



Influence of rain gauge calibration on data series at Re.S.M.A. station in Vigna di Valle (Italy)

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SYSTEMATIC ERRORS IN RAIN GAUGE MEASUREMENTS

Consistent measurement errors in rain gauge measurements are a well-known problem in the field of hydrological data. The most common cause of systematic errors is the non-ideal geometry of the rain gauge, which leads to a systematic underestimation of the rain depth. This is due to the fact that the rain gauge is not perfectly cylindrical and the rain is not perfectly horizontal. The most common cause of systematic errors is the non-ideal geometry of the rain gauge, which leads to a systematic underestimation of the rain depth. This is due to the fact that the rain gauge is not perfectly cylindrical and the rain is not perfectly horizontal.

The traditional measurement of precipitation at the ground has experienced in the last 20 years a renewed impetus of development, mainly oriented to the use of automatic recording instruments. One of the most important reasons for this has been the continuous updating of the calibration of the measurement of rain, that is to say, the use of automatic recording instruments. This has led to the use of automatic recording instruments, which are more accurate and reliable than manual measurements. The most important reason for this has been the continuous updating of the calibration of the measurement of rain, that is to say, the use of automatic recording instruments.

Legal regulation means a series of rules by which the use of both automatic and manual instruments is regulated. The most important reason for this has been the continuous updating of the calibration of the measurement of rain, that is to say, the use of automatic recording instruments. This has led to the use of automatic recording instruments, which are more accurate and reliable than manual measurements. The most important reason for this has been the continuous updating of the calibration of the measurement of rain, that is to say, the use of automatic recording instruments.

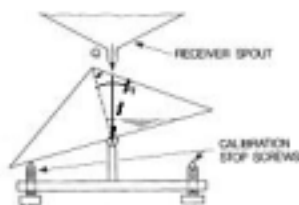
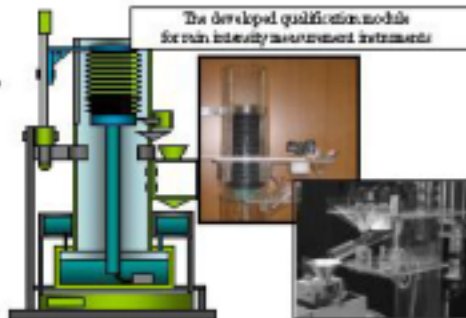


FIG. 1. Mechanics of the tipping-bucket rain gauge.

Abstract. The paper reports the results of a systematic inter-comparison of precipitation measurements at the Vigna di Valle station in Italy. The comparison was carried out between the data of the tipping-bucket rain gauge and the data of the automatic recording instrument. The results show that the automatic recording instrument is more accurate and reliable than the tipping-bucket rain gauge. The most important reason for this has been the continuous updating of the calibration of the measurement of rain, that is to say, the use of automatic recording instruments.



The qualification module has been designed and developed in the Department of Environment and Energy Engineering of the University of Calabria. It is a device that is used to calibrate rain gauges. The most important reason for this has been the continuous updating of the calibration of the measurement of rain, that is to say, the use of automatic recording instruments.

THE INTER-COMPARISON

The inter-comparison was carried out between the data of the tipping-bucket rain gauge and the data of the automatic recording instrument. The results show that the automatic recording instrument is more accurate and reliable than the tipping-bucket rain gauge. The most important reason for this has been the continuous updating of the calibration of the measurement of rain, that is to say, the use of automatic recording instruments.

$$I = \alpha \cdot I_0$$

where I is the true intensity, I_0 is the intensity measured by the gauge, and α is the calibration coefficient. The most important reason for this has been the continuous updating of the calibration of the measurement of rain, that is to say, the use of automatic recording instruments.

$$k = \frac{I_0 - I}{I}$$

The coefficient of the calibration curve for the TSPF set of rain gauges is given in Table 2. In the absence of wind, the error of the automatic recording instrument is about 10-15%. The most important reason for this has been the continuous updating of the calibration of the measurement of rain, that is to say, the use of automatic recording instruments.

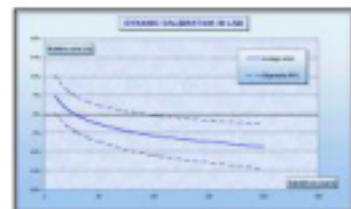


FIG. 2. Automatic calibration results for about 40 rain gauges of the TSPF family - Average rain rate and dispersion of 30%.



The CASSELLA gauge under calibration.

CONSTRUCTION OF THE FIELD GAUGE

The tipping-bucket rain gauge currently employed at the Vigna di Valle station for precipitation measurements has been recently replaced by a new one, using the automatic recording instrument. The most important reason for this has been the continuous updating of the calibration of the measurement of rain, that is to say, the use of automatic recording instruments.

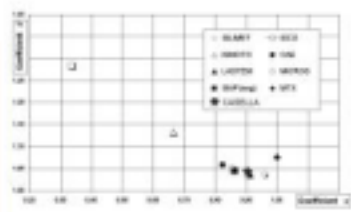


FIG. 3. Calibration coefficients for gauges from various manufacturers as obtained from the laboratory survey.



The field site of Vigna di Valle for meteorological observations and instrument inter-comparison.

RESULTS

The obtained results show that the automatic recording instrument is more accurate and reliable than the tipping-bucket rain gauge. The most important reason for this has been the continuous updating of the calibration of the measurement of rain, that is to say, the use of automatic recording instruments.

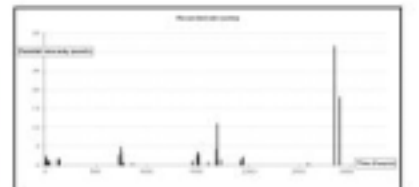


FIG. 4. The amplitude range of the signal in the rain gauge.

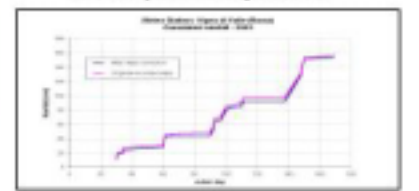


FIG. 5. Comparison between the signal and processed data series in terms of accumulated rainfall.

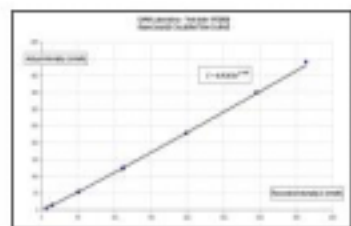


FIG. 6. Calibration curve for the CASSELLA gauge.

CONCLUSIONS

The results of the inter-comparison show that the automatic recording instrument is more accurate and reliable than the tipping-bucket rain gauge. The most important reason for this has been the continuous updating of the calibration of the measurement of rain, that is to say, the use of automatic recording instruments.

In conclusion, the use of the automatic recording instrument is recommended for precipitation measurements. The most important reason for this has been the continuous updating of the calibration of the measurement of rain, that is to say, the use of automatic recording instruments.