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EPFL Valais/Wallis SEMINAR

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Understanding and embracing the uncertainties in the remaining carbon budget for the Paris Agreement target

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Global mean warming is proportional to the total amount of CO2 emitted. This emergent property of the climate system, known as the transient climate response to cumulative CO2 emissions (TCRE) provides the basis for the concept of carbon budgets for meeting different temperature target levels, such as the 1.5°C target. Most of the CO_2 emission pathways that reach the 1.5°C and 2.0°C temperature stabilization level in the long term are based on the assumption that emitting CO_2 and removing it later by the implementation of artificial carbon dioxide removal from the atmosphere (CDR) leads to the same state of the climate system. However, a question remains whether the state of the carbon cycle differs among scenarios in which a given temperature level is achieved without overshoot or scenarios where that temperature level is temporarily exceeded and then resorted by CDR.
Remaining carbon budgets are also subject to different sources of uncertainty, such as the uncertainty in Earth System response to non-CO_2 forcing, future non-CO_2 scenario uncertainty, and uncertainties due to additional Earth System feedbacks currently under-represented in the Earth System models.
In this talk, I will talk about the challenges and opportunities in quantification of the uncertainties in the remaining carbon budgets (both geophysical and socio-economic) in Earth System Models, and how using observationally-constrained quantities could help with obtaining more accurate estimates. I will also explain the implications for the remaining carbon budget estimates in the light of the overall uncertainty, while emphasizing that despite those uncertainties, the implications remain the same: we need to reach net-zero emissions to stop warming.

CV: Katarzyna (Kasia) Tokarska

Kasia Tokarska is a climate scientist who worked on observationally-constraining future projections from Earth System Models during her postdoctoral research at the Institute for Atmospheric and Climate Science at ETH Zurich, Switzerland. Her work focuses on constraining future warming, estimating remaining carbon budgets for the Paris Agreement target, and quantifying related uncertainties using different methods. She also served as an expert reviewer of the IPCC Special Reports and is a contributing author to the upcoming IPCC AR6 report - Chapter 4 on constraining future warming projections. Her research interests encompass applying interpretable and physically-constrained machine learning to climate data analysis, particularly in the context of climate-carbon interactions. Kasia is a core member of the Climate Change AI community (climatechange.ai).
Kasia holds a PhD from the University of Victoria in Canada, where she worked with the CanESM modelling centre exploring carbon cycle responses in climate models of different complexity and different aspects of the carbon budgets framework. She also researched the role of negative emissions (artificial carbon dioxide removal from the atmosphere) on the reversibility of the Earth System, and the detection and attribution of anthropogenic climate change from the observed record.