

Determining Static/Kinematic Error

Some of the common problem that can result from static/kinematic error is Kalman Filter failures.

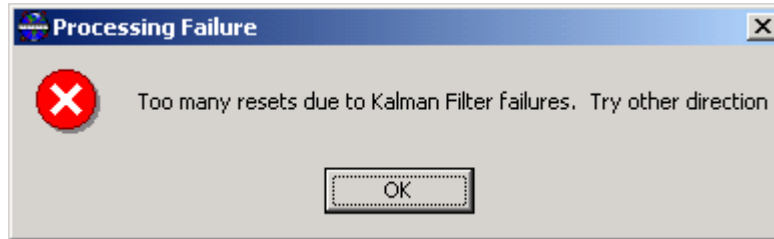


Figure 1 Kalman Filter Failures

Introduction

This section describes some of the plots that will assist in determining static/kinematic error or mismatch. Plots in GrafNav can be found under the *Output menu | Plot GPS Data*. The *Intermediate* radial button must be selected in order to access to some the plots.

Figure 2 shows the Static/Kinematic and Coverage Plot. This plot shows sections of the data that is kinematic or static. The red in the plot represents static and the green represents kinematic. Tick marks in the plot represent cycle slips.

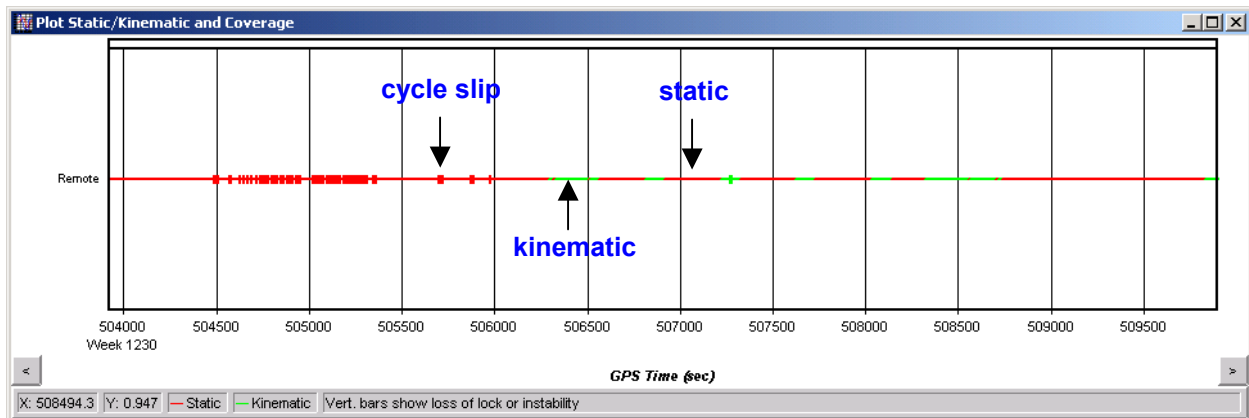


Figure 2 Static/Kinematic and Coverage Plot

Figure 3 shows the Velocity Profile Plot. This plot shows the north, east and up velocity. If an object is stationary (static) the plot should be zero.

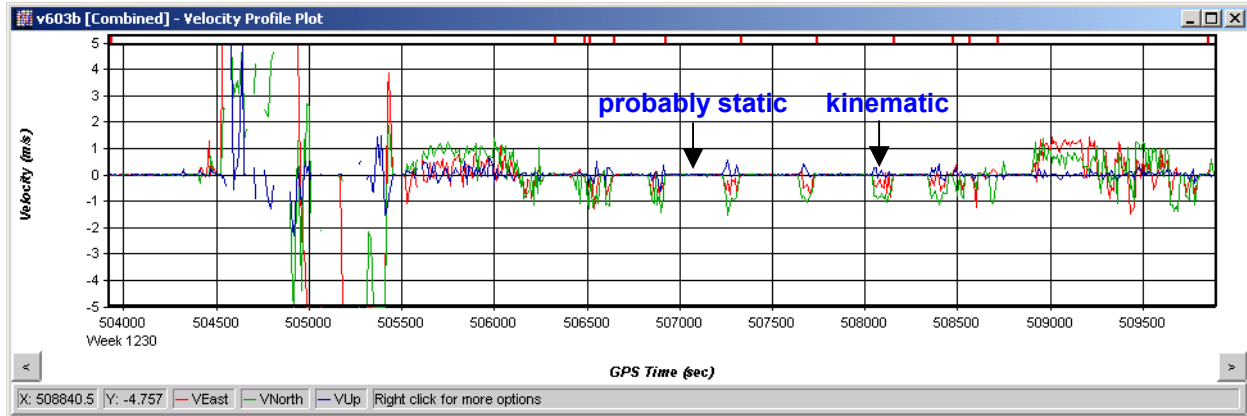


Figure 3 Velocity Profile Plot

Determine Static/Kinematic Error

The following are steps to determining static/kinematic error:

1. Make a backup copy of the Remote data (.gpb, .epp, .sta file)
2. Start a new GrafNav project.
3. Add Master and Remote, from the File menu.
4. Change all the epoch of the Remote to kinematic. *Process menu | View Remote | Raw GPS Data*. ViewGPB will come up:
 - a. *Edit menu | Switch Static/Kinematic*
 - b. Select *Kinematic* and *Number of*= a large number (e.g. 999999...). Click OK.
 - c. Close ViewGPB.
5. Process the data.
6. After the processing is done, plot the Velocity Profile plot (*Output menu | Plot GPS Data*).
7. Zoom in to the appropriate scale by right-click on the plot.
8. Now plot the Static/Kinematic and Coverage Plot of the original or backup Remote. The one with mismatch Static/Kinematic.
9. Resize the plot windows so that both plots can be arrange for comparison (see Figure 4).
10. Click on the plot to determine the approximate time where the mismatch start and end. The status bar, bottom of the plot, shows the time where it was clicked, also indicated by a red vertical line. Record down these times.

