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Variation of Solar "11-year cycle" during the grand solar minimum in the 4th century BC by measurement of ^{14}C content in tree rings

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Abstract content

Sunspot numbers, which reflect solar activity, have presented clear 11-year periodicity since the early 18th century. However in the period around 1645 to 1715 AD sunspots were almost absent, and this period is called the Maunder Minimum, one of grand solar minima implying weak solar activity. Variation of solar activity in grand solar minima can be investigated by determining the concentration of cosmogenic isotope ^{14}C in annual tree rings. We obtained the ^{14}C records of 1413 to 1745 AD including the Spoerer Minimum and the Maunder Minimum with annual time resolution. As a result of frequency analysis of these ^{14}C records, we found that the cycle length of the "11-year cycle" during the Maunder Minimum was around 14 years while that during the Spoerer Minimum was around 11 years. This suggests that a pattern of the "11-year" cycle length variation depends on a type of minima classified by their duration of ^{14}C increase. In order to verify this hypothesis, we have measured ^{14}C content in Japanese camphor tree rings during a possible grand solar minimum in the 4th century BC. Preliminary result shows the solar cycle length was several years longer than 11 years, as in the Maunder Minimum.

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Summary

Reference

Proceedings of the 30th International Cosmic Ray Conference; Rogelio Caballero, Juan Carlos D'Olivo, Gustavo Medina-Tanco, Lukas Nellen, Federico A. Sánchez, José F. Valdés-Galicia (eds.); Universidad Nacional Autónoma de México, Mexico City, Mexico, 2008; Vol. 1 (SH), pages 521-524

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