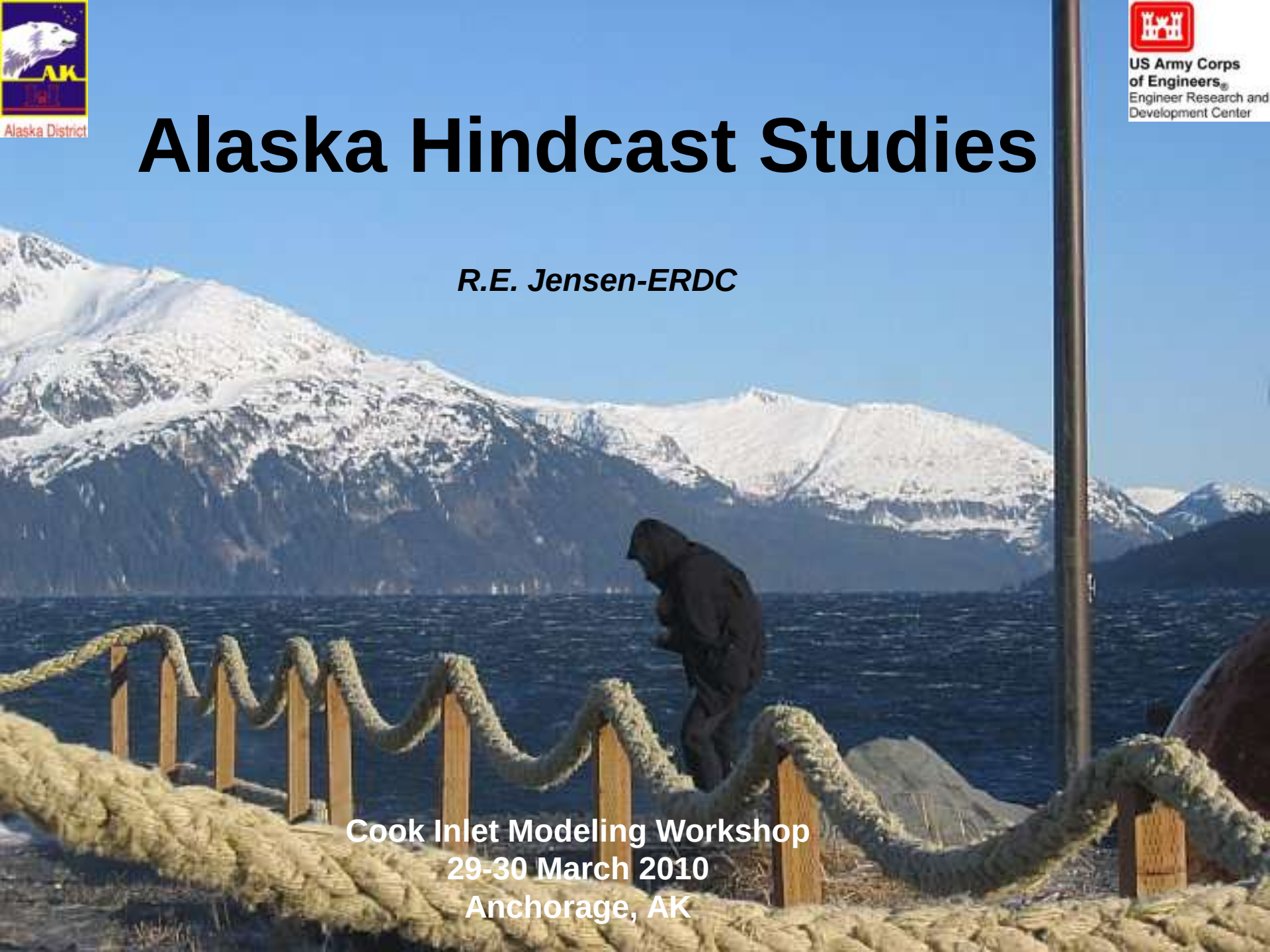

Alaska Hindcast Studies

R.E. Jensen-ERDC

Cook Inlet Modeling Workshop
29-30 March 2010
Anchorage, AK

Alaska Hindcast Studies

R.E. Jensen-ERDC

Alaska District

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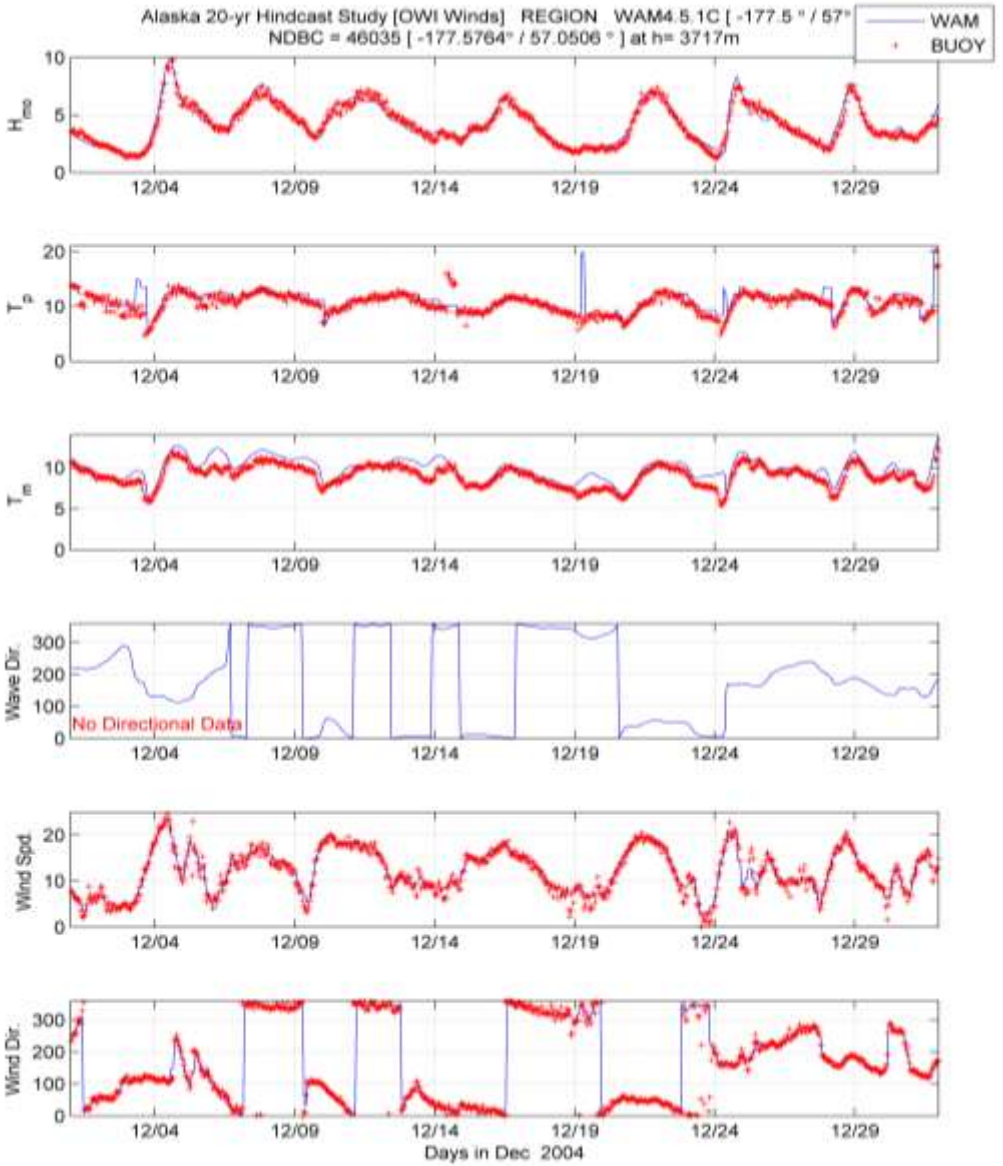
- Uniqueness
  - Winds:
    - Orographic-Terrain Steering
    - Katabatic- Temp Gradients
    - Low Pressure *Bombs*
  - Ice Coverage:
    - Temporal Variability
    - Delineates wind-wave generation
  - Wave Systems
    - North Pacific Storms (synoptic)
    - Decaying Typhoons (meso-)
    - Aleutian Island blocking (sub-meso)
    - Wind-sea generation (meso-)
    - Shelf and island steering (micro-)
  - Diverse Wave Climate
    - 6,640 Miles of Coastlines
    - Inter-annual variability
      - Changes in Ice Coverage
      - Differences in Storminess / Duration
  - Limited Buoy Data / Validation
    - One: Long-term
    - Increasing in 2000's
  - Uses:
    - Extremal Analyses
      - ICE COVERAGE DEPENDENCY
    - Details of Storms



