Rescue of Ukrainian early historical climatological data

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1 Introduction

• Detection and quantitative assessment of the recent climate change on global and regional scales is mainly performed based on data of instrumental measurements conducted on meteorological/climatological stations all over the world. Modern climate applications and climate services are seeing the need for more data and information (including its historical part) on climate variability at high temporal and spatial resolution.

• It is obvious that the longer and detailed records are the more valuable information can be extracted from the data regarding past, present and, definitely, future of the atmosphere, the climate and its variability. Their significant historical part still exists only in a hard copy form and has not been digitized yet in order to be introduced into scientific analysis.

• The main objective of our work is to present information on results of data rescue (DARE) activity conducted recently in the Ukrainian Hydrometeorological Institute (UHMI, Kyiv, Ukraine) in close collaboration with several national and international partners.

2 Data

• Our focus was concentrated on original sub-diary pre-1850 meteorological observations conducted at 8 meteorological stations located on the territory of the modern Ukraine. These 8 meteorological stations are only ones whose pre-1850 data have been found in a specialized archive of the Central Geophysical Observatory (an observation institution of the Ukrainian Weather Service).

• Meteorological stations: Kyiv, Kharkiv, Kherson, Poltava, Kamyanets-Podilsky, Lugansk, Dnipro, Kherson and Odessa.

3 Methods

• DARE was performed according to the recommendations of WMO (2016).

• All pages of the tables/books were photocopied.

• After creation of the database of the images, data were digitized manually by the authors.

• Values of only three variables were digitized: air temperature, atmospheric pressure (station level) and amount of atmospheric precipitations (rainfall).

• Several quality assurance procedures were performed in order to check the quality of data and the digitization process, including comparison with data previously digitized from other paper sources (UHMI, 1953) and intercomparison between stations by means of HOMER software (both on the monthly scale).

4 Results

• In total 291 103 values were digitized.

• These include 165 980 air temperature records (~57% of the total), 124 376 atmospheric pressure measurements (~42.7%) and 74 287 precipitation totals (~3.0%).

• Time series of differences between monthly data calculated from the rescued records and from UHMI (1953). The figure shows the data are at station level and the data are converted to the same time scale (months).

• Time series of daily air temperature measurements at Kyiv in 1848 (‘near without snow’). Temperature data were converted to the Celsius scale.

• Scatter diagrams of monthly data digitized from UHMI (1953) against similar values calculated from the rescued data.

5 Conclusion

• Apart from Kyiv, Kamyanets-Podilsky and Kherson, anomalies between the two kinds of monthly data increase with temperature magnitude, which leads to the significant seasonal/periodic course of the anomalies.

• Based on QA part of the HOMER software a mutual evaluation of monthly time series was performed and potential outliers were localized.

• However due to the large number of missing values along with the small number of stations analyzed, the results of such evaluation have limited validity.

References
