



The Energy, Environment and Climate Research Group

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Research Title: Design, construction, characterization and calibration of a Triple Sensors Rotating Shadowband Pyranometer

The availability of accurate solar radiation data in terms of diffuse, direct components and global, is a pre-requisite to achieve a suitable exploitation of the solar resources everywhere. The majority of the radiometric stations typically measures only two of the solar irradiance components and calculates the third. Often the diffuse component is measured and the direct calculated, because the measure of direct beam requires an additional cost for tracking of the sun by the pyrliometer. Thus, measurements of diffuse component of solar radiation are commonly made using the pyranometer fitted with an adjustable shading device. In developing countries the high capital costs of the commercially available radiometers prohibits the simultaneous use of two or three radiometers for ground-based measurements of the solar radiation components.

The commercially available radiometers



Figure 1 shows a photograph of a precision spectral pyranometer (PSP) fitted with a shadowband. It measures the diffuse component of solar radiation. It is on field operation at the Eduardo Mondlane University (UEM).

Figure 2 showing a photograph of a normal incidence pyrliometer (NIP), mounted on a sun tracker that points the pyrliometer at the sun continuously, for measuring the direct component of solar radiation. Also on field operation at the UEM.

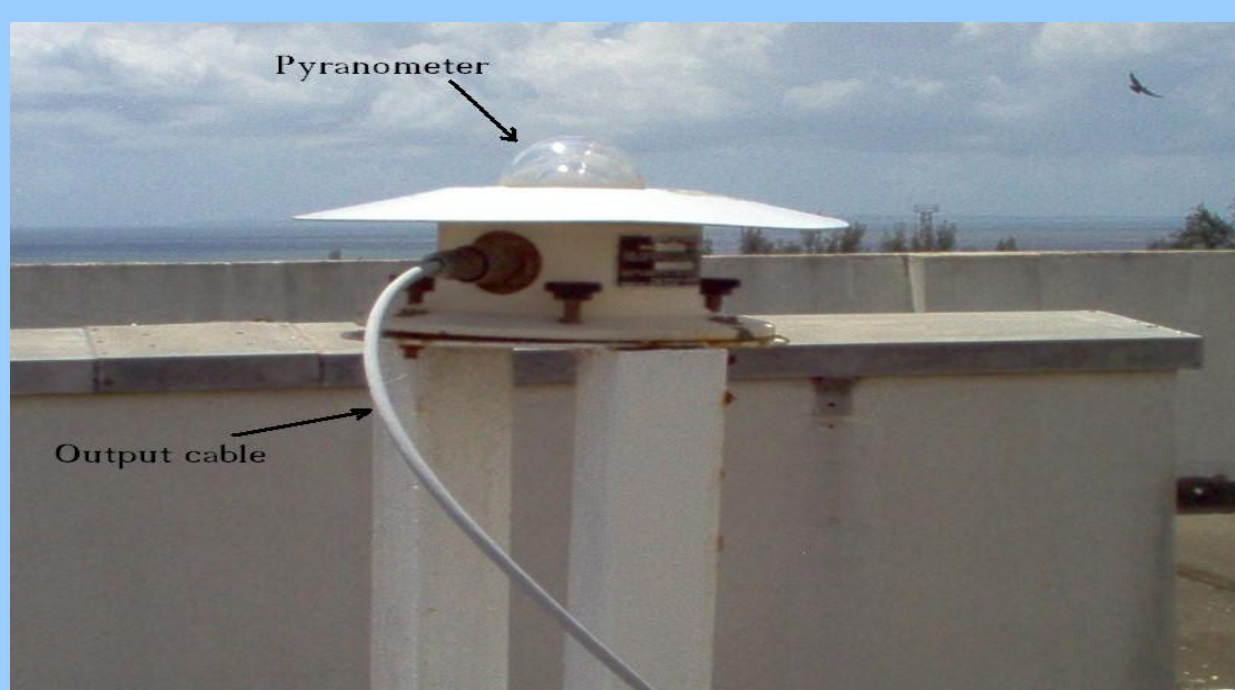
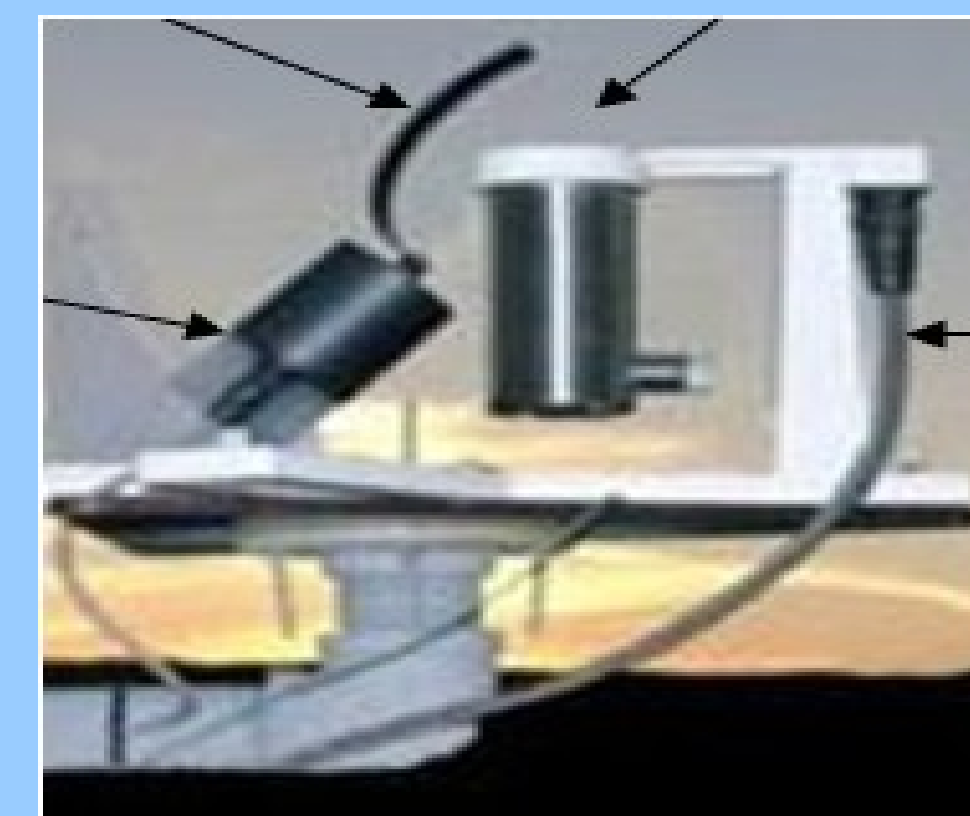


