



V for VDatum

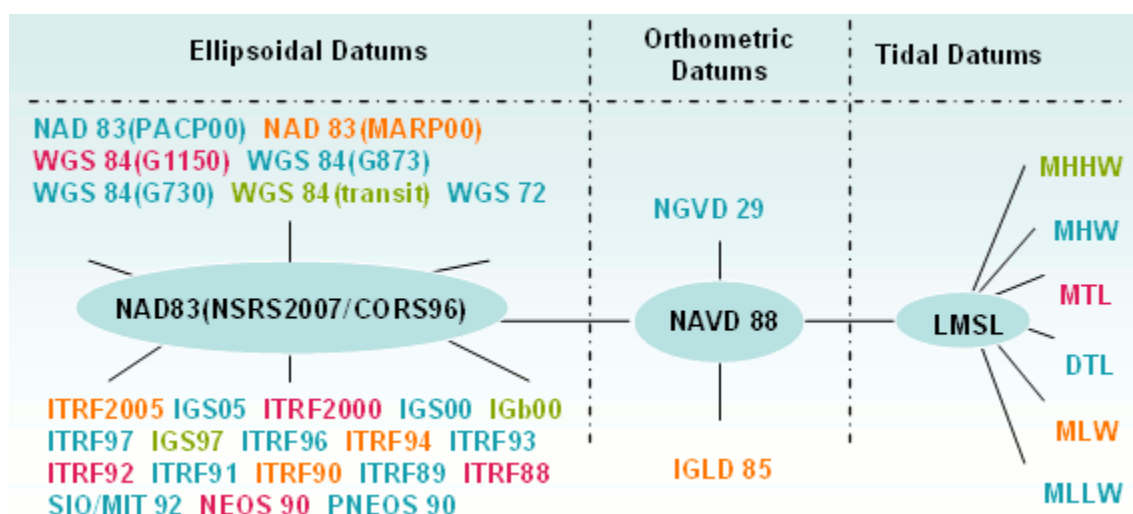
By Mircea Neacsu

HYPACK® 2011 is around the corner and one of the new features we are excited about is the implementation of VDatum. The following article tries to answer your first questions about this new addition to HYPACK®.

What is VDatum?

VDatum is a product of NOAA that allows conversion between different vertical reference surfaces, both tidal and non-tidal. You can find more information about it on the VDatum web site: <http://vdatum.noaa.gov>.

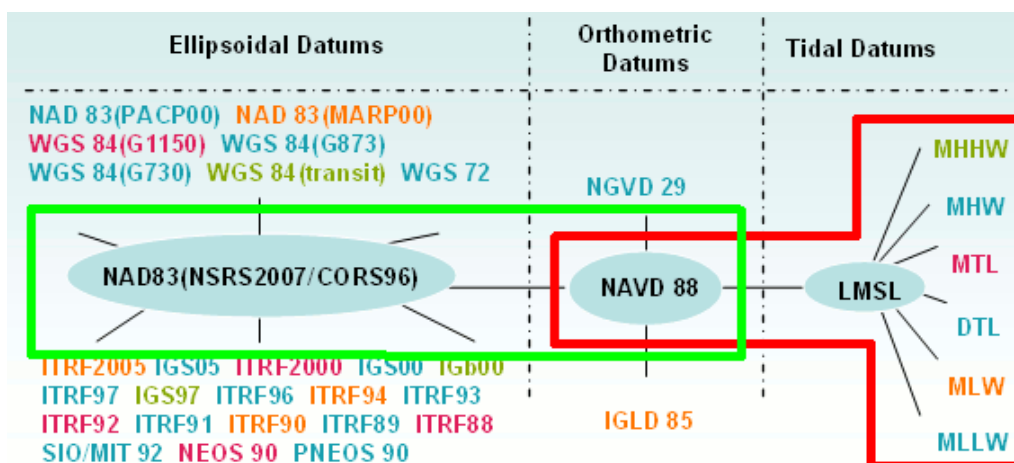
FIGURE 1. Conversions Supported by VDatum



What part of VDatum is implemented in HYPACK® 2011?

The conversions included in the red frame in Figure 2 will be implemented in HYPACK® 2011. The conversions in the green frame are already available through the use of the GEOID09 model.

