

Potomac Geophysical Society Meeting

April 20, 2017

Seismic and Hydroacoustic Analysis of Four Large Underwater Explosions off the East Coast of Florida

Jay Pulli, Raytheon BBN Technologies, Arlington, VA and
Kevin Heaney, Ocean Acoustical Services and Instrumentation Systems, Fairfax, VA

During the summer of 2016, the US Navy detonated four 10,000 lb. underwater explosions off the east coast of Florida as part of shock wave testing for the Littoral Combat Ships USS Jackson and USS Milwaukee. The water depth at the explosion site is 900 m and the announced source depths were 100 ft. Originally listed as magnitude 3.7 earthquakes in USGS bulletins, the source types were changed to “Experimental Explosion” as the Navy began releasing information to local news stations. Videos of the events provide further insight into the sources. These explosions were recorded on US seismic stations to distances of ~2000 km and on the hydroacoustic array at Ascension Island at a distance of ~8100 km. Seismic signals are complex; spectral and cepstral analyses reveal a secondary source that is delayed by 1.4 sec. This would normally correspond to a bubble pulse for that source size and depth, but also matches the time of the first water column bounce. At Ascension the signals arrive at an RMS level of 135 dB at an SNR of 30 dB. We modeled the propagation loss from the source to Ascension using broadband PE and find the loss to be 121 dB. Backing out this loss, we estimate source levels for the two explosions at 247 dB corresponding to explosion yields of 11,000 lbs.

Bios:

Dr. Jay Pulli is a Lead Scientist at Raytheon BBN Technologies, where he has worked for the past 20 years. He is also a Visiting Scholar at Boston College. He holds a PhD in Geophysics from MIT and is a past officer of the Potomac Geophysical Society. His research experience spans seismology, underwater acoustics, and infrasound.

Dr. Kevin Heaney is a Senior Scientist at OASIS. He holds a PhD in Oceanography from Scripps Institution of Oceanography. His research experience has included measurement and modeling of acoustic propagation from global scale hydro-acoustic models and the impact of oceanography on sonar performance systems. Dr. Heaney has transitioned several algorithms (ocean adaptive sampling and acoustic propagation models) to the US Navy.

If you find yourself at the Acoustical Society of America Meeting in Boston on June 29, we will be presenting this work, as well as Kevin’s Special Session on the History of Sonar.