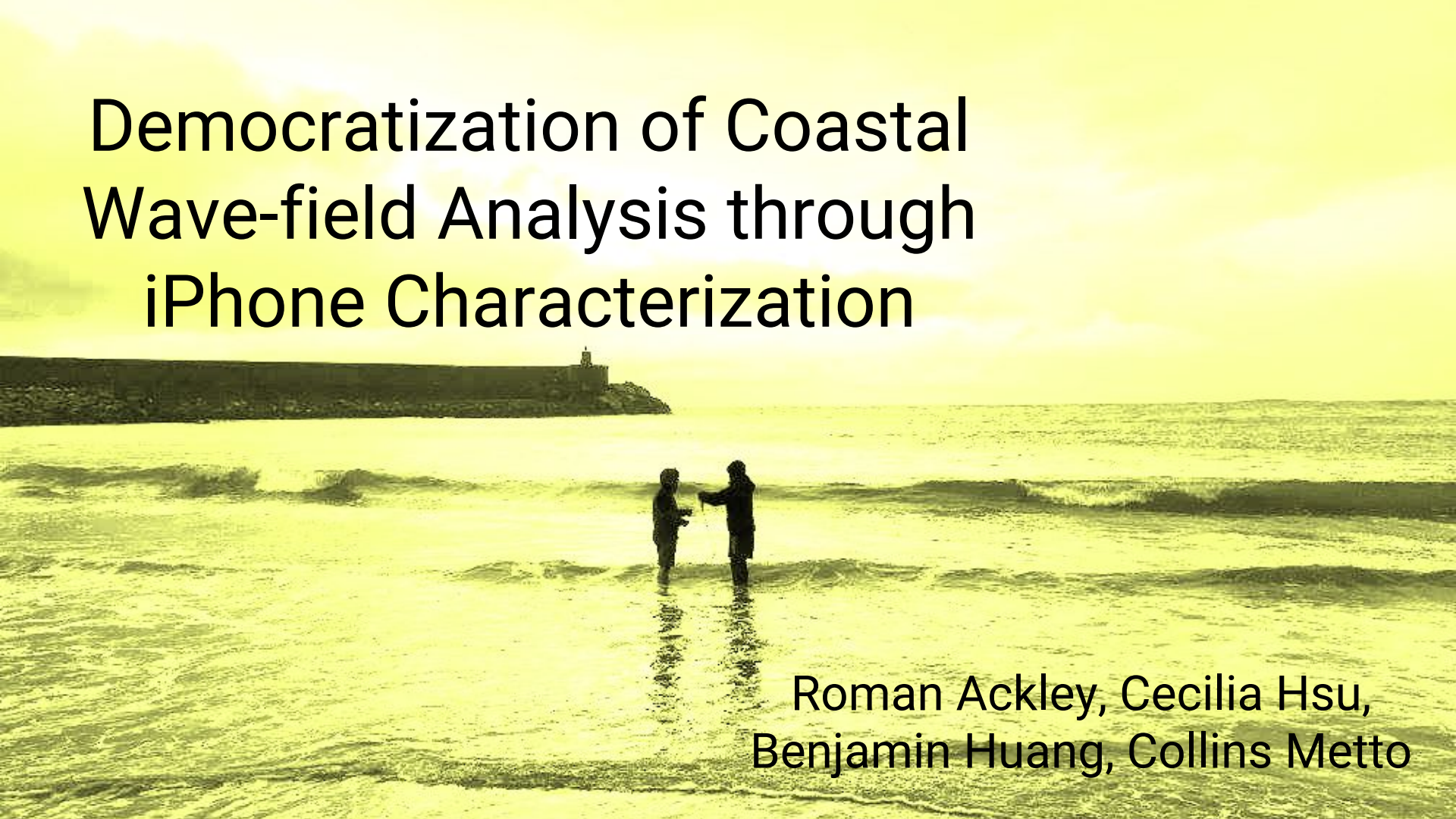
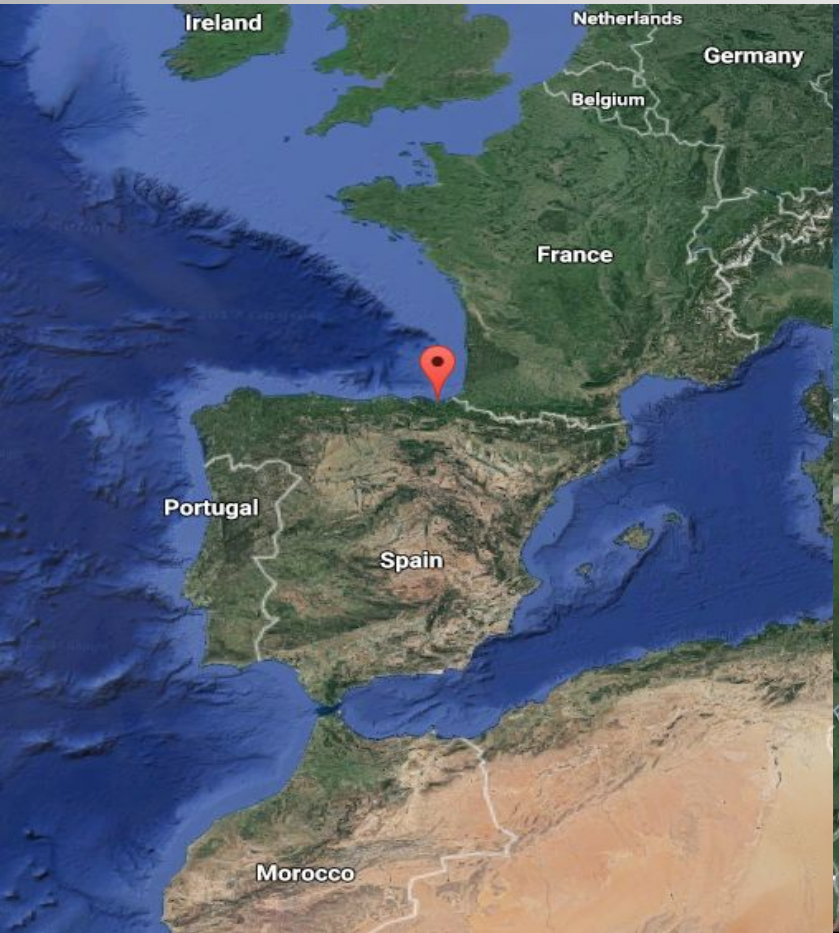
Democratization of Coastal Wave-field Analysis through iPhone Characterization



