

Electronic Incoming Solar Radiation Methodology

(Last rev. 04/10/2024)

Solar radiation is measured at the top of the Lutz tower (Figure 1).

Incoming solar radiation was originally measured electronically using LiCor Model Li200x Pyranometers (see figure 2) at the 42m level. In Nov. 2001 two new sections were added to the tower bringing the height to 48m. This was necessary to accommodate the increased height of the surrounding canopy. The sensor was moved to 48m on Dec. 7, 2001.

Originally, one pyranometers was used, however in Nov. of 2010 a second pyranometers was installed (see Figure 2). The reported value is the larger of both sensors for any given reporting interval. The sensors are designated as East (e) and West (w). The reported values in summary statistics based on the larger values of both sensors for any given reporting interval.

Incoming solar radiation is sampled once every 10 seconds. The average, minimum and maximum values are recorded every 15 minutes.

On June 6, 2016, the East sensor was replaced with a Kipp&Zonen SPLite2 pyranometer (see Figure 3).

On March 27, 2019, the East sensor was replaced with a Kipp&Zonen CMP11 pyranometer and the West Sensor was replaced with a Kipp&Zonen CMP3 pyranometer (see Figure 4).

A comparison of daily average solar radiation between the sensors is shown in Figure 5

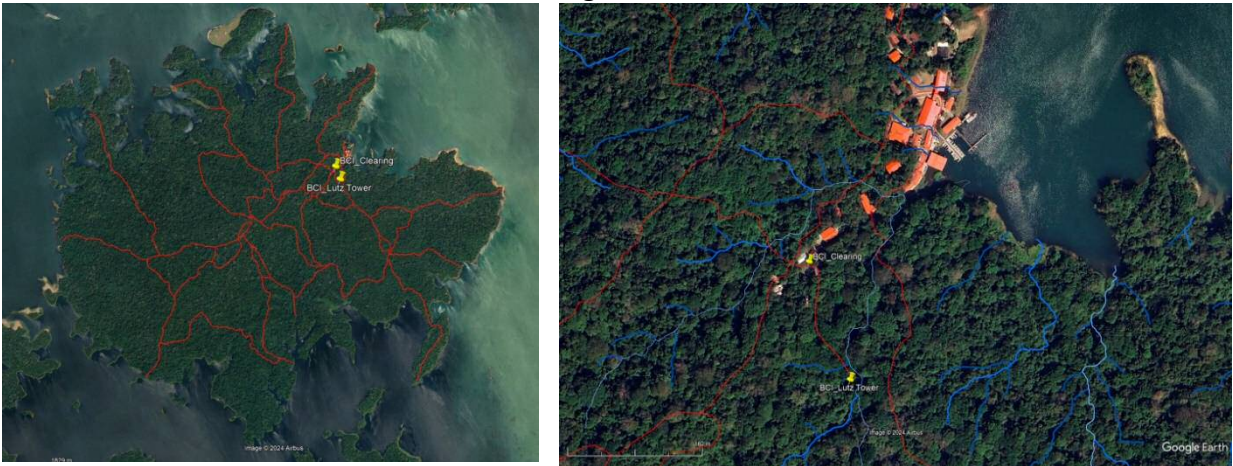
Sensor elements are replaced with newly recalibrated sensors every year according to the manufacture's recommendations.

Records are provided with two Quality Control flags. Flag one indicates the fitness-for-use of each record. Possible values are: good, bad, doubtful, missing. Records are marked as bad if they fail one or more QC tests. Likewise, records are marked as doubtful if they are potentially bad, but without sufficiently strong evidence to be marked as bad. The second QC variable provides that reason for marking a variable as bad or doubtful. Potential values are: range, step, persistence, drift. At this time only range tests have been applied.

Note:

As a result of damage to the Lutz tower, solar radiation is no longer being measured on the Lutz tower beginning in March 2024. Data from the AVA tower can be used to replace the Lutz data series. A comparison of daily solar radiation between the AVA and Lutz data shows a very high correlation ($R^2=0.96$) and a regression equation of $AVA_SR*0.848 + 1.746$ (see Figure 6)

Figure 1



Location of Laboratory Clearing and Lutz Tower (red lines are trails, blue lines are streams)

Figure 2



LiCor Model Li200x Pyranometers (with protective caps used during installation)

