Alaska Hydrokinetic Energy Research Center (AHERC)

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AHERC

- A resource to help communities make informed decisions (e.g. CBY, RME, USACE, AEA, PNNL, PMEL, etc.) about hydrokinetic energy
  - Develop and disseminate information for stakeholders to make informed decisions
  - Marine and in-river resource assessments
- Partner with industry, regulators, utilities and other interested parties to develop standards and protocols for RA and for integrating hydrokinetic energy into existing power infrastructure
- Social and environmental interactions between marine and hydrokinetic energy development, communities and biological resources
    - Evaluate whether hydrokinetic infrastructure impacts endemic biota through habitat alterations

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Brief Bio

- 1999 B.A. Physics, Reed College, Portland, OR
- 2010 Ph.D. Physical Oceanography, UAF (Dissertation on nearshore physical oceanography of the Alaskan Beaufort Sea)
- 2010-2012 Postdoctoral Investigator at Woods Hole Oceanographic Institution
- 2012-present Research Assistant Professor, Institute of Northern Engineering, UAF
- Have worked in all major saltwater bodies around Alaska (Gulf of Alaska, Bering Sea and Strait, Chukchi and Beaufort Seas
- Multiple oceanic transits across the international dateline and the Arctic Circle

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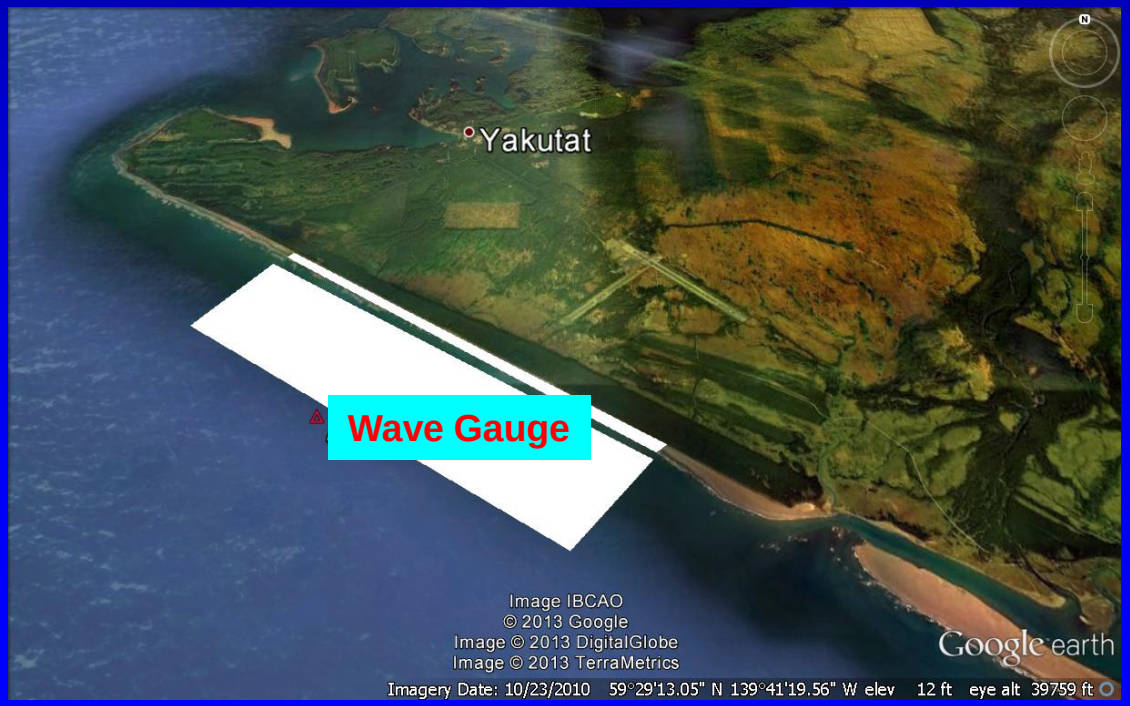
Background on UAF's involvement with the Yakutat wave energy project

- Since Nov. 2012 working with the CBY, Resolute Marine Inc., Benthic Geosciences and USACE to design and finance a cost effective monitoring program to evaluate and develop Yakutat's wave energy resource



