

## Implications of long solar cycle 23

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The length of solar cycle 22 was about 9.7 years. However, the solar cycle 23 is of over 13 years cycle length if the end of the solar cycle is admitted in August 2009 when the sunspot number was absolutely zero for a whole month. The Dalton minimum cold period occurred following the solar cycle length 13.6 years just after previous 9.2 year cycle. The Maunder minimum came after solar cycle length changed from 8.2 to 15 years. There have been only 3 solar cycles whose cycle lengths are longer than 13.0 years, if excluded are the solar cycles during the Maunder minimum when the sunspots are too rare to determine the cycle length. Those are the initial phases of Maunder and Dalton minima and this solar cycle 23. If the historic records of cold climate at two little ice ages are trusted and the correlation between the solar activity and the cold climate is reliable, the coming decades might be severe cooling period in respect of solar effect on climate. Then, the coming a couple of decades might be the time of tug war between two opposite climate forcings of anthropogenic global warming by carbon dioxide and the solar control cooling.

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