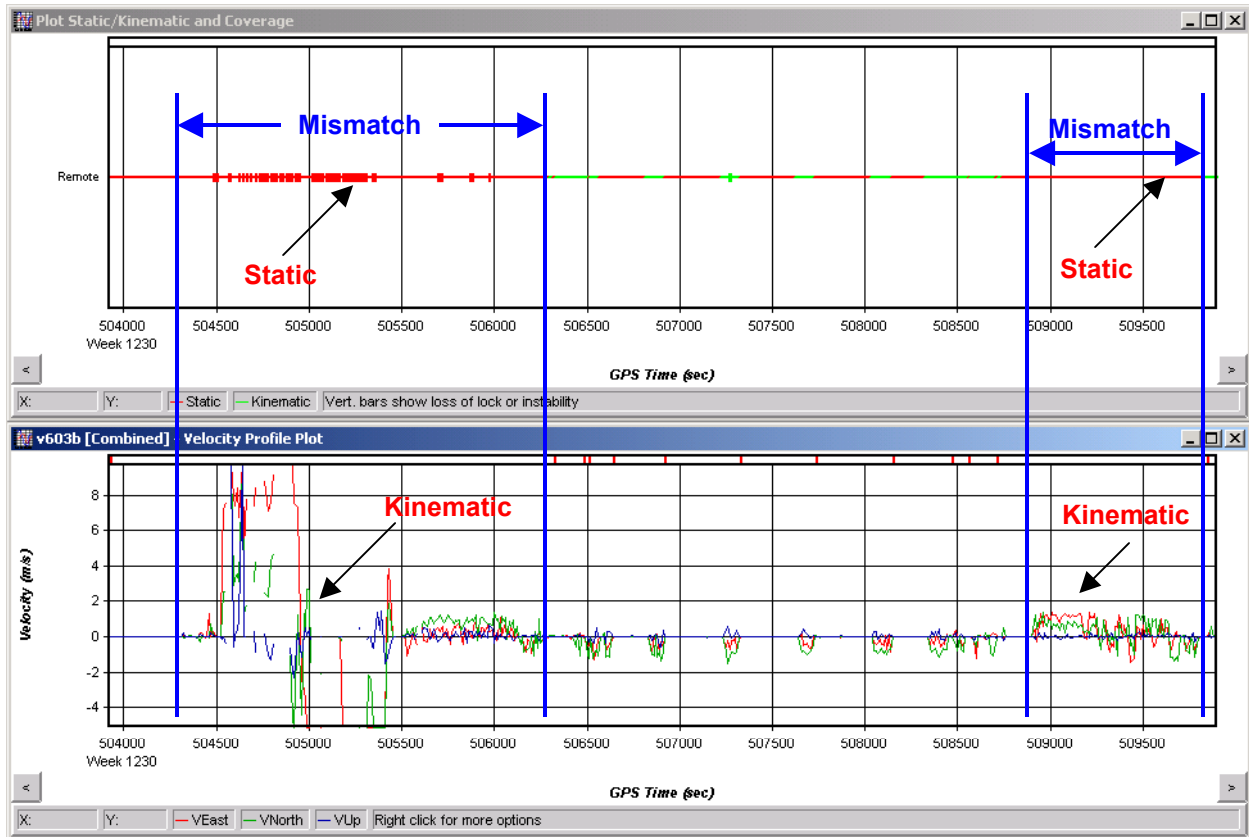


Figure 4 Comparison

Fixing Static/Kinematic Error

After determining where the problem is, now lets fix it. Follow the following steps:

1. Open the original or the backup Remote data. *File menu | View | Raw GPS Data.*
2. Go to the start time of the mismatch, *Search menu | Find Second* or F3. For example, the start time of the first mismatch in Figure 4 is 504300 sec.
3. Switch to Kinematic mode, *Edit menu | Switch Static/Kinematic.* Select *Kinematic*, and *Number of* = number of epoch, which can be calculated:

$$number_of_epoch = \frac{(end_time - start_time)}{interval}$$

For example, the first mismatch will have approximate start time of 504300 sec and end time of 506280 sec and data interval of 10 sec.

Therefore $number_of_epoch = (506280 - 504300) / 10 = 198$ epochs.

Another example, the second mismatch with start and end time of 508880 and 509830 respectively. $Number_of_epoch = (509830 - 508880) / 10 = 95$ epochs.

4. After switching the entire mismatch, close ViewGPB and add the corrected Remote data.