Coastal ecosystems and inland waterways are at an increased risk due to the consequences of climate change and anthropogenic causes such as boat wake. Adult red mangroves (*Rhizophora mangle*) have demonstrated significant wave-breaking capabilities. This experiment aimed to look at adult red mangroves' wave energy dissipating properties and how this changes with mangrove density.

**Methods:**
- Rigid mangrove models were created using PVC, steel wiring, and plastic tubing on a 1:5 scale using both South Florida mangrove data and field sampling.
- Wave parameters and water depth were scaled to fit the constraints of the Air-Sea Interaction (ASIST) wind-wave tank (15m × 1m w × 1m h) while maintaining conditions found in a natural setting.
- 4 mangrove densities were tested: 1-model, 3-models, 5-models, and 7-models
- Wave amplitudes of 0.08m, 0.10m, and 0.12m and wave frequencies of 1s, 1.33s, and 2s were used.

Over all trials, 1 model had a wave energy dissipation range of 0%-44.5%, 3 models 72.9%-98.6%, and 7 models 61.4%.

**5. Conclusion & Future Study**
- Adult red mangroves displayed wave energy dissipating potential, which increased with mangrove density.
- For 3 models, Wave Probe 2 and 5 were used rather than 3 and 5 so this could have affected the results.
- Future studies should include multiple sensor types as wave probes often returned faulty readings.
- Additional testing is needed but red mangroves represent a future, green protective measure for coastal regions and inland waterways.

**Acknowledgments**
- Thesis Committee: Brain Haus, Landolf Rhode-Barbarigos, and Cedric Guigand
- A special thanks to everyone in the SUSTAIN lab, Sandesh Lamsal, and to Rafael Araujo

---

**Figure 1:** Mangroves breaking waves, mangroves in the tidal zone, and global mangrove coverage map

**Figure 2:** Experimental setup in ASIST

**Figure 3:** Significant wave height for the 1-model and 7-model trials at Wave Probes 3 and 5

**Figure 4:** Significant wave height for the 3-model trials at Wave Probes 2 and 5