„THE GRAND CHALLENGES" IN DER GEOGRAPHIE

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BOOK OF ABSTRACTS

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Institut für Geographie und Regionalforschung, Universität Wien

Universitätsstraße 7, 1010 Wien

Organisationsteam   *Ronald Pöppl, Stephan Glatzel, Christiane Hintermann, Alois Humer, Ourania Kounadi, Kerstin Krellenberg*

Kontakt   *geowerkstatt2022@univie.ac.at*

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Pamela Baur (University of Vienna)
Thomas Zechmeister (Land Burgenland)
Andreas Maier (University of Vienna)
Stephan Glatzel (University of Vienna)
pamela.baur@univie.ac.at

Wetlands dominated with reed (Phragmites australis) can store carbon due to photosynthetic assimilation of carbon dioxide (CO_2) and sequestration of organic matter produced in the wetland soil or release it by emission of sediment-produced methane (CH_4). On an annual timescale about 15 % of the net carbon fixed by wetlands may be released to the atmosphere as CH_4. However, little is known about the contribution of central European reed belts as a source of greenhouse gases (GHG) in the course of a changing climate.

Lake Neusiedl is the westernmost steppe lake of Europe (approx. 320 km²) with no natural outflow. It is a saline and very shallow lake with water levels of maximal 1.5 m. Due to its shallowness, the lake is very sensitive to climate variations. The reed belt takes up about half of the lake area and represents the second largest coherent reed population in Europe after the Danube delta.

We use the eddy covariance (EC) technique to quantify continuously the vertical turbulent GHG exchange of H_2O, CO_2 or CH_4 between the reed belt and atmosphere. The EC observation are conducted since summer 2018.

We quantify the seasonal variations of CO_2 and CH_4 fluxes, evaluate the underlying factors being responsible for these variations and examine the differences in diurnal pattern. We also investigate the current ongoing drought periods (higher frequency, longer duration) on the carbon and water fluxes/balances of the reed belt.

2. BEYOND EAST AND WEST – A FRAMEWORK FOR RESEARCHING AND COMMUNICATING HISTORICAL LANDSCAPES

Markus Breier (University of Vienna)
Lukas Neugebauer (University of Vienna)
Karel Kriz (University of Vienna)
Alexander Pucher (University of Vienna)
markus.breier@univie.ac.at

The Project "Beyond East and West: Geocommunicating the Sacred Landscapes of "Duklja" and "Raška" through Space and Time (11th-14th Cent.)" attempts to recreate and communicate the sacred landscape during a time of transition and transformation. The interdisciplinary

project incorporates multiple media, like maps, images, and 3D models. The study area of the project is situated at the junction between the Dinaric mountain range and the coastal region of the Adriatic Sea. Historically, the region was shaped by the power struggle between Byzantium, the First Bulgarian Empire, and the Serbian Realm. Ecclesiastically, it was a zone of interaction as well as encounter between Rome and Constantinople. The aim of the project is to discover and visualise the spatial and temporal aspects of these encounters and transformation processes.

To communicate the historical sacred landscape, a map-centred online application is used as a hub. To explore the relations between places, events, actors and artefacts, the users can follow the links between the entities. Content created during this project is more than points, lines or polygons which can be displayed on a map. Many objects are complemented with images, and for selected churches 3D models using aerial images captured by UAVs will be created. "Story Maps" are created for selected core research topics to provide an easily accessible starting point for users. The broader aim beyond the current research project is to provide a flexible framework, which can serve as a platform for similar research projects in historical geography and digital humanities.

3. UNDERSTANDING GEOMORPHOLOGICAL CHANGES OF CASCADING HAZARDS TRIGGERED BY TROPICAL STORMS IN MOUNTAIN REGIONS. A CASE STUDY FROM THE SIERRA DE LAS MINAS, GUATEMALA.

