Geophysical Research Abstracts, Vol. 9, 00241, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-00241

Adaptive filtering of random noise in ultra-shallow seismic data

Y.-W. Li, **Y. Jeng***, and C.-S. Chen

Department of Earth Sciences, National Taiwan Normal University, Taipei, Taiwan
(geofv001@ntnu.edu.tw /Fax: +886-2-29333315 / Phone: +886-2-29347120 ext. 40)

* Corresponding author

Adaptive filtering method has been successfully applied to suppress speckle noise in 2-D digital image data. Recently, a variety of adaptive filtering algorithms have been developed and employed to remove random noise in geophysical data. In this paper, we select two popular adaptive filters, Wiener filter, which has been frequently used for eliminating random noise in linear, time-invariant system and median filter, which is effective in suppressing noise from time-varying system, to investigate the advantages of using adaptive filters to enhance S/N ratio of ultra-shallow seismic data. Synthetic common-shot record with added white Gaussian noise was employed to test the effects of 2-D window size on both filtering processes, and a set of prestack ultra-shallow seismic data recorded from a shallow fault zone was used to demonstrate the practical performance of the filtering process. The results indicate that a 3×17 window size would be the optimal window size for Wiener filter in eliminating noise and improving the data quality of our synthetic data but showed no significant difference for median filter when compared with a 3×11 window size. Examining the filtering performance of the two filters both in time and frequency domain, we notice that the recovery of the original signal depends on the character, intensity, and density of the noise. Inspecting the filtered records in $t-x$ domain, the median filter not only successfully removed the random noise but also suppressed the ground roll in the synthetic record. With the field data, the median filter rendered better resolution than the Wiener filter but it also suppressed signal that may have geological implications, making the result less desirable.

Our results propose that the adaptive filtering is effective in removing random noise

and suppressing some coherent noise in certain condition; however, due to the complexity of the seismic data interpretation, the quality of the filtered data should be examined based on the geological knowledge in addition to quantitative comparison.