# Wave Height Pressure Sensor

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## Abstract

By studying wave statistics, marine ecologists and oceanographers can better understand marine ecosystems and the way they respond to climate change. The *Wave Height Pressure Sensor* measures pressure data in a leak proof and robust casing. The design withstands a bio extensive environment, provides ease of use, and is designed for low cost, high volume, and quality fabrication.

## Project Objective

The Partnership for Interdisciplinary Studies of Coastal Oceans (PISCO) is currently studying near shore ecosystems along the California coast and in Moorea, Tahiti, as shown in Figure 1 and 2. Their current commercial wave measuring devices are expensive and overly complex. For this reason, there is a need for a low cost programmable pressure instrument for determining wave height only. It will be anchored to the ocean floor for periods of three to six months and will burst sample pressure at 1 to 4 Hz every hour.

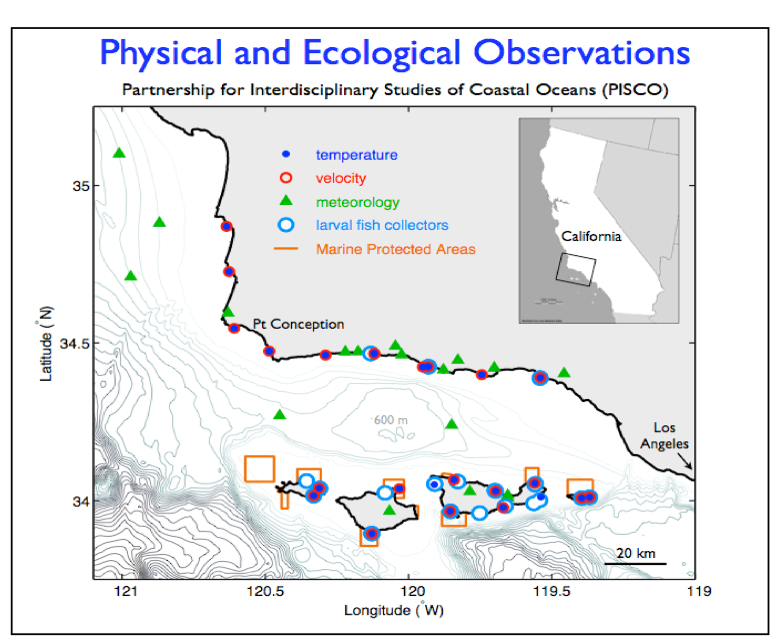


Figure 1. Potential device deployment locations along California's central coastline.

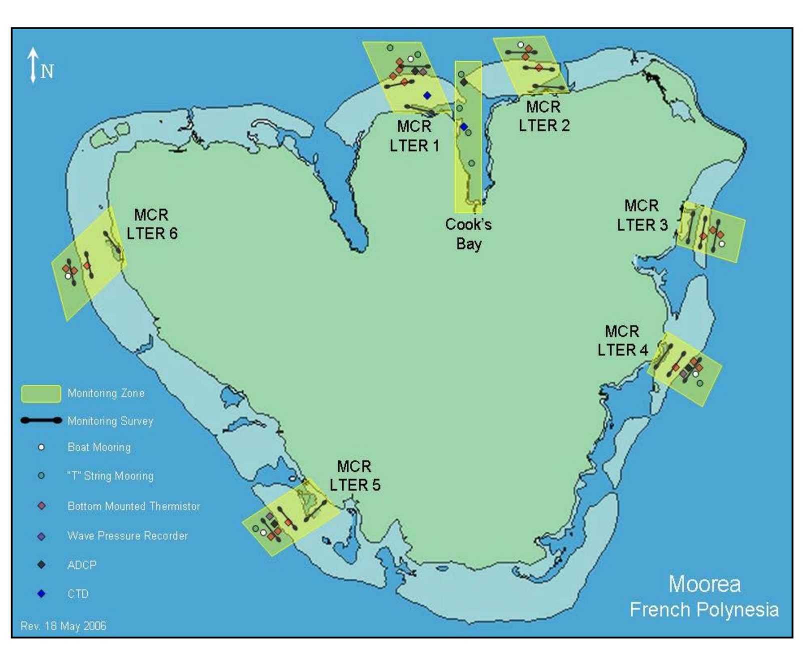


Figure 2. Potential device deployment locations in Moorea, Tahiti.

