



Application of satellite data for the quality control and homogenisation of ground-based measurements of solar surface radiation: the case of Poland

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Incoming solar radiation is the most important factor shaping climate system on Earth and the main element of the surface heat balance. Researchers increasingly often use satellite data, but despite undeniable advantages of these data, one should not neglect the research potential of actinometric data collected on the ground. Well-maintained and regularly calibrated measuring instruments provide the most accurate solar radiation data. Unfortunately, ground-based measurements are often subject to various errors which are difficult to detect, e.g. recording errors, equipment failures, changes in station locations and wrong calibration of instruments. Solar radiation data series are particularly prone to such errors.

This project develops a method for detecting errors in ground-based measurement solar radiation data and for homogenising these data. The project builds on climatological variables that are easy available and can be used to approximate surface radiation. The developed method for detecting errors is thus based on comparing measured solar radiation with the reference values modelled using: (1) daily air temperature range (coming from weather stations), (2) mean daily cloud cover (originating from the CM SAF's COMET dataset) and (3) aerosol optical depth (AOD-550, coming from ESA Climate Change Initiative aerosol_cci 2 data) by means of modified Supit-Van Kappel model. Before applying these data, we test their homogeneity and temporal stability. On this stage we do not use the satellite-derived surface radiation data. Excessive statistical differences between modelled and measured values indicate possible errors that should be replaced by corrected values. Thus, the last step of the project will be restoring homogeneity with the use of indirect methods based on the analysis of differences between ground-based and satellite data. To this end, the independent, satellite-derived data of daily sums of global solar radiation will be used (SIS product, SARA-2 database, CM SAF). The devised method for quality control and restoring homogeneity of data will be applied to create a base of homogenous, ground-based climatological data on global solar radiation in Poland in the period 1996-2012.