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Hydroacoustic study of errors in yield and location estimates for explosive sources in the southern ocean

D. K. Blackman(1), C. de Groot-Hedlin(1), and C. S. Jenkins(2)

(1) Scripps Institution of Oceanography, UCSD. La Jolla, CA (dblackman@ucsd.edu), (2) Indian Head Division, NSWC, Indian Head, MD

A series of small calibration shots were conducted in late December, 2006, along a transect from New Zealand to Antarctica in order to document the differences in spectral characteristics, transmission loss, travel-time, and azimuth predicted using propagation models typical for nuclear monitoring, and that observed. The high gradients in temperature and salinity that characterize the Antarctic Convergence Zone are expected to alter the propagation path, and the commonly rough sea surface is likely to scatter significant energy from sources south of ˜53°S, where the sound channel breaches the surface. Natural variability in the ACZ makes it difficult to model such effects accurately at all times so our experiment was designed to determine the scale of error introduced by such uncertainty in structure. Depth charges, set to trigger at 300, 460, and 600 m, were deployed at 6 stations between 54°S and 63°S. The International Monitoring System hydroacoustic station off Cape Leeuwin, Australia, recorded shots from all but one site. Macquarie Ridge probably blocked that source area. Several shots were also recorded at the Diego Garcia IMS station. This new data set will be characterized in terms of source-receiver transmission loss and spectral characteristics, used to infer source yield, as well as source location errors. Preliminary analysis of arrivals at IMS hydroacoustic stations in the Indian Ocean indicates that the time duration of each arrival depends on source location, and not on source depth or size. Conversely, the spectral content of the signals depends on source depth and charge size, but not on the source location.