Coccolithophore community response along a natural CO_2 gradient off Methana (northeastern Peloponnese peninsula, Aegean Sea)

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Methana is located at the eastern Peloponnese peninsula and represents the western end of the Aegean Volcanic Arc. The last eruption on Methana was in 230 BC, but the area is still hydrothermally active with gas emissions of mainly carbon dioxide and smaller amounts of nitrogen, carbon monoxide, and methane (Baggini *et al*., 2014). Data on the macroalgal community of the Methana seep site showed that benthic communities had decreases in

calcifying algal cover and increases in brown algal cover with increasing pCO_2 (Baggini *et al*., 2014).

During September 2011 and 2016, plankton samples were collected to study coccolithophore communities. A natural pH gradient, caused by marine CO_2 seeps off the Methana peninsula, was used as a natural laboratory to assess the effects of long-term ocean acidification on coccolithophores. We observed 69 coccolithophore species of which 34 are holococcolithophores. Nutrient and Chlorophyll-*a* concentrations showed typical oligotrophic summer Aegean Sea conditions. Cell concentrations were a maximum of $\sim 50 \times 10^3$ cells/l, with a high Shannon index of up to 2.8, along a pH gradient from 7.61 to 8.22. Water collected close to the main CO_2 seeps had the highest concentrations of holococcolithophores (max. $\sim 30 \times 10^3$ cells/l, 90% relative abundance), which were much higher than recorded in comparable coastal environments with normal pH values (Dimiza *et al*., 2008). In "normal" water conditions, species such as *Emiliania huxleyi* were more abundant (max. $\sim 7 \times 10^3$ cells/l at 40m depth). Changes in the community structure can possibly be related to increased temperatures, while the overall trend associates low pH values with high cell densities. *Emiliania huxleyi* was present only in low relative abundances. Neither malformed nor corroded coccoliths were documented, in contrast to observations by Ziveri *et al*. (2014) in similar environments. Our preliminary results indicate that in long-term acidified, warm and stratified conditions, the study of the total coccolithophore assemblage may prove useful to recognize intercommunity variability, which favors lightly calcified species such as holococcolithophores.

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