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UAF's Proposed Work

- Task 1
  - Participate as a consultant in the deployment of 1 mooring to record waves and currents offshore of Cannon Beach, Yakutat (RME lead)
  - Analyze wave and current data from moored instrument
- Task 2
  - Using data collected by RME and BGS construct a model simulation to extrapolate wave statistics inshore from mooring location (~20 m) to proposed WEC site (~5m), UAF lead
- Task 3
  - Using wider area data sources (modeled and measured wind, waves & bathymetry) simulate the multi-decadal variability of the area wave resource. UAF lead
    - This analysis will aid in understanding how to integrate variable wave derived power source into Yakutat's isolated grid and how to size the WEC array

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Methodology

- Task 2 will be accomplished using the SWASH modeling system (Simulating Waves Ashore)
- Task 3 will be accomplished using the SWAN (Simulating Waves Nearshore) modeling system
- SWASH is a robust wave model designed for areas where wave breaking & non-linear effects dominate (e.g. Yakutat's nearshore)
- SWAN is a robust wave model designed for regional & shallow water simulations
- Both incorporate multiple processes including
    - Non-linear wave-wave interactions
    - Wave propagation in time and space, shoaling, refraction due to current and depth, frequency shifting due to currents and non-stationary depth.
    - Wave generation by wind.
    - Three- and four-wave interactions.
    - Whitecapping, bottom friction and depth-induced breaking.
    - Dissipation due to vegetation.
    - Wave-induced set-up.
    - Propagation from laboratory up to global scales.
    - Transmission through and reflection (specular and diffuse) against obstacles.
    - Diffraction.

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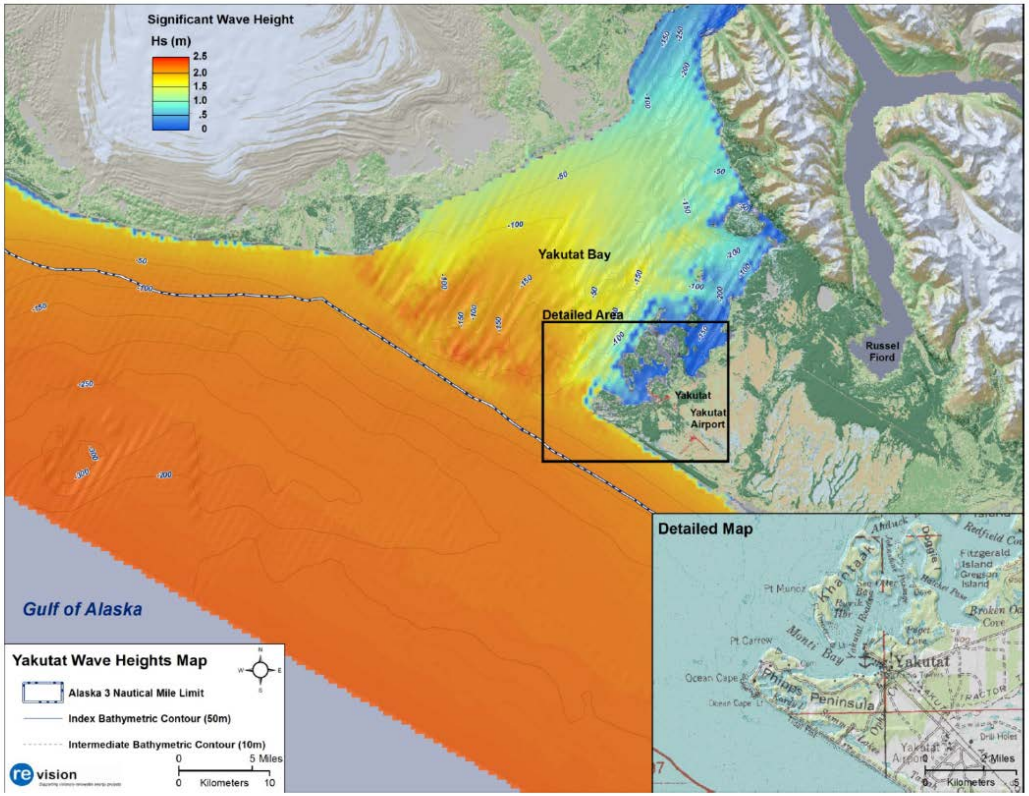

Figure 6 - Average Significant Wave Height (Hs) over the computational domain for the year 2008.

Source: Previsic and Bedard, 2009

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USACE

- David Williams, USACE Alaska Region has reviewed UAF and BGS study plans and his suggestions have been incorporated into updated SOWs
- USACE has the ability to match non-federal dollars in 3 areas relevant to the Yakutat wave energy study
    1.) Marine Mammal Monitoring
    2.) Wave and current observations and analysis
    3.) Bathymetric Surveys

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