Responses of marine bacteria to CO_2 enrichment in mesocosm perturbation studies

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Unabated CO_2 emissions will cause ocean pH at the end of this century to decrease to levels lower than have been experienced for tens of millions of years. The effect this will have on marine organisms, including marine bacteria, is largely uncertain. We have therefore studied the effect of CO_2 enrichment on bacterial abundance, activities, and diversity in 2 mesocosm CO_2 perturbation studies conducted in the Large Scale Mesocosm Facility of the University of Bergen (Pelagic Ecosystem CO_2 Enrichment Study, PeECE II and III). Triplicate mesocosms were maintained at three CO_2 levels ranging between 190-700 ppm (PeECE II) and 375-1150 ppm (PeECE III). Whereas the abundance of total, free-living, and attached bacteria did not differ with pCO_2 in both studies, bacterial protein production (BPP) and growth rate (μ) were significantly elevated under high pCO_2 during PeECE II. This effect was even more pronounced for cell-specific production rates, especially those of attached bacteria, which were up to 25 times higher than those of free bacteria. However, no significant pCO_2 induced changes in these parameters and bacterial diversity were observed during PeECE III. In contrast to PeECE II, phytoplankton species dynamics in PeECE III was almost identical in on all pCO_2 levels. Thus, our results suggest that there might be an effect on bacterial activities due to the proposed increase in pCO_2, however, these effects are mostly indirect, primarily being linked to phytoplankton dynamics.