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Sun Controlled Climate During Ice Ages Irregularities of solar activity affected the climate 20,000 years ago

04th of September 2014 / Kiel. In a model study, researchers from the GEOMAR Helmholtz Centre for Ocean Research Kiel reconstructed the relationship between solar activity and climate during the last ice age. Their chemistry climate model contributed significantly to a study by the Swedish Lund University, which has now been published in Nature Geoscience.

A well-known behavior pattern of the sun is its irregular solar activity. The most prominent activity cycle of the sun is the eleven-year sunspot cycle, where sunspot maxima and minima alternate every eleven years. But there are also other known solar variations on different time scales. Sunspots are areas on the surface of the sun that appear dark because they emit sunlight with reduced luminosity. At the same time, high-energy radiation, especially in the UV range, leaves the sun. During sunspot minima, there are fewer sunspots and therefore less solar UV radiation arrives at the Earth. The opposite is true during solar maxima.

More solar radiation, especially in the UV range, during solar maximum leads to a warming of the stratosphere (between 15 and 50 km) in the tropics and to increased ozone production. This in turn, via complex interaction mechanisms, leads to circulation changes in the atmosphere which are also felt . The mechanisms of how such changes in solar activity affect the atmosphere, however, are still subject of ongoing research. In particular, there is speculation whether or not the sun spot minima are connected to cold, snowy winters, or if the currently lower solar activity might be responsible for the pause in global warming.

Scientists from Lund University (Sweden), in cooperation with the GEOMAR climate scientists Prof. Dr. Katja Matthes and Dr. Rémi Thiéblemont, have succeeded in reconstructing ~~800 000~~ ^{800 000} activity back to the last ice age. The study was published in August in *Nature Geoscience*.

Ice cores from Greenland were used to gain insight into the solar activity at a time when Sweden and northern Germany were under a thick layer of ice. The analysis works in principle like for tree rings: The ice core reveals various layers that contain information on temperature and precipitation conditions. The radioactive molecules of beryllium and carbon play an important role because they occur in the atmosphere only when the magnetic field around the earth is too weak and too much cosmic radiation is allowed to pass through. Therefore, the presence of excessive radioactive beryllium and carbon in the ice core is indicative of a weak protective layer and

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