

## Electronic Air Temperature and Relative Humidity Methodology

(Last rev. 18/11/2024)

Barro Colorado Island – BCI (Figure 1) air temperature and relative humidity are measured electronically at the Laboratory Clearing ('El Claro') and the Lutz Tower (Figures 2 & 3) using combination sensors housed in naturally aspirated radiation shields (Figure 4)\*.

\*(From the manufacturer: the naturally aspirated 6 and 10-plate radiation shields' louvered construction allows air to pass freely through the shield, keeping the probe at or near ambient temperature. The shields' white color reflects solar radiation.)

Since 1990's, different sensors have been used. From 1995 to 2001 the Viasala HMP35C was used (see Temp\_Hum\_Probe\_Model\_hmp35c.pdf). From 2001 to 2010 the Viasala HMP45C was used. Between 2010 and 20xx the CS215 sensor was used. In 20xx Campbell Sci. HygroVue10 sensors have been in use (see Figure 5).

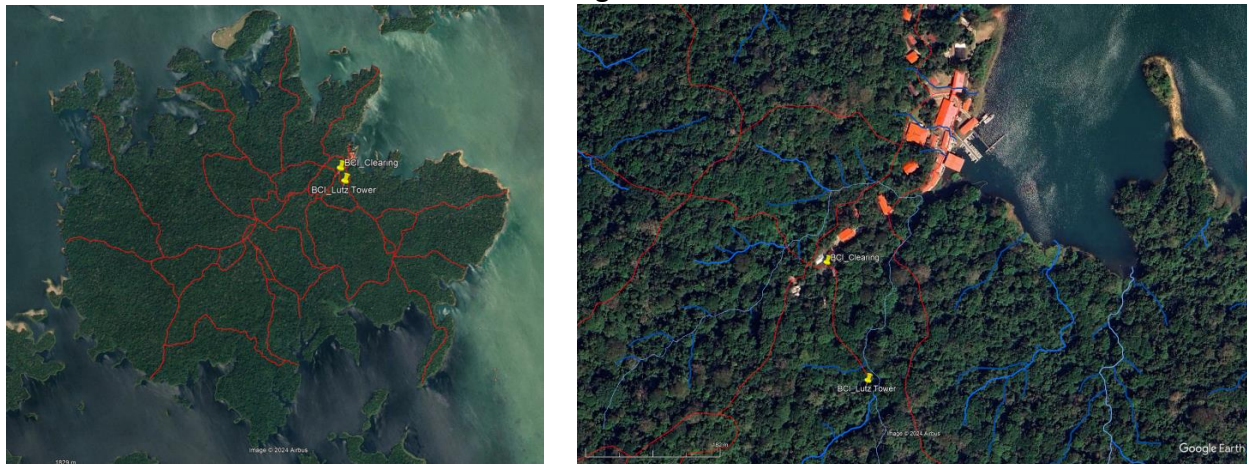
Air temperature and relative humidity are sampled every 10 seconds. The average, minimum and maximum values are recorded at the end of every 15 minute interval. Sensor elements are replaced every year according to the manufacture's recommendations.

Records are provided with two Quality Control flags. Flag one indicates 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, temperature and relative humidity are no longer being measured on the Lutz tower beginning in March 2024. Temperature data from the AVA tower could be used to replace the 48m Lutz data series. A comparison of daily solar radiation between the 40m AVA and 48m Lutz data shows a very high correlation ( $R^2=0.90$ ) and a regression slope of 1.05 (see Figure 6). A comparison of Relative Humidity shows a bimodal relationship (Figure 7) which may reflect a change in sensor at one of the sites.

Figure 1



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



Figure 2



Laboratory Clearing

Figure 3



Lutz Tower from below (left) and view of surrounding canopy from the top (right)

Figure 4



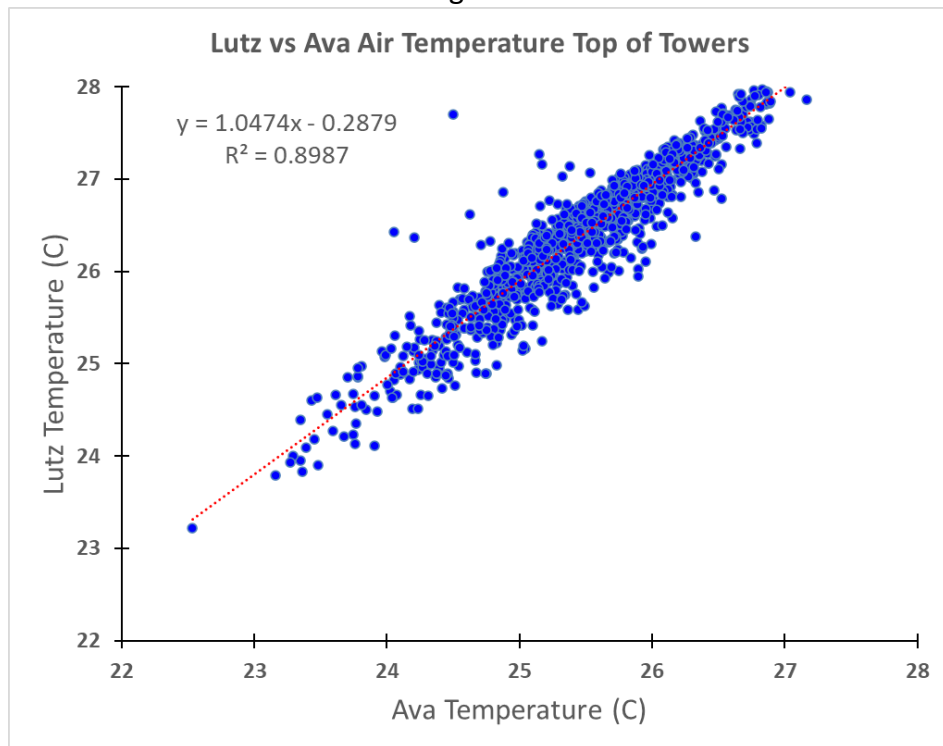
CS215 sensor Temperature & Humidity sensor inside 6-gill naturally aspirated radiation shield

Figure 5



Campbell Sci. HygroVue10 sensor

Figure 6



Comparison of Daily average temperatures at the 40m AVA tower and 48m Lutz tower sensors

Figure 7

