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Interactive Comment

Interactive comment on "Mass extinctions past and present: a unifying hypothesis" *by* S. A. Wooldridge

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A hidden "dark dissolution" process

It has been suggested that the urease hypothesis is in error because dark respiration (net CO2 release = acidification) causes the micro-environment of most reef organisms (including symbiotic reef corals) to fall below pH 7.9 during the night-time period (see e.g., Fig 2; Yates & Halley 2006) - with this situation being reversed during the day-time period as net CO2-uptake occurs due mainly to the photosynthetic activities of algal endosymbionts. In response to this criticism, I argue that there is strong and persuasive evidence to support the fact that scleractinian corals (Kawaguti & Sakumoto 1948), coralline algae (Chisholm 2000), soft corals (Tentori & Allemand 2006), and the integrated coral reef patch (Barnes & Devereux 1984; Yates & Halley 2006) typically undergo net decalcification (i.e. dissolution) during the night-time period. This means, that present-day net (positive) calcification rates across the diurnal cycle hide a "dark dissolution" component. Thus, the negative outcome of the urease hypothesis for marine organisms is already partially activated.

Coral bleaching = skeletal dissolution

Respiratory acidification (i.e. P:R $<<$ 1) that results in the pH micro-environment of symbiotic reef corals falling below 7.9 is known to occur during hot-water coral bleaching events (Al-Horani 2005). It is therefore not surprising that "at super-optimum temperatures (above 26oC) coral consume more O2 than they produce, decalcify, and produce CO2" (Al-Horani 2005). The degradation (negative selection) against calcifying reef ecosystems due rising sea surface temperatures and ocean acidification is thus indelibly linked. If that is not a Science or Nature paper for someone to test further and write about, then I don't know what is. Again, I challenge the scientific community to seriously consider the ramifications of the urease hypothesis.

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