Special Output Locations and 36 Documented in Report

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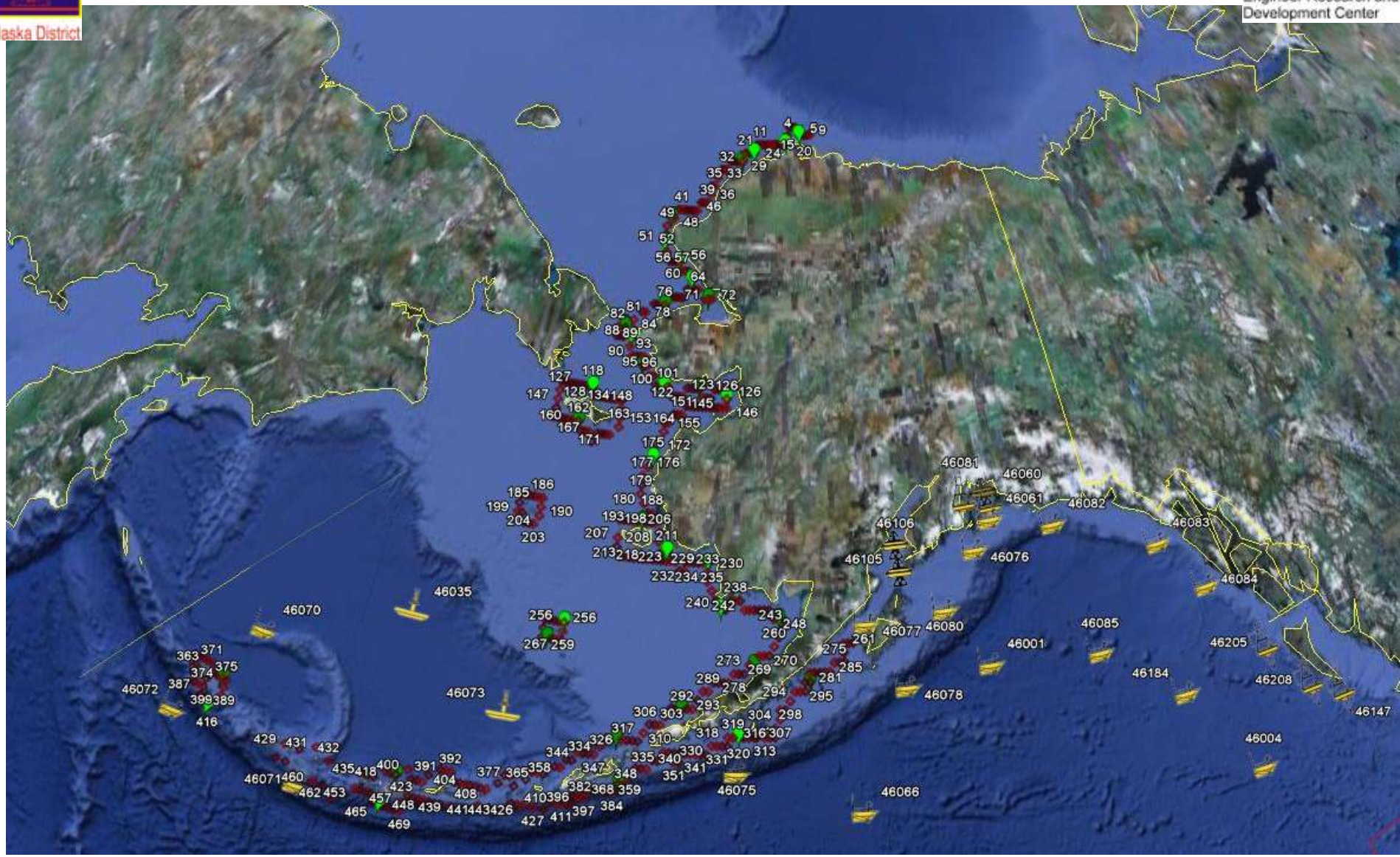

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Accessing all 469 Stations via Google Earth Interface

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http://frf.usace.army.mil/wis/ak/ak_main.html

For more information contact: Robert.E.Jensen@usace.army.mil

US Army Corps of Engineers
ERDC-Coastal and Hydraulics Laboratory
Wave Information Studies (WIS)

Alaskan 20-yr Wind and Wave Hindcast Study

Alaska District

This application requires that you have Google Earth installed on your computer.

