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QA and Normalisation of CSIRO Canberra Data to the BOM Canberra Standard

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Background

CSIRO data is measured at Black Mountain (Lat: 35.27°S, Long: 149.11°E, Elev: 525m) and BOM data is measured at Canberra Airport (Lat: 35.31°S, Long: 149.20°E, Elev: 578.4m) about 10 km east in much flatter terrain.

According to our comparison, the temperature measured at CSIRO Black Mountain campus is on average slightly higher than that obtained at Canberra Airport. The difference is consistent in terms of both a monthly and an hourly view. (For more details please refer to Figure 1 and 2 which compare BOM data for 2012 with CSIRO data for the 12 months to the end of June 2013.)

CSIRO metadata confirm that their anemometer (Wind Speed measuring device) is intentionally set-up lower than the WMO standard of 10 metres for the scientific purpose of directly measuring the speed affecting the adjacent solar photovoltaic (PV) panels. This should and does provide a much lower Wind Speed reading. This is confirmed and given scale by comparing against simultaneous BOM measurements. (Detail is shown in Figure 4 and 5.)

Due to the differences stated above, we provide two versions of the CSIRO Canberra RTY data on a monthly basis: one is the original observations obtained directly from CSIRO and the other has Temperature and Wind Speed normalized according to BOM observations at Canberra Airport to provide directly comparable data consistent with the long term average climate data used for simulation of Canberra buildings and renewable energy systems (the Exemplary Reference Meteorological Year, ERMV).

Temperature Normalization

Based on our interim QA process, the correlation between the BOM and CSIRO hourly Temperatures (in tenths of a degree C) is expressed by the empirically derived fomula:

$$\text{CSIRO}_{\text{Adjusted}} = 1.0423 * \text{CSIRO} - 15.201$$

Figures 1 and 2 show the hourly and monthly average difference before and after adjustment

Temperature (Hourly)

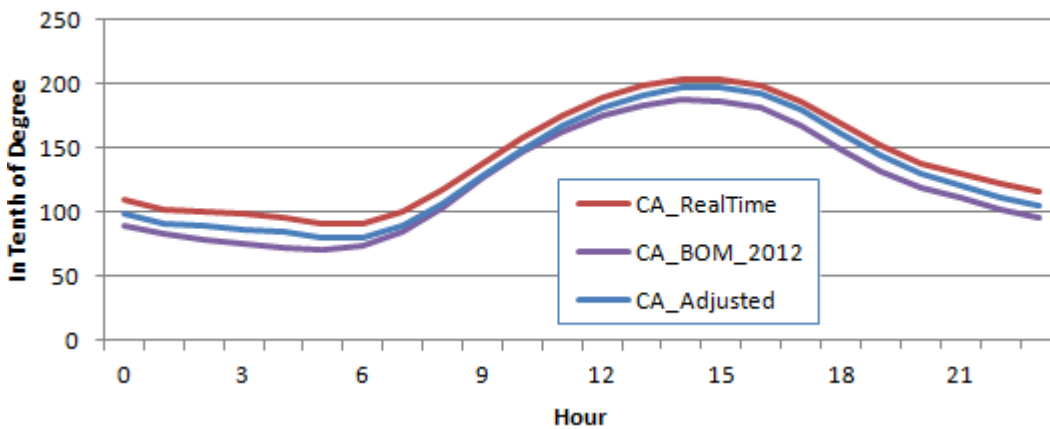


Figure 1 Diurnal Comparison of Raw and Adjusted Temperatures

Temperature (Monthly)

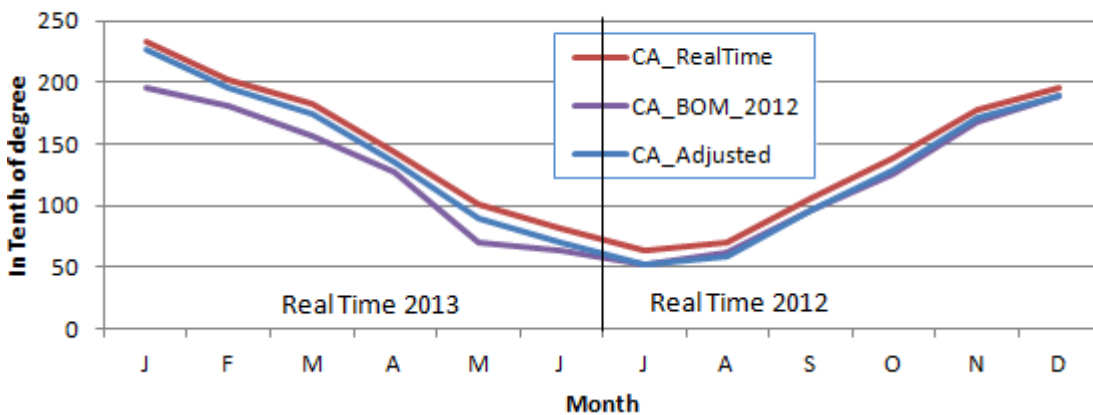


Figure 2 Seasonal Comparison of Raw and Adjusted Temperatures

Wind Speed Normalization

Based on our interim QA process, the BOM and CSIRO hourly Wind Speed (in tenths of m/s) show a correlation expressed by the fomula:

$$CSIRO_{Adjusted} = 2.8086 * CSIRO + 0.4246$$

The QA process also reveals that BOM Wind Speed diurnal patterns are predominantly one hour behind CSIRO, thus, the normalized CSIRO data is shifted one hour ahead.

Figures 4 and 5 show the hourly and monthly average difference before and after adjustment. Figure 3 shows the hourly difference without time shifting applied.

