

INCLINOMETER APPLICATIONS USING ENCAPSULATED ACCELEROMETER DATA CALIBRATED FOR VARYING MEGAPASCAL PRESSURE AND CRYO-TEMPERATURE CONDITIONS

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INCLINOMETER APPLICATIONS USING ENCAPSULATED ACCELEROMETER DATA CALIBRATED FOR VARYING MEGAPASCAL PRESSURE AND CRYO-TEMPERATURE CONDITIONS

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MEMS accelerometers offer high precision in tilt sensing but are sensitive to temperature and pressure. This work presents a robust inclinometer design and calibration method for harsh environments such as deep ice boreholes. We model drift behavior at cryo-temperatures and pressures up to 350 bar, showing that angle-based calibration significantly improves accuracy.

Beyond inclination sensing, we outline a compact logger concept that integrates the same calibrated sensor to also estimate borehole cross-sectional shape. While inclination performance has been experimentally validated, the sensor's high precision and successful calibration also make it a promising candidate for estimating borehole cross-sectional shape within the same logger system.

This approach enables accurate inclination monitoring and offers the potential for repeated borehole shape profiling throughout the decade, supporting both drill performance evaluation and glaciological deformation studies.

References

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