

RTK Tide Thoughts

By Pat Sanders

At the time of a sounding, we can interpolate the position of the RTK antenna (Easting, Northing and Height Above the Ellipsoid).

Let's define the Echosounder Measurement Point (MP) as either the transducer face plate (if it outputs the depth below transducer) or the static waterline at the transducer position (if you calibrated it using a bar check).

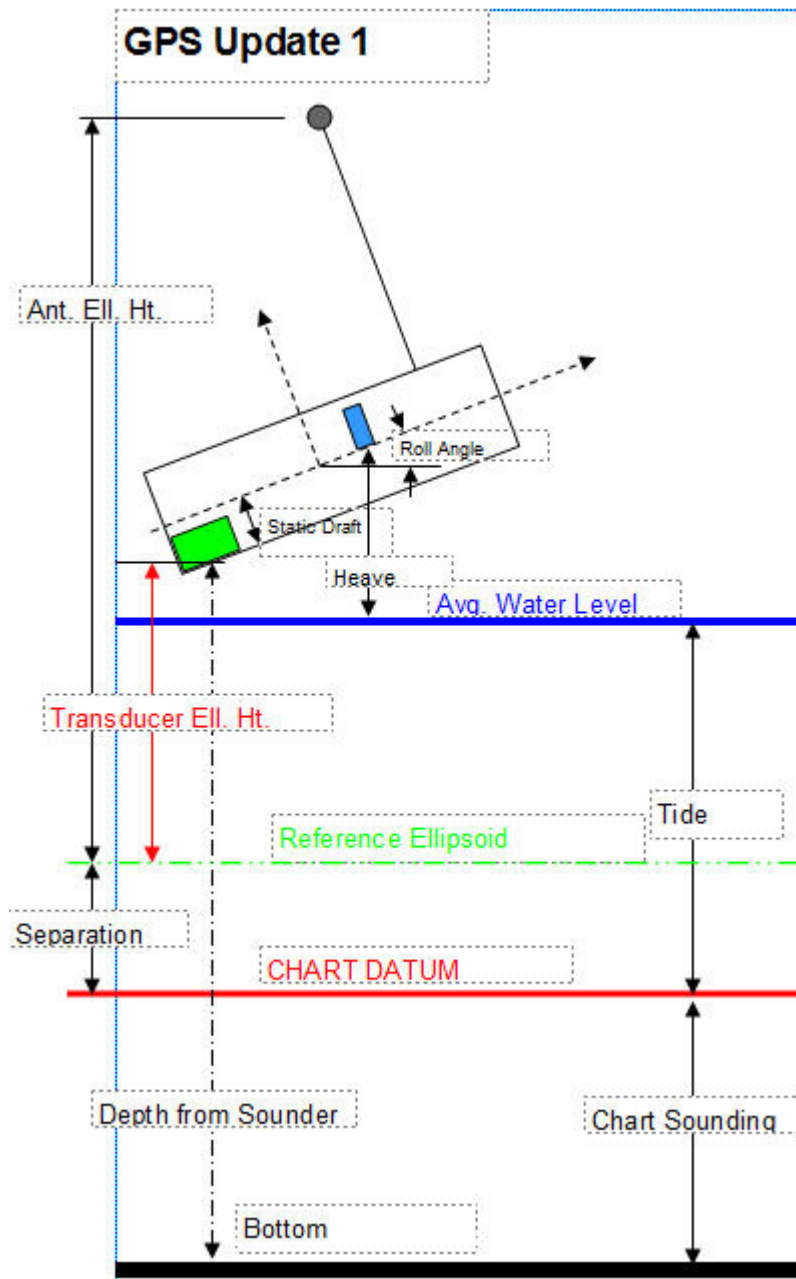
By interpolating pitch, roll and heading of the vessel at the time of the sounding, we can compute the position of the MP (Easting, Northing and Height Above Ellipsoid).

The Chart Sounding (CS) is then:

- $CS = B - MP_z - \text{Separation}$

Where:

- CS = Chart Sounding
- B = Depth Reported By Echosounder
- MP_z = Computed Height of Echosounder Measurement Point Above Ref Ellipsoid
- Separation = Height of Reference Ellipsoid Above Chart Datum



You'll notice that we haven't used the Heave correction or the Dynamic Draft correction. These values are incorporated into the height of the GPS antenna above the reference ellipsoid.

In order to compute a conventional Tide Correction (TC), we will need to compute the position of the MRU at the time of the sounding measurement. Knowing the offsets between the GPS Antenna and the MRU along with the pitch and roll at the time of the sounding measurement, we can compute:

- $MRU_z = \text{Height of MRU Above the Reference Ellipsoid}$

The Height of the Average Water Level (at the time of measurement) is then

- $HTAWL = MRU_z - \text{Heave} - \text{Separation}$

We can convert it to a HYPACK Tide Correction (TC) by negating the HTAWL value:

- $TC = -HTAWL = \text{Heave} + \text{Separation} - MRU_z$

The Tide Correction should be a constant (over a short period of time). However, positioning or time tagging errors will result in small differences between consecutive corrections. Therefore, SBMAX and MBMAX allow you to average the Tide Correction over a user-defined period of time.

By re-computing the heave at the point of the MP, our Chart Sounding could be expressed as:

- $CS = B + TC - \text{Heave}_{MP}$
 - The Heave must be recomputed to the location of the transducer, based on the offsets between the MRU and MP.
 - HYPACK convention where the Tide Correction is negative if the water level is above the chart datum.

So, in a perfect world:

- $CS = B - MP_z - \text{Separation} = B + TC - \text{Heave}_{MP}$
- $TC = MP_z + \text{Separation} - \text{Heave}_{MP}$
(which you will see from the diagram, is True!)