

## **An Affordable Broadband Seismometer: The Capacitive Geophone**

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A new style of instrument has been produced by transforming a geophone into a broadband seismometer. By converting a geophone into a capacitive sensor, the noise at low frequencies (100 sec to 10 sec) can be on the order of 10 ng per root Hz. This is a two order of magnitude improvement compared to a conventional geophone.

A conventional geophone uses the motion of a spring supported coil in the field of a permanent magnet to generate an output signal. Since this is an inductive measurement, the output is proportional to proof mass velocity. This causes reduced sensitivity at lower frequencies, yielding poorer resolution.

To improve the low frequency performance of a geophone, it is modified to capacitively measure proof mass position. Since the sensitivity of a capacitive geophone is constant at low frequencies, the sensitivity and resolution are maintained. Current results show that the noise is below 500 ng per root Hz and improvement to 10 ng per root Hz is possible.