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Barometric Test Results from the Arctic

At a recent operational test in Seward, Alaska, METOCEAN noticed an interesting anomaly in the results of some barometric pressure testing. At first sight, there appeared to be a significant constant offset in barometric pressure data of buoys in the water compared with the pressure in a reference barometer on shore (as shown in Figure 1).

It is interesting to note that average barometric pressure (BP) figures were generated by averaging the BP results of three identical drifting buoys floating in close proximity to each other. Each BP reading of these three buoys differed by no more than 0.1 mB from each other.

The type of graph shown in Figure 1 does not convey much information due to the large y-axis range. Plotting the difference of the two traces in this figure yields much more interesting results.

The barometric pressure differential graph (Figure 2) is very interesting. It is cyclic and almost sinusoidal in nature with a period of approximately 12 hours. This immediately indicates that the pressure error between the shore station and the buoys is almost certainly caused by tidal variations. To prove this, we used an internet resource to retrieve tidal information for the time and place of the operational test. We then converted this tidal information in meters to a corresponding pressure change in mB and plotted the results (Figure 3).

Figure 3 shows a definite correlation between the tidal effect and the pressure error. The tidal effect contributes as much as 0.5 mB to the pressure differential between the buoys at sea level and the barometer on the pier. A large part of the remainder of the difference is attributed to the distance from the pier to the top of the water at high tide. Figure 4 shows a plot of pressure error on the x-axis against tidal effect on the y-axis - proving beyond doubt the effect of the tide on the pressure differential (between the buoys and the shore station).

The x-y scatter plot shows a linear relationship between the pressure error and the effect of tidal variation on the barometric pressure. The black line is an automatically generated line of best fit proving the linear relationship.

It is interesting to note that the tidal effect was not evident in the first graph (Figure 1) where the pressure difference appears to be a constant offset. Often, viewing and plotting a data set in a variety of ways can illustrate interesting phenomena. Spending a little extra time on data analysis can prove to be very rewarding! ■

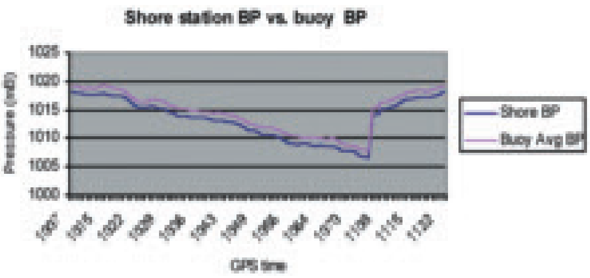

Figure 1.
The shore station barometric pressure compared with the average buoy barometric pressure.

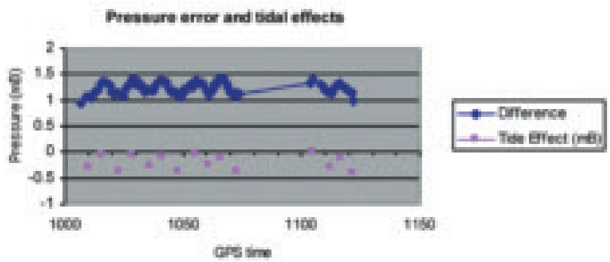

Figure 3.
The pressure error and tidal effect.

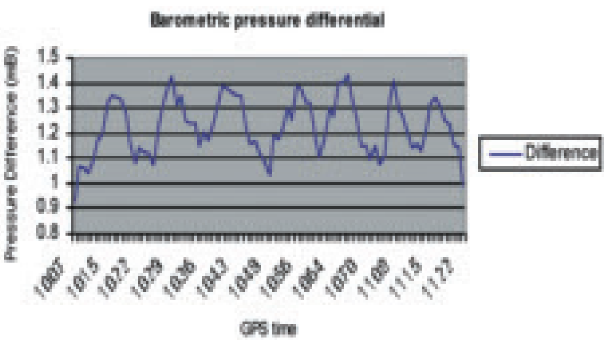

Figure 2.
The difference between buoy and shore barometric pressures.

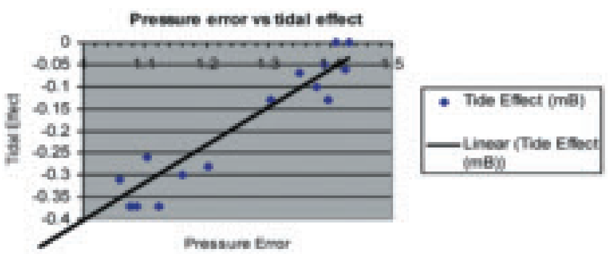

Figure 4.
The pressure error versus tidal effect with a calculated line of the best fit.