2023 INTIMATE Lecture series

Where land, ocean and ice meet…

Thursday, May 11th at 11am CEST - 10 am GMT

Proxy-Model

Kira Rehfeld (University Tübingen)

State and timescale-dependency of surface climate variability over the last 130,000 years

Substantial temperature and precipitation variability with large amplitudes occurred over the last 130,000 years, from the last Interglacial, through the last Glacial up to the last pre-anthropogenic global warming that led to the Holocene Interglacial more than 10 000 years ago. With the industrialization, human influence has overprinted natural variability of the Earth system, and the Holocene has given way to a continued warming now officially recognized as the era of the Anthropocene. Early evidence of large changes in climate variability between cold and warm Earth system states were recognized from Greenland ice core data since the late 20th century. With advances in palaeoclimate data compilation, analysis and proxy modelling we gained a spatio-temporal perspective on the evolution of the climate system over the last 130 000 years. Systematic comparison to state-of-the-art global circulation models (as used in the IPCC projections) shows shortcomings in these model systems beyond the centennial timescale. The newly emerging coupled Earth System models including dynamic ice sheets and solid Earth components show more promise in representing levels of variability consistent with palaeoclimate evidence. Data-model integration therefore improved our understanding of the longterm predictability of the climate system. Large unknowns in all compartments (Atmosphere, Ocean, Biosphere, Cryosphere, Anthroposphere) remain, each with significant influence on the future trajectory of the Earth system.

Lukas Jonkers (MARUM, Bremen)

Plankton turnover reveals steep gradients LGM ocean temperature

The Last Glacial Maximum (LGM) is the most recent time when Earth's climate was fundamentally different from today and has hence been a prime target for evaluating climate models. However, model evaluation based on paleoclimate data is non-trivial because of the indirect and uncertain nature of the paleoclimate observations. Here we propose a different approach, exploiting macroecological patterns in species turnover of marine plankton to assess LGM upper ocean temperatures simulated by the latest generation of climate models. Using an extended planktonic foraminifera database, we show that simulated LGM seawater temperatures are inconsistent with the temperature dependence of species turnover observed in the modern ocean. This inconsistency arises from a pronounced cooling in the midlatitude North Atlantic ocean that is absent from all simulations and likely reflects the way the AMOC is represented in the simulations. We suggest that the simulations that represent LGM climate as equilibrium are missing important dynamic ice-ocean interactions.

INTIMATE
Integrating ice core, marine and terrestrial records

Zoom link: https://tinyurl.com/34tuuff9

INTIMATE mailing list: https://tinyurl.com/yckj4t2z

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