Project: Exploring modeled climate variability in past cold and warm states of the Earth System

Project title: EXPLAINstates

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Allocation period: 2025-01-01 to 2025-12-31

Abstract

The seventh phase of the Coupled Model Intercomparison Project includes a compact set of targeted "fast track" experiments of high scientific interest to be run early, starting in mid-2025. Within EXPLAINstates we aim to explore fast track experiments, abrupt-127k (representing the last interglacial, LIG) and abrupt-0p5CO2, from a paleoclimate modeling perspective using the two state-of-the-art climate models ICON-XPP (abrupt-127ka experiment) and MPI-ESM-wiso (abrupt-0p5CO2). This spans an as-warm-as-present time period, and a simulation that is expected to be as cold as the Last Glacial Maximum (LGM) 21 thousand years ago. For the abrupt-127k experiment, we will include code to vary parameters of Earth's orbit (eccentricity, obliquity, precession) in ICON and then conduct the abrupt-127ka experiment. For the abrupt-0p5CO2 experiment, we want to perform both the abrupt-0p5CO2 and LGM experiment with MPI-ESM-wiso (isotope-enabled version of MPI-ESM) and investigate a potential analogy between the two states based on isotopic signatures.

These experiments are of great importance for a better understanding of the effects of various forcing factors on the climate system, their interactions and feedback processes. Exploring the last interglacial also helps to test the ability of state-of-the-art climate models to simulate future warming. In this way, these experiments contribute to a better understanding of current and future climate change. The project aims to prepare first tests and a modeling framework for a follow-up DFG proposal in 2025 targeting climate variability and climate stability over the last 130 kyrs and their significance for future climate change.