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QA and Normalisation of Macquarie University Data to the BOM Sydney RO (Regional Office) Standard

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Background

Macquarie data is measured at Macquarie University MQ (Lat: 33.76°S, Long: 151.12°E, Elev: 66.8m) and BOM data is measured at Sydney RO (Lat: 33.86°S, Long: 151.21°E, Elev: 39m) about 14 km east nearer the coast at Observatory Hill, The Rocks, except for the wind measurements which are from Fort Denison in Sydney Harbour.

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

The comparison also shows the wind speed from Macquarie data is consistently lower than the Sydney measurements. (Details are reflected in Figures 3 and 4.)

Metadata for the MQ site indicate mature eucalypts on three sides of the weather station enclosure and it is inferred that this is the major cause of the substantial difference in measured speeds.

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

Similar analytical comparison with the simultaneous BOM data for Parramatta show far smaller differences in temperature and smaller differences in wind speed, so the unadjusted MQ data can ordinarily be used for applications in that area. For wind-sensitive designs, further manipulation of the weather data is recommended.

Temperature Normalization

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

$$MQ_{Adjusted} = 0.6516 * MQ + 68.985$$

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

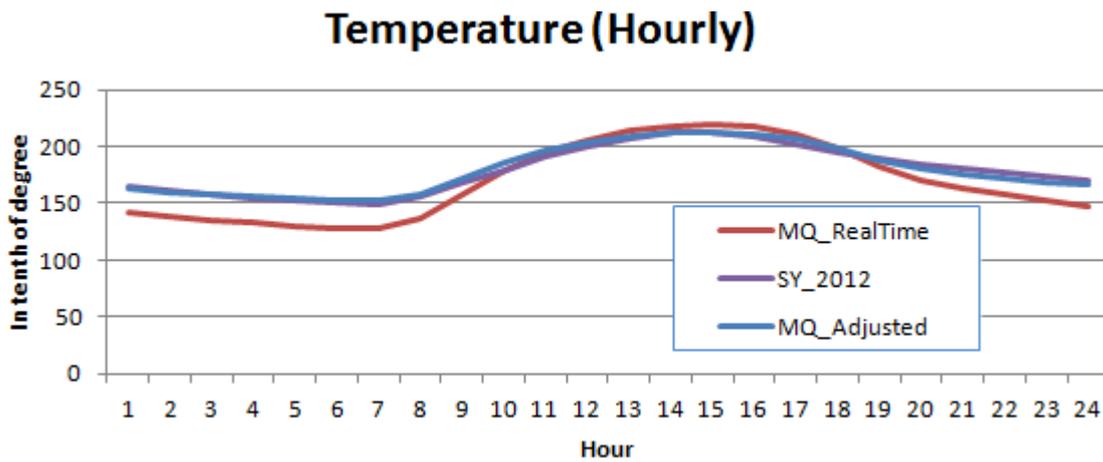


Figure 1 Diurnal Comparison of Raw and Adjusted Temperatures

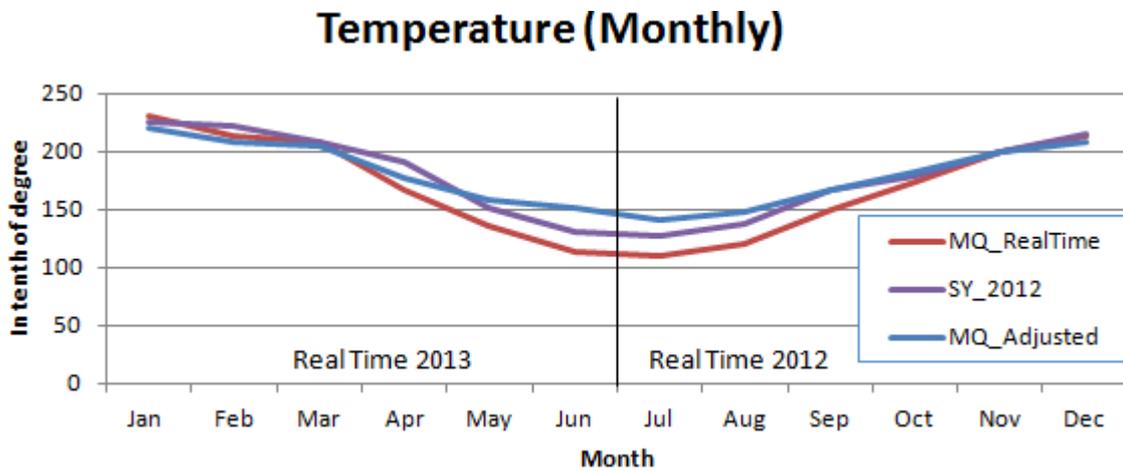


Figure 2 Seasonal Comparison of Raw and Adjusted Temperatures

Wind Speed Normalization

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

$$MQ_{Adjusted} = 0.595 * MQ + 35.134$$

Figures 3 and 4 show the hourly and monthly average difference before and after adjustment.

