In order to form theses about the climate, its variability or changes, one should have long series of measurement data satisfying the criterion of comparability. Unfortunately, ground-based measurements are often subject to various errors which are very difficult to detect. Real climate signal may be often hidden in ground-based measurement data series behind non-climatic noise caused by such factors as recording errors, equipment failures, changes in station locations and wrong calibration of instruments. Solar radiation data series are particularly prone to such errors, thus quality control of the data (detecting errors) and restoring homogeneity (correcting errors) is essential and should be performed prior to further analyses. Conducting research based on data series which had not been subject to quality control procedure may lead to incorrect results and conclusions. So far, there is no data quality control method which is consistent, accurate and which could be used for Polish actinometric data, particularly those with a high temporal resolution (daily values). Existing methods for data quality control are mostly limited to simply rejecting values considered as erroneous. Additionally, they can be used only to detect gross errors or to analyse homogeneity of data with a low temporal resolution (e.g. monthly means).

The aim of the project is to develop and verify a method for detecting errors in ground-based measurement data on global solar radiation reaching the Earth's surface, and to devise a method for homogenising these data. To this end, the project will use high-resolution satellite data on solar radiation, cloud cover and atmospheric aerosols concentration. The project builds on climatological satellite data that proved to be sufficiently accurate and homogenous to be used for detecting errors in ground-based measurement data on solar radiation. The method for quality control and restoring homogeneity in measurement data developed in this project will make it possible to verify quality of radiation measurements in their native resolution. This will be of the utmost importance for advancing research on solar radiation. The base of homogenous ground-based climatological data on global solar radiation in Poland, elaborated as part of the project, will be made available to other researchers in the form of a digital repository. Thanks to that, it will be possible to use the results of the project in many applications, among others in agriculture and solar industry.

Having a high quality, homogenous measurement series without any gaps, it will be possible to achieve the main scientific objective of the project – analysing variability of solar radiation in Poland in the context of contemporary climate changes. Moreover, the relation between changes of solar radiation, cloud cover and atmospheric aerosols concentration will be subjected to examination. One should remember that incoming solar radiation is the most important factor shaping climate system on Earth and the main element of the surface heat balance. This is why analysing changes in solar radiation on the globe in the context of changes of radiative forcing and contemporary climate changes is so crucial. Analysing, as part of the project, the dependence of radiation measured on the ground upon cloud cover and amount of aerosols in the atmosphere, will bring us closer to finding an answer to the question to what extent changes in solar radiation result from changes in cloud cover and to what extent – from changes in aerosols concentration. There is no unambiguous answer to this issue yet. It will contribute to gaining new knowledge about the foundations of contemporary changes in the most important element of Earth energy balance – solar radiation. Identifying these changes is particularly important in the context of the need of climate change mitigation and adaptation.