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Comparison of daily mean air temperatures based on the different measurement intervals and the effect on the trends

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Meteorological observation has been carried out at Tohkamachi Experimental Station, Niigata Prefecture, since 1917. Daily mean air temperature has been calculated based on minute-by-minute data since 1990 when automatic measurement started. Before then, observation was undertaken manually at fixed times, and the interval between these times had changed over time. In this study, I compared daily mean air temperatures based on different statistical methods, in order to investigate the influence of their differences on the long-term trends of annual mean air temperature or winter mean air temperature. Hourly air temperatures from 1997 to 2007 were used for the comparisons. I found that the mean air temperature based on more than six temperature measurements per day was equal to the mean of hourly measurements. On the other hand, the mean value of three measurements per day or the mean value of daily maximum and minimum air temperatures became higher than the mean of hourly measurements. The mean differences for the 11 years were 0.2 ^{o}C for the mean value of three measurements per day and 0.5 ^{o}C for the mean value of daily maximum and minimum air temperatures. The differences for the winter mean air temperature (from December to February) were 0.2 ^{o}C and 0.4 ^{o}C, respectively. The annual mean air temperature and winter mean air temperature from 1927 to 1989 were corrected using these results. Then I estimated that the rising rate of air temperature from 1918 to 2007 will increase by 0.03 ^{o}C / 100 yr for annual mean and by 0.07 ^{o}C / 100 yr for winter mean compared with the present rate without correction.

Keywords: daily mean air temperature, statistical methods, long-term trends