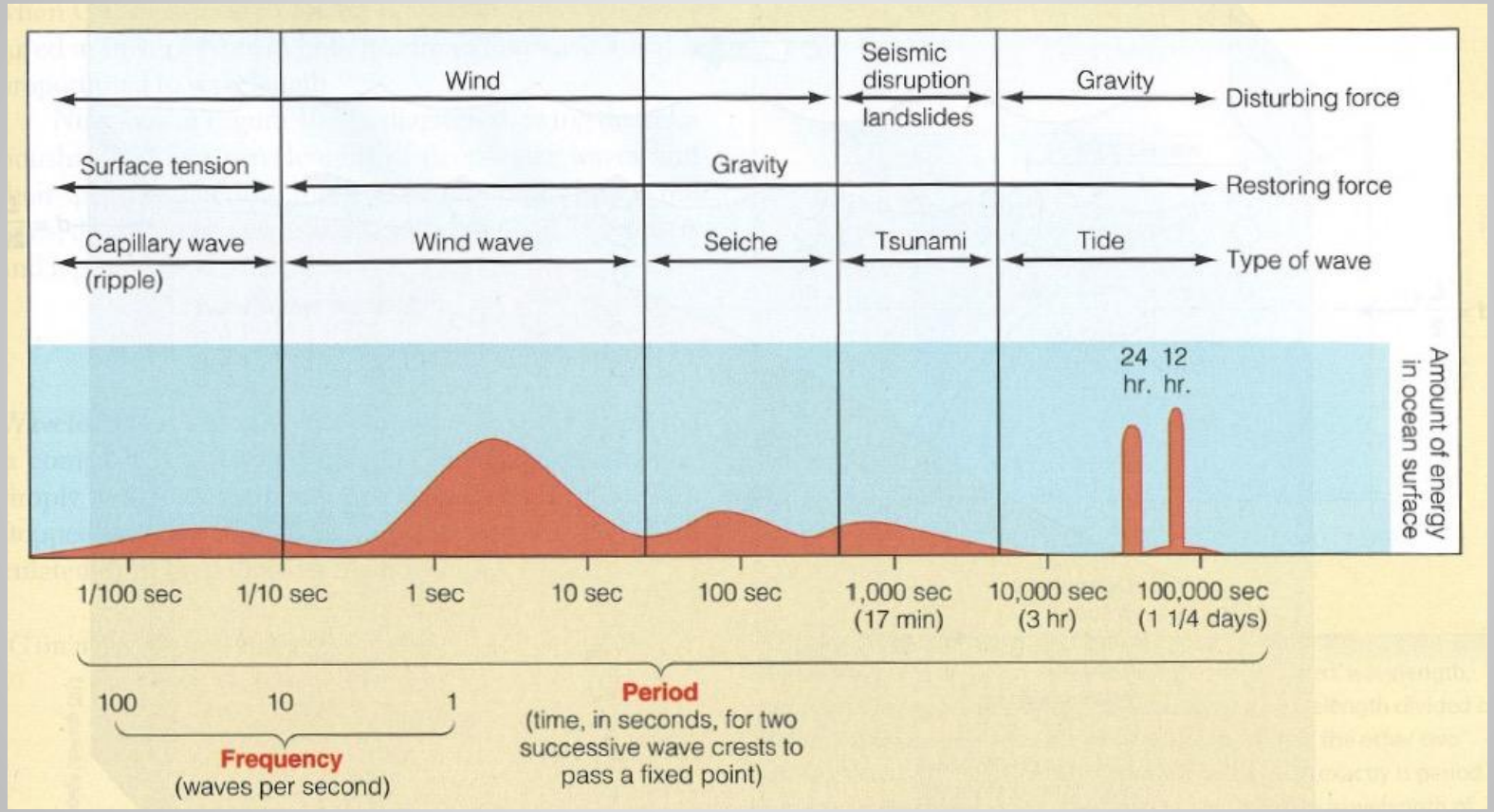
Roman Ackley, Cecilia Hsu,
Benjamin Huang, Collins Metto

