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**Reconstruction of Winter Temperature since the 1830s in Kawanishi
Based on Historical Weather Documents**

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In the present study, we estimated the winter temperature variations from 1830/31 to 2008/09 in the town of Kawanishi in the southern part of Yamagata prefecture using daily weather reports and observations documented in an old personal diary. Using historical weather reports, we computed the snowfall rate (percentage ratio of snowfall days to the total number of precipitation days) for each winter during the study period. Then, mean winter temperatures in Kawanishi were estimated using a simple linear regression analysis based on the relationship between the mean winter temperature and snowfall rate, which was computed from historical weather reports. The results of this analysis showed that there were several warm winters in the late 19th century. The warm winters were observed in a period extending from the late 1840s to the early 1850s, and a period in the late 1860s. The results also showed that the temperatures in those warm winters were similar to the average winter temperature for the period 1970/71-1999/2000. By comparing the time series of estimated temperatures to those of long-term historical instrumental temperature data since the late 19th century, we found that the variation in the estimated temperature correlated well with that of the instrumental temperature data. This indicates that the estimated results in the present study are highly reliable.

Key words: historical diary weather records, climatic reconstruction, winter, air temperature

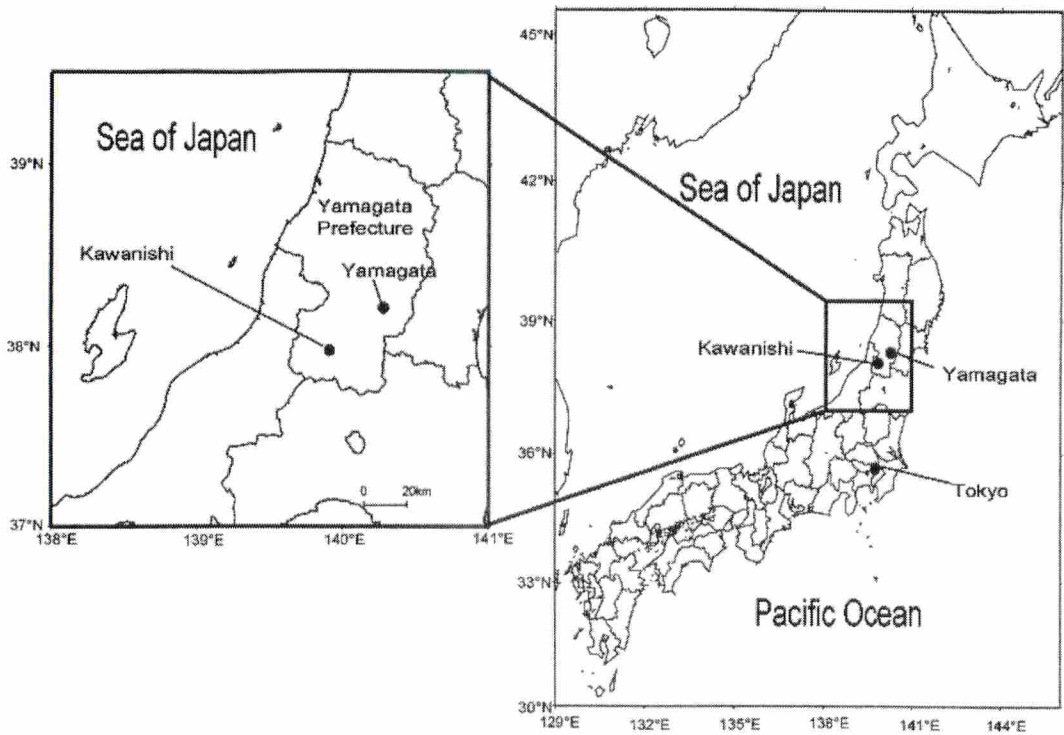


Fig. 1 Location of Kawanishi town where Takeda Gen'emon's diary was documented

Table 1 Major weather descriptions in Takeda Gen'emon's diary and weather classification in the present study

「竹田源右衛門日記」の 主な天候表現	本研究における天候分類
雪 小雪 俄雪 吹雪 みぞれ あられ 雹	雪
雨 小雨 俄雨 大雨 霧雨 雷雨	雨
晴れ 快晴 曇	無降水

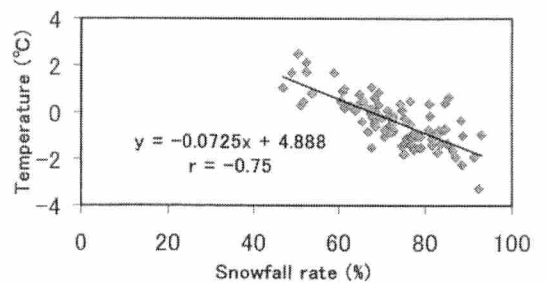


Fig. 2 Relationship between mean winter temperature in Yamagata and snowfall rate computed from Takeda Gen'emon's diary

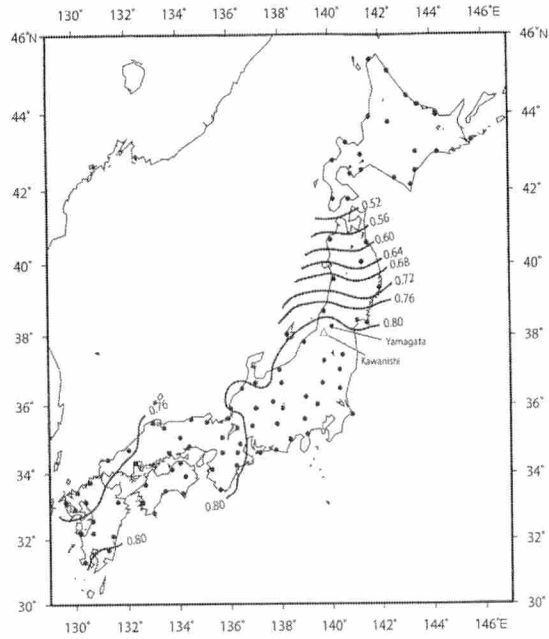


Fig. 3 Distribution map of correlation coefficients of the mean winter temperature in Kawanishi and at other observatories. Dots indicate observatories used for the calculation.

