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
Yakutat Site Evaluation Tasks

• Task 1
  - Deploy 1 mooring to record waves and currents offshore of Cannon Beach, Yakutat

• Task 2
  - Analyze wave and current data from moored instrument

• Task 3
  - Use mooring data and best available area bathymetry to construct a model simulation to extrapolate waves inshore from mooring location (~30-40 m) to proposed WEC site (~5m)

• Task 4
  - Using wider area data sources (modeled and measured wind, waves & bathymetry) simulate the multi-decadal variability of the area wave resource.
    • 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
Yakutat Site Evaluation Tasks

• Task 5
  - Sea bed survey (USACE Lead?): repeat single beam transects to determine sea bed morphology
    • Will this include sidescan survey or engineering soil tests?
    • Any other methods?

• Task 6
  - Marine Mammal Survey (RME Lead?)

• Task 7
  - Cannon Beach erosion hazard assessment
    • If Yakutat contacts DGGS, DGGS can perform this work free of charge

• Task 8
  - Site engineering analysis (RME Lead?)
    • Soil analysis, construction hazards survey, WEC to grid engineering

• Task 9
  - Install a WEC and connect to the grid!
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.
• 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
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
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