

The cold periods before and after the warmest early Heian era –No existence of Medieval Warm Event in Japan –

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A continuous reconstruction of quantitative paleotemperatures in the Holocene was conducted by using alkenone sea surface temperature (SST) measurements from coastal sedimentary cores because of the strong correlation of SST with atmospheric temperature (AT) in the coastal bay area. Especially during the last three thousand years, the SSTs (ATs) fluctuated by 2.1 degree, with a maximum in 820AD (24.3 degree, 25.9 degree). In addition, the large minimum SSTs (ATs) was observed at 990 AD (22.4 degree, 24.0 degree). Low temperature was also observed in 560-620AD. The Medieval Warm Period (MWP) in 950-1250 AD (sometimes 1000-1400 AD) is a period of warming by a few degrees that was primarily confined to Europe and North America. The period and affected areas are, however, still open to debate. The IPCC Assessment Reports (2001, 2007) and Mann et al. (2009) discussed the “MWP around 1000 AD”, which may have been local or regional. Bradley et al. (2003) reviewed the evidence and concluded that the warmest medieval ATs were not synchronous around the globe. The MWP was not identified in western Japan because a cold climate prevailed in 990–1150 AD. Particularly low temperatures around 1000–1100 AD can be verified by historical documents from in and around the ancient capital city of Kyoto (Ishii, 2002). It is also confirmed by the evidence that large decrease of SSTs(ATs) was reconstructed in Uchiura (Funka) Bay in northern Japan. Therefore Japanese islands did not experience MWP although MWP has been reported from Europe, USA, and China. Although it is difficult to exactly specify the causes, one plausible mechanism is ENSO. It is suggested that the equatorial Pacific was predominantly in an El Niño phase in 900–1200 AD. Actually, the Southern Oscillation Index (SOI), a proxy for an ENSO event, with negative values corresponded to an El Niño episode. At the modern condition, the Pacific high is weakened, with reduced atmospheric pressure in the western North Pacific in the vicinity of Japan. This results in an enhanced Okhotsk high, which tends to be accompanied by a cold and cloudy/rainy summer in Japan (Meteorological Agency of Japan, 2014).

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