Spain

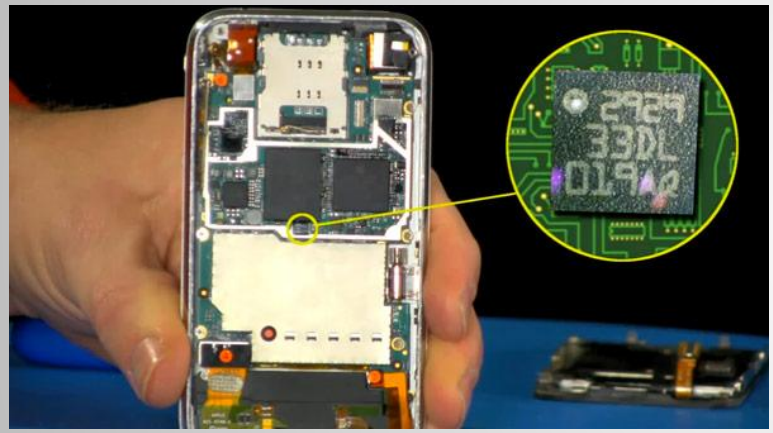


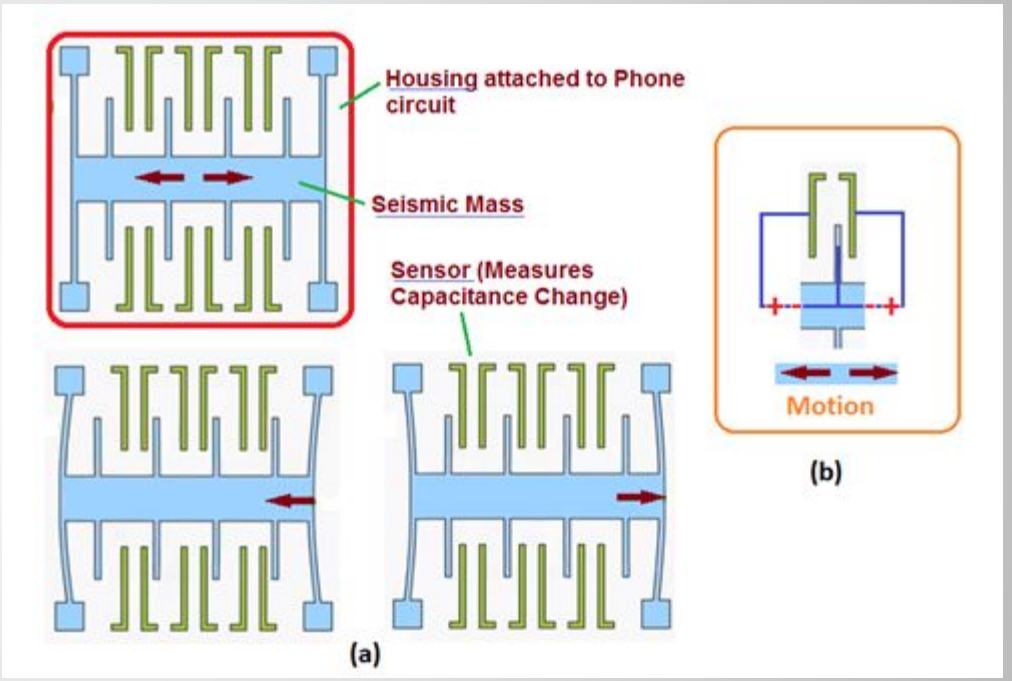
Zumaia

Types of Waves

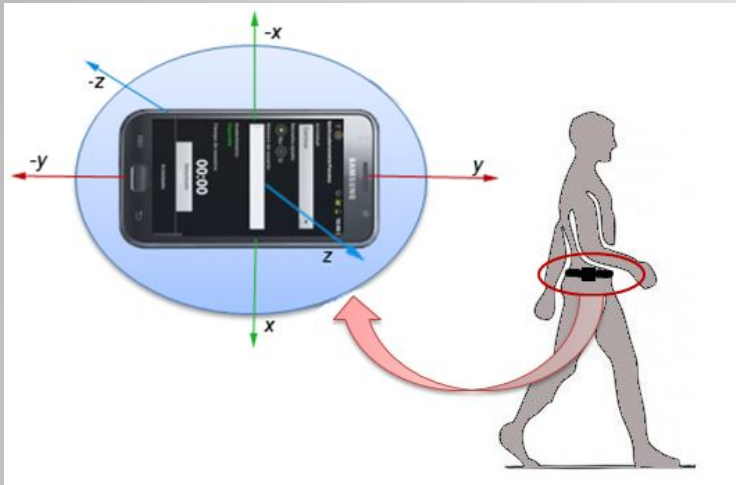


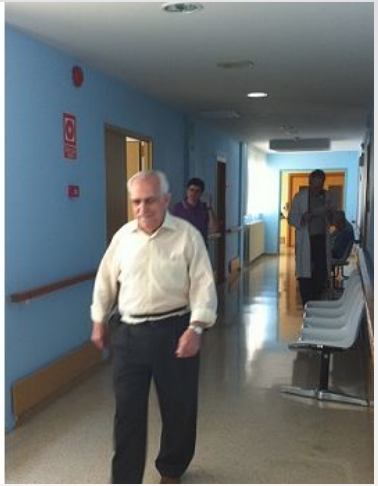
iPhone accelerometer





Existing uses of smartphone accelerometers





"A Mobile and Ubiquitous Approach for Supporting Frailty Assessment in Elderly People"
J. Fontecha et. al.

"MyShake: A smartphone seismic network for earthquake early warning and beyond"
Q. Kong et. al.