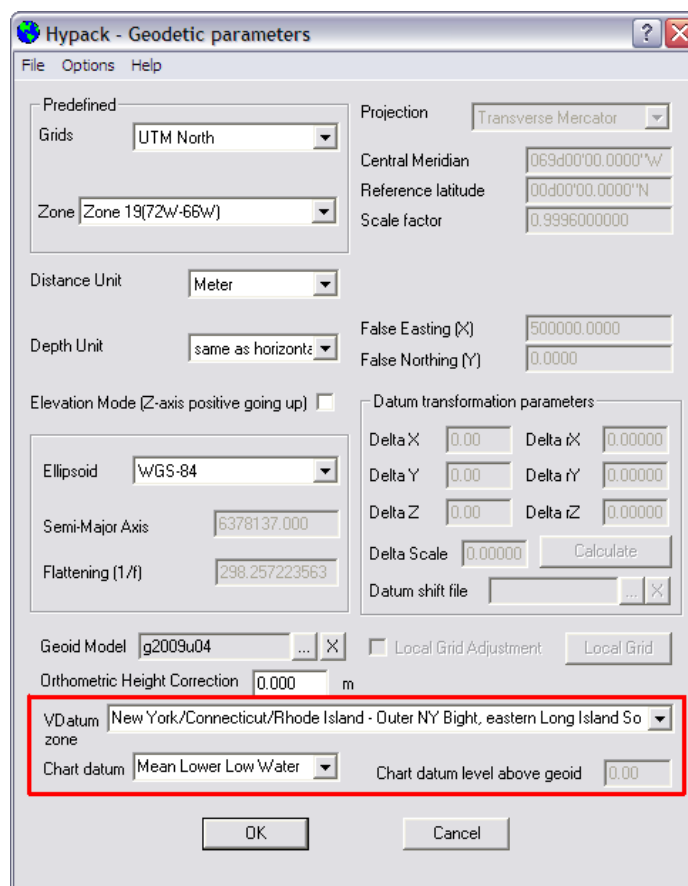
FIGURE 2. VDatum Conversions Supported in HYPACK® 2011



What do I have to do to use VDatum in HYPACK® 2011?

Not much. Just select the area where you are working and the tidal surface you want to use as reference in the Geodetic Parameters program:

FIGURE 3. Configuring for VDatum in your Geodesy Settings



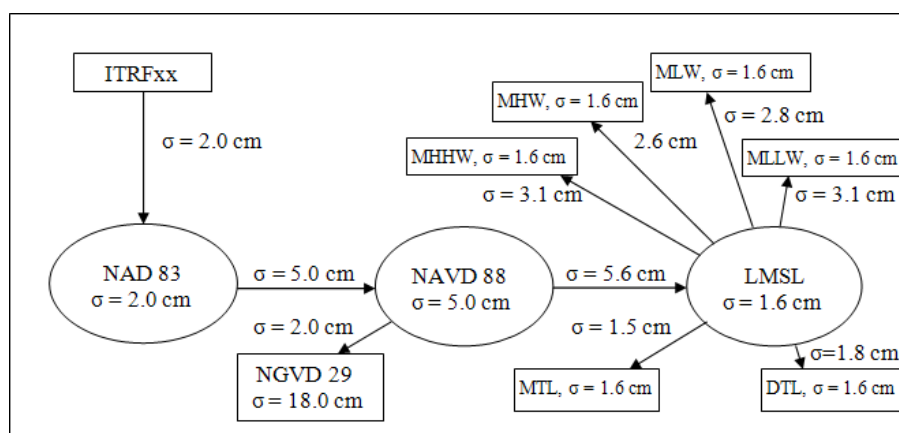
Are you serious? Is this all I need to do?

Yes and Yes. Sorry, we tried to make it simpler but really couldn't ☺.

How accurate is it?

The VDatum web site has a more detailed discussion but the following graphic (from the same source) gives a rough estimate of the order of magnitude of the errors you can expect. The graphic is for Chesapeake Bay but other regions have similar values.

FIGURE 4. Error Order of Magnitude



To find the total uncertainty of a complex transformation, you have to take the square root of the sum of squares of each individual transformation. For instance to go from WGS84 (same as ITRF2000) to MLLW you have to calculate:

$$\sqrt{2.0^2 + 5.0^2 + 1.6^2 + 1.6^2} = 5.8 \text{ cm} \quad \sqrt{2.0^2 + 5.0^2 + 1.6^2 + 1.6^2} = 5.8 \text{ cm} \quad (\text{EQ 1})$$

So according to NOAA you can expect around 2 inches of error when going from WGS84 to MLLW. We tested with a couple of points and either we got lucky or the NOAA estimate is **very** conservative because the error was less than 1 inch in both cases.

How does VDatum get in that long formula you use to calculate kinematic tide?

The formula in question is:

$$T = (N - K) - A - H - D + OHC$$

When using the VDatum model, $K = -V$ where V is the value coming from the model. Until now, the K values came from a KTD file. The only change introduced by the implementation of VDatum is that any KTD file is silently ignored and the K value is taken from the VDatum model (with reversed sign).

How big are the VDatum files?

Quite big! The compressed tidal datums for all regions are about 300MB. That makes your HYPACK® 2011 package a whopping 630 MB.