Universität Augsburg University

Environmental Health Sciences (EHS),
Faculty of Medicine

Institute of Geography,
Faculty of Applied Computer Science

2. EHS-Symposium

Environmental health risks in a changing world

Research contributions from physical geography

Friday, 01/10/2021, 14:00-18:00 CET

Human health risks associated with the natural environment and the human activities therein are interconnected, comprise a wide range of spatial scales and are temporally dynamic and changing. It has been recognized that the health of our natural environment and human health are inextricably linked. Our planet is changing in an unprecedented rate and new challenges emerge from climate and environmental change, globalization, urbanization, and lifestyle changes.

The aim of the symposium is to highlight research from the field of physical geography regarding current and future health risks from different compartments of the natural environment, discuss their interconnections and implications for future interdisciplinary environmental health and geographical research.

This symposium will be held online via Zoom, with presentations by respected and prominent speakers followed by discussions. The target group are scientists and stakeholders from the field of geography and environmental sciences, environmental health sciences, medicine, planetary health and related disciplines as well as the interested public.

Schedule (15 minutes talk + 5 minutes discussion):

14:00 -14:20	Welcome & Introduction (Elke Hertig, Augsburg)
14:20-15:00	***Health risks associated with soils***
14:20-14:40	Microplastic in agricultural soils - an environmental and health risk? (Peter Fiener, Augsburg)
14:40-15:00	Soil in the air - Arable land as source of particulate matter emissions (Roger Funk, Müncheberg)
15:00-15:40	***Water-related health risks***
15:00-15:20	High resolution hydro-meteorological modeling for regional malaria transmission in Africa (Harald Kunstmann, Augsburg)
15:20-15:40	Danger of groundwater contamination widely underestimated because of shortcuts for aquifer recharge (Andreas Hartmann, Dresden)
15:40-16:10	**Break**
16:10-16:50	***Health risks connected to the atmosphere***
16:10-16:30	Environmental stress in cities (Benjamin Bechtel, Bochum)
16:30-16:50	Heat and ground-level ozone pollution in Europe (Elke Hertig, Augsburg)
16:50-17:10	Predicting air quality using emulators (Luke Conibear, Leeds)
17:10-17:30	Air pollution from wildfires in the Mediterranean area (Ricardo Trigo, Lisbon)
17:30-18:00	Discussion & Synthesis

Registration:

The event will take place as a Zoom meeting.

For participation please register at **ehs@med.uni-augsburg.de**.

You will then receive the link to access the zoom meeting.

The invitation and the registration link can also be found under
https://www.uni-augsburg.de/de/fakultaet/med/profs/klimawandel-gesundheit/

Abstracts:

Peter Fiener, Water and Soil Resources Research, Institute of Geography, Faculty of Applied Computer Sciences, University of Augsburg, peter.fiener@geo.uni-augsburg.de

Microplastic in agricultural soils - an environmental and health risk?

The microplastic contamination of our environment is widely discussed in case of oceans and generally aquatic ecosystems, while little is known regarding soil systems. First estimates assume that the microplastic contamination of soils is at least in the same order of magnitude as the contamination of oceans. In contrast to aquatic ecosystems most soil contamination is directly linked to land use and management, namely fertilisation with microplastic rich compost or sewage sludge or directly use of plastic materials in crop and fruit production. This talk will introduce into the sources of soil microplastic contamination, the microplastic stocks already accumulated in soils and most challenging the first results of studies dealing with ecotoxicology and microplastic entering the food-web.

Roger Funk, Landscape Pedology, Leibniz Centre for Agricultural Landscape Research (ZALF) Müncheberg, rfunk@zalf.de

Soil in the air - Arable land as source of particulate matter emissions

Wind erosion and soil cultivation can release soil dust, which, when carried into urban areas, have an influence on air quality. Particulate matter of the PM10 fraction (particle diameter < 10 µm) is particularly involved in this, as it remains in suspension for a long time and can be transported over long distances. PM10 is known to be harmful to one’s health and can act as additional stress on people, who are already in a precarious health situation. Measurements of urban air quality in Berlin have shown that the so-called regional background is already responsible for about 50 % of the total pollution. Long-distance transports and sources in the rural surrounding areas contribute to this value. A listing of long-lasting PM10 episodes in Germany indicated that increased PM10 levels also occurred in the spring and summer months, coinciding with wind erosion events or agricultural activities as seedbed preparations or harvesting. The immediate consequence of the tillage induced dust emissions is a reduction of soil fertility, because particles of the clay and silt fractions as well as organic particles are affected. These particles are also carriers of nutrients, pollutants and active substances of pesticides or herbicides. This results in the special environmental as well as health aspects of dust emissions from the agricultural sector. The presentation highlights in brief causes and effects of dust emissions from agricultural land and presents first quantifications for the region Brandenburg/Berlin.

