# Configuring Antenna Vertical Offsets when Saving Tide as Depth

By Judy Bragg

We recently had a user who was using an RTK antenna on a sled to measure the changing bottom depths. It is an unusual application, but possible given the correct hardware configuration.

There are 2 keys:

- Recording tide as depth
- The offset for the antenna height on the sled.

## **Recording Tide as Depth**

The GPS drivers were designed to calculate RTK tide corrections, that is the vertical change in water level caused by tide.

Our user was also measuring changing vertical position of the antenna relative to the reference ellipsoid, but the change was caused by sloping bottom contours that must be recorded as depths.

The Advanced Tab of the Kinematic and GPS drivers include an option for just this purpose—Record Tide as Depth.

| înematic Setup                           |  |               |                              |       | ? ×    |
|--|--|---------------|------------------------------|-------|--------|
| Genera                                   | al Alarms GPS S  | Status Codes  | , Advanced                   | E)    |        |
|  | - Used sentences   |               |                              |       |        |
|  | Unless you really know what you are doing, leave all the checkboxes CHECKED! |               |                              |       | :      |
|  | 🗖 PTNL,GGK   | E RMC         | 🗖 GGK                        | 🗖 GLL |        |
|  | 🗖 PTNL,QA  | 🔽 GGA         | 🗖 GST                        | 🗖 GNS |        |
|  | 🗖 VTG  | 🗆 HDT         | 🗖 LLQ                        |       |        |
|  | Ignore checksum  |               | Show debug messages          |       | jes    |
|  | Record tide as depth   |               | Graph synchronization values |       |        |
| Use UTC time even when not synchronizing |  |               |                              |       |        |
|  | 🔲 Use MSL he   | eight from G0 | GA sentence                  |       |        |
|  |  |               |                              |       |        |
|  |  |               | 0                            | Ж     | Cancel |

Great! Now the changes in the sled height will be recorded as depths and we're ready to go right?! Not quite.

## Accounting for the Antenna Offset

### **Typical Case**

Normally, the height offset for your GPS antenna is the distance from the antenna to the static waterline (a negative number to indicate that the antenna is above water). The depth comes from the echosounder and tide is calculated using the antenna height in the equation.





N = Height of the Geoid Above the Ellipsoid Reference (as read from the Geoid model in real time) *plus an orthometric correction specified in the Geodetic Parameters program.* 

**Note:** In this example the Orthometric Height Correction is zero. The N value stated equals the measurement in the diagram above.

- A = Height of the RTK Antenna Above the Ellipsoid Reference
- H = Height of the RTK Antenna Above the Boat Origin Point
- D = Dynamic Draft Measurement

Now let's load the raw data to the Single Beam Editor. The program reads the offset information from the header in the data file and applies it in the final depth calculations which are then displayed in the editor windows. The editor displays tide corrections from the raw TID records calculated during Survey. No further calculations are done by the editor for the initial display (unless sound velocity corrections have also been loaded).

#### When using Tide as Depth

In the case where we record tide as depth what happens?

As we have seen, when we calculate tide in the GPS driver, the antenna height is included in that calculation. But now we are saving that tide value as a depth. When we go to the Single Beam Editor, it applies the antenna offset *again* because it's a depth.

We need to avoid the double correction for the antenna height. We still have to account for the antenna height somewhere, but we want the depth value to stand as recorded during Survey when we take the data to the Single Beam Editor.

We can do this by leaving the GPS Height offset at zero and entering it instead under Orthometric Height Correction in the project's geodesy settings.

| Vertical Offsets                 | Offsets   Starboard   0.00   ftUS   Yaw   0.00   deg.     Forward   0.00   ftUS   Roll   0.00   deg.     Vertical   0.00   ftUS   Pitch   0.00   deg.     Vertical Postive Downward   0.200   sec.   sec. |
|----------------------------------|---|
| Orthometric Height<br>Correction | Geoid Model a2003u03 Local Grid   Orthometric height correction 7.000 ftUS   OK Cancel  |

The equation then becomes:

 $T_R = -K + N - A - H - D + OHC$  $T_R = -4 + 9 - 22 - 0 - 0 + 7 = -10$ 

The same tide value is calculated. It is then saved to the raw file as a depth in an EC1 record instead of as a tide correction in a TID record.

When we take it to the Single Beam Editor, the antenna offset is zero and the tide correction is zero (and there would be no sound velocity correction loaded) so the Editor has no vertical corrections to apply and the depth remains as recorded during Survey.