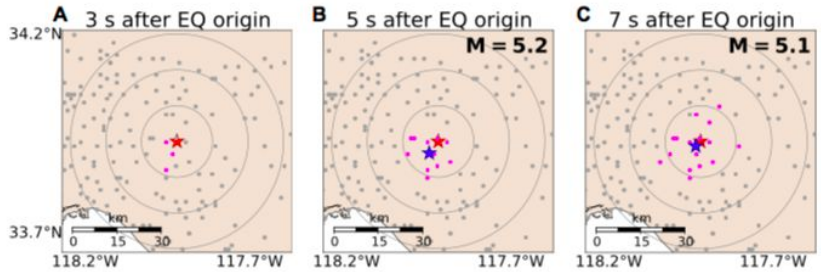
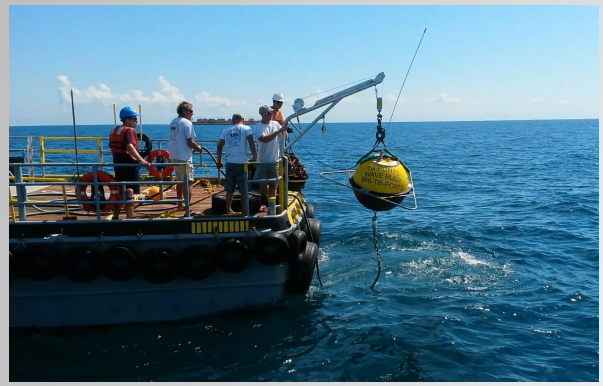
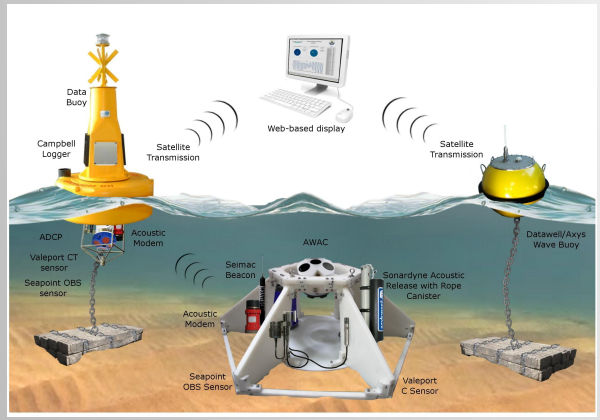


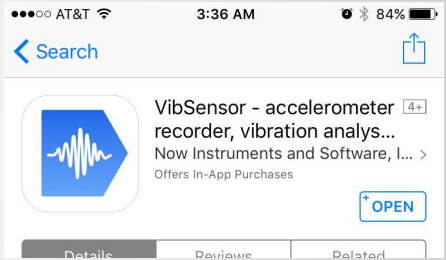
Fig. 6. Snapshots of trigger detections for the 2014 M5.1 La Habra earthquake simulation at 3, 5, and 7 s after the event origin time. Gray dots are stations, and pink indicates a trigger. The true earthquake (EQ) location is the red star with circles at 10-, 20-, and 30-km radius. The blue star represents the estimated event location first detected at 5 s. The magnitude estimate at each point in time is shown in the upper right.