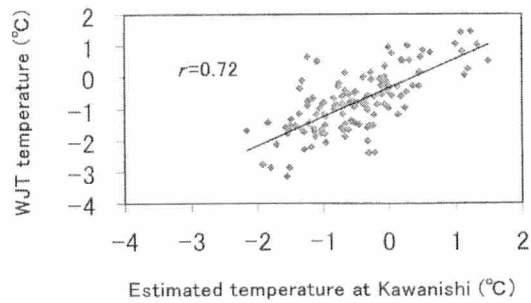


Fig. 4 Relationship between estimated winter temperature in Kawanishi and WJT temperature (Zaiki et al. 2006), 1830/31-1979/1980

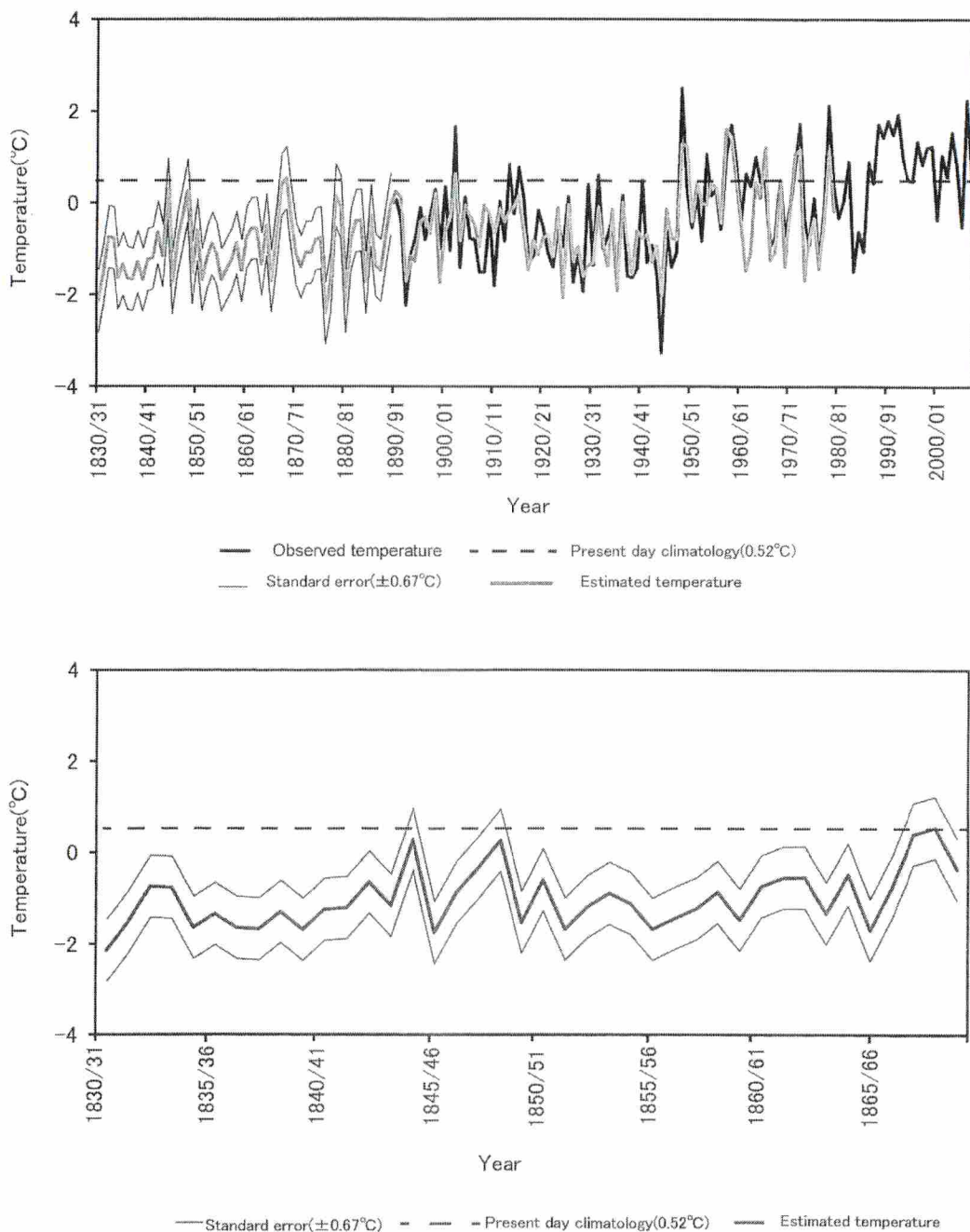


Fig. 5 Variations in mean winter temperature in Kawanishi

(a) temperature variations for the period 1830/31-2008/2009. (b) temperature variations for the period 1830/31-1869/1870.

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