# Molecular and geochemical investigation of sediments covered with white mats at the Logatchev hydrothermal vent field

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Microbial mats have been described for different hydrothermal vent sites, e.g. along the East Pacific Rise (Taylor *et al*., 1999), in the Western Pacific (Takai *et al*., 2003), and at the Loihi Seamount (Moyer *et al*., 1995). In our study, we investigated the microbial community of two different sediments covered with white mats at the Logatchev hydrothermal vent area on the Mid-Atlantic Ridge (14°45`N). The white areas were occasionally interspersed with mussels at diffuse venting sites.

Temperature measurements showed 2-3 °C in the surface layer of both sediments increasing to up to 99°C in 28 cm depth. The corresponding temperature profiles revealed a linear temperature gradient indicating a high convective heat flux and no fluid flow. In contrast, the temperature of the sediments outside of the white-covered areas increased from 2-3°C to a maximum of only 8°C in 28 cm depth. To investigate the microbial diversity within the sediment surface layer (0-1 cm) of the white-covered areas 16S rRNA clone libraries were constructed. The analysis of about 100 clones per site resulted in 10-13 detected phyla. Using operational taxonomic units (OTUs), members of the *Gamma-*, *Delta-*, and *Epsilonproteobacteria* as well as of the phylum *Bacteroidetes* were identified as mat specific. CARD-FISH experiments confirmed that members of these four phylogenetic groups constitute the majority of microorganism in the surface sediment layer of the "white mat" community. Typical filamentous sulphur-oxidizing bacteria of the genera *Beggiatoa* and *Thiothrix* were not detected.

In conclusion, the microbial community of the white mats was found to be highly diverse. However, mat specific groups were identified, which phylogeneticaly affiliated mainly with cultured sulphur-oxidizing bacteria. The high temperature in the deeper sediment layers correlates with the appearance of the white mats on the sediments. This suggests that a high subsurface temperature could cause processes supporting the formation of white mats on hydrothermal sediments.

## References

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# U-Th magma residence times of the Plinian Mercato eruption at Mt. Somma-Vesuvius (Southern Italy)

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Plinian phonolite eruptions are a permanent dangerous threat for the population close-by to explosive volcanoes and have an effect on global climate changes. Hence, phonolite residence times in the crust are critical for assessing the potential hazard and frequencies of such explosive phonolite volcanic systems. So far, previous U-Th-studies on phonolites suggest time scales for the whole differentation process forming a basanite to a phonolite of hundred of years up to hundred of thousend years. However, it is still unclear how long an differentiated phonolite and potentially explosive magma can reside in the crust without eruption or solidifying. Our combined petrological, geochemical and isotope study on late-stage phenocrystic unzoned phonolite Ca-garnets from a phonolite sample of the Pomici di Mercato eruption from Mt. Somma-Vesuvius (Southern Italy) permit for the first time the precise determination of the residence time of a differentiated phonolite magma in the shallow crust: These Ca-garnets, glass and whole-rock from the 8.1 ka-old phonolite Pomici di Mercato eruption define an U-Th-isochrone age of 14.4 ± 1.1 ka (2σ). It follows that explosive phonolite magma resided for more than 5 ka before eruption beneath Mt. Somma-Vesuvius in the shallow crust. In addition, given the recorded frequencies of eruptions from this volcano over the time, the Pomici di Mercato eruption was preceded by an exceptionnel long repose time. This could be explained by the closed-system behaviour of the Mercato reservoir, that was not refilled since Ca-garnet crystallisation and was not triggered by an input of new volatile-rich, less-differentiated magma.