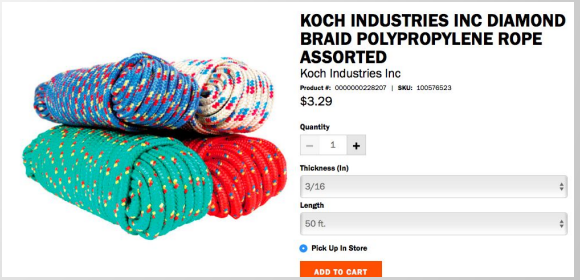
Methods of measuring wind waves





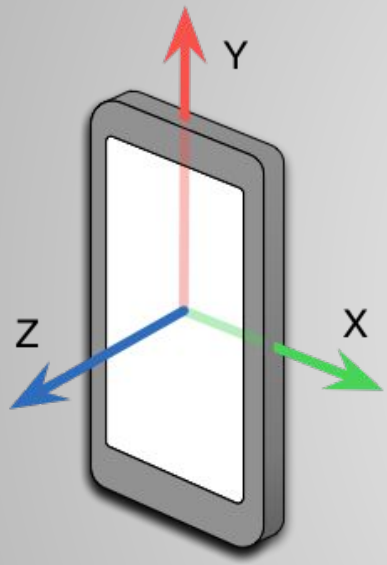
$58,000+

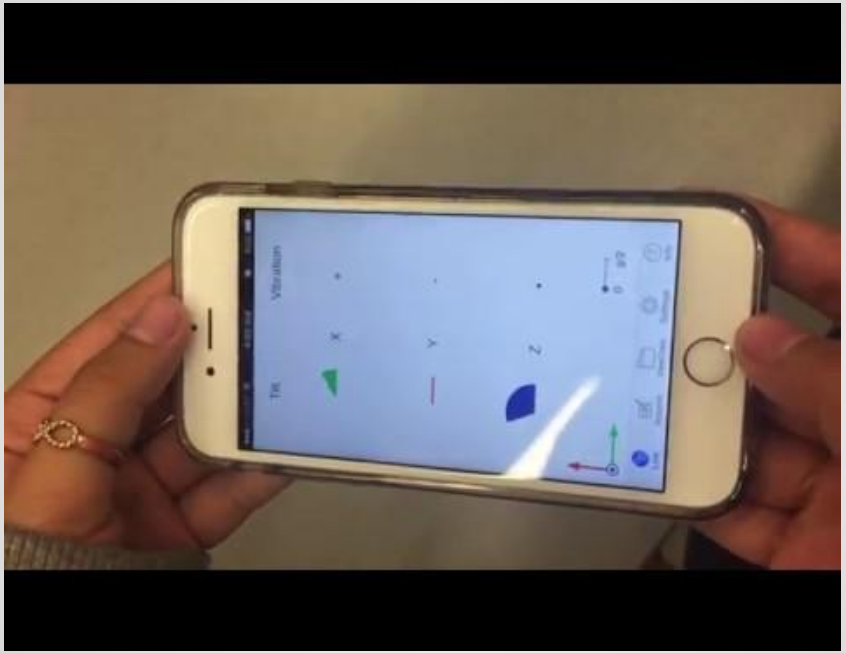


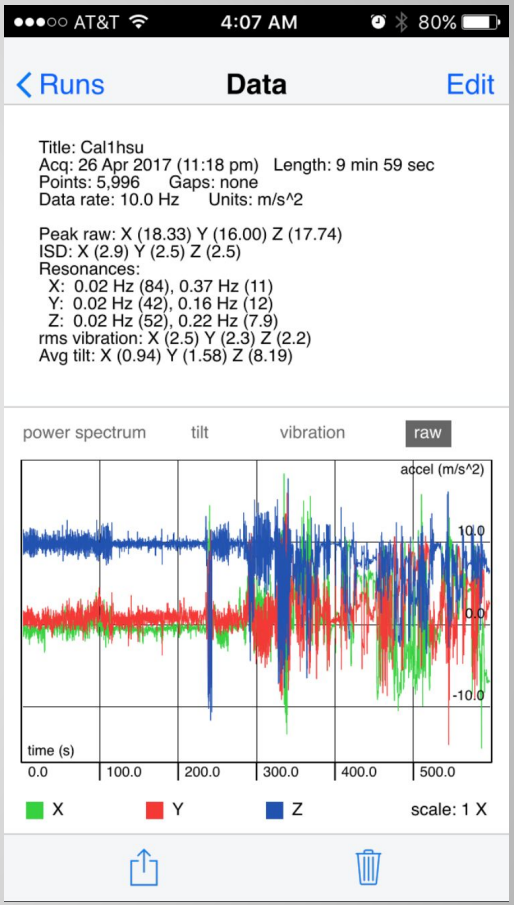


$18

Wave Accelerometer Methodology







iPhone: Waves vs. Walking

Walking in Jadwin

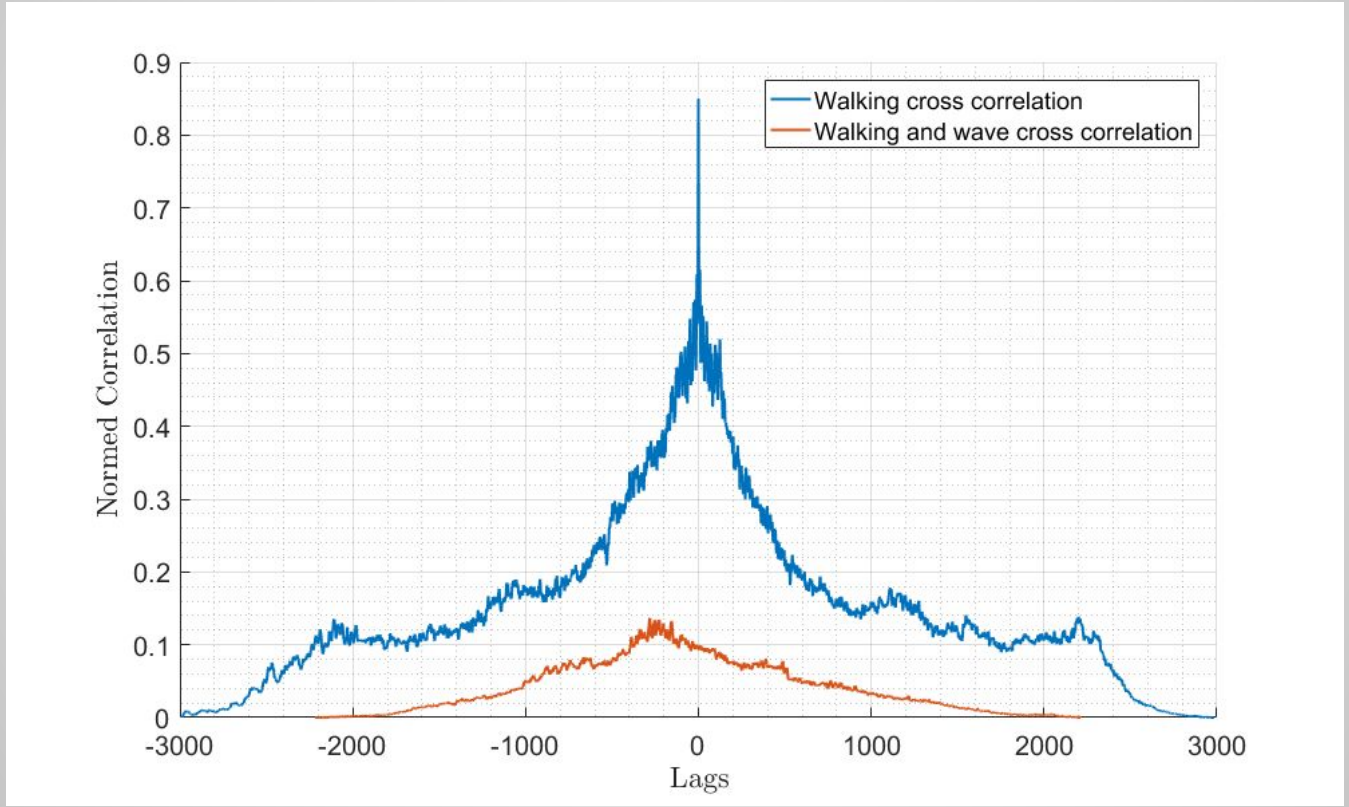
Motivation

- Democratizing science
