Climate seesaw links northern and southern hemisphere in the glacial period

http://www.frontlight.cn 2006-11-14

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[摘要] November 9, 2006.. Paleoclimate records from Antarctic and Greenland ice cores showed different temperature patterns during the last glacial period. Latest ice core results from Antarctica show that these changes are not independent. Even shorter and smaller temperature variations in the south were directly linked to the rapid temperature variations in the north via changes in the ocean circulation in the Atlantic.

[关键词] Climate seesaw;glacial periodglacial period;Antarctic;Greenland

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Paleoclimate records from Antarctic and Greenland ice cores showed different temperature patterns during the last glacial period. Latest ice core results from Antarctica show that these changes are not independent. Even shorter and smaller temperature variations in the south were directly linked to the rapid temperature variations in the north via changes in the ocean circulation in the Atlantic.

The results show that for any period in the time between 20,000 to 55,000 years before present Antarctica gradually warmed when the North was cold and warm water export from the Southern Ocean to the North Atlantic was reduced. In contrast the Antarctic started to cool every time more warm water started to flow into the North Atlantic during warm events in the north. This result suggests a general link of long

-term climate changes in both hemispheres via a "Bipolar Seesaw" when the Atlantic overturning circulation changes.

Scientists working together in the European Project for Ice Coring in Antarctica (EPICA) were able to precisely synchronize climate records from Antarctica and Greenland using the common information on global changes in methane concentrations archived in air bubbles in the ice.

The ice core analyses were performed on the new EPICA ice core from Dronning Maud Land, which is located in the Atlantic sector of Antarctica. Due to its rather high snow accumulation rate this core allows for reconstruction of higher resolution atmospheric and climate records than previous ice cores from the East Antarctic plateau. This is a prerequisite for the precise synchronisation of the Dronning Maud Land core with its Greenland counte

Based on the new synchronized time scale the scientists were able to directly compare high-

resolution temperature proxy records from Antarctica and Greenland. This showed that the Bipolar Seesaw was a process acting throughout the last glacial period and probably beyond.

"It is really astounding how systematic this process worked also for smaller temperature changes in Antarctica. Our data shows that the degree of warming in the south is linearly related to the duration of cold periods in the North Atlantic." says paleoclimatologist and corresponding author of the study Dr. Hubertus Fischer from the Alfred

-Wegener Institute for Polar and Marine Research (AWI) in Bremerhaven,Germany.

The study now published in Nature synthesizes the work of EPICA scientists from 10 European countries (Belgium, Denmark, France, Germany, UK, Italy, the Netherlands, Norway, Sweden and Switzerland) and their expertise in various aspects of ice core research and glaciology. As the German partner within EPICA, AWI was responsible for the Dronning Maud Land drilling operations. In addition many of the analyses on the Dronning Maud La

Coordinated under the umbrella of the European Science Foundation (ESF), EPICA is funded by the participating countries and the European Union. EPICA is one of the core projects of the AWI Research Program "Maritime, Coastal and Polar Systems" in the "Earth and Environment" research section of the Helmholtz Association of German Research Centers.

The manuscript "One-to-one coupling of glacial climate variability in Greenland and Antarctica" will be published in Nature on Nosember 9, 2006.

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