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The influence of pH and dissolved inorganic carbon on coccolith size and morphology of *Emiliania huxleyi*

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The coccolithophore *Emiliania huxleyi* was cultured under a broad range of carbonate chemistry conditions to assess the response of coccolith size and morphology to different concentrations of CO_2, HCO_3^-, CO_3^{2-} and pH. Currently, large amounts of emitted carbon dioxide lead to an increase of CO_2, HCO_3^- and the total dissolved inorganic carbon concentration while it leads to a decrease of CO_3^{2-} and pH in seawater. First results of our experiments indicate that coccolith size increased with increasing partial pressure of CO_2 (pCO_2) until pCO_2 reached 500 μatm and slowly decreased with pH when pH became lower than 8. In the pCO_2 range from 20 to 500 μatm, the surface area of the distal shield element increased from a mean value of 6 μm^2 to 10 μm^2. At pH levels below 8, distal shield surface area decreased from 10 μm^2 at pH 8 to 7 μm^2 at pH 7. In contrast to size, coccolith morphology seems to be mainly affected by pH and only marginally by inorganic carbon availability. The degree of malformations and the frequency of malformed coccoliths increased linearly with decreasing pH. Although, the dependency of coccolith size on prevailing carbonate chemistry conditions during growth and the good conservation of coccoliths in marine sediments suggest that coccolith size might be a useful proxy for paleo carbonate chemistry conditions, the application of such a proxy might be difficult. This is because coccolith size is known to be affected by other environmental factors such as for example salinity, and different strains of E. *huxleyi* might produce coccoliths of different sizes.