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Sedimentological Description of Antigua sample

Key Points

- *Halimeda*-dominated carbonate mud
- The sample (76%) is dominated by unidentified silt-sized (42-63 μm) and clay sized (<42 μm) grains
- Sand sized components making up 24% of the sediment are dominantly fragments of the calcifying green alga *Halimeda sp.*

1. Composition Analysis

Sediment was wet-sieved into different size fractions and composition of grains larger than 63 μm were semi-quantitatively determined under stereoscope:

>500 μm and 355-500 μm size fractions (1% of total sediment)

dominated by angular *Halimeda sp.* fragments

common: benthic foraminifera, organic matter (remains of algae and grass),

rare: unidentified grains and clasts, coralline algae fragments, other skeletal fragments

250-355 μm size fraction (1% of total sediment)

dominated by angular *Halimeda sp.* fragments

common: sponge spicules, benthic foraminifera, ostracods, organic matter (algae or grass remains),

rare: black and green grains of unidentified, origin possibly volcanic

150-250 μm (5% of total sediment) and 63-150 μm (20% of total sediment)

smaller size fractions contain the same components as above.

< 63 μm (~73% of total sediment)

However, most of the sample is smaller than 63 μm and makes up the silt-sized (42-63 μm) and clay-size (<63 μm) fractions of the sediment. It is too small to be fully identified under the stereoscope, however mud- and silt-size aggregates are bound together by organic matter.

2. De-carbonated sample

Sample dissolved in HCl in order to remove all carbonate. Residual sample dominated by organic matter, with cellulose and algal sheets visible

rare: black and green grains of possibly volcanic origin

3. Grain-size Analysis

Grain-size distribution was determined by using a laser particle size analyzer. The sediment is dominated by grains smaller than $63\ \mu\text{m}$, which corresponds to the silt and clay-size fraction.

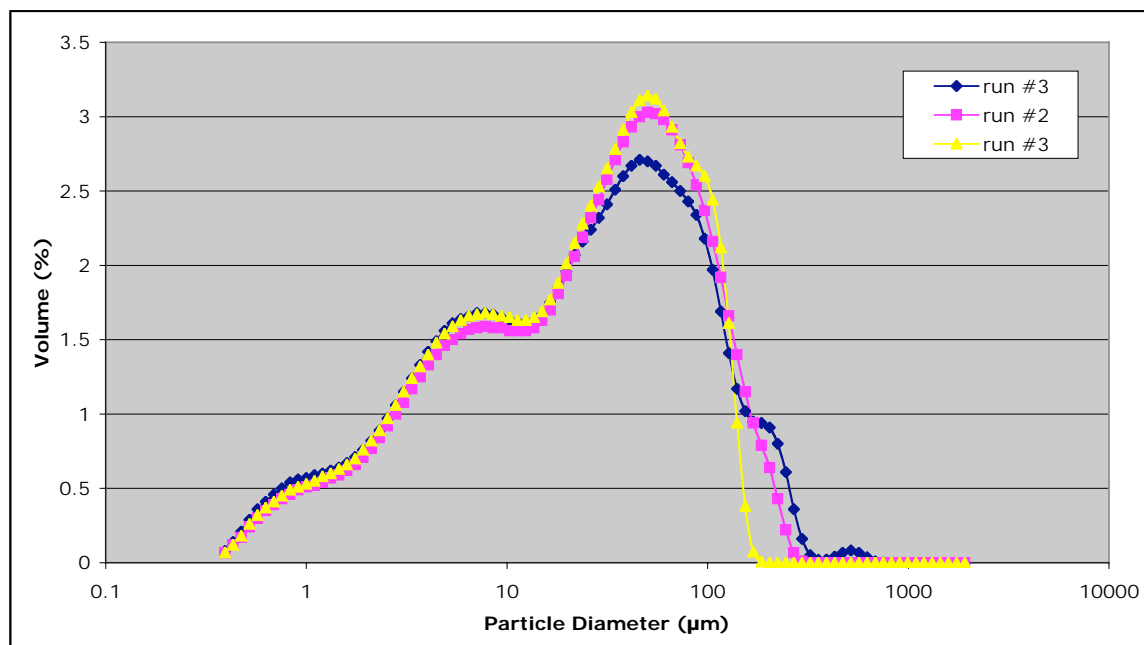


Figure 1. Grain-size distribution. Sediment is dominated by carbonate mud ($< 63\ \mu\text{m}$).

Sediment was divided into three aliquots and analyzed separately. The 3 measurements are within very good agreement of each other. The average sediment is $36.7 - 45.5\ \mu\text{m}$ in size. The sediment is dominated by grains below $63\ \mu\text{m}$ and thus termed a carbonate mud.

4. Environmental Implications

Halimeda sp

Halimeda sp is a calcifying green algae. It photosynthesizes and thus requires light. It commonly grows in water depths of 2-30 m in reef and near back-reef areas and is a major carbonate sand producer. The skeletal mineralogy of *Halimeda sp* is aragonite.

Carbonate Mud

It is difficult to determine the origin of the carbonate mud via the stereoscope – a more detailed analysis via SEM (scanning electron microscope) is required to better characterize and identify the silt ($42-63\ \mu\text{m}$) and clay ($< 42\ \mu\text{m}$) fractions. Based on observations using the stereoscope, carbonate mud contains *Halimeda* fragments in aggregates, which are lined by organic matter.

Summary

Halimeda sp fragmentation and its angular grain shape argues for in-situ production and deposition or only very little transportation (i.e. currents). Based on the high mud content, the sediment was deposited in a low energy environment (i.e. back-reef lagoon or leeward side of an island).

Disturbing this sedimentary layer due to construction will result in the suspension of the mud into the water column and affect the turbidity of the ambient water. Once suspended it will take a long time to settle and while in suspension will decrease visibility considerably. This turbid water could affect surrounding and downstream fauna and flora.