- Determine bathymetry

Questions

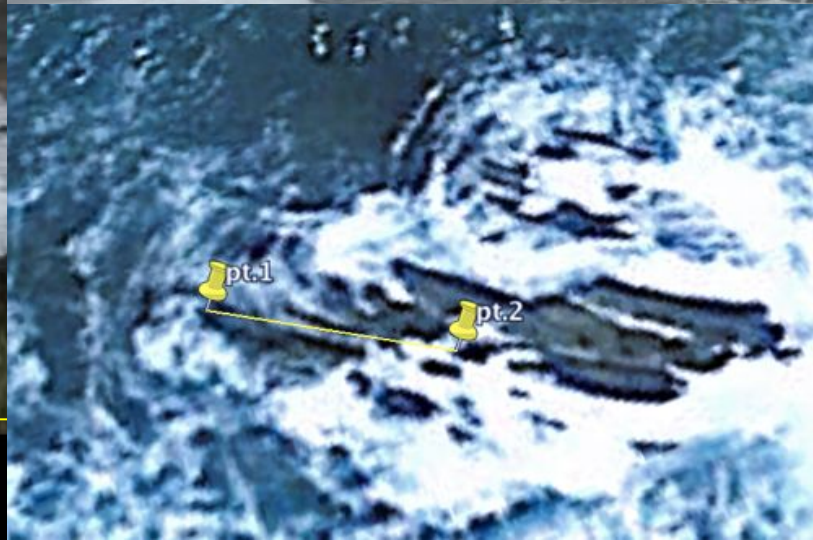
- Are accelerometer data taken from VibSensor on an iPhone in an ocean wavefield distinguishable from arbitrary data?
- Do wave periods produced by iPhone-VibSensor accelerometer data closely match those produced by photogrammetry?
- Is tide height strongly correlated with wave periodicity?

