Contribution ID: **36** Type: **Oral preference**

# WINCH AND HOSE SYSTEM OF LARGE-DEPTH HOT WATER DRILL

*Thursday 18 September 2025 12:25 (20 minutes)*

Hot water drilling technology is a crucial method for exploring subglacial environments in polar regions. The winch and hose system form an essential component of the hot water drill, becoming increasingly critical as drilling depth increases. China discovered a large subglacial lake, whose buried depth is approximately 3600 meters, in the Princess Elizabeth Land through aerial ice radar surveys. Named the Qilin Subglacial Lake, a large-depth hot water drill winch and hose system was developed to support the Qilin Subglacial Lake scientific drilling project.

This system primarily consists of a drilling winch, drilling hose, water return winch, and water return hose. To provide power to the drill tool and enable real-time monitoring of drilling parameters, an embedded-cable non-metallic composite hose was developed as the drilling hose. The length of drilling hose is 3800 meters, with an inner diameter of 40 mm and an outer diameter of 68 mm. It has a breaking force of no less than 100 kN and a working pressure rating of no less than 12 MPa. To achieve precise deployment and retrieval of the drilling hose, a multi-motor cooperatively driven drilling winch was developed. This winch mainly comprises a fully electric injection head and a large-capacity drum. The injection head is responsible for raising and lowering the drilling hose, while the drum follows to spool or unspool the hose. The injection head offers a maximum lifting capacity of 50 kN. The drum has a hose capacity of 4000 meters, with a speed range and control accuracy of 0-15 m/min ± 0.01 m/min. The water return hose also utilizes an embedded-cable non-metallic composite hose. It incorporates power cables, signal transmission lines, and anti-freeze heating lines. These lines are responsible for powering the submersible pump, transmitting signals from the downhole return water system, and preventing freezing/thawing the hose, respectively. The length of water return hose is 380 meters, with an inner diameter of 40 mm and an outer diameter of 73 mm. The water return winch adopts a conventional winch design concept and is responsible for raising and lowering the submersible pump. It has a hose capacity of 400 meters, a maximum speed of 30 m/min, and a lifting capacity of 25 kN.

**Primary author:** LI, Bing (China University of Geosciences, Beijing, China)

**Co-authors:** SUN, Youhong (Southeast University, Nanjing, China); YANG, Yiyong (School of Engineering and Technology, China University of Geosciences, Beijing, China); LI, Yazhou (China University of Geosciences (Beijing)); FAN, Xiaopeng (Jilin University, Changchun, China); ZHANG, zaixing (中国地质大学（北京）); CHAI, Yifei (School of Engineering and Technology, China University of Geosciences, Beijing, China)

**Presenter:** LI, Bing (China University of Geosciences, Beijing, China)

**Session Classification:** Oral sessions

**Track Classification:** Hot water drilling