Comparison of Apogee and Setra pressure sensors: Indoor and outdoor testing

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Barometric pressure sensors can easily be calibrated to a reference but the long-term stability is often poorly characterized. Here we compare a lower cost sensor (Apogee Instruments, model SB100) with a higher cost reference sensor (Setra model 276) in a 140-day study. This study extends work done by Chard and Bugbee (2006) in a long-term study of pressure sensors.

Materials and Methods

A Setra model 176 pressure sensor and three Apogee Instruments SB-100 barometric sensors were connected to a Campbell Scientific CR3000 datalogger. The sensors were maintained indoors where the temperature varied from 19 to 26 C.

Two additional apogee sensors were connected to CR1000 datalogger in an unheated, outdoor enclosure where the temperature varied from -15 to 35 C (June to December).

In a previous study (Chard and Bugbee 2006), the Setra Model 276 was compared against a mercury manometer 500 days. The drift rate was negligible.

The voltage output of the SB-100 sensors was converted to pressure in kPa using the multiplier (0.0218 kPa/V) from the manufacturer. An offset was used to match the Setra sensor.

The same calibration was applied to both outdoor sensors and the differences between the two sensors was less than 0.02 kPa for the duration of the tests. A 15-minute running-average was applied.

Results

The largest difference between the inside Setra Model 276 and the inside Apogee SB-100 during this test was <0.03 kPa (middle plot, blue line, Figure 1)

The largest difference for the outside sensors was <0.2kPa, with most of the deviations at less than 0.1 kPa (red line in the middle plot of Figure 1).

Temperature dependence of the outside SB-100 sensor is shown in Figure 2.

