Large-scale variability in surface bacterial carbon demand and growth efficiency in the subtropical northeast Atlantic Ocean

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ABSTRACT: We present surface estimates of bacterial respiration, bacterial heterotrophic production (BHP), and bacterial growth efficiency (BGE), and their relationship with nutrient availability, along a trophic gradient from coastal upwelling waters to the open-ocean waters of the eastern North Atlantic. Bacterial respiration generally ranged between 10 and 30 μg C L^{-1} d^{-1} and was relatively unaffected by nutrient enrichment. In contrast, BHP showed higher variability (more than one order-of-magnitude range) and was affected by carbon and/or phosphorus additions in different regions. Empirical bacterial carbon-to-leucine (Leu) conversion factors (CFs) (range, 0.02- 1.29 kg C mol Leu^{-1}) decreased from the coast to the open ocean, largely influencing the BHP estimates in oligotrophic waters. We found high percentages of Leu respiration in oceanic waters (average 68% of Leu taken up by bacteria), possibly related to the low CFs found offshore. Empirical CFs were highly correlated to BGE (Pearson correlation coefficient $r = 0.86$, $n = 12$, $p < 0.0004$, log-log transformed), which varied between 1% in offshore waters and 56% in the upwelling waters. Empirical CFs could be critical not only for accurately constraining BHP, but probably also for predicting BGE in oceanic waters.

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