UCD Meteorology M.Sc. Research Project 2010

Profiling and Investigating Valentia Observatory's Solar Radiation Records

In the recent past the sun has been emitting solar radiation at a steady rate. The amount of sun's energy reaching the top of the Earth's atmosphere is approximately constant. The amount of sun's energy reaching the surface of the Earth varies greatly depending on atmospheric conditions as well as the diurnal cycle. The amount of solar energy reaching the surface of the Earth is of keen interest to climatologists, agriculturists and commercial industries among numerous others.

Valentia Observatory has been monitoring Global solar radiation since 1954. Today it measures a suite of radiation measurements including Global, Diffuse and Direct solar radiation.

Valentia's official observatory instrument used to measure Global radiation is a Kipp & Zonen (K&P) CM5 pyranometer. A similar CM5 used with a manually adjusted shade ring to measure Diffuse radiation. In 2002 a K&P 2AP solar tracker was installed which uses upgraded pyranometers (CM11's) to *automatically* measure Global and Diffuse solar radiation. This tracker measures Global and Diffuse radiation 'in parallel' to the official CM5 instruments.

Valentia also measures Direct solar radiation by means of two Eppley pyrheliometers situated on the solar tracker.

The primary objective of this project is to compare the solar measurements of the official manually maintained instruments (CM5s) to the automated measuring instruments situated on the solar tracker (CM11s).

<u>The student will be required to:</u>

- Extract the relevant data from file types of different formats over the period 2002 - 2009
- Statistically compare the Global and Diffuse record set of the official CM5 pyranometers to their equivalent CM11 instruments situated on the solar tracker. Identify any discrepancies, biases, seasonal or diurnal deviations and attempt to explain any found.
- Compare and contrast the two Eppley pyrheliometers (Direct instruments) and identify any discrepancies.
- As a general rule one would expect $Global - Direct \approx Diffuse$ Investigate this relationship and attempt to explain any discrepancies.
- Present extracted data in a tidy usable format.

Methods and results (both graphical and statistical) to be presented in a report.

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