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Electronic gimbaling for low frequency geophones

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Today's multi component seismic acquisition systems suffer from orientation problems if they are deployed in inaccessible environments like the deep sea (OBCs, OBSes and seafloor observatories). If MEMS are no viable alternative because of internal noise, power, or dynamic range constraints, 15 Hz geophones, or costly mechanical gimbal systems had to be used in the past.

A "Full-Tilt" 4.5 Hz geophone will be presented as a cost effective alternative that operates in any orientation at low geophone noise and distortion levels. An integrated position sensor keeps the geophone's coil in its center position due to an electronic feedback arrangement that produces a compensation current, which is proportional to sine of the tilt angle. A tiny fraction of this compensation current is added to the seismic signal. Therefore, the Z-component of a 3 axis arrangement can be accurately determined by vector rotation in a first post-processing step automatically.

Real data from a cable based seafloor observatory will be presented comparing the 3C-signals of Full-Tilt geophones to MEMS accelerometers. Also measurements regarding the signal to noise ratio and the power spectrum will be discussed.