## Acknowledgments

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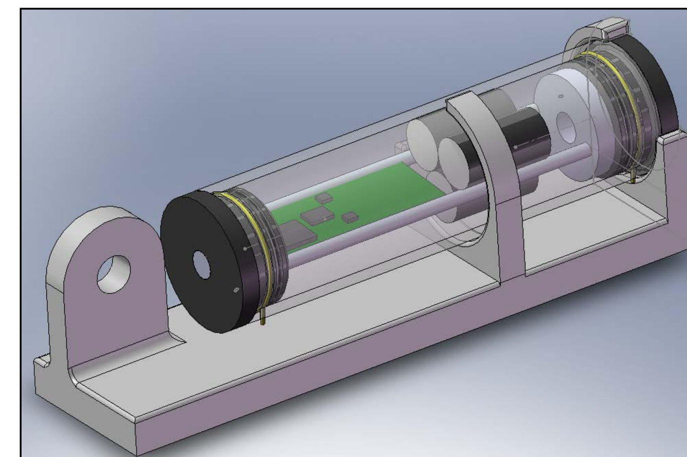

Figure 3. Model of device with potential anchor

Figure 4. The Wave Height Pressure Sensor

Figure 5. Divers anchoring down the benchmark device

## Engineering Challenges

Electronics and Programming

- Program a PIC microcontroller using C
- Design and fabricate a Circuit board
- Utilize FAT file allocation on SD Card
- Achieve required resolution by means of an external analog to digital converter
- Calibrate pressure transducer
- Minimize power consumption
- Develop a user interface using LabView

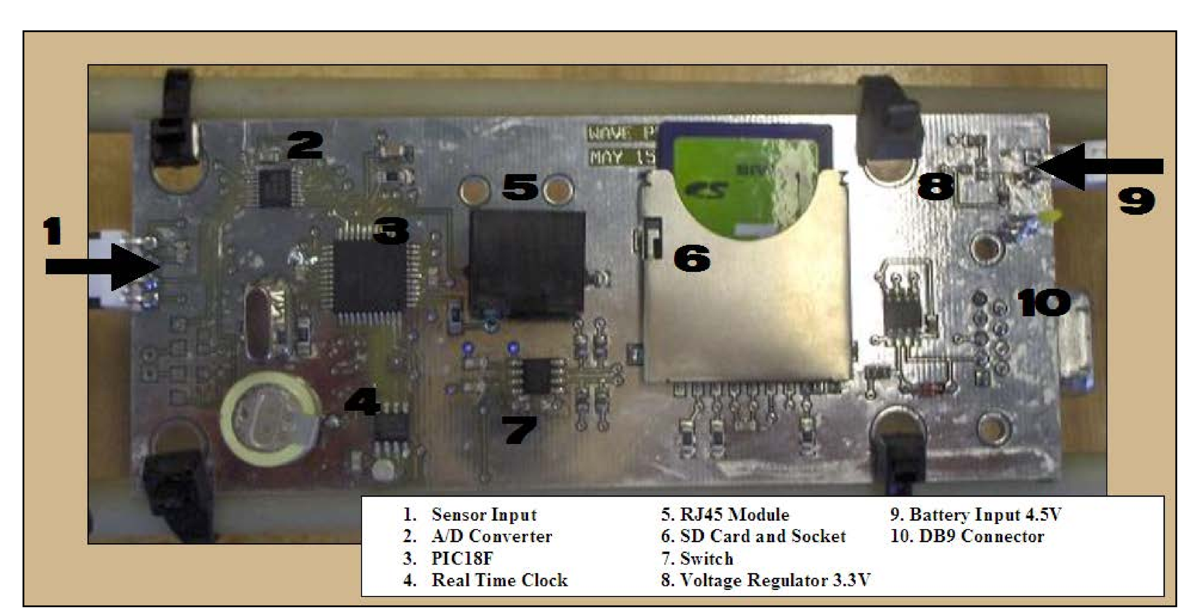


Figure 6. Fabricated Circuit Board

Casing Design

- Minimize bio fouling through material selection
- Design casing to meet depth/ pressure requirements

