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Cold Periods During the Last Millennium

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ABSTRACT

Studies of temperature change during the last millennium in China and in other regions of the globe were reviewed. Cold periods were identified for East Asia, USSR, Europe, North America, Polar Region and Southern Hemisphere. Most of them were grouped into the same time intervals: first half of 12th, second half of 13th, second half of 15th, 17th and 19th century. Temperatures in the last two cold periods were 0.5°C-1.0°C lower than the average of the 20th century. The first three cold periods were less cold and less uniform in geographical distribution and in temporal variations. Therefore, the first three cold periods may be regarded as the transition from the Medieval Warm Period to the Little Ice Age. Long-term variations of solar activity and volcanism were compared with the changes of temperatures. The second to the fourth cold periods seem to relate to the Wolf, Spörer, and Maunder Minima of solar activity. The intensification of explosive volcano eruptions in early 15th and 17th century may also have contributed to the occurrence of the third and fourth cold periods. However, only a slight increase of volcanism and a weak decrease in solar activity in the early 19th century can hardly fully intepret the severe cold period throughout the 19th century. Perhaps neither one nor both of the aforementioned factors can be responsible for all of the five cold periods identified during the last millennium. It is suggested that the changes in cryosphere, biosphere and the oceans may interact with the atmosphere, controlling (together with the external factors) the occurrence of the cold periods. Of course, anthropogenic factors should also be considered, especially for the last one and a half centuries. Finally, factor or factors other than those aforementioned, such as changes in orbital parameters, may also take part in regulation of the climate for the last millennium.

(Key words: Historical records, Paleoclimate, Temperature, China)

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