

## **Methane gas seepage – Disregard of significant water column filter processes?**

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Marine methane seepage represents a potential contributor for greenhouse gas in the atmosphere and is discussed as a driver for climate change. The ultimate question is how much methane is released from the seafloor on a global scale and what fraction may reach the atmosphere?

Dissolved fluxes from methane seepage sites on the seabed were found to be very efficiently reduced by benthic microbial oxidation, whereas transport of free gas bubbles from the seabed is considered to bypass the effective benthic methane filter. Numerical models are available today to predict the fate of such methane gas bubble release to the water column in regard to gas exchange with the ambient water column, respective bubble lifetime and rise height. However, the fate of rising gas bubbles and dissolved methane in the water column is not only governed by dissolution, but is also affected by lateral oceanographic currents and vertical bubble-induced upwelling, microbial oxidation, and physico-chemical processes that remain poorly understood so far.

According to this gap of knowledge we present data from two study sites - the anthropogenic North Sea 22/4b Blowout and the natural Coal Oil point seeps - to shed light into two new processes gathered with hydro-acoustic multibeam water column imaging and microbial investigations. The newly discovered processes are hereafter termed Spiral Vortex and Bubble Transport Mechanism. Spiral Vortex describes the evolution of a complex vortical fluid motion of a bubble plume in the wake of an intense gas release site (Blowout, North Sea). It appears very likely that it dramatically changes the dissolution kinetics of the seep gas bubbles. Bubble Transport Mechanism prescribes the transport of sediment-hosted bacteria into the water column via rising gas bubbles. Both processes act as filter mechanisms in regard to vertical transport of seep related methane, but have not been considered before. Spiral Vortex and Bubble Transport Mechanism represent the basis for a follow up research scheduled for August 2016 with the R/V POSEIDON with the aim to better constrain their mechanisms and to quantify their overall importance.