models. In this study, a drip irrigation scheme and a plastic mulch module were incorporated into the Common Land Model (CoLM) to examine their influences on vapor (evapotranspiration) and energy fluxes. Our results show that two irrigation factors, the irrigation timing and amount, have high potential in affecting CoLM outputs. After a calibration of above irrigation parameters, the revised CoLM with an added irrigation module produced a better simulation of evapotranspiration than the default one. However, large uncertainties still exist that fluctuation in simulated evapotranspiration is substantial at a daily scale, without considering the impact of plastic mulch. Expectedly, incorporating the mulch module improved the CoLM performance in simulating both vapor and energy fluxes. Plastic mulch reduced net radiation and sensible and latent heat fluxes, and it suppressed ground heat fluxes during the daytime and improved ground heat fluxes during the nighttime. Our results indicate that the agricultural practice, drip irrigation under plastic mulch, should be implemented into CoLM and other land surface models for studying vapor and energy fluxes in oasis agroecosystems or other similar dry agricultural ecosystems.



The soil-mulch-vegetation-atmosphere system in Oasis