Yenny Alejandra Jiménez Donato (University of Vienna)
alejandra.donato@univie.ac.at

Tropical regions are the most prone regions to natural hazards and cascading disasters. The geographical and geological conditions of these regions, along with intense rainfall, high rates of weathering, environmental degradation, and global warming, contribute to the increasing impact of hydro-meteorological hazards. More frequent and intense events reduce the time of recovery and therefore, introduce new risk factors that can exacerbate existing vulnerabilities. The analysis of natural hazards in tropical regions faces several challenges, such as the lack of baseline data, which prevents the implementation of adequate disaster risk reduction measures. Here we combine multiple sources of data and approaches, such as remote sensing, field data acquisition, and physical modelling to understand the impacts of coupled-landslide flood events in the Sierra de las Minas. The Sierra de las Minas is a very complex region due to coalescing events such as hurricanes, earthquakes, land mass movements, and floods. The impact of Hurricane Mitch in 1998 is used as a reference to understand the frequency and magnitude of these types of cascading hazards, the triggering factors, and the multi-hazard dynamics. The results are subsequently compared with a more recent event, the Hurricanes Eta/Iota in 2020. This analysis aims to improve the understanding of these complex hazards in tropical regions and to strengthen the development and implementation of appropriate disaster risk reduction in rural communities.

4. COVID-19'S INFLUENCE ON IM/MOBILITY ASPIRATIONS OF STUDENTS AND YOUNG ACADEMICS

Elisabeth Gruber (Friedrich Alexander University)
elisabeth.eg.gruber@fau.de

Students in higher education represent a group with a high probability to become mobile. First, students very often need to migrate (internally) to be able to attend universities. Further, mobility programmes and mobility imperatives lead to a higher tendency to become also internationally mobile. During the COVID-19 pandemic student's mobilities were widely stopped, at least temporarily due to lockdowns, restricted (international) migration, and partly even paused funding for international programmes. With online teaching widely available, we experienced how students moved back to/stayed at their parent's places and thus became immobile. In a recent research project, I explored how this immobilization has influenced students' future im/mobility. I want to find out whether aspirations to be or become im/mobile internally as well as internationally have changed and if so, how. Three different groups of students were targeted, all of them studying in the city of Vienna: a) international students, who came to Vienna for studying; b) students, who moved to Vienna for their studies from other parts of Austria and (c) students, who grew up in Vienna. Following a mixed-method approach, a quota-sampled online survey has been conducted, as well as narrative interviews. The research found that only a minority has changed future living aspirations, but that the pandemic for around 25% has triggered a reconsideration of future living. Results will be discussed in the context of recent literature on life-course decision-making processes of young people and placed in contemporary research frames on im/mobilities.

5. MAPPING HOHE TAUERN NATIONAL PARK. OPTIMIZING DEPICTION QUALITY OF LARGE SCALED TOPOGRAPHIC MAPS BASED ON OPEN DATA

Benedikt Hajek (University of Vienna)
Karel Kriz (University of Vienna)
benedikt.hajek@univie.ac.at
karel.kriz@univie.ac.at

Open Data and geospatial data collected by volunteers (VGI-Data) are nowadays easy to obtain and available with worldwide coverage through projects like OpenStreetMap. However, due to the inhomogeneity of quality, the use of these geospatial data leads to new challenges of representation in the field of large-scale topographic mapping. Besides quality research, new processing and depiction methods for the integration of these data are emerging. In a pilot project for the *Hohe Tauern National Park*, a 1:40,000 scale map is being created, which will be tailored for both print and web representations as a Tile Map Service (TMS). In this project, methods are applied that have been developed for the specific requirements of (semi-)automated processing of Open Geodata. The main focus will be on elements for the representation of terrain morphology. Thus, a new method for the generation of rock and scree representations is applied. Alongside other automated processes a method for slope-dependent smoothing of a digital elevation model (DEM) for the improvement of contour lines is tested in this context.

The goal of this work is to increase the depiction quality of large-scale topographic maps based on Open Data in order to optimize them for the integration of further thematic layers of other research disciplines.

6. HOW TO MAKE BIOGEOMORPHOLOGICAL DISTURBANCE AND STABILITY TANGIBLE AT CATCHMENT SCALE?

Stefan Haselberger (University of Vienna)
Ulrich Zangerl (University of Vienna)
Jan-Christoph Otto (University of Salzburg)
Sabine Kraushaar (University of Vienna)
Simon Scheper
Lisa-Maria Ohler
Robert R. Junker
stefan.haselberger@univie.ac.at

The interaction between abiotic and biotic development in glacier forelands depends on the abundance and traits of vegetation and the frequency and magnitude of geomorphic processes as shown in plot-scale studies. Vegetation has the potential to stabilize terrain, while geomorphic processes have the potential to disturb vegetation succession. It remains a challenge to capture this disturbance and stability in order to locate stages of biogeomorphic succession on catchment scale.

