#### GFZ **Response of the Methane Cycle to Climate Changes in the Past and Present** Helmholtz-Zentrum POTSDAM El'gygytgyn **Drilling Project**

# J. Griess<sup>1,2</sup>, K. Mangelsdorf<sup>2</sup>, D. Wagner<sup>1</sup>

Deutsche Forschungsgemeinschaft **DFG** 

# Introduction

Artic permafrost environments play an important role within the global methane cycle. Thawing of permafrost and the associated release of this climate relevant trace gas due to an increased microbial turnover of organic carbon and from ancient methane reservoirs represent a potential risk to global warming. For the prediction of a future development of the permafrost

environment and its contribution to the global atmospheric carbon budget, it is important to understand in which way this system reacted to environmental changes in the past.



## **Study Site**

The El'gygytgyn lake region, Northeast Siberia, represents an ideal model system for studying the response of the methane cycle to climate change. It is supposed to be unglaciated since the time of a meteorite impact 3.6 Ma ago and since that time the permafrost went through four major climate-induced stages during the last 300,000 years. These changes in climate caused chemical and physical variations in sedimentary column and thus, we expect changes in the composition of key microrganisms being implicated in methane cycle. Drilling was conducted in November 2008 since it was rescheduled. Samples are being transfered to Germany by now.



El'gygytgyn Lake (67°30'N, 172°05'E) in Northeast Siberia (Foto: S. Quart, University of Cologne)

Distribution and thickness of Eurasian permafrost. The red circle indicates the drilling site at the El'gygytgyn Lake in northeast Siberia (modified after Perry-Casteneda Map Collection, University of Texas).

## **Scientific Concept**

Our studies will be conducted on combining microbial biomarker dynamics of the methanogenic and methanotrophic analyses and rRNA gene analyses in a high stratigraphic resolution. Sediment horizons with and without elevated methane concentrations will be investigated in order to assess spatial

communities. These spatial dynamics refer to vertical variations in different core depths influenced by changing environmental conditions in the past.

#### **Genotypic Biomarker**

#### **Phenotypic Biomarker**



In the horizons of interest the structure of the microbial communities The extraction of microbial biomarkers from environmental samples is quantitative and correlates with the cellular biomass of the will be characterised by clone libraries and DGGE-fingerprints with focus on methanogenic and methanotrophic communities to obtain sample. Furthermore signals of viable and fossil markers can be detailed information on their taxonomy. distinguished.

## Outlook

The obtained data will be interpreted in context of the results on inorganic properties in permafrost deposits of the El'gygytgyn lake region and paleoclimate reconstructions in this area provided by cooperation partners of the ICDP project "Scientific Drilling at El'gygytgyn Crater Lake".

<sup>1</sup>Alfred Wegener Institute, Research Unit Potsdam, Telegrafenberg A45, Potsdam, Germany

#### Juliane.Griess@awi.de

www.awi.de/en/go/geomicrobiology www.gfz-potsdam.de

<sup>2</sup>Helmholtz Centre Potsdam, GFZ German Research Centre for Geosiences, Telegrafenberg Potsdam, Germany