ESTABLISHING CHART DATUM ACROSS THE BAY OF FUNDY USING VIRTUAL TIDE GAUGES

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Abstract

A GPS receiver installed on a ferry for 8 months was used to extract the tidal constituents across the Bay of Fundy, Canada. The spatial sampling was achieved by simulating a string of virtual tide gauges, which resulted in a non-uniform time series of GPS-observed water-level heights at each virtual tide gauge. A tidal model was developed from each non-uniform time series using a weighted least-squares solution to a set of harmonic functions. Mean Lower Low Water with respect to the WGS84 reference ellipsoid was computed for the location of each virtual tide gauge using eight months of predicted semidiurnal high and low waters.

The time period between ferry crossings results in sampling intervals longer than the semidiurnal tide signal in the Bay of Fundy, thus traditional methods of harmonic analysis are not applicable. Instead, *a priori* knowledge of the tide signal at each end of the ferry route is used to overcome the large and non-uniform sampling intervals.

The methods developed in this research can potentially contribute to extending the spatial distribution of water-level data from the coastline to offshore areas. In turn, these methods can provide control for hydrodynamic models and improve knowledge of the relationship between chart datum and a reference ellipsoid.