

## Editorial: Special issue on solar radiation measurement



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Solar energy is the electromagnetic energy emitted by the sun, which is the dominant energy driving the Earth's climate system<sup>[1-2]</sup>, the radiation fluxes to and from the Earth's surface are crucial to the heat economy of the Earth, tiny variations in solar radiation will produce natural forcing of Earth's climate with global- and regional-scale responses<sup>[3-4]</sup>, therefore, accurate solar radiation measurements are significant for the energy balance that determines the Earth's climate<sup>[5]</sup>. Moreover, with global energy crisis intensifies, the utilization of solar energy resource has been putting on more and more attentions by many countries, correspondingly, accurate solar radiation measurements are broadly needed in evaluating photovoltaic power plant location<sup>[6]</sup>. For both ecological and economic interests, many in-depth researches on solar radiation measurement including standardization, instrument, observation method, uncertainty evaluation and many related aspects have been done, so over the past decades, great improvements and innovations spring up constantly in the field of solar radiation measurement. In this issue we recommend you the current situation analysis of solar radiation measurement, a series of the last researches

on solar spectroradiometer development, ISO 9845.1 revision, solar simulation system design, uncertainty evaluation for comparison results of National Radiometric Standards and World Radiometric Reference, error analysis and correction of sunshine duration sensor, development and application of working standard pyranometer, contrastive observation of solar thermal and photovoltaic resource are introduced.

According to the Guide to Meteorological Instruments and methods of observation published by World Meteorological Organization (WMO), radiation may be classified into two groups according to their origin, namely solar and terrestrial radiation<sup>[7]</sup>. The spectrum of solar radiation ranges from 290nm to 3000nm which sometimes called shortwave radiation, while terrestrial radiation emitted by the Earth's surface and the atmosphere is called longwave radiation, due to 99.99% of the terrestrial radiation wavelength is longer than 3000nm<sup>[8]</sup>. According to the type of radiation to be measured, meteorological radiation instruments are classified into different kinds, for example, global solar radiation, diffuse radiation and reflect radiation are measured with thermopile or photovoltaic pyranometers by different installation positions, direct solar radiation is measured by means of pyrhemeters<sup>[9]</sup>, while terrestrial radiation is measured with pyrgeometers<sup>[10-11]</sup>. Light is the radiation visible to human eye, the spectrum of which is between about 360nm and 760nm, and is very important to plants for photosynthetic reaction, we measure it by photosynthetically active radiometers, the same with ultraviolet radiation measured by UV radiometers. In order to make the measurements accurate, comparable and consistent, good calibration and maintenance are needed, because there is no standardized reference for radiation instruments, the responsibility for the calibration of radiometric in-

struments rests with World, Regional and National Radiation Centres, the World Radiation Centre (WRC) at Davos maintains the World Radiometric Reference (WRR) by World Standard Group, through the international comparison organized every five years, the WRR transfers to Regional and National Radiation Centres, which then calibrate the network instruments periodically<sup>[11]</sup>. In China, National Radiometric Reference is kept at National Centre for Meteorological Metrology of CMA, and we participate into the International Pyrheliometer Comparisons (IPCs) from 2000, which makes the meteorological radiation measurement in China synonymous with international standards.

Currently, radiometric instruments are becoming more automatic, and intelligent, high-accuracy which make the measurements more accurate, the application of these instruments will give us a better understanding of the earth-atmosphere system and lead us a better life.

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