A proposal to drill “Geiseltal” – a near complete terrestrial section of the Eocene in Central Europe

Project Value

✓ Increase of the supraregional publicity of Geiseltal through media attention in the course of the drilling project
✓ Expansion of the tourism infrastructure (e.g. visitor center)
✓ Innovative concept for the (re)use of lignite for climate research

Project Motivation

The Geiseltal is known worldwide for its perfectly preserved vertebrate fossils from the last greenhouse/hothouse phase of the earth's history, the Eocene. The lignite deposited here represents a hitherto unexploited climate archive, with which we can gain unique insights into climate fluctuations, as we may see them in the next 100-200 years due to human-induced climate change.

Aims

i. Two boreholes are planned close to the shore on Lake Geiseltal, under strict consideration of environmental requirements
ii. Drilling will be operated with HiPerCoRig, a drilling rig developed in Germany for research purposes as a floating drilling platform
iii. Estimated core recovery of >100 m, allowing to construct a quasi-continuous profile through all major lignite seams
iv. The chemical composition of sediments, plant fossils etc. will provide insights into past climate fluctuations

Outline

Figure 1: Modelled evolution of atmospheric carbon dioxide concentrations (pCO2) during the Cenozoic (modified after Hansen et al. 2013); The RCP8.5 pCO2 level scenario is the highest baseline emissions scenario in which emissions continue to rise throughout the twenty-first century (IPCC, 2022). Modern day pCO2 level is indicated as well as the time frame covered by the Geiseltal lignites.

Figure 2 (left): HiPerCorrig is a novel, high-quality soft sediment coring system; its performance has been demonstrated on perialpine lakes in over 200m water depths; modified after Harms et al. (2020)

Figure 3: (above): Bathymetry map of the modern Geiseltal lake (Germany); Proposed Coring Positions are indicated by yellow stars.

Figure 4: (right): Idealized Geiseltal depositional regime (modified after Hastings et al., 2015); OK = Oberkohle; OHM = Oberes Hauptmittel; MK = Mittelkohle; UHM = Unteres Hauptmittel; UK = Unterkohle; BMH = Basis Hauptmittel; BK = Basiskohle

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