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## Sidewall thermal ice-coring system

### Content

A kind of thermal sidewall ice corer is proposed, which could: (1) be used in dry boreholes with diameter of 135-170 mm; (2) limit the damage to parent borehole wall thus permitting subsequent long-term observations. The thermal sidewall ice corer consists of a driven unit, a bendable core barrel and a thermal drill head. By changing the moving direction of coring tool from vertical to horizontal direction when the core barrel bends, coring in horizontal layers is completed. The prototype was developed to test coring performance with small-size thermal drill head with inner and outer diameters of 30 mm and 40 mm, so vertical coring test was conducted, and ice cores with diameter of 25-27 mm were retrieved. During the test, the rate of penetration gradually increased from 1.44 m/h to 2.13 m/h as the input power increased from 50 W to 250 W. Then a thermal sidewall coring testing stand was built up. The brass thermal drill head have inner and outer diameters of 30 mm and 56 mm, and the coring movement was driven by an electric motor. Sidewall dry hole coring test was done and showed: (1) discharge of meltwater could delay melting at the end of ice cores; (2) a groove would be formed at the downhill side of horizontal sidewall hole by the flowing meltwater. During the horizontal coring test, the rate of penetration increased from 0.16 m/h to 2 m/h as the input power increased from 19 W to 560 W. As the prototype of thermal sidewall corer could only work in dry boreholes, later improvements would enable wet hole coring. By using thermal sidewall corer, it would be practicable to core in horizontal ice layers, and the parent hole wall could be relatively well reserved to install temperature, deformation and other sensors for subsequent long-term observations.

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