MASTER OF SCIENCE
IN
ENGINEERING ACOUSTICS

MODEL-DATA COMPARISON OF SHALLOW WATER ACOUSTIC REVERBERATION IN THE EAST CHINA SEA

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In this thesis, the Monterey-Miami Parabolic Equation (MMPE) model is used to generate predictions from numerical analysis of the reverberation loss structure and peak vertical correlation structure generated by the water/bottom interface, the bottom/sub-bottom interface, and the bottom volume for a shallow water environment. These predictions are then compared to the peak vertical correlation analysis of recorded data collected in an actual shallow water environment similar to the modeled environment. This experimental data was recorded by a 32-element vertical line array (VLA) that recorded the reverberant return generated by charges detonated over the continental shelf in the East China Sea as part of ASIAEX. A comparison is made between predictions and recorded data by analyzing trends in peak vertical correlation with decreasing bandwidth. The influences of interface roughness, bottom volume perturbations, and water volume turbulence on peak vertical correlation is also determined.

KEYWORDS: Shallow Water Reverberation, Reverberation Pressure Levels, Coherence, Peak Vertical Correlations, East China Sea, MMPE

DEVELOPMENT OF FOUR-ELEMENT END-FIRE ARRAY AS SEISMO-ACOUSTIC SONAR SOURCE

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The goal of the research described in this thesis was to design and develop a four-element end-fire array to be used as a seismo-acoustic SONAR source to preferentially excite Rayleigh waves. A four-element end-fire array, consisting of four vertical-motion inertial mass shakers spaced 25 cm apart (approximately one-quarter wavelength), was deployed on the sand in the near-surf zone of Del Monte Beach. The beam of the array was directed to end-fire by using a delay/pulse generator to individually trigger four function generators. Testing at the beach was conducted and results have shown nice end-fire beam patterns at a radius of 3.5 meters, with approximately 15 dB suppression to the rear of the array relative to the forward direction.

KEYWORDS: Seismic SONAR, Seismo-acoustic, Landmine Detection, Seismic Waves, End-fire Array