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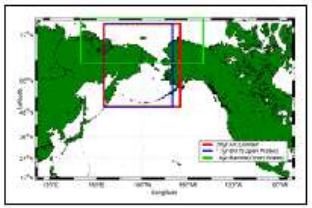
Click here, if you already have Google Earth, to download the **Alaska hindcast kmz file**

Download

Long-term wind and wave climates play a critical role to the USACE. The estimates of the wind speed, direction, and accompanying wave characteristics presented in the form of significant wave height (Hmo), peak period (Tp), mean wave period (Tm), and the vector mean wave direction (mean) provided along a coastline are used for design, planning and the execution of site specific projects the USACE is responsible. Alaska is a very unique area, with coastlines of over 1,500 miles, tidal variations of ± 3-m, ice coverage that is time variant because of climate variability delineating wind-wave generation. Storm systems vary in intensity and size derived from large synoptic-scale North Pacific storms, decaying typhoons, and in the local domain are controlled by orographic (terrain steering), katabatic effects (temperature gradients), and low pressure meso-scale bombs.



Over the past ten-years two projects requiring long-term wave climatologies have been undertaken. The first entitled Engineering Studies in Support of Delong Mountain Terminal Project (DMT, Jensen et al., 2002), and the second Barrow Storm Reduction Study (Chapman et al. 2004). These studies focused on providing long term wind, wave and water level estimates for selected sites along the western and northern Alaskan coastline. They were the first attempts to resolve many issues faced in an arctic domain. These hindcasts were limited to what was defined as open-water seasons, or for the period from June through December of each year. The information provided from these studies could be applied to only a part of the Alaskan coastline, and did not answer all the questions for domain. The success of these studies were garnished from high-quality wind fields possessing local orographic and katabatic effects; mean monthly (DMT) and mean weekly (Barrow) ice fields, and procuring a wave measurements from the private sector and for the DMT study deploying a directional wave buoy for critical wave model validation.

These studies stimulated a great interest to possess a continuous, long-term wave climatology that would extend beyond the DMT, and Barrow projects covering the entire western Alaskan coastline. The USACE-Alaska contracted ERDC's Coastal and Hydraulics Laboratory to perform this wind-wave hindcast study.

As in the previous two projects the success of this project resides in the proper evaluation and construction of the wind fields. Oceanweather, Inc. (http://www.oceanweather.com) provided the wind (also pressure fields) and ice fields for hydrodynamic modeling efforts. Wave modeling efforts were performed in-house with WAM Cycle 4.5.1C (Komen et al. 1994; Gunther, 2005). The execution of the 20-yr Alaska Wind and Wave Hindcast Study followed the procedures and lessons learned from the DMT and Barrow project.

As in the case of the previous two studies, validation of the wind and wave model results were performed for all available point-source measurements in defined area as well as incrementally evaluated in the Gulf of Alaska. The hindcast period selected is from 1985 to 2004. Evaluating extreme wave conditions selected storms from the early 1950's through 1984 were added to the data base. Four hundred sixty nine output locations were selected along the Alaskan coastline extending along the Aleutian Island chain. Integral wave parameter (significant wave height, four different definitions of the wave period, two definitions of the wave direction, directional spread, for the total and partitioned into wind-sea and swell components), along with the directional wave spectra are saved on a one-hour interval for the duration of the hindcast period. Along with the time series, special products were generated for each of the special output locations. Thirty-six locations were selected, processed and documented in this report. All other results have been archived with their respective products and provided to the USACE-Alaska for their use.

The complexities generating a 20-year Alaskan Wind and Wave Climate are great, however if the spatial and temporal variation in the wind fields, ice edge are correctly posed, the implementation and evaluation of a wave model is properly addressed then success in the project can be attained.