Analysis of Multibeam Data Sets from the New Zealand Common Data Set

By Pat Sanders

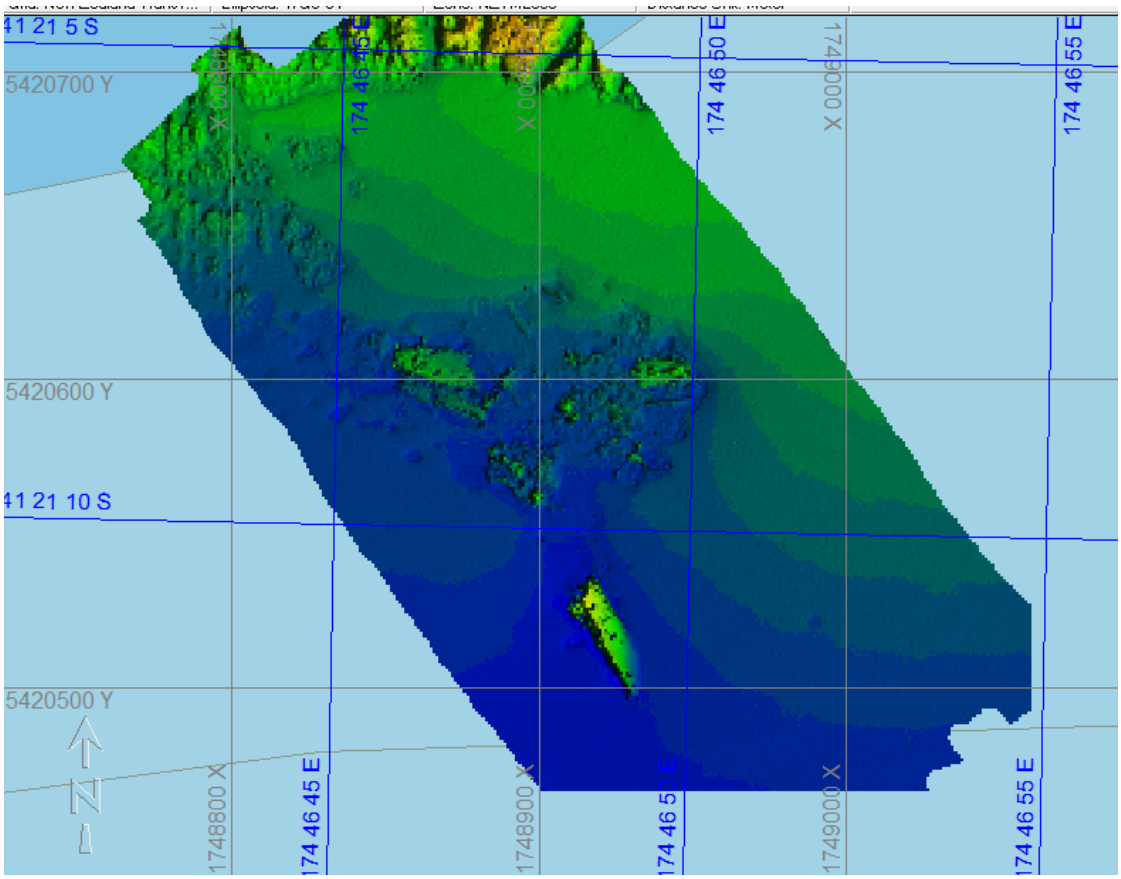
The hard drive we received from the 2012 Shallow Water Multibeam Conference has data sets for different areas that were surveyed with Geoacoustics, R2Sonic, Reson and Kongsberg multibeam systems. None of the data was collected with HYSWEEP®.

I took the 'cleaned' XYZ data for each system. All data was on the New Zealand TM 2000, with the exception of the Geoacoustics, which was on UTM South (174E – 180E). I converted the Geoacoustics data using the Project Conversion routine, with perfect results.

The Kongsberg data is in Lat, Long, Z format. I converted their data using the TEXT TO XYZ program under the Geodesy menu with perfect results.

