Contribution ID: **11** Type: **Oral**

A New Smart System of Rapid Continuous Coring Drilling with Air Reverse Circulation in Antarctica

Tuesday 1 October 2019 16:00 (20 minutes)

Rapid ice coring is one of the most important means of the polar scientific research, which is of great significance for research of earth system science. However, rapid ice core drilling technology and equipment is a bottleneck of the polar scientific research under the polar extremely harsh and cruel work condition. The conventional polar ice core drilling equipment work effectively in a short time (effective working time is only about 20 days to estivate at Kunlun Station at Dome A, East Antarctica, and effective working time is less than two months to pass the summer at Zhongshan Station) to drill in the ice at an average drilling speed of 20~30 m per day, then a month maximum drilling depth is about 500 m of ice. Through making a breakthrough in the key technology, a set of ice drilling equipment is researched and developed for rapid continuous coring drilling with air reverse circulation in the polar ice to a depth of 500-800 m in Antarctica at drilling speed of 30-50 m/h within 3-5 days, including a set of drill pipe automatic quick connect system, ice core automatic discharge and collect system, along with high integration, lightweight, automation and intelligence. This equipment mainly includes rapid and continuous ice-coring drilling tools with full-hole air reverse circulation, the fast drilling system on the surface of the ground, automation system of quickly adding drilling pipe and ice core collection, transmission and emission system, etc.

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Session Classification: Session 4