British Geological Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL

the Lyell centre

HERIOT WATT UNIVERSITY

Water, life, and energy in subsurface environments

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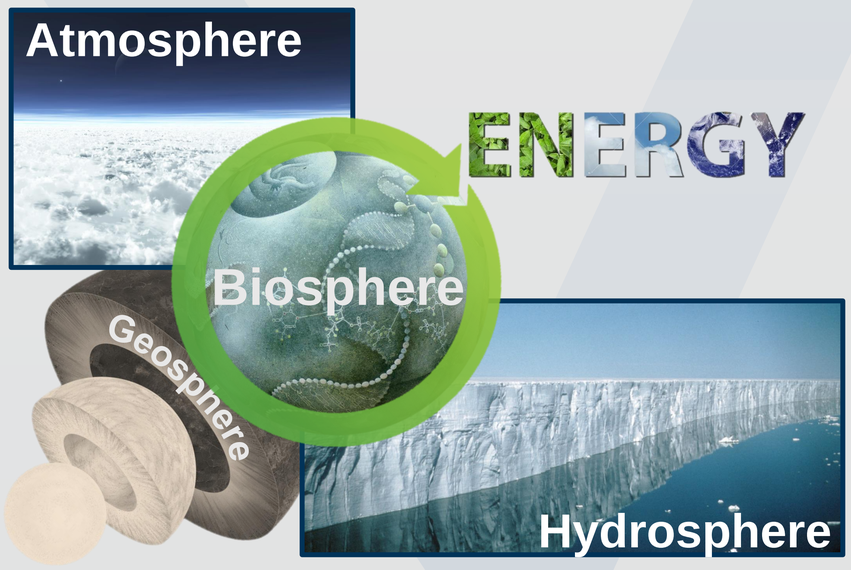
Subsurface environments are one of the largest biomes on Earth.

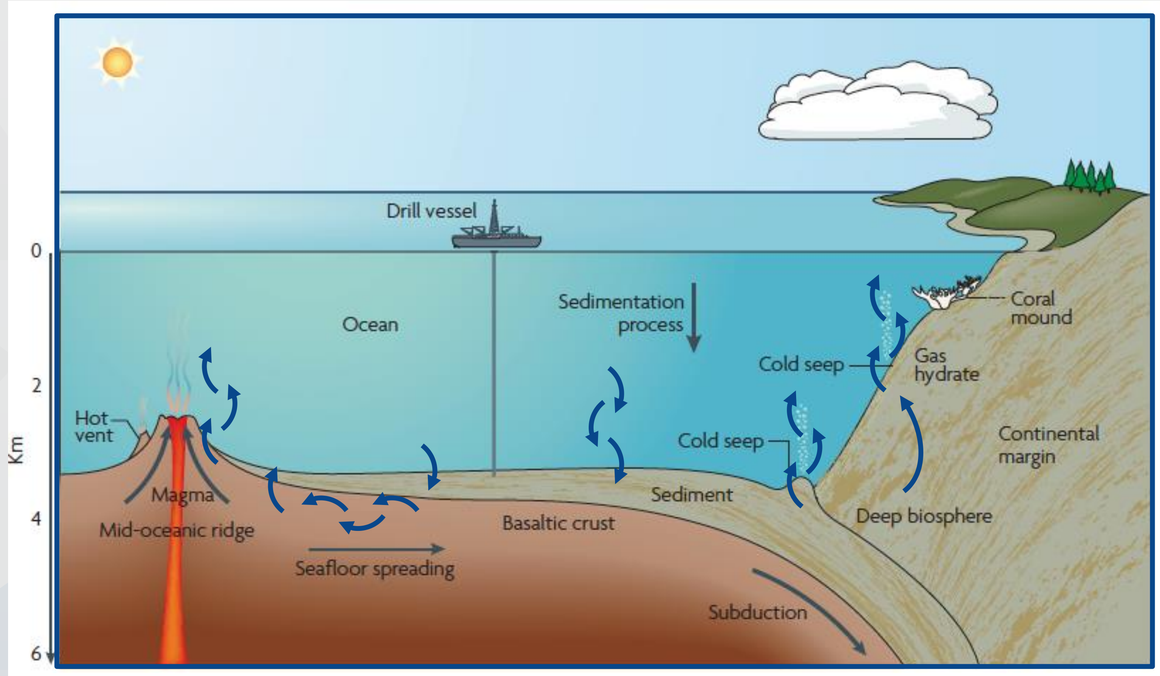
- It is estimated that 10^{29} microbial cells live in deep marine sediments and even in the oceanic crust.
- Energy and nutrients are highly limited in the deep subsurface, and turnover times can be of 100 to 1000 years.
- Understanding these slow metabolic processes is highly challenging, and one of the biggest unknowns in carbon cycling and subsurface life.



At the Lyell Centre we combine geosciences, hydrogeology and microbiology to investigate the abiotic and biotic components of subsurface environments, fluid and microbial transport, their role in petroleum formation, industrial applications and the dynamics of the “slow life” in the deep biosphere.


JOIDES Resolution, IODP


Sediment sampling with a gravity core at Aarhus Bay, Baltic Sea
Photo credit: Nils Risgaard-Petersen



Potential routes for microbial transport into, within and from the subsurface. Modified from Jørgensen and Boetius (2007) *Nature Rev. Microbiol*.

The deep subsurface is a resource for long-term water and energy security.

- Subsurface hydrology investigates infiltration processes, fluid transport, aquifer exchange with the surface, and is key to water resource management.
- Combining hydrogeology and microbiology, we study reservoir colonisation, heavy oil formation and biodegradation, marine microbial biogeography, and life at the extreme.
- Microbial activity in reservoirs causes souring and biofouling, but can also be harnessed for industrial application in enhanced oil recovery and improved reservoir management.