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A Quality Assurance System for Canadian Hourly Pressure Data

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In this study a comprehensive quality assurance (QA) system, which includes the hydrostatic check combined with a statistical homogeneity test, is designed and applied to hourly pressure records (for 1953-2002) from 761 Canadian stations, to produce a high-quality database of hourly station and sea level pressures for various climate studies. The main principles of the QA system are described in detail, followed by a brief emphasis on the error correction algorithms. The general performance of the QA system and the main problems in the Canadian historical hourly pressure database are discussed and illustrated through various examples. The results show that there are serious systematic errors (i.e., sudden changes in the mean, or mean shifts) in the Canadian hourly pressure database, which are caused either by the use of incorrect station elevation values in the reduction of barometer readings to station or sea level pressure values (e.g., the “50-ft rule” or station relocation without updates to the station elevation), by transposing/swapping station and sea level pressure values, or by mistakes made in the archive data ingestion or data recording/digitization processes (e.g., use of a wrong base number). Random errors also exist and are mainly due to the transposition of two digits or miscoding of one or two digits. These errors must be corrected before the data are used in various climate studies, especially climate change-related studies.