3aUW38. Multistatic sound speed profile estimation. Hisashi Shiba (Radio Application Div., NEC Corp., 1-10, Nisshin-Cho, Fuchu, Tokyo 183-8501, Japan, h-shiba@aj.jp.nec.com)

Sonar is an indispensable component of harbor security systems. Sound propagation is one of the big problems for coverage estimations, since sound speed profiles are complicated under the complex environment like harbors. A new approach for sound speed profile estimation had been proposed using surface scattering by single sonar for frequent measurements which are required in the operation planning phase of high accuracy coverage evaluations. Although the configuration is simple, it consumes much time for higher accuracy estimations, because multiple angle transmissions need multiple waiting time and averaging considering surface fluctuations also need lots of time. This requirement is not favorable for quick sonar operations. One of the ideas reducing estimation time is using multiple sonars under multi-static configurations. This new concept uses multiple sonars, and it is suitable for harbor protections, since all sonars on the bottom do not become obstacles for ship navigations unlike tethered arrays used in acoustical tomography. And it can be said that multiple sonars should be deployed for covering wide and complex harbor areas with networks. Under this situation, a multi-static operation is a natural conclusion for harbor security. This new approach reduces the total estimation time. The rest problem is accelerating computing time of solving nonlinear simultaneous equations. A new acoustical structure model is under evaluation. The trial results are reported, if it is found to work well.

3aUW39. Measurements of the peak pressure and sound exposure level from underwater explosions. Alexander G. Soloway (Dept. of Mech. Eng., Univ. of Washington, 1013 NE 40th St., Seattle, WA 98105, soloway@u.washington.edu) and Peter H. Dahl (Dept. of Mech. Eng. and Appl. Phys. Lab., Univ. of Washington, Seattle, WA)

There is an interest by the Navy to determine the sound field produced by underwater explosions to minimize the impact on marine life during training exercises. This work presents measurements of underwater explosions collected 7 km off the coast of Virginia in shallow water (depth 14 m) with sound speed conditions considered approximately iso-speed. Explosive charges with TNT equivalent weight 0.1 to 6.0 kg (W) were deployed at approximately mid-water and bottom depths. Acoustic data were recorded using a 9 element vertical line array at range 430 m and single-element autonomous systems at ranges 170, 430, and 950 m. The peak pressures and sound exposure levels (SEL) are calculated from the data; at 430 m peak pressures as high as 220 dB re 1 μPa and SEL as high as 190 dB re 1 μPa^2 s were measured. The peak pressures are compared to semi-empirical equations that are functions of range and W to the one-third power, such as Arons [J. Acoust. Soc. Am. **26**, 343-346 (1954)], and both the peak pressures and SEL are compared to simulations obtained using the parabolic wave equation. [Research supported by Naval Facilities Engineering Command.]

3aUW40. Surface wave shape inversion from forward scattered ocean acoustic data. Sean Walstead and Grant Deane (ECE/SIO, UCSD, 9500 Gilman Dr., 0407, La Jolla, CA 92093-0407, swalstead@ucsd.edu)

Prior work has shown that surface wave shape can be determined by analyzing underwater surface reflected acoustic signals in a wave tank. In this talk, forward scattered data from the Surface Processes and Communications Experiment (SPACE08) is analyzed with regard to surface wave shape inversion. Multipath arrivals representing surface, bottom-surface, and surface-bottom paths are distinguishable, implying that knowledge of the surface is known approximately 1/3, 1/2, and 2/3 the distance between source and receiver. Surface scattering losses including out of plane scattering and small scale roughness are numerically simulated and compared to actual ocean data. Methods are proposed for including these loss factors in a forward model of surface scattering that can be correlated with environmental conditions observed at the Martha's Vineyard Coastal Observatory.

3aUW41. Analysis of ambient noise in the habitat of Indo-Pacific humpback dolphin (*Sousa chinensis*) in the West Coast of Taiwan. Ruey-Chang Wei, Lian-Han Kuo (Inst. of Appl. Marine Phys. and Undersea Technol., National Sun Yat-sen Univ., Kaohsiung, Taiwan), Jeff Chih-Hao Wu, and Chi-Fang Chen (Dept. of Eng. Sci. and Ocean Eng., National Taiwan Univ., No. 1, Sec. 4, Roosevelt Rd., Taipei, Taiwan, d98525001@ntu.edu.tw)

The west coast of Taiwan is one of the major habitats of Indo-Pacific humpback dolphin (*Sousa chinensis*). Ambient noise, changes with natural environment and human activities, is possible to affect the behaviors of marine mammals. Thus, it is necessary to conduct a long-term and systematic investigation of ambient noise in this area. This study deployed two underwater acoustic recorders (SM2M) in New Huwei River of the Yun-Lin coastal area (site YL) and Waisanding sandbar (site WS). 68- and 45-day acoustic data were collected in site YL and site WS. Results show that the low-frequency noise in site WS is lower than site YL due to the contributions of shipping or mechanical noises. In site YL, ambient noise of 1 to 2 kHz contains periodic changes because of the behaviors of croakers. Croakers usually appears before midnight in site YL, but no similar phenomenon is found in site WS. The frequency overlap between hearing range of marine mammal and high-level ambient noise is possible to cause the masking effect, even hearing loss. [Sponsored by the Forestry Bureau, Council of Agriculture, Taiwan under project "Population Ecology of Chinese White Dolphins and Ambient Noise Monitoring in its Habitat" No. 101-08-SB-14).]

3aUW42. The effects of source motion and bottom bathymetry on temporal coherence in shallow water propagation. Jennifer Wylie and Harry DeFerrari (Appl. Marine Phys., Univ. of Miami, RSMAS, 4600 Rickenbacker Cswy., Ops 11, Key Biscayne, FL 33432, jennie.wylie@gmail.com)

Previous studies on coherence have been focused on the effects of water column fluctuations on temporal coherence with a stationary source/receiver setup. However, with focus being turned to moving source setups there has been documented a significant drop in temporal coherence. With a moving platform, the propagation path will change based on relative source/ receiver position, and hence the bathymetry along the path will vary. Here, we will examine the effects that this bathymetric variation and related ship speed contribute to coherence loss. A range dependent parabolic equation model will be used to predict the temporal coherence for individual mode arrivals. A slowly varying random bottom will be introduced to the model and the coherence calculated for different ship speeds and for both radial and tangential tracks. Results will be compared with stationary source/receiver setups in order to determine at what ship speed/ bottom bathymetry does source motion become the driving factor in loss of coherence versus water column fluctuations from a stationary setup. Preliminary results indicate that at a speed of 2 knots, there is remarked loss of coherence at all modes except the first with even small variations in bottom bathymetry, which is in agreement with experimental results.

3aUW43. Research on phase generated carrier demodulation algorithm phase drift of fiber-optic hydrophone. Ge Yu and Jinshan Fu (College of Underwater Acoust. Eng., Harbin Eng. Univ., Bldg. 145, Nantong St., Harbin, Harbin 150001, China, liz.221@163.com)

The paper outlines phase generated carrier (PGC) modulation and demodulation principles of interferometric fiber-optic hydrophone. For demodulation error caused by phase drift, the paper proposes a simple and practical method, using the cross-correlation between the measured signal and the two reference signals to lock the small signal of desired frequency and measure it. Two reference signals with a constant phase difference can directly output the phase of the measured signal. The paper realizes a real-time PGC demodulation system based on LABVIEW with sampling frequency 200 kHz and demodulates 400 Hz underwater acoustic signals. The experiment results show that this system can guarantee the interferometer to operate sensitively. The effectiveness and robustness of the proposed method is demonstrated via this experiment.