This study considers vegetation cover as proxy for stability and uses high-resolution UAV data to locate patterns of stabilization. Field based plot sampling along a chronosequences provides insight into distribution of species composition. Potential soil loss and present geomorphic process domain is considered as proxy for disturbance. The revised universal soil loss equation model (RUSLE) was used to calculate potential soil loss and geomorphic mapping was used to locate and asses geomorphic processes.

The combination of methods allowed us to allocate eight different stages of biogeomorphic succession based on the intensity of potential disturbance and the observed level of stability. It was possible to allocate initial, current and past stages of potential ecosystem engineering of plants. The catchment wide analyses of stability showed how important it is to consider geomorphic disturbance in succession analyses. The approach of this study is easily transferrable to other glacier forelands and will help to pin down the spatial distribution of biogeomorphic succession on catchment level.

7. DEVELOPMENT OF A MAP OF POTENTIAL ORGANIC SOIL AREAS

Christine Kroisleitner (University of Vienna)
Sandra Ascher (University of Vienna)
Yujing Deng (University of Vienna)

Stephan Glatzel (University of Vienna)
christine.kroisleitner@univie.ac.at

Despite recent approaches Austria lacks knowledge of peat area, particularly on agricultural land, although it is recognized as a key environment for future carbon storage. After all, Austria indents to lower GHG emissions by 36% until 2030 in non ETS sectors by an increase of carbon sequestration in soils but the lack of a standardised and nationwide map on organic soil hampers reliable estimates on GHG emissions from peatland. This study aims to assess available soil and environmental data in order to compile a map of probable organic soil areas. As the Austrian soil map (eBOD2) was found the only applicable soil dataset, we focussed on developing an algorithm to specify probable organic soil areas with the combination of hydro-climatological, geomorphological and geological data. We used the climatic water balance in conjunction with groundwater table depth to specify areas with sufficient water supply. By using the topographic wetness index, slope and landforms we derived areas with high water storage capacity. Further we used the probability of peat to appear in a certain geological setting as indicator for an impounding setting. In three case study regions we derived probabilities for every input dataset to appear in conjunction with organic soil. The combined resulting maps show good accordance with organic soil areas compared to eBOD2 besides a tendency for overestimation in wide river valleys. This indicates deficiencies in the distinction between peatland and other wetlands. Further data, like vegetation or soil pH are needed overcome this issue.

8. TANGIBLE HISTORIES, EMBODIED MEMORIES, AND AN (IM)POSSIBLE END OF FAR-RIGHT VIOLENCE: TOWARDS A GEOGRAPHICAL CONSIDERATION OF ANTIFASCIST TRADITIONS

Felicitas Kübler (University of Klagenfurt)
felicitas.kuebler@aau.at

A growing number of human geographers have addressed the contemporary rise to power of far-right parties and non-parliamentary groups (e.g. ijurr 2019; Geographische Zeitschrift 2021/4; 2022/1). A burgeoning debate engages with the spatial patterns as well as appropriations of space by and through the far-right. However, so far there are only a few works focussing on the geographies of resistance against the far-right and antifascist action (Ince 2019). Addressing this lacuna in the current debate on the far-right, this presentation is part of a larger PhD-project researching the practices, discourses, and materialities through which antifascist groups construct historical knowledge, and relate to past experiences and strategies outside institutionalized forms of remembrance. Due to the often violent and traumatic nature of this historic knowledge this project pays special attention to the embodied forms of remembering, thus focussing on local and situated contexts. To consider the emotional, embodied, rational, and strategic relations of these 'antifascist memories' the project introduces Theodor W. Adorno's (1997; 2007) negative dialectics as one theoretical approach to grapple with the construction of counter-hegemonic memory.

In sum, this presentation introduces antifascist geographies as a necessary addition to the engagement with the far-right in German speaking contexts and outlines some ideas how place-based historic knowledge and acts of remembering are part of antifascist action and strategies. For the latter I propose Adorno's negative dialectics as one approach to focus on the specific counter-hegemonic implications of "antifascist memories".

9. ACCESSING THE CORRECTNESS OF ALREADY IMPLEMENTED LANDSLIDE SUSCEPTIBILITY MAPS ON PREDICTING NEWLY LANDSLIDE OCCURRENCES. AN APPLICATION TO LOWER AUSTRIA.