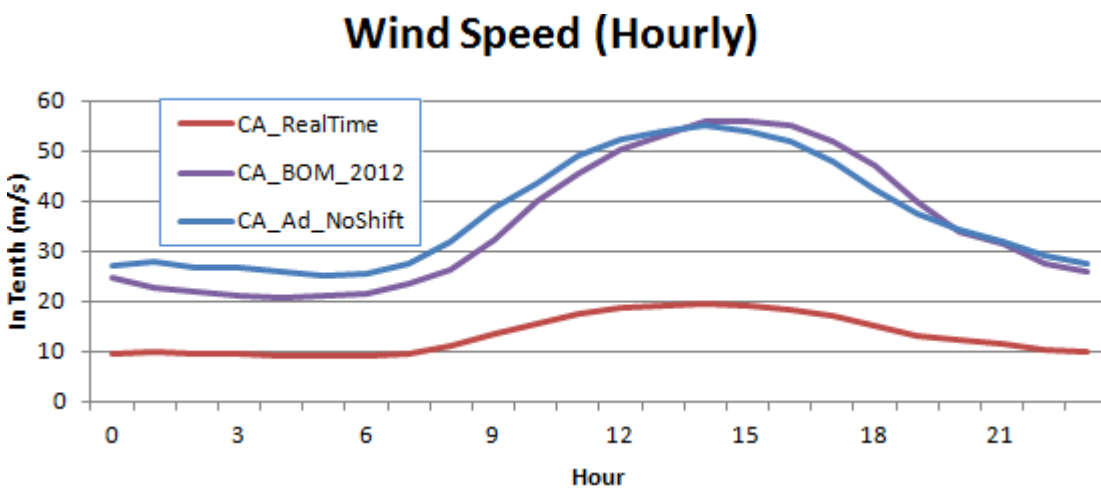


Figure 3 Diurnal Comparison of Raw and Adjusted Wind Speeds

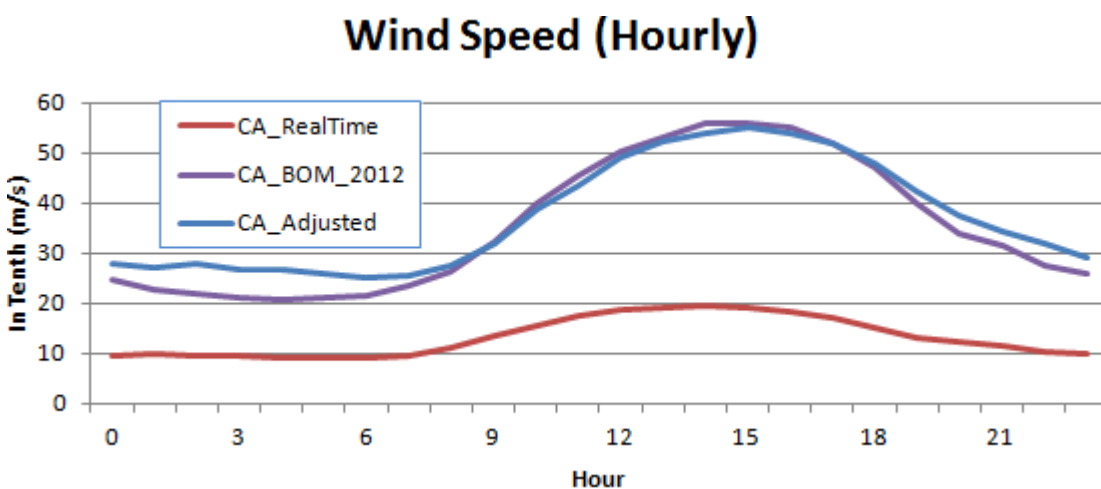


Figure 4 Diurnal Comparison of Raw and Time Shifted Adjusted Wind Speeds

Wind Speed (Monthly)

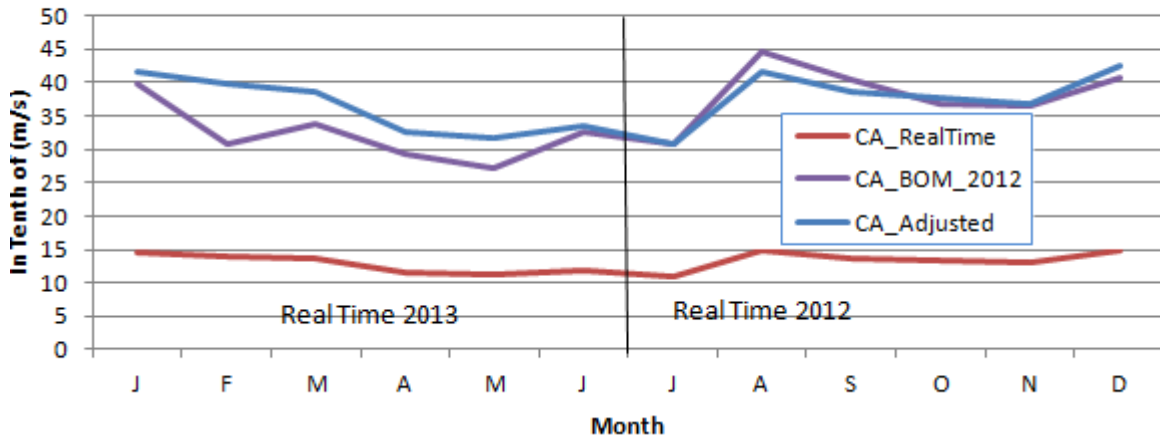


Figure 5 Seasonal Comparison of Raw and Time Shifted Adjusted Wind Speeds