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A model for wave energy assessment on the West Coast of Vancouver Island (Extended Abstract)

Clayton Hiles
Triton Consultants Ltd

Michael Tarbotton
Triton Consultants Ltd

Bradley Buckham
The University of Victoria

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Clayton Hiles[1)], Michael Tarbotton[1)], Brad Buckham[2)]
[1)] Triton Consultants Ltd - Vancouver, British Columbia
[2)] The University of Victoria - Victoria, British Columbia

1. Introduction

Global wave energy inventories [1,2] have shown that the West Coast of Canada possesses one of the most energetic wave climates in the world, with 40-50kW/m on average at the continental shelf. With this energetic climate there is an opportunity to generate significant quantities of renewable electricity through the use of wave energy conversion (WEC) technologies. Despite this opportunity, little work has been performed to quantify the resource with precision.

Resolving the distribution of the wave resource, especially near-shore, is a critical step to enable wave energy development. Utilities such as BC Hydro require knowledge of the resource so that they can effectively plan infrastructure development such as transmission lines. Proponents of wave energy developments require detailed wave resource data to ensure project viability.

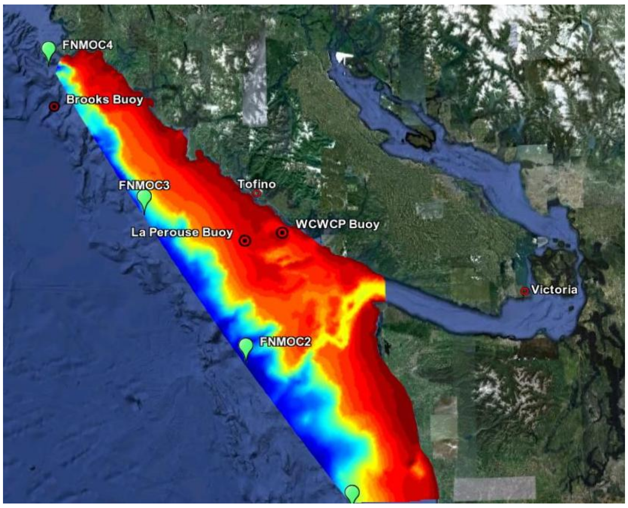

Figure1. Coloured bathymetric contours on the computational domain over Google Earth image. Points indicate buoys and green balloons the location of wave boundary conditions.

Previous studies have focused either on the off-shore wave climate [3], or have focused on small sections of coastline [4,5]. The present work details the development of a wave model covering waters from the continental shelf to the shore-line of the West Coast of Vancouver Island (see Fig. 1).

2. Model Setup

The industry standard SWAN [6] software is used as the base of this model. Bathymetric boundary conditions are sourced from the Canadian Hydrographic Service. Wind conditions are sourced from the *Coupled Ocean / Atmosphere Mesoscale Prediction System* wind model. Off-shore wave boundary conditions are sourced from the *The Fleet Numerical Meteorology and Oceanography Center* wave model. Initial testing showed that the model has little sensitivity to variation in water levels and currents [5] and so they are not included.

Model computations are made on an unstructured grid consisting of triangles of varying sizes. This allows for low resolution in deep water and higher resolution where it is needed in shallower water.

3. Validation

The model was run at 3 hour time steps through the month of December 2009. The results were validated by comparison to several buoys. Table 1 shows the bias, scatter index and correlation coefficient for the significant wave height (H_s) at the La Perouse, WCWCP and Brooks buoys. The Brooks buoy is used to assess the accuracy of the wave boundary conditions.

Table 7. Validation statistics for significant wave height (m) results and boundary conditions, December 2009.

Buoy	Mean	Bias	Scat. Index	Cor. Coef
Brooks	3.08	-0.31	22%	0.87
La Perouse	2.75	0.06	14%	0.91
WCWCP	2.45	-0.16	19%	0.90

4. Discussion and Conclusion

Surprisingly, the wave model results show slightly greater accuracy than the wave boundary conditions. Though the increase in accuracy has likely occurred by chance, it does give confidence to the setup and execution of the model.

The model requires further validation and development, but even at this stage may be as tool to further the understanding of the wave climate on the West Coast of Vancouver Island, and so support efforts to exploit its wave resources.

1. References

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