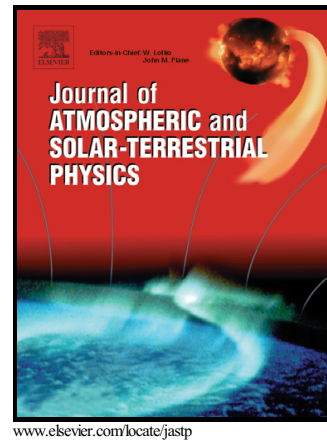


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Correlation between solar activity and the local temperature of Antarctica during the past 11,000 years

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# **Title: Correlation between solar activity and the local temperature of Antarctica during the past 11,000 years**

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## **ABSTRACT**

The solar impact on the Earth's climate change is a long topic with intense debates. Based on the reconstructed data of solar sunspot number (SSN), the local temperature in Vostok (T), and the atmospheric CO<sub>2</sub> concentration data of Dome Concordia, we investigate the periodicities of solar activity, the atmospheric CO<sub>2</sub> and local temperature in the inland Antarctica as well as their correlations during the past 11,000 years before AD 1895. We find that the variations of SSN and T have some common periodicities, such as the 208-year (yr), 521-yr, and ~1000-yr cycles. The correlations between SSN and T are strong for some intermittent periodicities. However, the wavelet analysis demonstrates that the relative phase relations between them usually do not hold stable except for the millennium-cycle component. The millennial variation of SSN leads that of T by 30~40 years, and the anti-phase relation between them keeps stable nearly over the whole 11,000 years of the past. As a contrast, the correlations between CO<sub>2</sub> and T are neither strong nor stable. These results indicate that solar activity might have potential influences on the long-term change of Vostok's local climate during the past 11,000 years before modern industry.

**Keywords:** solar activity, climate change, periodicity, wavelet coherence

## **1 Introduction**

Global warming is one of the hottest as well as the most debatable issues in both the scientific and public community at present. Many factors are thought to be the potential reasons to cause the

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