## Results

Design efforts resulted in:

- Pressure calibrated data (Figure 6 and 7)
- 2 GB of functional memory storage
- Estimated battery life of up to 1 year
- Functional operating depth of 6 ft.
- Estimated cost savings of $11,750/unit (Figure 9)

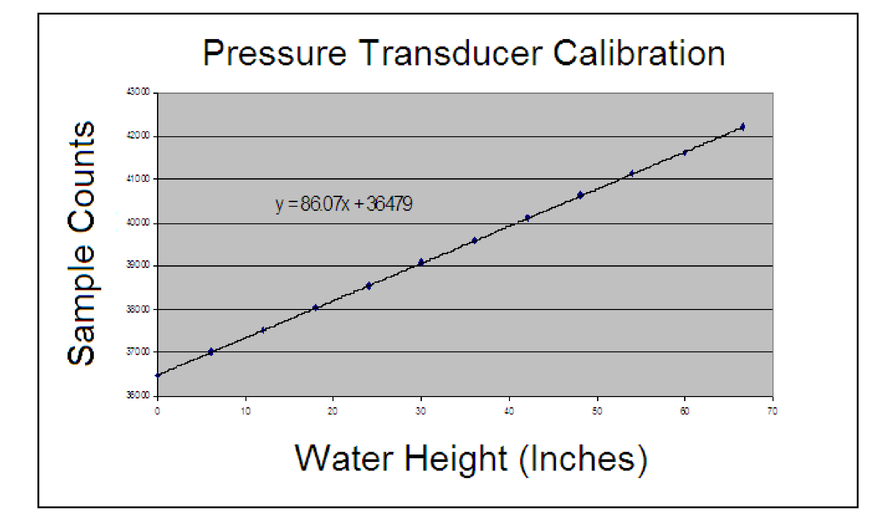


Figure 7. Linear Calibration Curve

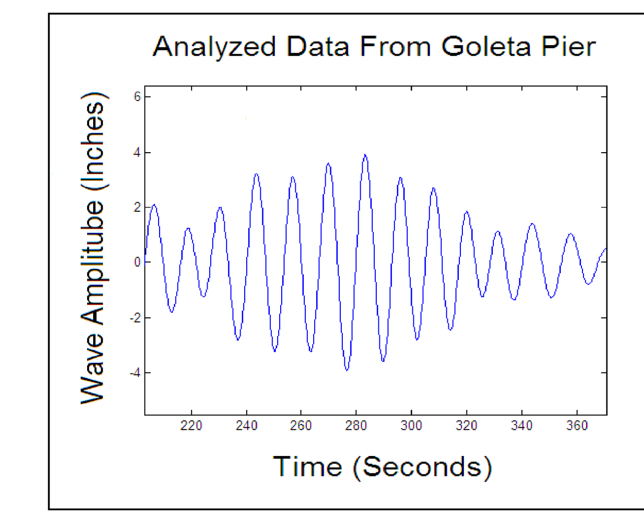


Figure 8. Results of data taken from Goleta Pier

| Cost / Unit | Wave Height Pressure Sensor | SeaBird 26+ |
|---|---|---|
| | $250 | $12,000 |

Figure 9. Cost Comparison with the Benchmark Seabird 26+

## Recommendations

Resolution and operating depth should be increased by modifying the ADC gain and modifying the pressure transducer. An anchoring device must be designed prior to field use. Finally, the *Wave Height Pressure Sensor* is to be tested against the benchmark *Seabird 26+ device* for a three month deployment time to test for accuracy.

## References

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