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Meteorological observations of Gottfried Reyger in Gdansk from 1722 to 1786 and their applicability to studies of the climate change

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Gottfried Reyger (1704-1788) came from a merchant family living in Gdansk. His research interests after graduation focused on natural science, geography and astronomy. He was a member of Naturforschende Gesellschaft in Danzig, Gdansk's first scientific society focusing on natural sciences, established in 1742. In addition to these interests, he also conducted systematic daily weather observations in Gdansk in the period from December 1721 to the end of 1786, the results of which were presented at two publications "Die Beschaffenheit der Witterung in Danzig as Jahr 1722 bis 1769 beobachtet nach und ihren Veränderungen Ursachen erwogen" (1770) and „Die Beschaffenheit der Witterung in Danzig. Zweyter Theil vom Jahr 1770 bis 1786, nebst Zustätzen zur Danziger Flora" (1788). Reyger's descriptions are fairly accurate, as the author devoted much attention to the properties of thermal and pluvial characteristics of each month, weeks and sometimes even individual days. This information enables reconstruction of the variability of temperature and precipitation for all months, seasons and years of the studied period. It was made using the method of 3-point monthly thermal and pluvial precipitation data indexing (below normal (-1), normal (0) and above normal (1)), carried out in relation to the contemporary conditions independently by three researchers (two climatologists and one historian). However, an evaluation of meteorological conditions in seasons and years was made on a 7-point scale according to the proposal of Pfister et al. (1994). The relatively cold periods covered the years 1725 to 1732, 1739 to 1742, 1749 to 1751, 1762 to 1765 and 1780 to 1786. The second half of the 1730s as well as the turn of the 1750s were warmer. The years 1730-1742 were very humid, whereas the turn of the 1740s and the decade of 1760s were quite dry. No statistically significant trends of air temperature were observed in the analysed period. Otherwise, the precipitation totals changed significantly and negative trends occurred throughout the year, in spring, winter and autumn. On average, the springs in the analysed period were much cooler than now and so were the summers, however to a lesser extent, while the autumns and winters were relatively warmer. All the spring months and June were particularly cold, while February and September were anomalously warm. Wet and dry seasons were observed more often than nowadays. As a result, seasons with normal precipitation totals occurred less frequently. Little precipitation often occurred in May and June, but it was very frequent in March and July. The results of a comparison of reconstructed thermal and pluvial indices with the series of observations were satisfactory. In the case of air



temperature, the correlation coefficient varies between 0.73 (winter) and 0.60 (spring and annual series). As for precipitation totals, the results were similar, varying between 0.71 (summer) and 0.61

(the whole year). The only exception is winter (just 0.40), where such a low coefficient probably resulted from the uncertainties of the series of observations due to unexplained details of the methods of observation of solid precipitation.