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The development of portable hot-point drill and measurement of 10-m depth snow temperature at Zhongshan Station –Dome A profile

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Snow temperature at 10 m depth in ice sheets and ice caps represents the local average annual temperature. Up to now, in Antarctica, a fair number of long-term observations of temperature and 10 m snow temperature have been made. However, only a handful of measurements have been taken at the eastern part of East Antarctica. In order to obtain the snow temperature data at Zhongshan Station –Dome A area, the method of "electrothermal drilling –temperature measurement by temperature chain –temperature chain recovery and reuse" was adopted to determine temperature distribution in snow at several locations of the studied area. A portable hot-point drill with high efficiency has been designed. During the 35th Chinese National Antarctic Expedition (2018-2019), this system was successfully used to drill more than 20 holes along Zhongshan Station –Dome A profile at the camping time of the snow-vehicle traverse on their way to and from Dome A. The temperature of snow at 16 sites was measured to the depth of 12-15 m (in most cases) and once to the depth of 50 m at Dome A. To some extent, these temperature data can reflect the spatial and temporal distribution characteristics of snow temperature at inland of East Antarctica, thus providing valuable basic research data for further explaining how the Antarctic ice sheet, as the largest cold source in the world, affects the global climate system and global warming.

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