Pedro Lima (University of Vienna)
Stefan Steger
Helene Petschko
Jason Goetz
Joachim Schweigl
Michael Bertagnoli
Thomas Glade (University of Vienna)
pedro.lima@univie.ac.at

The usage of statistical methods to predict potential landslide prone locations is well established in the literature. However, the application of these maps on the daily basis for spatial planning is uncommon. As result of the MoNOE research project (Method development for landslide susceptibility modelling in Lower Austria), a landslide susceptibility map has been created in 2014. 8The application of this map, by spatial planners and geologists, supports the strategic spatial planning in Lower Austria (approx. 19200 km²). Build over an inventory of 12,889 slides and using a variety of meaningful morphological and geo-environmental layers as predictors, the predictions were performed using a generalized additive model (GAM). Aiming an easily-applicable map, the final landslide susceptibility consists of three susceptibility classes ("low", "medium" and "high"), in a 1:25,000 scale. The "low" landslide susceptibility covers 78% of all pixels within the study area, while the "medium" covers 16% of all pixels, while the "high" susceptibility class is represented by 6% of all pixels in Lower Austria. Although well accepted by the stakeholders, and apparently competent on predicting landslides, some important questions recently arise: a) Is this map able to correctly predict new landslide events that occurred after the implementation of this map? b) With the inclusion of these new samples, is the terrain susceptibility still the same? c) If the terrain susceptibility has changed with the inclusion of the unused (partly recently mapped) samples, why and to what extent?

By aiming to answer these questions, a review project named MoNEW is currently ongoing, with the overall objective to access the accuracy and quality of the MoNOE predictions. New landslides were obtained from two main different sources: 1) recently occurred damage related landslides from a cadastre of landslide events (in German: "Baugrundkataster"), and 2) landslides mapped from hillshades of a high-resolution LiDAR DTM. Based on these new samples, the final quality of the MoNOE can be explored and quantified. After that, the landslide susceptibility is recalculated, and potential differences will be quantified and deeply investigated. Therefore, the identical MoNOE methodological design will be applied to ensure comparability and quality control.

Initial analysis demonstrated that most of the new landslides occurred within the highest landslide susceptibility class, indicating an apparent good ability of the MoNOE susceptibility

model to predict these landslides. However, this highly varies depending on the inventory source. The correspondence between the landslides and the highest landslide susceptibility class fluctuates between 34 to 64% (this percentage was 70% by design in the original *MoNOE* project). This variation might be explained by the positional accuracy and mapping methodology of the new landslides (i.e., point positioning on the landslide polygon). Additionally, it was observed that most of the new landslides occurring in other less susceptible classes (i.e., "low" and "moderate") were located in close proximity to the highest susceptibility class. The higher discrepancy between landslides and "lower" landslide susceptibility classes, was constantly observed for the "Baugrundkataster" samples, which are report-based samples, constantly mapped either on the damaged infrastructure of in the center of the landslide. This might highly effectively explain this difference, once the model was built and therefore design to predict scarp samples/locations.

Beyond this qualitative and quantitative assessment, during the *5. Geographie-Werkstatt*, the MoNEW landslide susceptibility model will be presented, and detailed compared to the previous MoNOE predictions. The changes on the spatial predictions will be quantified and thoroughly investigated.

10. GRADUATION DURING COVID-19 PANDEMIC: CON/FFLATING EXPERIENCES AND PRACTICES OF PUPILS TAKING THEIR SCHOOL-LEAVING EXAMS IN SPRING 2020

Belinda Mahlknecht (University of Innsbruck)
belinda.mahlknecht@uibk.ac.at

The COVID-19 pandemic has profoundly and abruptly changed young people's qualification experiences and spaces. Measures such as stay-at-home orders, closure of schools and distance learning particularly affected those among them who were in the middle of a crucial step in their educational lives: the period around the 2020 school-leaving exams and their graduation from school. The presentation shows results from the COV-IDENTITIES research project, which used a qualitative longitudinal multi-method design to repeatedly follow young adults in Tyrol/Austria in-situ during the pandemic from spring to summer 2020. We combined written narratives with 'Mobile Instant Messaging Interviews' to meet the combined requirements of research with vulnerable groups in hard-to-reach contexts. When Austria imposed the first lockdown with house arrest in mid-March 2020, schools had to switch to distance learning. At this point in time our study's participants were just weeks away from their 'Matura' – a transitional period of their lives which is challenging and busy, even without a pandemic around. Based on insights from digital geographies on the relationship between digital and offline spaces, young people's digital geographies' preliminary research on young people's education and qualification during the pandemic we debate pupils' variegated experiences with distance learning - focusing on the challenge of their individual techno-social and socio-material (cON/FFlated) presence in a polymedia environment. We focus on the rapidly changing life situations and point to an urgent need for qualitative and multi-methodological designs that focus on the negotiations of young adults in these particularly difficult life situations in cON/FFlating spaces.