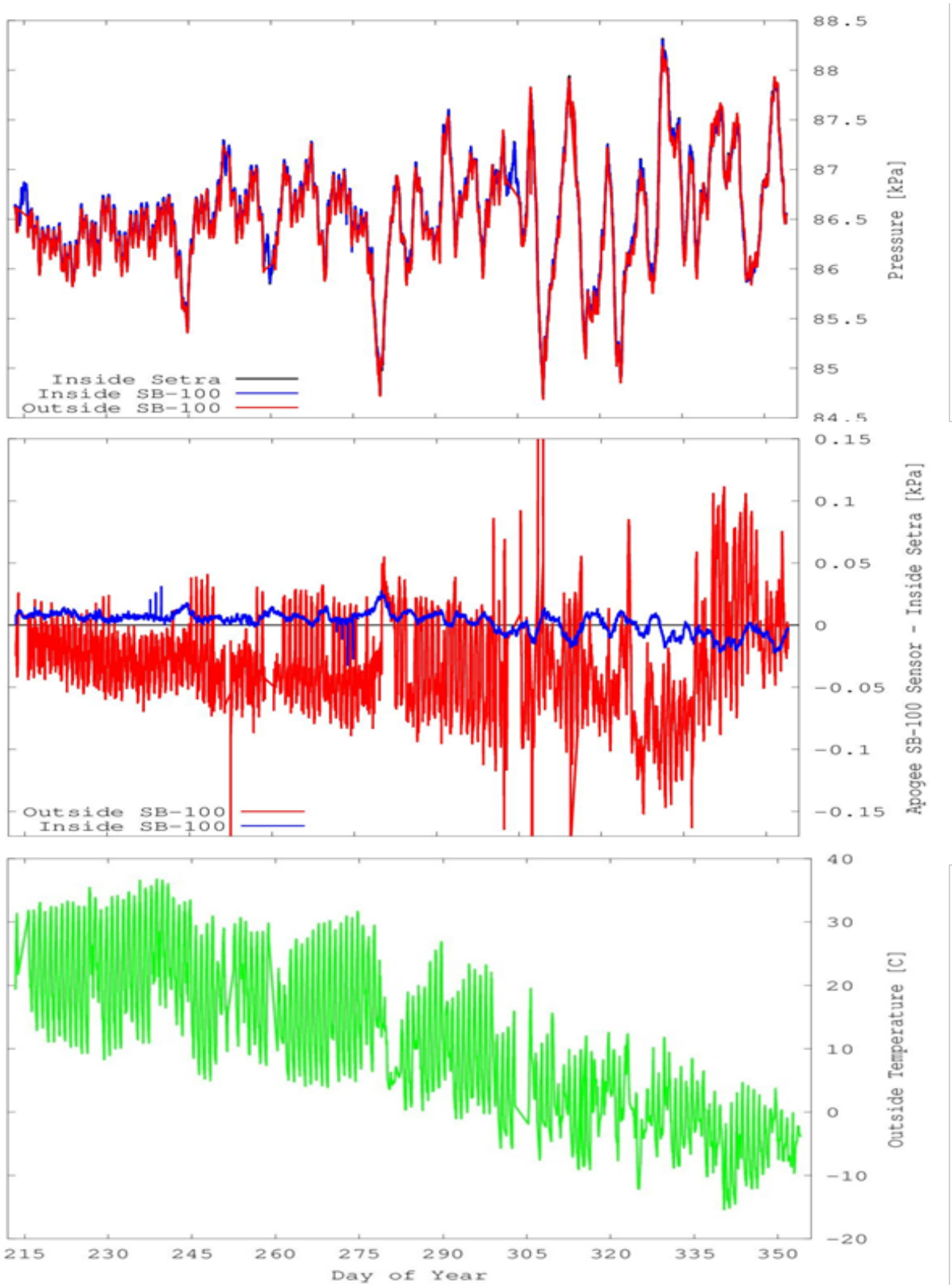

Figure 1 Comparisons of absolute pressure (kPa), pressure difference (kPa) and outdoor temperature (Celsius) over more than 140 days and over a wide range of outdoor temperatures.

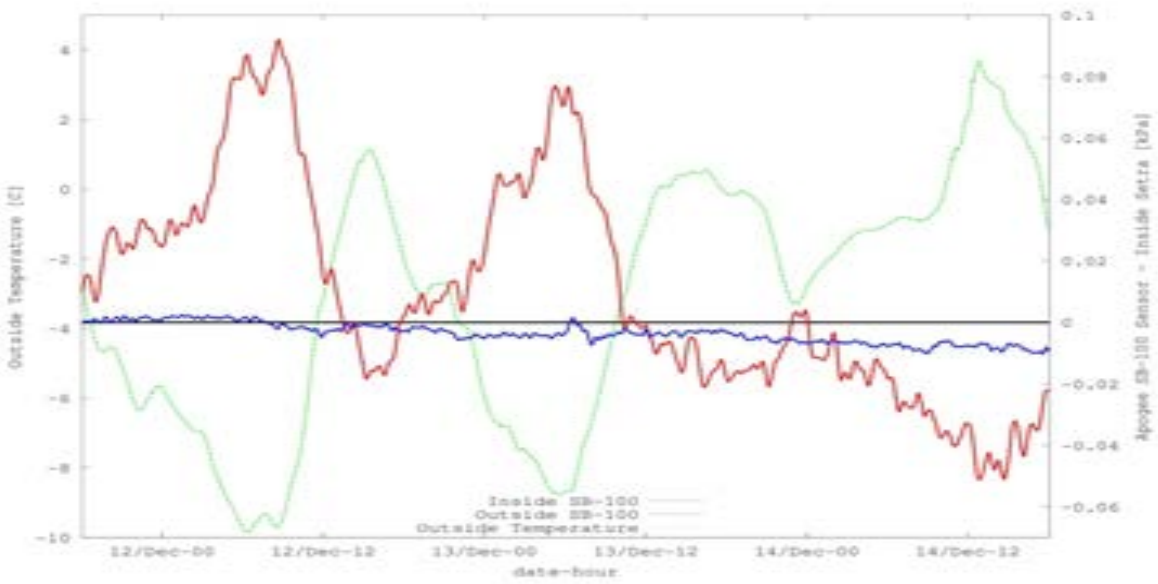

Figure 2. Effect of temperature on pressure difference between sensors.

The Apogee SB-100 sensor is a cost-effective option for measurements of atmospheric pressure. It performs better if it can be kept indoors at a moderated temperature.

Chard, Julie and Bruce Bugbee. 2006. Electronic Measurement of Barometric Pressure: A Comparison of Omega Model EWS-BP-A, Setra Model 276, Setra Model 278, Vaisala Model PTB101B, and Apogee Instruments Model BPS. http://www.apogeeinstruments.com/content/barometric-pressure-sensors.pdf.