Bering Strait may be global temperature stabilizer

April 10 2012, by Bob Yirka

Satellite photo of the Bering Strait. Image: NASA.

(Phys.org) -- A diverse group of climate researchers has found after running computer simulations that the strait that separates North America and Russia might be serving as a global temperature stabilizer. This, they write in their paper published in the *Proceedings of the National Academy of Sciences*, is because when the strait is blocked, melting glacial freshwater in the Arctic Ocean can't make its way to the Pacific, causing it to back up and eventually flow into the Atlantic, disturbing the Atlantic Meridional Overturning Circulation (AMOC) and eventually air temperatures.

The team began with evidence of wildly fluctuating temperature extremes in the northern hemisphere that occurred during a portion of

the last big Ice Age. During that time, temperatures rose and fell in Greenland as much as 10°C over just a period of a few years. This, the team theorized, happened because glaciers in the northern hemisphere grew to such a size that ocean levels dropped sufficiently to cause a land bridge to appear between Siberia and Alaska, cutting off flow between the Arctic and Pacific oceans.

To find out if their theory was correct, they turned to a heavy-duty global computer simulation where they first ran data to show conditions with a land bridge in place cutting off the Pacific Ocean from the Arctic, and then with the Strait open as it is today. Their simulation backed up their theory which goes like this: When a land bridge appears, cold fresh water from melting glaciers is unable to flow into the Pacific, so instead, it overflows into the Atlantic Ocean. And that creates a problem because normally the AMOC causes cycling of warm water from the south to flow north, and cold water from the north to flow south. The engine for this system is cold salt laden water in the north sinking beneath incoming warm water. If the cold water in the north is fresh, as it would be if it were coming from the melted glaciers, then it wouldn't sink and the whole AMOC system would stop. And if it stopped, air temperatures could change quickly. The computer simulation actually showed the same temperature fluctuations over Greenland as researchers have found, via core ice samples, occurred the last time the Strait closed during the last Ice Age.

In contrast, the computer simulation showed much more stable temperatures in the absence of a land bridge allowing glacial melt to flow into the Pacific Ocean. This the team concludes, means we don't have to worry about wildly fluctuating temperatures any time soon, so long as the Strait remains open, which virtually everyone agrees will be the case for the foreseeable future as global warming is expected to lead to warmer water and rising ocean levels.

More information: Role of the Bering Strait on the hysteresis of the ocean conveyor belt circulation and glacial climate stability, *PNAS*, Published online before print April 9, 2012, doi: 10.1073/pnas.1116014109

Abstract

Abrupt climate transitions, known as Dansgaard-Oeschger and Heinrich events, occurred frequently during the last glacial period, specifically from 80–11 thousand years before present, but were nearly absent during interglacial periods and the early stages of glacial periods, when major ice-sheets were still forming. Here we show, with a fully coupled state-of-the-art climate model, that closing the Bering Strait and preventing its throughflow between the Pacific and Arctic Oceans during the glacial period can lead to the emergence of stronger hysteresis behavior of the ocean conveyor belt circulation to create conditions that are conducive to triggering abrupt climate transitions. Hence, it is argued that even for greenhouse warming, abrupt climate transitions similar to those in the last glacial time are unlikely to occur as the Bering Strait remains open.

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