Harald Kunstmann and Diarra Dieng, Regional Climate and Hydrology, Institute of Geography, Faculty of Applied Computer Sciences, University of Augsburg, herald.kunstmann@geo.uni-augsburg.de

High resolution hydro-meteorological modeling for regional malaria transmission in Africa

Malaria remains a major health problem predominantly in tropical countries and is still being one of the biggest causes of mortality worldwide. It is an ancient vector borne infectious disease caused by parasitic protozoans of the genus *Plasmodium* and is transmitted by female mosquitos of the *Anopheles* species. The spatiotemporal distribution of this vector is sensitive to climate conditions and the distribution of hydrometeorological variables, particularly temperature, precipitation, and humidity. We present first results of a joint high resolution hydrometeorological- and subsequent dynamical vector transmission modelling. Our approach uses the atmospheric- and terrestrial model system WRF-Hydro in 1km spatial resolution and the grid cell distributed dynamical vector transmission model VECTRI which is analysed at monthly scale. Our study addresses both Kenya and Burkina Faso with a focus on the two Health and Demographic Surveillance Systems (HDSS) site regions of Nouna and Kisumu, respectively. We present an analysis of the performance of the hydrometeorological model system and first results of the VECTRI modeling.

Andreas Hartmann, TU Dresden, Faculty of Environmental Sciences, Institute of Groundwater Management, 01062 Dresden, andreas.hartmann@hydmod.uni-freiburg.de

Danger of groundwater contamination widely underestimated because of shortcuts for aquifer recharge

Groundwater pollution threatens human and ecosystem health in many regions around the globe. Fast flow to the groundwater through focused recharge is known to transmit short-lived pollutants into carbonate aquifers, endangering the quality of groundwaters where one quarter of the world’s population lives. However, the large-scale impact of such focused recharge on groundwater quality remains poorly understood. Here, we apply a continental-scale model to quantify the risk of groundwater contamination by degradable pollutants through focused recharge in the carbonate rock regions of Europe, North Africa, and the Middle East. We show that focused recharge is the primary reason for widespread rapid transport of contaminants to the groundwater. Where it occurs, the concentration of pollutants in groundwater recharge that have not yet degraded increases from <1% to around 20 to 50% of their concentrations during infiltration. Assuming realistic application rates, our simulations show that degradable pollutants like glyphosate can exceed their permissible concentrations by 3 to 19 times when reaching the groundwater. Our results are supported by independent estimates of young water fractions at 78 carbonate rock springs over Europe and a dataset of observed glyphosate concentrations in the groundwater. They imply that in times of continuing and increasing industrial and agricultural productivity, focused recharge may result in an underestimated and widespread risk to usable groundwater volumes.

Benjamin Bechtel, Urban Climatology, Institute of Geography, Ruhr-University Bochum, benjamin.bechtel@rub.de

Environmental stress in cities

Urban environments are highly relevant for human health risks for several reasons. First, cities are places with a high degree of anthropogenic transformation and artificial metabolism, resulting in diverse and potentially harmful environments. Second, cities are home to the majority of humanity and thus places with high densities of vulnerable people. Finally, both cities and their natural environments are changing at unprecedented speed. The talk gives an overview on several urban environmental health risks and their interaction with a particular focus on heat stress.

Elke Hertig & Sally Jahn, Regional Climate Change and Health, Faculty of Medicine, University of Augsburg, elke.hertig@med.uni-augsburg.de

Heat and ground-level ozone pollution in Europe

Temperature extremes and air pollution pose a significant threat to human health. A specific concern applies to heat events and elevated ground-level ozone concentrations, due to the physical relationships between these variables, the single and combined effects of both variables on human health and the anticipated substantial changes in the scope of climate change. The present contribution addresses relationships between air temperature and ground-level ozone, the association of these variables with atmospheric circulation patterns, the anticipated changes under future climate change as well as their association with human morbidity and mortality.

Luke Conibear, University of Leeds, UK, l.a.conibear@leeds.ac.uk

Predicting air quality using emulators

Air pollution exposure is a large public health problem in China. Chemical transport models are used to quantify the impacts of emission changes on air quality. However, they are limited by their large computational demands. Machine learning models can emulate chemical transport models, enabling many more sensitivity experiments to be explored. Here, we develop emulators for China and apply them in a case study over 2010-2020.

Ricardo Trigo, Instituto Dom Luiz (IDL), Faculdade de Ciências, Universidade de Lisboa, Lisbon, Portugal, rmtrigo@fc.ul.pt

Air pollution from wildfires in the Mediterranean area

The last decade has been marked by the increasing occurrence of Mega-fires, with more than 10.000 ha of burned area in several regions characterized with a Mediterranean type of climate, including Portugal and Chile 2017, Greece 2018, California and Australia 2020. Besides extensive human, ecological and economic losses these large-fires can have a significant impact in air quality as they can release substantial amounts of gaseous and particulate pollutants into the atmosphere. The release to the atmosphere of carbon related pollutants is mainly driven by the increase of fire emissions resulted from large and intense fire seasons frequently exacerbated by long dry periods. Some examples of air pollution are shown relative to the large fire events occurred in Portugal and Greece. Still, it is difficult to discriminate if a certain pollutant is emitted by wildfires or by other natural or anthropogenic sources. It is important to stress that exposure to smoke-related air pollutants from wildfires has been associated with a wide range of human health effects and is expected to worsen.