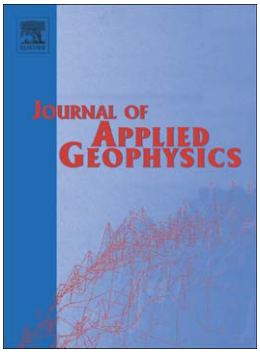

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Frequency band adjustment match filtering based on variable frequency GPR antennas pairing scheme for shallow subsurface investigations.

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Abstract

Ground penetrating Radar (GPR) is an efficient tool for subsurface geophysical investigations, particularly at shallow depths. The non-destructiveness, cost efficiency, and data reliability are the important factors that make it an ideal tool for the shallow subsurface investigations. Present study encompasses; variations in central frequency of transmitting and receiving GPR antennas (T_x-R_x) have been analyzed and frequency band adjustment match filters are fabricated and tested accordingly. Normally, the frequency of both the antennas remain similar to each other whereas in this study we have experimentally changed the frequencies of T_x-R_x and deduce the response. Instead of normally adopted three pairs, a total of nine T_x-R_x pairs were made from 50MHz, 100MHz, and 200 MHz antennas. The experimental data was acquired at the designated near surface geophysics test site of the Zhejiang University, Hangzhou, China. After the impulse response analysis of acquired data through conventional as well as varied T_x-R_x pairs, different swap effects were observed. The frequency band and exploration depth are influenced by transmitting frequencies rather than the receiving frequencies. The impact of receiving frequencies was noticed on the resolution; the more noises were observed using the combination of high frequency transmitting with respect to low frequency receiving. On the basis of above said variable results we have fabricated two frequency band adjustment match filters, the constant frequency transmitting (CFT) and the variable frequency transmitting (VFT) frequency band adjustment match filters. By the principle, the lower and higher frequency components were matched and then incorporated with intermediate one. Therefore, this study reveals that a T_x-R_x combination of low