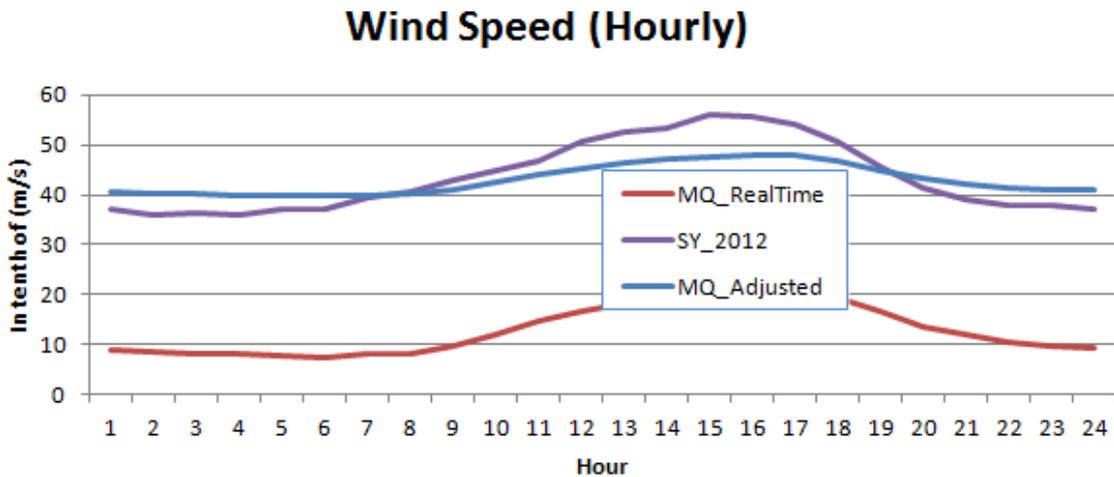


Figure 3 Diurnal Comparison of Raw and Adjusted Wind Speeds

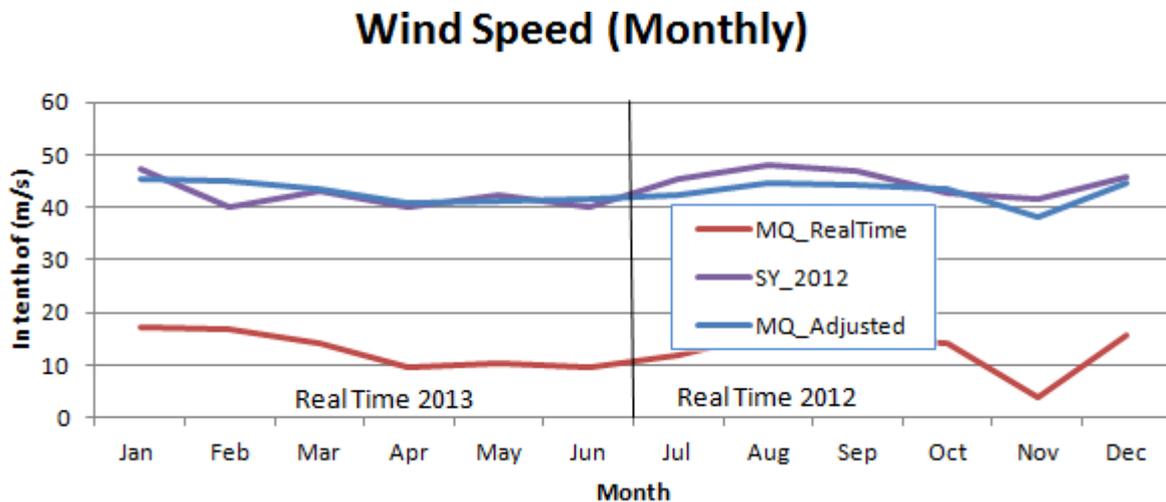


Figure 4 Seasonal Comparison of Raw and Adjusted Wind Speeds