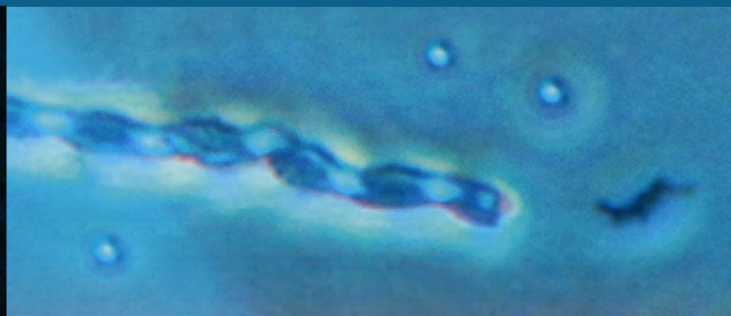


Analysis of microbial functionality of arctic deep sea hydrothermal vent systems and cold seeps through metagenomics and metaproteomics

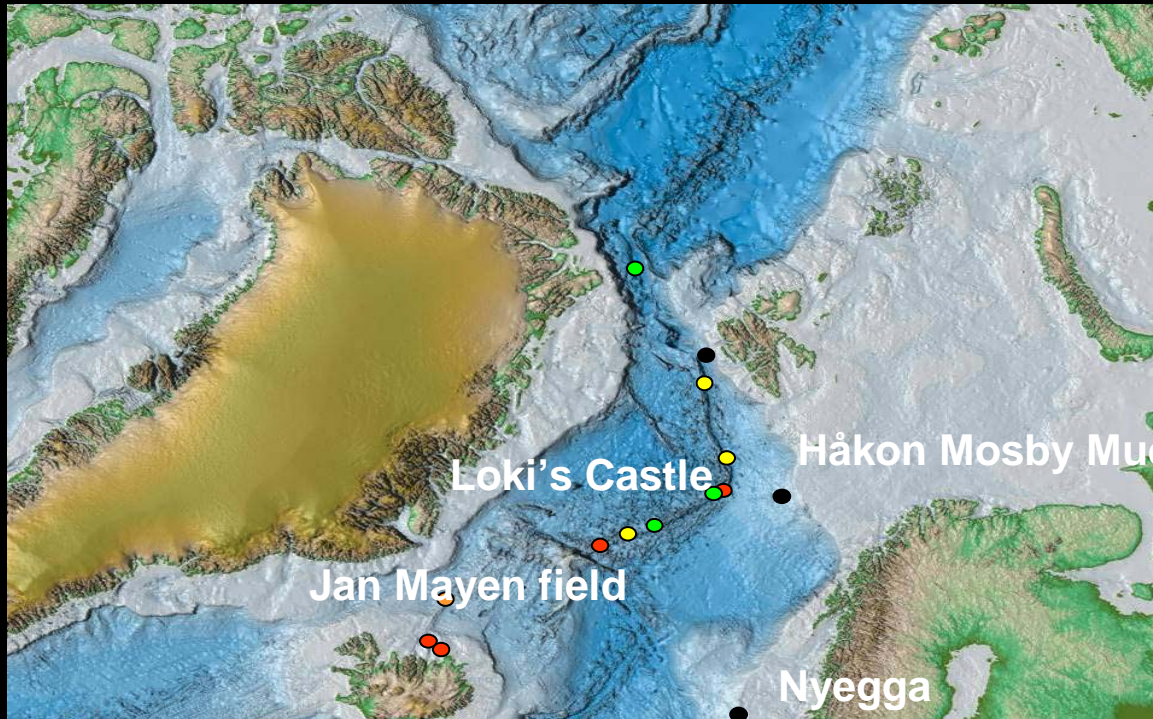
Principal Investigator: Dr. Ida Helene Steen
Presenter: Dr. Anja Hegen
University of Bergen

Centre for Geobiology



Deep Seafloor • Deep Biosphere • Deep Time & Roots of life

Unique Sampling Location



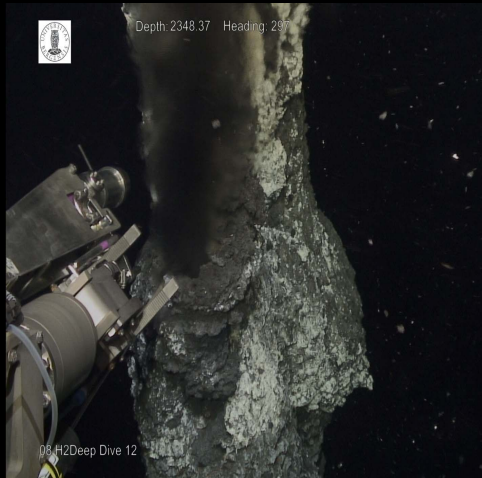
- Hydrothermal plume
- Sulfide deposits
- Extinct field
- Active field
- Mud volcanoes & cold seeps



Gas hydrate - Nyegga

1. Jan Mayen and Loki's castle are arctic hydrothermal fields located on the Arctic Mid-Ocean Ridge (AMOR)
Pedersen, RB et al. Nature Communications (accepted)
2. Nyegga is located on the Norwegian shelf where hundreds of pockmarks have been discovered.
3. UiBs Center for Geobiology undertakes annual research cruises to these locations

Loki's castle – discovered in 2008



Sulfide chimneys



Barite chimneys

	Fluid temp	pH	CH ₄	H ₂	H ₂ S
Loki's castle	<317° C	5.5	13.5	4.9	4.1

Pedersen RP et al Geophysical Monograph Series, Volume 188, 440pp. (in print).

Loki's Castle

1. Sulfide chimneys – discovered in 2008
2. Small barite chimneys (low-temperature) – discovered in 2009
3. Dense microbial mats are present on the chimney walls
4. We analyse the microbial communities in the mats by metagenomic, metatranscriptomic and metaproteomic tools

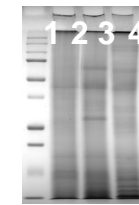
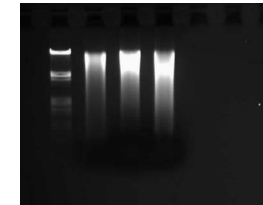


Experimental strategy

Sampling:



Extraction of DNA and proteins



Metagenome:

DNA



454-pyrosequencing



Newbler; contig assembly

Metaproteomics; Protein work-up and mass spectrometry

Protein



1D-SDS-PAGE



In-gel tryptic digest



LC-MS/MS; LTQ

Bioinformatic analysis:

Metagenome; contigs

Taxonomy

Functional potential

BlastX/MEGAN

« Open Reading Frames (ORFs)

Perl scripts



Mascot search engine:

Mgf-files (Mascot Generic file)

Database: Translated ORFs from metagenome

Database: Selected genomes based on Taxonomy of Metagenome study + ORFs

Protein identification and validation

« Standalone Blast

« Database: Non-Redundant

(all available protein sequences from NCBI)

Annotation

The UiB Centre for Geobiology as a FP7 project partner

- Access to unique sampling locations
- Expertise in
 - Discovery and sampling of arctic deep sea microbial communities
 - Extraction of DNA and protein from marine sediments and hydrothermal microbial mats
 - Integrated metagenomic and metaproteomic analyses
- Contact information
 - Centre for Geobiology <http://www.uib.no/geobio/en>
 - Dr. Ida Helene Steen; e-mail: ida.steen@bio.uib.no; Phone +4755588375
- Efficient project management service at the University of Bergen: UiB is currently involved in 63 projects in FP7 and coordinates 14 of them

