



## Production-respiration relationships at different timescales within the Biosphere 2 coral reef biome

Falter, James L., M. J. Atkinson, Chris Langdon

Limnol. Oceanogr., 46(7), 2001, 1653-1660 | DOI: 10.4319/lo.2001.46.7.1653

**ABSTRACT:** Temporal relationships between organic carbon production and respiration are not well understood in coral reef ecosystems. We monitored dissolved oxygen ( $O_2$ ) concentrations within the Biosphere 2 coral reef biome over a 3-yr period (1 January 1997-1 January 2000), to calculate daily rates of gross production (P), community respiration (R), and net community production (NCP). P averaged  $170 \text{ mmol } O_2 \text{ m}^{-2} \text{ d}^{-1}$ , and R averaged  $173 \text{ mmol } O_2 \text{ m}^{-2} \text{ d}^{-1}$ , which yielded a mean NCP of only  $-3 \text{ mmol } O_2 \text{ m}^{-2} \text{ d}^{-1}$ , or a difference of only 2%. This long-term balance between P and R reflects the closed-system design of the biome. The SD of P, however, was  $\pm 56 \text{ mmol } O_2 \text{ m}^{-2} \text{ d}^{-1}$ ; that of R was  $\pm 47 \text{ mmol } O_2 \text{ m}^{-2} \text{ d}^{-1}$ ; and that of NCP was  $\pm 26 \text{ mmol } O_2 \text{ m}^{-2} \text{ d}^{-1}$  or  $\pm 15\%$  of mean P. To better resolve the behavior of P, R, and NCP at different timescales, each of these time series were spectrally decomposed into four frequency bands that corresponded to four timescales:  $<1$  week, 1 week-1 month, 1-3 months (subseasonal), and  $>3$  months (seasonal to annual). At timescales  $>1$  month, the variance of P was not different from the variance of R. At timescales of  $<1$  month, the variance in P was significantly greater than the variance in R ( $P < 0.01$ ). Furthermore, the correlation between changes in P and changes in R became weaker with decreasing timescale. We suggest that changes in P and R become well matched at timescales that coincide with the turnover of carbon by the dominant macroalgae within the biome (1-3 months). In addition, we conclude that measurements of NCP based on daily or weekly data sets are not good indicators of the long-term net metabolic performance of coral reefs.

### Article Links

[Download Full-text PDF](#)

[Return to Table of Contents](#)

### Please Note

Articles in L&O appear in PDF format. Open access articles may be freely downloaded by anyone. Other articles are available for download to subscribers only, or may be purchased for \$10 per article. All L&O articles are moved into Open Access after three years.

