

Historical space weather monitoring of prolonged aurora activities in Japan and in China

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Great magnetic storms are recorded as aurora sightings in historical documents. The earliest known example of “prolonged” aurora sightings, with aurora persistent for two or more nights within a 7 day interval at low latitudes, in Japan was documented on 21–23 February 1204 in Meigetsuki, when a big sunspot was also recorded in China. We have searched for prolonged events over the 600 year interval since 620 in Japan based on the catalogue of Kanda [1933] and over the 700 year interval since 581 in China based on the catalogues of Tamazawa et al. [2017] and Hayakawa et al. [2015]. Before the Meigetsuki event, a significant fraction of the 200 possible aurora sightings in Sòng dynasty (960–1279) of China was detected at least twice within a 7 day interval and sometimes recurred with approximately the solar rotation period of 27 days. The majority of prolonged aurora activity events occurred around the maximum phase of solar cycles rather than around the minimum, as estimated from the 14C analysis of tree rings. They were not reported during the Oort Minimum (1010–1050). We hypothesize that the prolonged aurora sightings are associated with great magnetic storms resulting from multiple coronal mass ejections from the same active region. The historical documents therefore provide useful information to support estimation of great magnetic storm frequency, which are often associated with power outages and other societal concerns.

Reference: Kataoka, R., H. Isobe, H. Hayakawa, H. Tamazawa, A. D. Kawamura, H. Miyahara, K. Iwasaki, K. Yamamoto, M. Takei, T. Terashima, H. Suzuki, Y. Fujiwara, and T. Nakamura (2017), Historical space weather monitoring of prolonged aurora activities in Japan and in China, *Space Weather*, accepted.