

Eilat reef calcification rate equation validation in Australian reefs

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Laboratory and natural community experimental studies have demonstrated that Ocean Acidification (OA) has potentially deleterious effects on CaCO_3 budgets of coral reefs. Previously, relations between the diurnal average net community calcification rate (G_{net}), seawater temperature and aragonite saturation state (Ω_{arag}) were developed based on their seasonal variations in a Red Sea coral reef, hereafter the Eilat rate equation. During 2008-2009, G_{net} of Lizard Island (LI) and One Tree Island (OTI) reef flats were measured during the same seasons, using nearly the same methodologies employed ca. 30-40 years before, in order to validate the predictions made with the inorganic component of the Eilat rate equation (G_i). Comparison of diurnal average G_{net} from LI and OTI with their corresponding G_i agree well with the Eilat trend line after normalizing them to a constant live coral coverage of 8% - $G_{\text{net-norm}} = G_{\text{net}} \cdot 8\% / \text{Live coral coverage}$ (live coral coverage of LI reef flat). Similarly, G_{net} values measured by Shaw et al. (2013) and Falter et al. (2012) on Lady Eliot Island and Ningaloo reef flats during winter and summer also agree well with the Eilat trend line after normalization. Thus, the Eilat rate equation is a useful monitoring tool to assess the effects of OA on whole reef communities over time, while taking into account also changes in live coral coverage.

