

Interactive comment on “CO₃²⁻ concentration and pCO₂ thresholds for calcification and dissolution on the Molokai reef flat, Hawaii” by K. K. Yates and R. B. Halley

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There should be a minus sign in front of equation 1.

I feel strongly that the rates of calcification should be reported in units of moles not mass. I suggest the units be mmol CaCO₂ /m²/h to ease comparison with previous work.

I checked the calculation of some of the rates in Table 1 and I am pretty sure the rates are per hour and not per 4 hours.

I analyzed the data in Table 1 a little differently. I computed rates during the day and night by regressing TA against time for the daylight and night time data respectively. I

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find that all the day time rates are positive, i.e. net calcification and all the night time rates are negative, i.e. dissolution. The one exception is the sand bottom in July 2001 when there was net calcification at night.

Environment $p\text{CO}_2$ G, $\text{mmol CaCO}_3/\text{m}^2/\text{h}$

Sand 2/10/00 Day 607 0.30 Sand 7/23/01 Day 616 2.0 Sand 2/9/00 Night 605 -1.4
Sand 2/10/00 Night 570 -0.9 Sand 7/23/01 Night 611 1.1

10% cover 7/28/01 Day 619 3.6 7/29/01 Day 1058 3.2 7/28/01 Night 1064 -0.9

22% cover 2/16/00 Day 331 8.4 2/17/00 Day 723 5.0 2/16/00 Night 731 -6.2

Rubble 2/13/00 Day 517 3.6 2/14/00 Day 610 0.9 2/13/00 Night 646 -6.0

The difference between whether G is positive or negative has to do with time of day and not $p\text{CO}_2$. For example on 7/28/01 $p\text{CO}_2$ averaged 1058 during the day but there was a significant net calcification rate.

I think the data are saying that changes in the $p\text{CO}_2$ and saturation state of the water column are not exerting a strong control on the process of dissolution. This could explain why the correlations between G and $p\text{CO}_2$ are not very strong and vary so much between winter and summer.

I don't think the data support the conclusion that the transition from precipitation to dissolution in these systems will occur when $p\text{CO}_2$ rises above 650 ± 195 .

I think the authors have some nice rates of dissolution to report but have not identified the controlling variable. I suspect that they will have to extend their studies into the chemistry of the pore waters.

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