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Hohenpeissenberg temperatures are too high between 1781 and 1850

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A detailed study of historical sources with relevance to the early instrumental observations at Hohenpeissenberg resulted in the
Having been in use at Hohenpeissenberg from 1781 to 1841, the Palatina thermometer was found to suffer from a positive bias of 0.5°R (or 0.63°C) as discovered by Lamont following a re-calibration made in 1842. Although this fault had become known, no correction was ap-plied to the Hohenpeissenberg temperature series until now. The main reason was due to the composition of the glass used during the early instrumental period. Glass of this period shows a long-term rise of the freezing-point position that newer types of glass do not suffer from. These early glasses showed a thermal after effect extending over several years which mani-fested in a shrinking of the thermometer bulb with the consequence that the freezing-point rose. While originally this effect was interpreted to be a consequence of the external air pres-sure compressing the evacuated thermometer, it took many decades to find out that the mix-ture of certain glass ingredients were responsible and around 1886 Schott succeeded in find-ing a glass most suitable for manufacturing thermometers which were nearly free from ther-mal after effects. Hemmer calibrated his thermometers at an air pressure of 27 Paris inches instead of 28 inches (sea level pressure). This bias, however, seems to be small (<0.1°R) in comparison to other disturbances. In rare cases, the graduation at the lowest end of the scale of the Palatina-thermometer was insufficient to exactly observe the temperature. Since only 22 such occasions occurred, the overall trend will not be influenced by these missing data.
Other stations of the Societas Meteorologica Palatina, which were also supplied with ther-mometers from Hemmers manufacturer Artari can be expected to suffer from a similar bias of the gradually rising zero-point and this bias may partly be responsible for the discrepancy between instrumental and proxy data before 1850.
Another bias, which only occurred in Bavaria, originates from the different observing times for the period, 1879-1900, which were set at 0800 h, 1400 h and 2000 hr instead of 0700 h, 1400 h and 2100 h both before and afterwards. In addition a different formula was used to calculate the daily average. Although the responsible scientists in Munich became aware of this formula-effect, no correction was applied. Therefore the temperatures were too low in that period and must be shifted by +0.5° C.
After correction the temperature series (lowering by 0.6°C for the first 70 years and rise by 0.5°C between 1879 and 1900), the climate warming at Hohenpeissenberg becomes much more pronounced.
There remain two biases that cannot be quantified without a major detailed study being made:
(1) At the start of the observations, the window of the observation room was always kept “open during dry weather”. It is not known how long this practice remained in use.
(2) Lamont also employed an easily melting glass to construct his thermometers that were in use between 1841 and 1878. Lamont checked that within 3 years the freezing-point of his thermometers remained stable within 0.1°R. An analysis of the glass composition seems to be necessary to find out whether it also suffered from a rising freezing-point position. Lamont replaced the Hohenpeissenberg thermometer in 1842 by a new instrument produced in his own workshop. One still existing Lamont-thermometer, but not that one of Hohenpeissenberg, was re-calibrated and the zero-point found to have lowered by –1.4° C. Since the opposite drift had been expected and the original Lamont-type Hohenpeissenberg thermometer is no longer available, no correction is justified for the period in which this thermometer was in use.