Nature-Based Erosion Prevention Field Data and Modeling of Drag Force on Giant Kelp Under Winter Swell

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Coastal erosion costs around $500 million per year due to damages to essential infrastructure (NOAA, 2025). Scientists have explored nature-based solutions to coastal erosion, specifically testing wave energy reduction due to the drag imposed by kelp forests. Utter and Denny (1996) created a model that predicted the tension on kelp given wave heights. However, their model underestimated the tension observed in the field which created a paradox. Here, I determined coefficients for a power relationship between water velocity and kelp drag, by conducting a field experiment that measured the drag on kelp at different boat velocities. By conducting the field experiment at velocities of large storm waves, which previous work neglected to do, I developed a model that accurately represents kelp drag. In conclusion, a more accurate model with higher drag values is an incentive for implementing kelp as a nature-based solution to coastal erosion.

Awards Won: