

**ACQUISITION, PROCESSING AND ANALYSIS
OF ARCTIC SINGLE-SENSOR SEISMIC DATA
FOR ATTENUATING SOURCE-GENERATED
COHERENT NOISE**

By

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APPROVAL PAGE

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ABSTRACT

Three component (3C) accelerometers (VectorSeis sensors), based on Micro-Electro Mechanical Systems (MEMS), and conventional one component (1C) geophones were used in acquiring data of an arctic field test (Northern Russia) to study the benefits of using 3C and 1C sensors.

The 1C data recorded with the VectorSeis sensors and the conventional geophones are similar and characterized by extreme lateral variations in the velocities and amplitudes of coherent noise. The datasets were processed to attenuate the noise, enhance coherency, resolve the statics problems and determine velocity models for stacking.

The terrain features of the test site show variability of the surface. With the opportunity of the MEMS sensors to measure the sensor tilt information, the analysis of the tilts is done and it shows that, there are large tilt angles for many sensors and that these angles are independent from the terrain features. The tilt of the sensors negatively affects data quality. It is expected that tilt correction will be beneficial.

The rotation of the sensors to the vertical is done to correct them for tilt and it shows improvement in data quality. It was found that the 3C rotation has greater impact than the 1C rotation. The 3C rotation enhances the P-wave events and reduces the S-wave and Rayleigh wave events on the vertical component. The stacks show the differences in the amplitude of the 1C and 3C rotation but the 3C difference has higher

amplitudes than the 1C difference. Also the 3C rotated stack shows improvement and enhancement in the resolution of the P-wave reflections in the vertical data.

The VectorSeis data (acceleration data) were converted numerically to be as if they were recorded with geophones (velocity data). The converted data became less noisy than the VectorSeis data and nearly similar to the geophone data. The converted stack section has more high frequency noise than the geophone stack section. The same conversion is applied to the stacked VectorSeis section. The produced post-stack converted stack section is similar, but slightly better than the pre-stack converted stack section.

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