11. THE FATE 13C LABELED ARTIFICIAL ROOT EXUDATES IN A PEAT MESOCOSM STUDY

Raphael Müller (University of Vienna)
Andreas Maier (University of Vienna)
Robert Peticzka (University of Vienna)
Erich Inselsbacher (University of Natural Resources and Life Sciences, Vienna)
Stephan Glatzel (University of Vienna)
raphael.mueller@univie.ac.at

Peatlands cover ~3% of the world's land surface, but are key players in global carbon cycles. Root exudates are known drivers of carbon cycling in agricultural soils, causing priming effects and influence substrate quality. Detailed knowledge of the fate of root exudates in peat and their role on decomposition is still incomplete, hindering our understanding how peatlands react under future changing climatic conditions.

Our laboratory mesocosm study aims to shed light on short-term effects of artificial root exudates on the decomposition of peat, specifically on the evolvement of CO_2, CH_4, DOC and microbial biomass. We sampled 6 undisturbed peat cores from "Pürgschachen Moor" and mounted ports in three depths for water collection. Three cores were spiked with 140 mg 13C labelled artificial root exudates at -15 cm depth. We monitored CO_2, and CH_4 (including $13CO_2$ and $13CH_4$) efflux from the cores daily and sampled DOC weekly. Solid peat was sampled for all depths and 13C content was determined.

Results show that 34% of added root exudates were released as gaseous carbon (31.4% CO_2, 2.6% CH_4) during our experiment while 66% remained in solid and liquid phase. We observed no significant differences of total carbon losses between treatment groups, suggesting that no markable priming effect occurred. Also, DOC concentrations and microbial biomass carbon showed no significant differences.

Our findings indicate a remarkable low mobility of DOC within peat columns, a limited effect of root exudates on the decomposition of peat and we demonstrated main pathways of root exudates in short-term.

12. HOTSPOTS AND HOT MOMENTS: THE ROLE OF CONNECTIVITY AND RESILIENCE SCIENCE FOR MANAGING HUMAN-IMPACTED CATCHMENT SYSTEMS

John Edward Perez (University of Vienna)
Ronald Pöppl (University of Vienna)
john.edward.perez@univie.ac.at

Fine sediment input into river systems is an environmental challenge of increasing global significance due to accelerating soil erosion rates in agricultural catchment systems. Along with erosion rates, the pattern of sediment transport within cultivated hillslopes determines the amount of material that can be delivered into river channels in such systems. To effectively

manage this problem, it is necessary to identify sediment sources, sinks, and the linkages within and between different landscape compartments along sediment pathways. Sediment connectivity is an emerging concept that can help to address on- and off-site effects of soil erosion by describing the efficiency of fine sediment transfer through these different zones. Field assessments and process-based modeling have been typically used in quantitative soil erosion and connectivity investigations. However, conceptual and methodological challenges remain in using connectivity to understand geomorphic systems. A major advance in recent years has been the adoption of network analysis as an approach to directly quantify sediment connectivity. As part of the Horizon 2020 project "i-CONN", this study aims to develop a conceptual and methodological framework to assess sediment transport processes in agricultural catchments using a connectivity approach, and to test its application in catchment management. Combining field-based connectivity analyses and process-based modelling, soil erosion and sediment transport at multiple spatial scales will be simulated for the Fugnitz catchment, Lower Austria. Sediment connectivity at each scale will be directly measured using network analyses and subsequently, hotspots and hot moments of sediment connectivity will be determined. From the developed combination of methods and tools, land management scenarios will be explored and assessed for system-wide impacts on sediment connectivity. Insights from the developed framework can be used to designate connectivity hotspots where interventions may be targeted to mitigate on- and off-site impacts of soil erosion.

