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IFALIK ATOLL

Tide and Tide Measurement 2015

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Methodology

In order to measure the tide, a tide gauge was set up on the lagoon side of the island, approximately 20 m off shore near the main Men’s House (Figure 1). The location was chosen based on the location of the selected transect of the observational wells so that it would facilitate elevation measurements, and enable frequent supervision of the gauge.

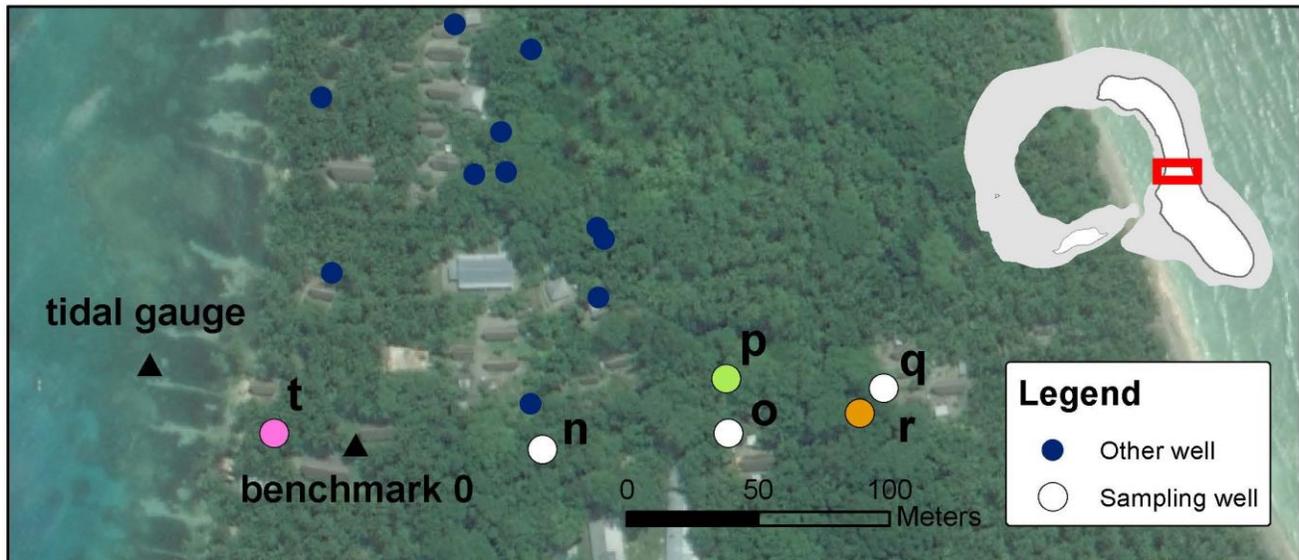


Figure 1: Map showing the tide gauge location on Ifalik Atoll. *Map credit: Maria Kottermair.*

A pressure-based level logger, a *ca.* 2-meter long rebar, and a *ca.* 1.6-meter long PVC tube *ca.* 5 cm in diameter were used to construct the tide gauge. The rebar was pencil-sharpened with a welding flame and grinding machine.

During low tide, the rebar was hammered in thick branch coral sediment behind a reef bedrock pinnacle for additional protection against wave attack (the direction of the waves was considered).

The lowest expected low tide level was also taken into consideration when choosing the location. To ensure vertical position of the bar, a spirit level was used during hammering. The logger was then tied to the rebar by an adjustable metal screw bolt clamp tie and a zip tie (Figure 2) using a mask and snorkel. To buffer the effect of the waves on sea level logging, the rebar with the logger was covered with the PVC tube. The lower extreme of the tube was placed about 1 cm above the coral ground in which the rebar was placed in order to allow hydraulic pressure to regulate the water level within the tube. At two points on the tube, two additional openings were made for zip ties. The tube was then placed on top of the rebar and tied with zip ties (Figure 3). The tube top was well above sea level even during high tide.

Significant data started being collected: 16 August 2015; 15:26.

Significant data stopped being collected: 22 August 2015; 12:57.

The selected logging interval was 5 min.

Location (in WGS 1984): 144.453794°E 7.249807°N



Figure 2: The water level logger tied to the rebar with an adjustable metal screw bolt clamp tie and a zip tie.



Figure 3: Placing the PVC tube over the rebar. The gauge was set up behind a coral pinnacle (red arrow) in the wave shadow. The pink arrow shows the wave direction. *Photo credit: Maria Kottermair*

Results

See raw data spreadsheet (not included here due to the volume of data record (they can be obtained separately from the team leader).

Observations & Recommendations

The relatively still conditions around the logger created by the PVC tube made ideal conditions for the growth of algae that crucially affected the measurements. If the same kind of tide-gauging setup is to be used it is hence not recommended to use a PVC tube in the future. If the measuring interval is really small, *e.g.* 5 min, the number of data should suffice to calculate a smooth tidal curve (averaging the values or by least square analysis), regardless of the noise from the waves.

The observations made during the reconnaissance walk around and across the island suggest that the low tide on the ocean side started to occur earlier than on the lagoon side. It is possible, that seawater gets perched during high tide in the relatively well-enclosed lagoon, and, hence, needs more time to drain out of the lagoon when low tide occurs. Likewise, it is possible that as the tidal bulge crosses the area from east to west it floods the ocean side reef before it fills up the enclosed lagoon (*i.e.*, the high tide on the reef occurs earlier).

For proper ground water modeling it is thus highly recommended to place tide gauges on both island sides in future ground water observations. From preliminary observations the best site would be the reef flat in the area near the former channel between Rawaiu and Falalap as it seems to be the most open to the open ocean. The reef flat is, however, not ideal for tide measurements because the water stays partially moated on the reef flat behind the reef crest during low tide and/or is occasionally filled by water brought by high waves. However, the record of high tides would be still accurate and would also allow to obtain the lag time between the two sides of the island. Based on this lag and exact timing of the peak high tides, the timing of the peak low tides could be inferred, while the tidal range could be approximated from the record on the lagoon side of the island.