

## Quantification of old weather record by comparison of weather record in modern diaries and meteorological observed data

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Daily weather record of old diaries is very useful for climate reconstruction in historical times because of its exceptionally high temporal resolution as paleoclimatic proxy data. However, there is difficulty in estimating quantitative meteorological variables such as precipitation from their qualitative and subjective weather description. In this study, we attempt to develop a method to quantify weather record of diaries by focusing on the degree of detailed description of weather record.

Here we define "detailed description rate" as the proportion of the number of days with detailed weather description (more detailed than simple description in one word such as "fine" or "rain" ) to the number of days with any weather description. It has high negative correlation with the threshold of recording precipitation phenomenon in diary (Sho et al., 2017). Based on this relationship, we used the seasonal detailed description rate to correct the seasonal number of precipitation days for weather record of diaries written in the Edo era in Kagoshima and Kyoto, Japan. As a result, unrealistic secular trend seen in the time series of the seasonal number of precipitation days before correction was cancelled and the agreement with climatic reconstructions from other proxy data was improved for the corrected time series. This infers the possibility that the difference in weather classification criterion among writers of diary can be adjusted and long time series of a meteorological variable such as precipitation can be composed from weather record of diaries by different writers by using the detailed description rate.

Moreover, we are comparing weather record of various diaries written in the Meiji and Taisho periods (late 19th to early 20th centuries) with four-hourly precipitation data at the neighboring meteorological station to understand the detailed relationships between weather recorded in diaries and actual meteorological phenomena at that time.

Keywords: historical daily weather record, detailed description rate, quantification