Calculating the GPS Deviation in MS Excel

**Fig. 1:** A portion of the GPS data in Excel showing readings taken on the first two days.

Steps in calculating the deviation in Excel:

1. Organize your data in a fashion similar to that shown in Fig 1.

2. We will assume that the mean of readings taken on the morning of the first day of the study represent the TRUE geographic (X, Y) coordinates in UTM of the stationary object. However, if you wish, you can use only the very first reading taken on the morning of the first day (i.e., 550874 E, 4119267 N) as the true reading (It’s your choice). Using the average function in Excel,

   \[=\text{AVERAGE(D4:D8)}\]

   we calculate the TRUE Easting as **550873 E** from the set of five Easting readings. The result is placed in cell **F8**. Likewise, using the average function,

   \[=\text{AVERAGE(E4:E8)}\]

   would give you the mean of the five corresponding Northing readings (**4119266 N**) taken on the morning of the first day of sampling. The result is placed in cell **G8**.

3. Using the Pythagorean equation (see handout on Dynamics of GPS Readings) we can calculate the deviation of each pair of coordinates from the TRUE readings. That is, if \(c\) represents the deviation, then

   \[c = \sqrt{a^2 + b^2}\]
From the spreadsheet data the deviation of the first pair of readings taken in the first morning from the TRUE reading is

\[ 1.5232 = \sqrt{(550874 - 550873)^2 + (4119267 - 4119266)^2} \]

The Excel formula for the above is

\[ =\text{SQRT}((D4 - $F$8)^2 + (E4 - $G$8)^2) \]

Notice that the cell addresses for the Easting and Northing of the TRUE reading (F8 and G8, respectively) contain the $ symbol before the column and row coordinates (i.e., SF$8 and S$G8, respectively). This ensures that these cells (and the values they contain) do not change as the formula is copied and used to calculate the deviation of the other readings from the TRUE reading. So that the deviation of the last readings taken on Tuesday afternoon from the TRUE readings is,

\[ 5.9933 = \sqrt{(550870 - 550873)^2 + (4119261 - 4119266)^2} \]

Again, the Excel formula is

\[ =\text{SQRT}((J13 - $F$8)^2 + (K13 - $G$8)^2) \]

4. We can now calculate the deviations of all readings from the TRUE readings.