I wanted to compare the results of the different systems over a common bottom, so I used the data from the Wellington Wreck area, which was surveyed with each system. Using the Reson data set as my base, I generated TIN TO TIN Difference Statistics in the TIN MODEL program, comparing each other multibeam data set to the Reson data set.

FIGURE 1. *Color-coded depth data from Reson data set.*



Based on a 1m x 1m Difference Grid, the Average Depth Difference (Depth Bias) and Standard Deviations were:

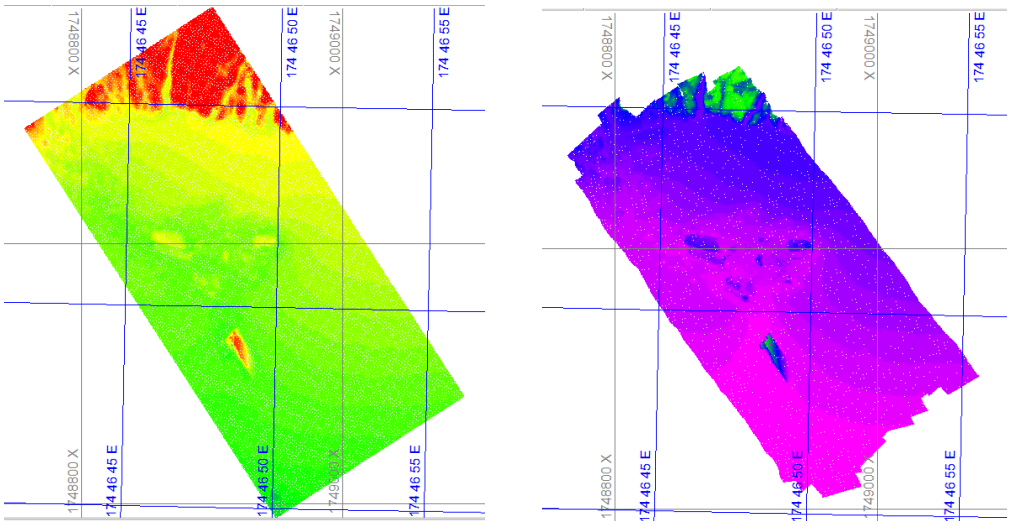
Data Set (compared to Reson)	Depth Bias	Standard Deviation
Geoacoustics	-11.81m	0.27m
R2Sonic	1.11m	0.27m
Kongsberg	1.35m	0.26m

I was shocked to see the large Depth Bias (Average Difference in Depth) between each system. I went ahead and did a visual inspection to check the sounding closest to the S41-21-10, E174 46 50 intersection. This is in a relatively flat area.

System	Depth	Depth Diff
Geoacoustics	7.03	-11.82
Reson	18.85	0.00
R2Sonic	19.96	1.11
Kongsberg	20.22	1.37

Due to the large Depth Bias difference between the Geoacoustics and other data sets, I went back and re-examined it to make sure I hadn't made a mistake in the translation of the data. The feature wreck in the south center of the area plots up in exactly the same spot, just with a depth different by almost 12m.

FIGURE 2. *Geoacoustics Data Set (Left) and Reson Data set (Right)*



Somebody must have made a boo-boo….

Anyways, even if we exclude the Geoacoustics data from our evaluation, there still appears to be a large depth bias between the different systems. You would have thought that since these data sets were to be the basis for papers/studies submitted to the 2012 Shallow Water

Multibeam conference, this would represent the manufacturer's best efforts. In the best case, the average bias between the R2Sonic and Kongsberg data is 24cm in a depth of 15-20m.

SOME CONCLUSIONS:

- If these are the best efforts of multibeam manufacturers, then their true abilities are greatly exaggerated.
- Perhaps it's time we stopped pretending we can survey to the cm accuracy…. (Stop asking me to save the data to millimeter resolution.)
- I'm sure the TPU computed for each survey was great! It just goes to show you the over-emphasis of TPU…..
- Maybe they should have collected the data in HYSWEEP!