Using U/Ca Ratios to Reconstruct Past Ocean pH

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Bamboo Corals
- Deep sea corals live in intermediate to deep waters.
- Consist of alternating segments of inorganic calcite interlayers and organic chitinous nodes.
- Long-lived organisms that can grow as old as 350 years.

Coral Collection
Samples collected in 2007 aboard the Western Flyer.

Coral as a Seawater pH Proxy
- [CO₂⁻] in seawater is inversely correlated with total atmospheric CO₂, therefore atmospheric carbon loading is directly correlated to oceanic pH.
- Previous studies document an inverse relationship between U/Ca ratios in the calcite of foraminifera shells and the [CO₂⁻] in seawater (Russell et al. 2004).
- Bamboo coral skeleton U/Ca may exhibit the same relationship to seawater.

Research Question: Can bamboo coral skeletons be used to reconstruct past ocean pH via the inverse correlation between U/Ca and [CO₂⁻]?

Names, Longitudes, Latitudes, Depths, and Locations of Samples

<table>
<thead>
<tr>
<th>Name</th>
<th>Longitude</th>
<th>Latitude</th>
<th>Depth</th>
<th>Diameter</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>T661 A9</td>
<td>-121.084</td>
<td>34.045</td>
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<td>1.39 cm</td>
<td>Rodriguez Seamount</td>
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<td>1954</td>
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<td>T1100 A3</td>
<td>23.6497</td>
<td>37.21.5032</td>
<td>1353</td>
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<td>Pioneer Seamount</td>
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<td>T1100 A4</td>
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<td>37.21.5712</td>
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<tr>
<td>T1102 A12</td>
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<td>1500</td>
<td>1.49 cm</td>
<td>Seamount</td>
</tr>
</tbody>
</table>

Methods
- Hand drill used three times along radius of each coral to obtain powder (See Sverre LeRoy’s poster).
- Standards and samples analyzed UC Santa Cruz’s ICP-MS to determine the U/Ca ratio.
- First trial:
  - Powder in 1% HCL cleaned centrifuge tubes
  - Standards prepared using Optima Grade Fisher Scientific HNO₃
- Second trial:
  - Fisher Scientific trace metal nitric used for cleaning and standards
- Future trials:
  - Standards and samples will be prepared at UCSC

Preliminary Results
- Test sample contains 121.5 ppm CaCO₃.
- 1% nitric blank and P_U·Ca standard analyzed.
- All standards and samples [U] higher than predicted.
- Blank replaced with 1% nitric made at UCSC resulted in low [U] as predicted.
- In future tests, the intensities, in cps, can be translated to concentration.

Immediate Concern
Reduce the amount of U in blank to allow for better precision when measuring concentration of sample.

Further Questions
Is there variability in the U/Ca ratios recorded in the corals?
If so, what is the cause of such variability? Change in O₂, pH, temperature?

Acknowledgments
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