

Electronic Precipitation Methodology

(Last rev. 23/10/2024)

Precipitation is measured in the Laboratory Clearing ('El Claro'). This is an open area surrounded by trees of up to 20m in height (see Figures 1 and 2).

Rainfall has been electronically measured on BCI since 1925, first by the Panama Canal Authority (ACP), and then beginning in 1972, by STRI. The ACP continues to collect rainfall data to this day.

Since 1990, STRI has measured rainfall using tipping buckets. The first generation of tipping buckets had a resolution of 2.54mm (0.1") and recorded total rainfall at intervals of 15 minutes. In June of 1983 this resolution changed to 0.254mm (0.01") with recording intervals of 1 minute. In 1994 the recording interval was changed to every 5 minutes.

Currently, the Hydrological Services Model TB4 tipping bucket is being used (see Figure 3).

The tipping bucket is calibrated yearly according to the manufacturer's specifications (see Figure 4).

In Sept. 2019 a new type of gauge was installed. The *OTT Pluvio² S* (see Fig. 5) measures temperature-corrected precipitation mass. This sensor output several different variables:

- Real-time output: the measurement results greater than 0.1mm/min within one minute after the occurrence of the precipitation event (fastest response) [bci_cl_ra2_int_elect](#)
- Non-real-time output: the measurement results 5 minutes after occurrence of the precipitation event (more accurate) [bci_cl_ra2_nrt_elect](#)
- For more information about this sensor, read the accompanying manual [OTT_Pluvio2_Manual.pdf](#)

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.

OTT vs Hydrological Services gauges

A comparison of monthly totals over a period of 3.5 years shows that the OTT gauge reports approximately 4.5% less rainfall than the Hydrological Services gauge (see Fig 5).

Hydrological Services vs Manual gauges

Electronically measured precipitation tends to underestimate precipitation – as measured by manual measurements. This is a well-known but poorly understood phenomenon. On BCI, monthly total manually measured precipitation is approximately 13.5% more than the electronically measured data – despite yearly calibrations of the electronic sensor (see Fig. 6).

Figure 1



Location of Laboratory clearing

Figure 2



Clearing Site showing location of tipping bucket in right corner of fenced in area.

Figure 3



Hydrological Services Model TB3 tipping bucket

Figure 4



Tipping Bucket Calibration

Figure 5



OTT Pluvio² S Rain gauge

Figure 6

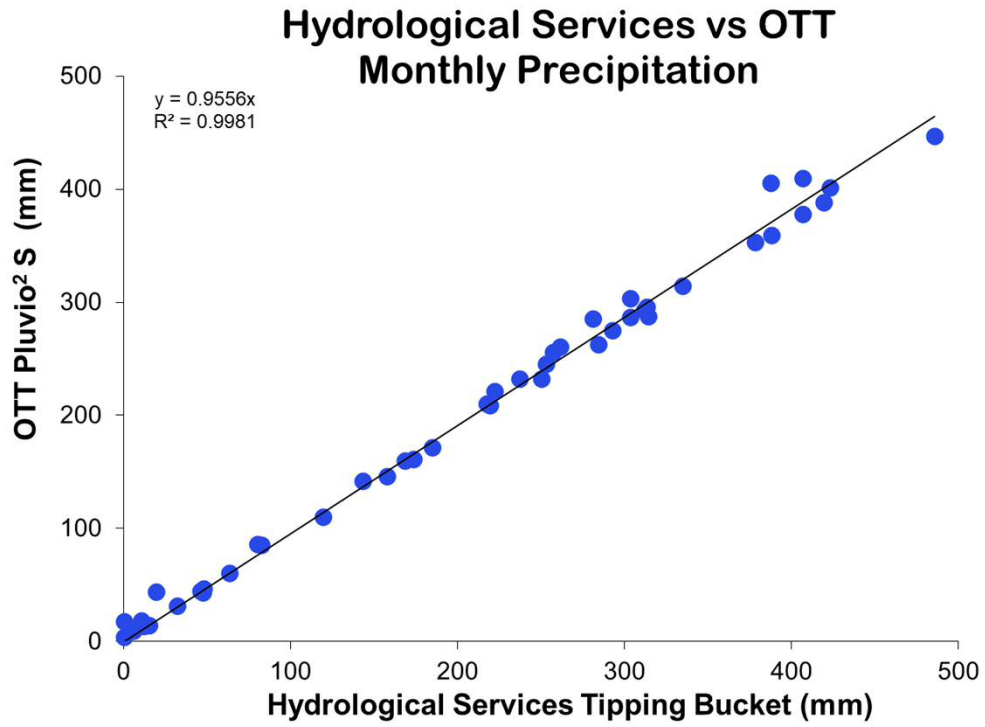


Figure 7