13. IS THAT POSSIBLE TO ESTIMATE RAINFALL FROM ORDINARY AUDIO DATA?

Xing Wang (University of Vienna)
Xuejun Liu (Nanjing Normal University)
Thomas Glade (University of Vienna)
Mingzheng Chen (Nanjing Normal University)
xing.wang@univie.ac.at

As one of the most basic meteorological and hydrological elements, rainfall remains one of the most challenging elements to measure accurately due to its high spatial and temporal variability. Obtaining high-quality rainfall products is essential for flood monitoring, disaster warning, and weather forecasting research, however, still challenges the current rainfall networks in terms of spatial and temporal resolution and accuracy. With the increasing broader recognition gained by Citizen Science in meteorology and the advancement of Internet of Things (IoT) technologies, "anything may become data" has become a common meme. Therefore, any Citizen-accessible observations that carry rainy signals, including but not limited to visual, audio, and microwave, contain a rich source of rainfall information. Numerous analyses indicate that ordinary audio data from widespread sources (e.g., mobile phones, surveillance cameras) has been regarded as an alternative rain gauge in our research. In our study, deep learning-based approaches were introduced for extracting deep rainfall information from acoustic features while achieving stable quantitative rainfall estimations. Take the surveillance audio data as an example, and experimental results show the efficiency of the proposed system in rainfall estimation. This method can also be employed on smartphones, which can theoretically achieve better performance since the advantage of the sensor capacity ensures a higher quality of the collected rainfall audio compared with surveillance audio data. Our

research is a new attempt to develop a low-cost, citizen science-based rainfall observation method, which can also provide a beneficent supplement to the current rainfall observation networks.

14. VISUAL GEO-TEMPORAL-COMMUNICATION OF CLIMATE DATA FLEXIBLE DISPLAY OF MEASUREMENT SERIES FOR ARBITRARY CLIMATE PARAMETERS

Dominik Wieser (University of Vienna)
Karel Kriz (University of Vienna)
dominik.wieser@univie.ac.at

