

Computer Simulation of Tidal Signal Prediction in Long Range Ocean Acoustic Travel-Time Measurements

WANG Shuozhong¹, and Theodore G. Birdsall²

1. *Department of Electronic & Information Engineering, Shanghai University, China*

2. *Department of EECS, University of Michigan, USA*

Abstract

When using long range sound travel-time measurements to monitor the ocean temperature changes, the tidal effects must be corrected from the data. On the basis of a linear model of the tidal signal, and using measurements taken within a specified period and at 4 hour intervals, a pseudo-inverse method is used to predict the travel-time change due to the aggregate effect of barotropic tides along the sound path. The sampling period should be sufficiently long to give an acceptable prediction accuracy. In order to estimate all the major tidal constituents and separate closely spaced frequency components, a sampling period of 18 months is recommended. The linear model should include as many constituents as possible to minimize the prediction error. This is feasible because in modeling the tide, the only parameter needed for each constituent is the frequency; and the frequencies of the astronomical components are known to a high precision, while the non-astronomical components are trivial in this application. Quantization errors are reduced by means of multipath averaging.

Keywords: computer simulation, tidal signal prediction