Figure 3



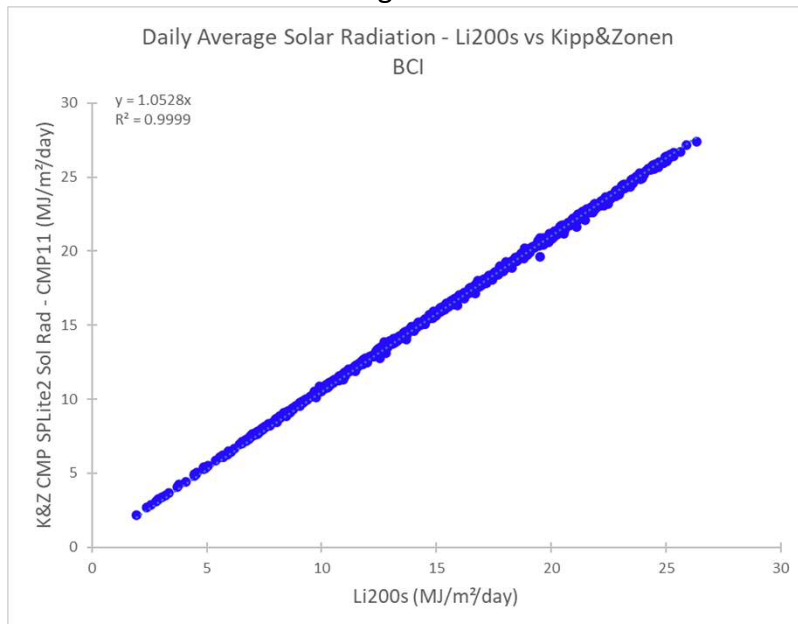
Kipp & Zonen SPLite2

Figure 4

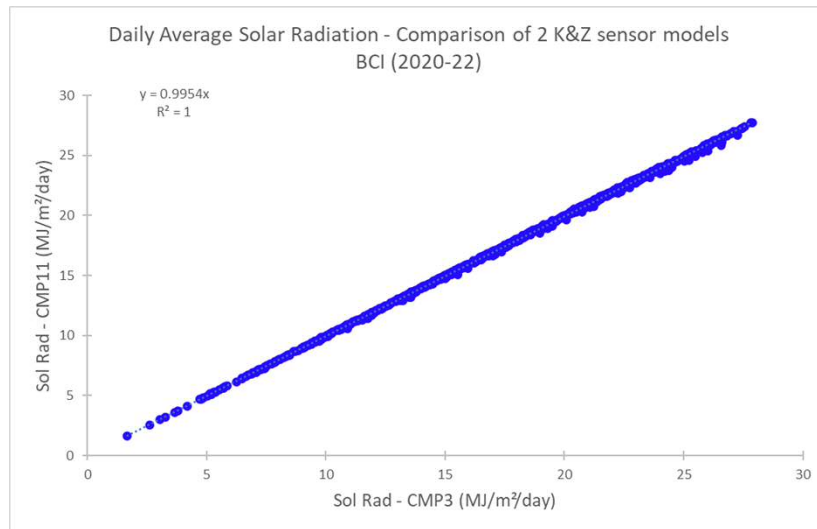


Kipp & Zonen CMP3 (left) and CMP11 (right)

Figure 5

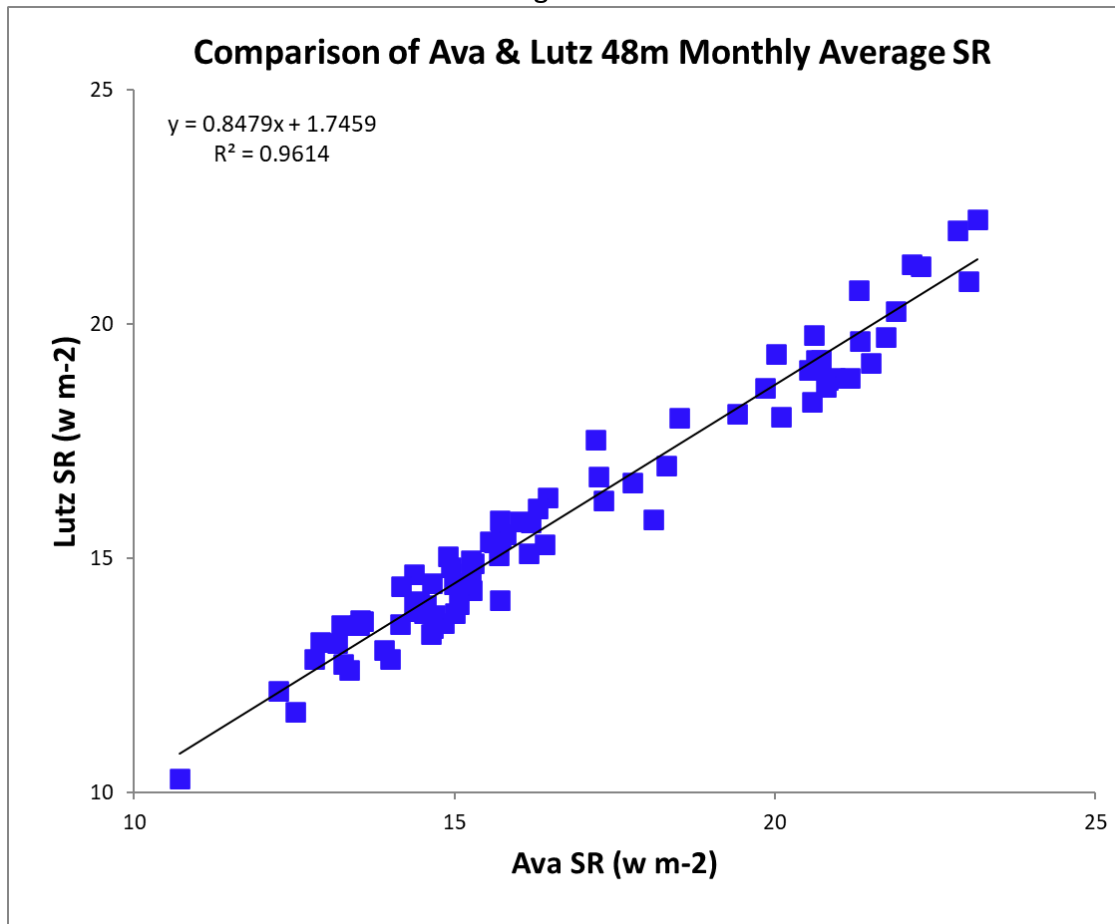


Comparison of Daily average solar radiation between LiCor Li200SB and Kipp&Zonen SPLite2 Pyranometers



Comparison of Daily average solar radiation between Kipp&Zonen CMP3 vs CMP11 Pyranometers

Figure 6



Comparison of AVA and Lutz daily total solar radiation