

Storm Surges

January 24, 2014

Abstract

Abstract to be completed

1 Introduction

[3]

2 Model Configuration

2.1 Model domain

2.2 Boundary conditions

2.2.1 Tidal forcing

The model was forced by tidal elevations and currents at the Juan de Fuca and Johnstone Strait boundaries. Tidal heights and currents at grid points along the Juan de Fuca boundary were extracted from Webtide, an online web prediction model for the northeast Pacific Ocean, which is based on [2]. The Johnstone Strait boundary was forced with...? (e.g. we might use tidal harmonics measured and calculated by [5])

2.2.2 Temperature and salinity

Temperature and salinity at the Juan de Fuca boundary were taken from a climatology which was created from observations collected by (which Masson ref?) over the period of 19??-2004?.

2.3 Initial conditions

2.4 River forcing

River input provides a significant volume of freshwater to the Salish Sea and can influence stratification, circulation and primary productivity. However, most rivers in the domain are

not gauged so parameterisations were required to represent river flow. [4] provides a method for estimating freshwater runoff in the Salish Sea region based on precipitation. Monthly runoff volumes for each watershed for each year from 1970 to 2012 were acquired from [4], as well as monthly averages.

Freshwater runoff from each watershed was divided between the rivers in that watershed. The area drained by each river was estimated from Toporama maps by the Atlas of Canada and watershed maps available on the Washington State government website. The watersheds included in our model were Fraser (which represents approximately 44% of the freshwater input into our domain), Skagit (12%), East Vancouver Island (North and South) (12%), Howe (7%), Bute (7%), Puget (6%), Juan de Fuca (5%), Jervis (4%) and Toba (3%).

The monthly flow from each river was input as a point source in the three grid points closest to the surface at the model point closest to the mouth of each river. Incoming water was assumed to be fresh, with a temperature of ?? degrees C. A total of 150 rivers were parameterised by this method.

2.5 Atmospheric forcing

3 Model Evaluation

3.1 Tidal evaluation

The model was initially evaluated qualitatively by comparing patterns of tidal amplitude and phase to results from [1]. For example, the amphidromic dome around Victoria was observed in the M_2 results, as well as the monotonic decrease in M_2 amplitude moving northwards along the Strait of Georgia. Initially, the Johnstone Strait boundary was closed, but modelled M_2 amplitudes were too small compared to measured amplitudes... TBC

Once our model was reproducing observed tidal patterns, model results were quantitatively evaluated by comparing modelled harmonic constituents to measured harmonic constituents at tidal measuring stations throughout the domain. Comparisons were made using the complex difference (D), defined by [1] as:

$$D = [(A_0 \cos g_0 - A_m \cos g_m)^2 + (A_0 \sin g_0 - A_m \sin g_m)^2]^{1/2} \quad (1)$$

where A_0 , A_m , g_0 and g_m are observed and modelled amplitudes and phases.

Complex differences were less than ??cm at all stations in our domain, which was assumed to be acceptable for our purposes.

4 Storm Surge Hindcasts

5 Conclusions

References

- [1] M. G. G. Foreman, R. A. Walters, R. F. Henry, C. P. Keller, and A. G. Dolling. A tidal model for eastern Juan de Fuca Strait and the southern Strait OF Georgia. *Journal of Geophysical Research-Oceans*, 100(C1):721–740, 1995.
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- [3] D. Masson and P. F. Cummins. Observations and modeling of seasonal variability in the Straits of Georgia and Juan de Fuca. *Journal of Marine Research*, 62(4):491–516, 2004.
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