iPhone: Consistency

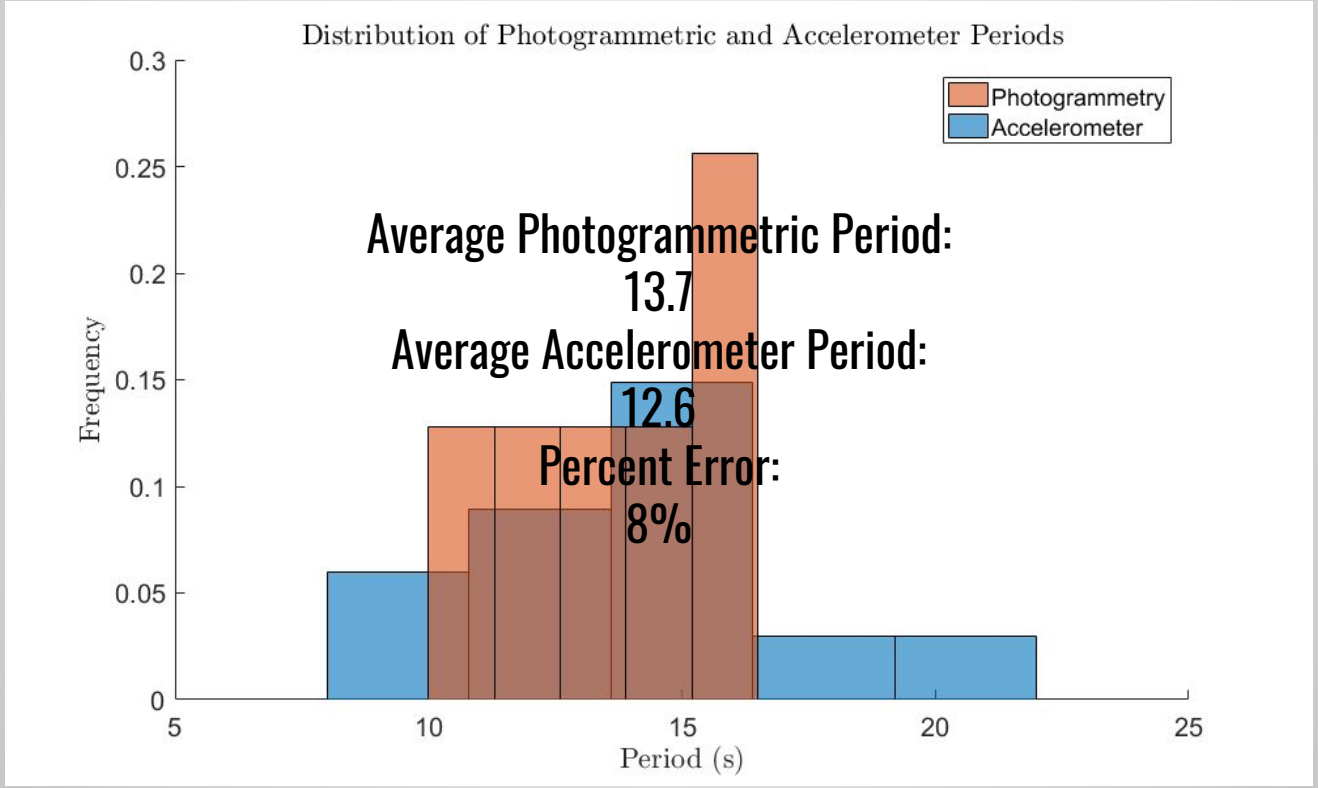


Itzurun Beach

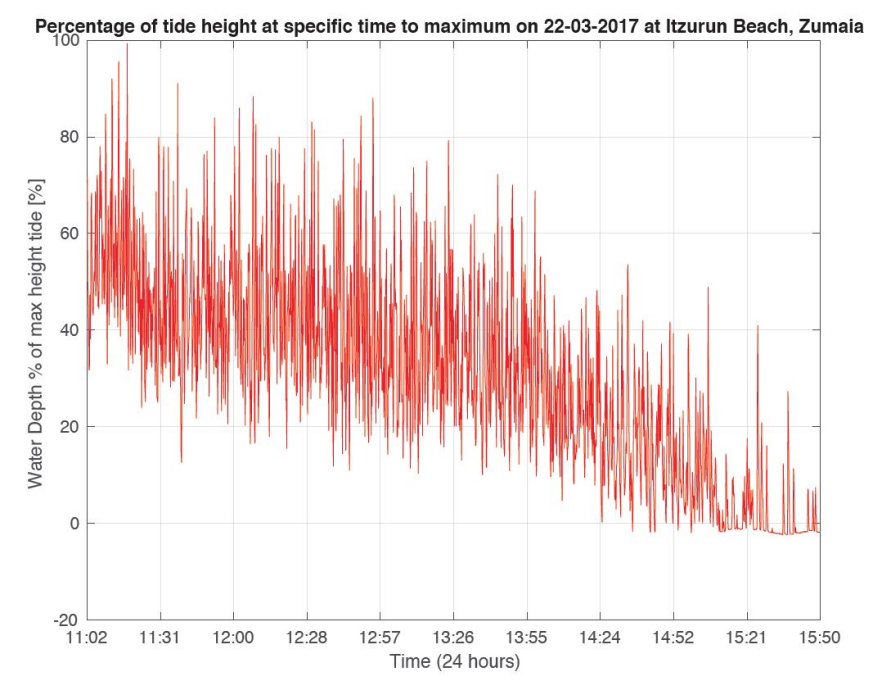
Itzurun Beach, 9:49-58 AM

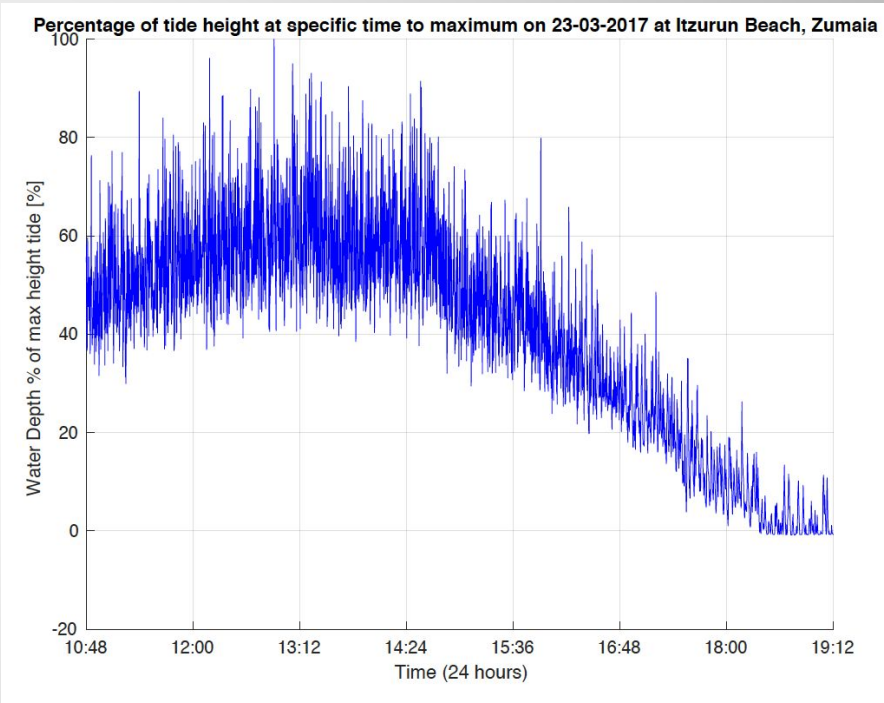


Photogrammetry vs. iPhone-VibSensor

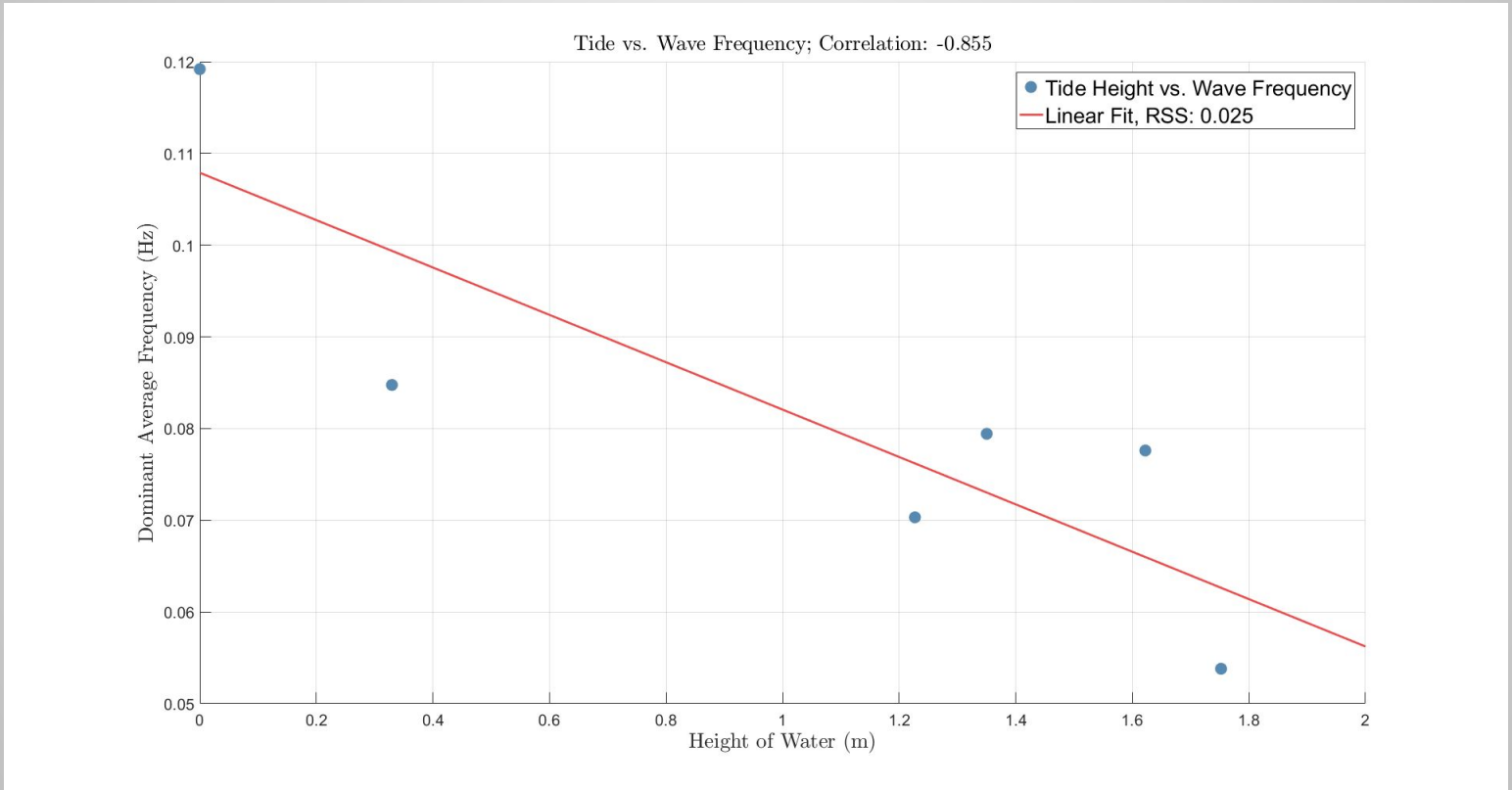


Scientific Application: Tide Height at Rocosa





Tide and Wave Frequency

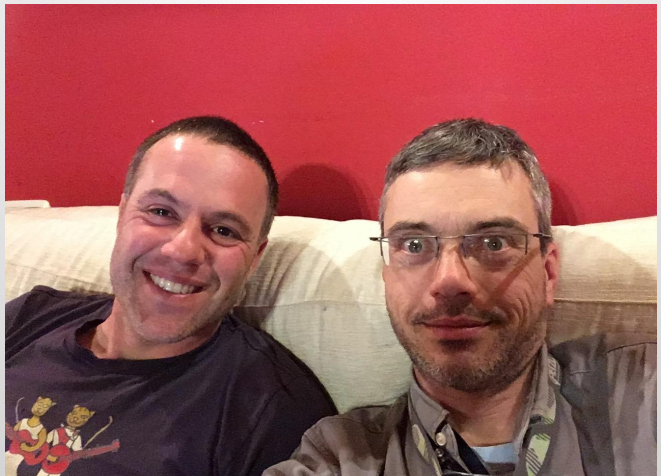


Conclusions

- Wave fluctuations measured through VibSensor were less noisy than arbitrary iPhone movements.
- The iPhone accelerometer through VibSensor was able to capture major wave frequencies, as suggested by photogrammetry.
- Tide height is correlated with wave periodicity. Why might this happen?

Acknowledgements

- Many thanks to Liam O’Connor, Sanna Lee, and Sierra Castaneda for lending us their iPhones.
- Thanks to Joe Zhang and Sarah Betancourt for weather data, Emmanuel Teferi and James Smith for beach visuals, and Nick Ritter for GPS points.
- Thanks to Frederik Simons and Adam Maloof, for making it all possible.



questions?