Figure 3 Shows a photograph of a precision spectral pyranometer on field operation at the UEM. It measures the global solar radiation.

The simultaneous use of the above shown radiometers is not common in most radiometric station since this requires high financial cost.

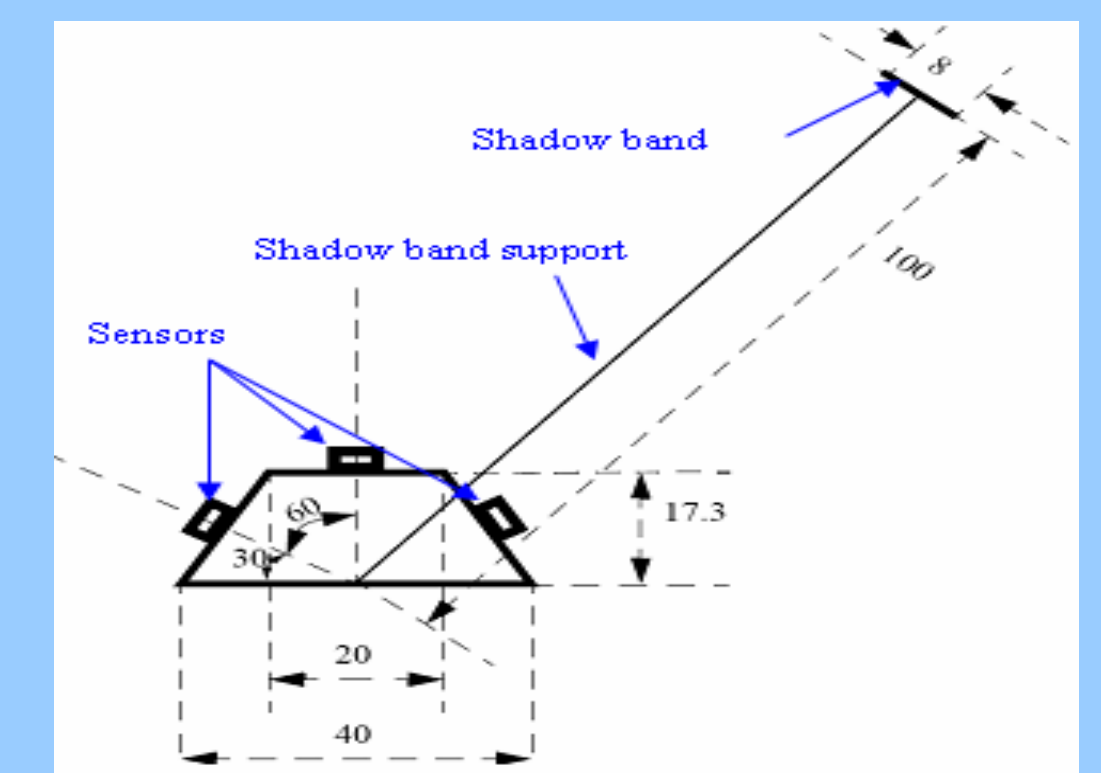
The rotating shadowband pyranometer (RSP) has come into general use as an alternative to address the capital cost, by measuring on a single instrument the diffuse and global solar radiation. It also addresses some physical disadvantages on simultaneous use of three radiometers, such as the inter-calibration worries over absolute sensitivity and spectral passband and guaranteeing that the measurements are synchronous. Figure 4 shows an example of a RSP.



The Proposed Radiometer

On the RSPs, still remains the problem regarded to the cosine response. To address this it is proposed the triple sensors rotating shadowband pyranometer (TSRSP). Fig. 5 illustrates the TSRSP, the core of the present research work.

The TSRSP, is designed to measure the diffuse and the global solar radiation, on a single instrument. The main objective is to fabricate a low-cost solar radiation detector that can easily allows on mapping solar resources along the country



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