Geophysical Research Abstracts
Vol. 20, EGU2018-2513, 2018
EGU General Assembly 2018

Resource Assessment of Polymetallic Nodules Using Acoustic Backscatter Intensity Data from the Korean Exploration Area, Northeastern Equatorial Pacific

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A high level of confidence in resource data is a key prerequisite for conducting a reliable economic feasibility study in deep water seafloor mining. However, the acquisition of accurate resource data is difficult when employing traditional point-sampling methods to assess the resource potential of polymetallic nodules, given the vast size of the survey area and high spatial variability in nodule distribution. In this study, we analyzed high-resolution acoustic backscatter intensity images to estimate nodule abundance and increase confidence levels in nodule abundance data. We operated a 120 kHz deep-towed sidescan sonar (DSL-120) system (1×1 m resolution) across a 75 km2 representative area in the Korean Exploration Area for polymetallic nodules in the Northeastern Equatorial Pacific. A deep-towed camera system was also run along two tracks in the same area to estimate the abundance of polymetallic nodules on the seafloor. Backscatter data were classified into four facies based on intensity. The facies with the weakest and strongest backscatter intensities occurred in areas of high slope gradient and basement outcrops, respectively. The backscatter intensities of the two other facies correlated well with the nodule abundances estimated from still-camera images. A linear fit between backscatter intensity and mean nodule abundance for 10 zones in the study area yielded an excellent correlation (r2=0.97). This allowed us to compile a map of polymetallic nodule abundance that shows greater resolution than a map derived from the extrapolation of point-sampling data. Our preliminary analyses indicate that it is possible to greatly increase the confidence level of nodule resource data if the relationship between backscatter intensity and nodule abundance is reliably established. This approach has another key advantage over point-sampling and image analyses in that detailed maps of mining obstacles along the seafloor are produced when acquiring data on the abundance of polymetallic nodules.