

Calibración exterior de piranómetros en el IPMA de acuerdo con la Norma ISO 9847:1992

Outdoor calibration of pyranometers at IPMA, following ISO 9847:1992

C. Morais Esteves, J. Neto, M. Mendes, J. Marques

Instituto Português do Mar e da Atmosfera (IPMA), Lisboa, Portugal

RESUMEN

Pyranometers play a fundamental role in meteorology and climate research by measuring incoming solar radiation at the Earth's surface, a key variable controlling weather processes, climate variability, and surface–atmosphere energy exchanges. In this study, 23 pyranometers were calibrated at the Portuguese Institute for Sea and Atmosphere (IPMA) following the ISO 9847:1992 standard, which is based on outdoor calibration through comparison with a higher-class reference pyranometer. The calibration procedure relies on the determination of a reference irradiance constant obtained from simultaneous measurements between the test and reference instruments. Only data corresponding to solar elevation angles greater than 20° were considered to ensure measurement reliability. For each pyranometer, two independent calibration constants were computed using two different methods and subsequently compared. If the relative deviation between the two constants exceeded 2%, the corresponding data series was rejected. When the deviation was below 2%, the resulting calibration constant was further validated using an independent dataset. Prior to calibration, the root mean square error (RMSE) between test and reference irradiances for the 23 pyranometers ranged from 105.19 to 15.35. After calibration, RMSE values were substantially reduced, lying between approximately 19.56 and 14.92, indicating a significant improvement in measurement accuracy. These results demonstrate the effectiveness of the ISO 9847:1992 outdoor calibration methodology and highlight its importance for ensuring the quality and consistency of surface solar radiation measurements.