Existing climographs such as the Walter-Lieth-diagram are typically suitable for the representation of aligned climate parameters. However, to enable a clear and understandable communication of complex parameters a sophisticated representation is required. This paper deals with a visual geo-temporal communication approach that enables a flexible display of measurement series for arbitrary climate parameters. To address this assumption a conceptional framework for a new chart representation method was designed. A grid of coordinates consisting of two parameters is created, in which the measured data of certain time periods can be located as points (Figure 1). In contrast to comparable existing approaches, the focus of this diagram is on geo-temporal-communication. For this purpose, the climate data of different spatial references are superimposed within the diagram. By means of reference lines and appropriate axis labels, spatial climatic differences can be quickly recognized. In addition, the development of the measured data over time is indicated by an arrow. The legend not only explains the point symbols of the diagram but is structured in tabular form and serves to communicate climate data. However, the decisive feature of this type of climate diagrams is the fact that they are suitable for displaying any climate data. This means that not only the joint development of temperature and precipitation, for example, but also of sunshine hours and air pressure can be illustrated. This provides a high degree of flexibility for visual geo-temporal-communication of arbitrary climate elements and their changes over time.
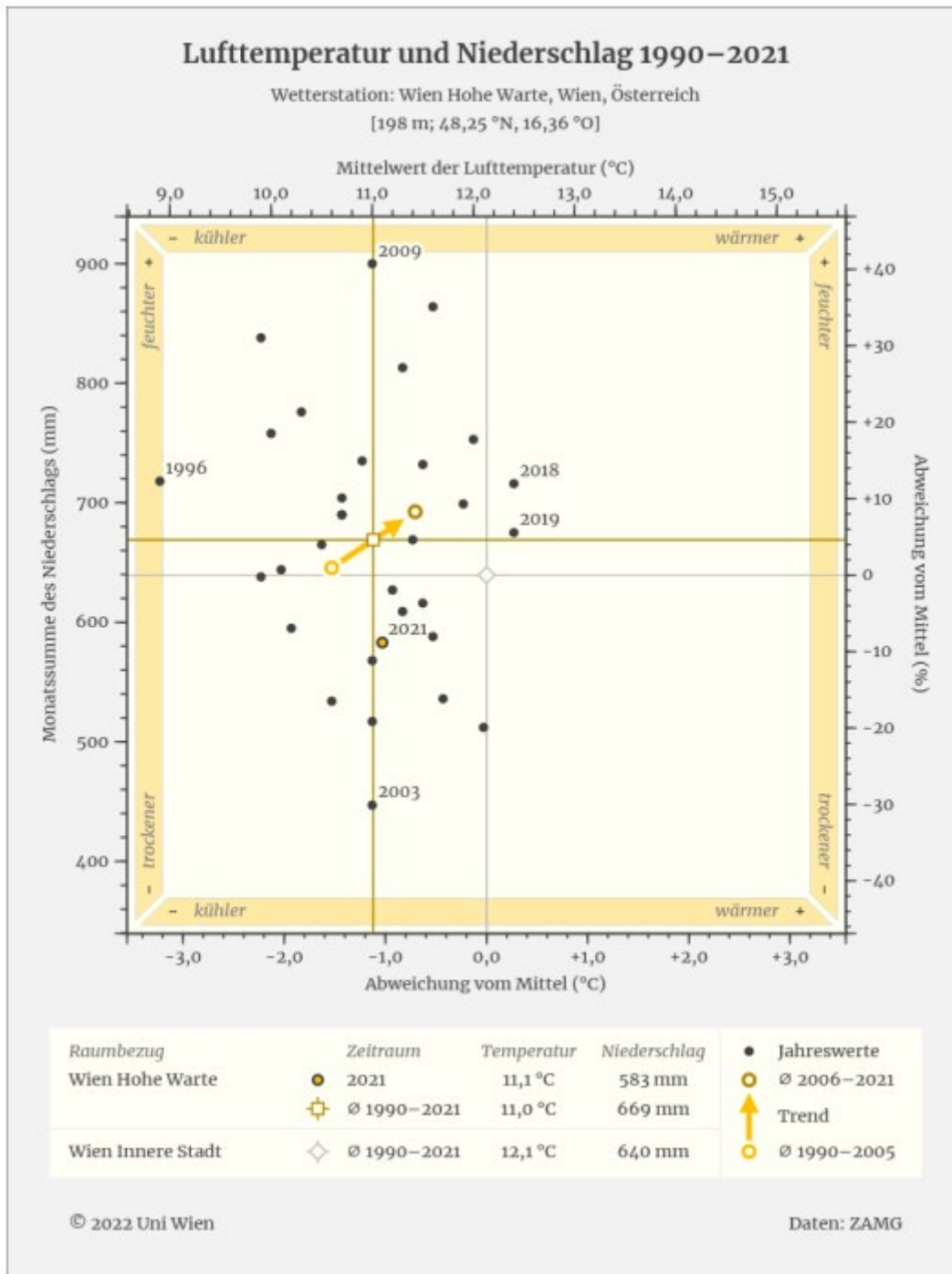
Figure 1. The point chart shows measured data of temperature and precipitation for Vienna.

15. 'LEAVING SOMETHING BEHIND': MIGRATION GOVERNANCE AND AGRICULTURAL CHANGE IN RURAL THAILAND

Raffaella Pagogna,
Harald Sterly
Patrick Sakdapolrak
raffaella.pagogna@univie.ac.at

Traditionally, life and social reproduction in rural Thailand has been shaped by different forms of subsistence and cash-crop based agriculture. While this is still the case, over the last decades different forms of international and internal migration (i.e. labour, marriage, education) have introduced new dynamics to rural life in general and changes in livelihood strategies in particular.

As part of the H2020 AGRUMIG project, which works with a comparative approach in seven countries in Africa, Asia and Europe (Ethiopia, Morocco, Nepal, China, Thailand, Kyrgyz Republic and Moldova), we have examined the different roles that migration plays for rural development in two regions in the north and north-east of Thailand. The sites differ a lot, regarding the contexts and the role of migration for livelihoods: In the Northeast, with well-established domestic and international migration systems, for poorer households, migration is predominantly a permanent coping strategy against livelihood risks, supplementing household income. Better-off households make more strategic use of remittances to modernize farms. The Northwest is heterogenous, with migration being a rather recent phenomenon. Migration for higher education and the respective costs are a strong driver for agricultural changes, pushing many farmers out of traditional silvicultural practices and into commercial maize farming.

We found that key factors shaping these differences in migration systems are the agri-environmental setting, the embedding in commercial agricultural production systems, and cumulative effects of past migration.