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# PROGRESS AND LEARNINGS OF THE ICE AND SUBGLACIAL BEDROCK DRILLING PROJECT IN PRINCESS ELIZABETH LAND, EAST ANTARCTICA

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The exploration of the subglacial geological environment represents a pivotal frontier in Antarctic scientific research, offering crucial insights into the Earth's cryosphere and its role in global climate systems. In 2023, a collaborative scientific initiative was launched among Jilin University, China University of Geosciences (Beijing), and VNIIOkeangeologia. This partnership aimed to comprehensively investigate the subglacial geology and dynamic processes of the northwestern region of Princess Elizabeth Land in East Antarctica, an area characterized by its complex geological structures and potential influence on ice sheet stability.

The overarching goal of this project was to penetrate the Antarctic Ice Sheet and retrieve high quality bedrock samples suitable for indepth geological analysis. These samples would provide invaluable information about the region's geological history, tectonic evolution, and physical properties, enabling researchers to better understand the longterm development of the Antarctic ice sheet.

During the 2023 - 2024 austral summer, a dedicated joint research team, composed of members from the Chinese National Antarctic Research Expedition (CHINARE) and Russian Antarctic Expedition (RAE), undertook this challenging mission. Armed with the cable suspended Ice and Bedrock Electromechanical Drill (IBED), a cutting - edge drilling device developed by Jilin University, the team successfully drilled through a 545 m thick ice sheet. This remarkable achievement led to the acquisition of a 0.48 m long subglacial bedrock sample, establishing the deepest bedrock borehole in East Antarctica to date.

The drilling site was strategically selected in the central region of a high - amplitude, linear magnetic anomaly, which was identified through prior geophysical surveys as an area of significant geological interest (Talalay et al. 2025). To accommodate the diverse characteristics of the subsurface formations at varying depths, including snow, firn, glacier ice, brittle ice, and basal ice, the team employed a series of specialized drilling modules. Each module was meticulously designed to optimize drilling efficiency, minimize sample disturbance, and ensure the integrity of the collected materials (Talalay et al. 2021).

This report provides a detailed account of the progress and performance of the ice and subglacial bedrock drilling project. It offers a comprehensive summary of the technical experience gained in the field, a thorough analysis of the root causes of the encountered problems, and an indepth discussion of the treatment methods employed. The findings and lessons learned from this project will not only contribute to future research in the region but also serve as a valuable reference for similar Antarctic exploration endeavors, facilitating a deeper understanding of the subglacial world.

References

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