UP 2: Soil and Water

Time: Monday 16:30–18:00 Location: ELP 6: HS 4

UP 2.1 Mon 16:30 ELP 6: HS 4

Das Klima-Endspiel in Zukunftsdiskursen. Potentiale katastrophaler Szenarien in der Klimakommunikation — •Gunther Seckmeyer und •Gerriet Schwen — Leibniz Universität Hannover, Institut für Meteorologie und Klimatologie

Vor 50 Jahren kristisierte die New York Times mit vernichtender Schärfe "Die Grenzen des Wachstums", wobei sie anmerkte: "Today the vision is mass death from insecticide poisoning, climatic changes, or some other form of retribution from an angry biosphere." Das sei als Zukunftsprognose vielleicht nicht falsch, aber "a false inevitability of doom do not speed the day of salvation" - Angst- und Panikmache helfen nicht, die richtigen Entscheidungen zu treffen um Lösungen zu finden. Diese Kritik wird immer wieder vorgebracht.

Im Jahr 2022 veröffentlichten Kemp et.al. "Climate Endgame: Exploring catastrophic climate change scenarios", um mehr Aufmerksamkeit auf wahrscheinlicher werdende katastrophale Szenarien zu lenken. Gefördert vom Land Niedersachen haben wir als transdisziplinäres Team Wissenschaftler*innen zu der Bedeutung des 'Climate Endgame' in unseren Zukunftsdiskursen befragt und planen nun Veranstaltungen als soziale Realexperimente mit Akteuren aus Politik, Medien und Aktivismus, um solidarische Weltuntergangsnarrativen zu erforschen.

Die öffentliche Kommunikation ist weiterhin vom Ideal dominiert positiv zu kommunizieren. Würde ein ungeschönter Blick auf unsere Lage Kräfte freisetzen, um die schlimmsten Folgen der Klimakrise abzumildern? Und: Wie klingt eine Kommunikation klingen, welche das Ausmaß der Klimakrise vermittelt ohne Überforderung auszulösen?

Invited Talk UP 2.2 Mon 16:45 ELP 6: HS 4

Increasing water limitation of global ecosystems in a changing climate — •Rene Orth[1], Jasper Denissen[2], Wantong Li[3], and Sungmin O[4] — [1]University of Freiburg, Germany — [2]European Centre for Medium-Range Weather Forecasting, Germany — [3]Max Planck Institute for Biogeochemistry, Germany — [4]Ewha Womans University, Korea

Climate change involves changes in temperatures and precipitation in many regions. These changes in turn affect terrestrial ecosystems that require sufficient water and energy to provide essential services such as food security and the uptake of human-caused CO2 emissions.

This presentation will introduce the concept of ecosystem water and energy limitation, and identify areas where each limitation prevails. These areas are characterised by different sensitivities of evapotranspiration and vegetation productivity to temperature and precipitation. A special focus will be on the global trends of ecosystem water limitation, where our results show increased water sensitivity across recent and future decades in many regions.

The presentation will also illustrate that this increasing ecosystem water limitation has diverse implications including (i) increased vulnerability of vegetation to droughts which can lead to more frequent and pronounced drought impacts on vegetation functioning and (ii) a weakening of the greening trend of global vegetation, thereby counteracting the effect of rising temperatures and CO2 levels in many regions.

UP 2.3 Mon 17:15 ELP 6: HS 4

Dürren in Deutschland: Warum der Klimawandel hydrologische Extreme verstärkt — •Axel Kleidon — Max-Planck-Institut für Biogeochemie

Die wärmeren Temperaturen des globalen Klimawandels verstärken den Wasserkreislauf, Verdunstung und Niederschlag nehmen zu. Aber auch Extremereignisse wie Starkregen, Hochwasser, Trockenperioden und Dürren häufen und intensivieren sich. Wie passt das zusammen? Einfache physikalische Betrachtungen zeigen, welche Faktoren hauptsächlich die Stärke des Wasserkreislaufs im Erdsystem regulieren und wie dies die Wasserverfügbarkeit auf dem Festland bestimmt. Damit lassen sich die beobachteten Änderungen der Wasserbilanz in Deutschland interpretieren und die zunehmende Trockenheit in Deutschland erklären.

UP 2.4 Mon 17:30 ELP 6: HS 4

Metrology for multi-scale monitoring of soil moisture — •Markus Köhli for the SoMMet collaboration — Physikalisches Institut, Heidelberg University, Germany

Soil moisture as a key variable in agriculture, forestry, groundwater recharge, weather, climate, and greenhouse gases emission in the environment. Several measurement methods exist on multiple scales, however, poorly harmonized. Despite its significance this lack of precision marginalized the topologically complex assessment of soil moisture. Thus, there is a need to establish the chain of traceability - the metrological determination of uncertainties. In addition, there is an urgent need for real-time, high-quality, temporally and spatially consistent data on soil moisture. Such are needed to optimise water management strategies as well as climate change monitoring, modelling and mitigation. To address these needs, the project 'Soil Moisture Metrology' (SoMMet) has been set up in the framework of the European Partnership on Metrology. The consortium consists of nine National Metrology Institutes and nine research institutions. Its aim is to develop sound metrological tools and establish a metrological foundation for soil moisture measurement methods. On the point scale (10^{-1} m - 10^{1} m), novel primary and secondary standards of measurements will be developed specifically for soil samples. On the intermediate range (10^{2} m - 10^{3} m), the metrological basis of the cosmic-ray neutron sensing method will be established, in laboratory and outdoors. On the large scale (10^{3} m - 10^{4} m), satellite-based remote sensing products will be utilized to derive the soil moisture products.

UP 2.5 Mon 17:45 ELP 6: HS 4

Correcting cosmic-ray neutrons for everything: latest attempts to isolate the soil water signal from external influences — •Martin Schrön[1], Markus Köhli[2], Jannis Weimar[2], Daniel Rasche[3], and Lasse Hertle[1] — [1]Helmholtz-Zentrum für Umweltforschung GmbH - UFZ, Leipzig — [2]Physikalisches Institut, Heidelberg University — [3]Geoforschungszentrum - GFZ, Potsdam

Cosmic rays on Earth interact with the soil and are substantially moderated by hydrogen atoms. Since the reflected neutron flux is a function of the soil water content, cosmic-ray neutron measurements above the ground are widely used to estimate the average field soil moisture. However, many exernal factors spoil the accuracy of the product, which need to be corrected for. Cosmic rays do travel a long way from supernovae remnants through the solar system, the Earth's magnetosphere, the atmosphere, the biosphere, and the lithosphere, where each component has their challenges in store. Relevant effects are caused by, e.g., solar activity, the geomagnetic field, air pressure, air humidity, temperature, landscape heterogeneity, vegetation, snow, and even by scientists themselves. The list of influencing factors is long, and so is the number of approaches and proposed solutions. We will present the major influencing factors and discuss the latest attempts to tackle their correction.