



QRev -

Processing Software For Moving-Boat ADCP Streamflow Measurements

David S. Mueller

Office of Surface Water

Please Mute Your Phones

Overview

- **QRev Goals**
- **QRev Processing Approach**
- **Recommended Workflow**
- **QRev's Graphical User Interface**
- **QRev Features**
- **Recommended Workflow**
- **Requirements and Limitations**

QRev Goals

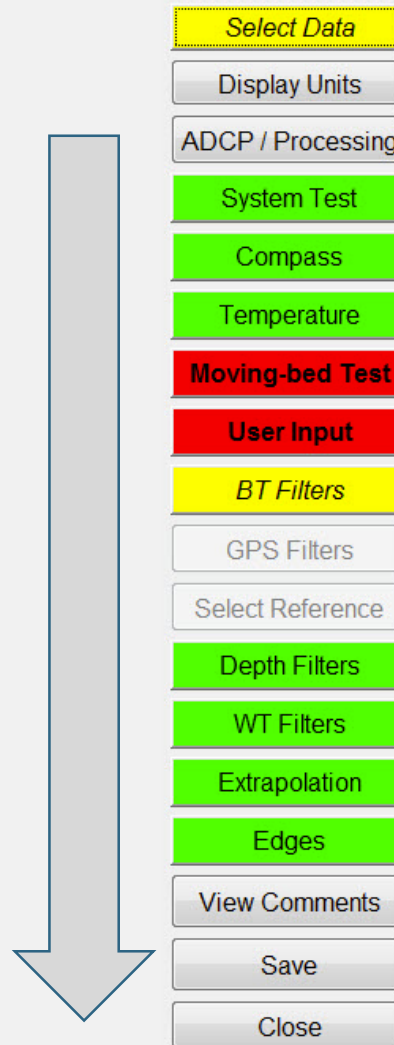
- **USGS standard processing algorithms**
 - Apply same algorithms to data independent of manufacture of ADCP
- **Use the best data available**
 - Manufactures' software often ignore usable data due to their approach to handling invalid data
- **Use the best interpolation methods with available data to estimate values for invalid data**
 - Manufacturers' software use forward or backward propagation of data and not interpolation.
- **Improve consistency and efficiency**
 - Automate data quality evaluation
 - Automate data uncertainty estimation

QRev Processing Approach

Not using an ensemble ignores potentially good data

Holding a value constant is not the best estimate of the missing data

QRev linearly interpolates invalid data to allow use of valid data



- Discharge
 - Water velocity
 - Depth
 - Boat speed
- Water velocity
 - Depth
 - Boat speed
- Depth
- Boat speed
 - Bottom track
 - GPS

Workflow

- **Collect data in field using manufacturer software**
 - WinRiver II
 - RiverSurveyor Live
 - Use USGS procedures as before
- **Postprocess data in field using QRev**
 - For current versions of RSL you will need to reprocess the data in RSL to create the Matlab files.
 - Once data are loaded into QRev the manufactures software should not longer be used for processing.
- **Load data into SV Mobile**
 - *_QRev.xml
- **Office checking and review must be done in QRev using saved QRev file**
 - *_QRev.mat

QRev Main Window

QRev - 2.80 C:\dsm\dsm_downloads\0211139110_131\

Select Data

Display Units

ADCP / Processing

System Test

Compass

Temperature

Moving-bed Test

User Input

BT Filters

GPS Filters

Select Reference

Depth Filters

WT Filters

Extrapolation

Edges

View Comments

Save

Close

Measurement Details (Units: English)

PARAMETERS	MEASUREMENT	60316102847r	60316103...	60316103...	60316103...
DISCHARGE					
Use		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Total Q (ft3/s)	768.420	808.451	740.996	760.008	775.603
Top Q (ft3/s)	180.345	188.383	173.576	178.056	182.2
Middle Q (ft3/s)	487.750	514.621	469.337	485.317	493.3
Bottom Q (ft3/s)	94.206	98.997	90.863	90.716	95.0
Left Q (ft3/s)	3.451	4.581	4.709	3.211	1.7
Right Q (ft3/s)	2.669	1.870	2.512	2.708	3.1
TIME					
Duration (s)	1279.0	207.0	234.0	185.0	215
Start Time (03/16/2016)	10:28:49	10:28:49 R	10:32:41 L	10:37:00 R	10:40:2
End Time (03/16/2016)	10:52:54	10:32:16	10:36:35	10:40:05	10:43:5
REFERENCE					
Navigation Ref		BT	BT	BT	BT
Composite Tracks		Off	Off	Off	Off
Depth Ref		BT	BT	BT	BT
MOVING-BED					
Moving-bed	No				
Correction	No				

Measurement Quality Assessment

	COV %	% Q
Q:	3.03	Left/Right Edge: 0.45 / 0.35
Width:	0.84	Invalid Cells: 0.06
Area:	1.00	Invalid Ens: 3.77

Parameter	Automatic	User
Random Uncertainty	3.2	
Invalid Data Uncertainty	0.8	
Edge Q Uncertainty	0.2	
Extrapolation Uncertainty	0.9	
Moving-Bed Test Uncertainty	1.0	
Systematic Uncertainty	1.5	
Estimated 95% Uncertainty	4.7	4.7

User Rating: Not Rated

Profile Extrapolation

Messages

SYSTEM TEST: No system test;
 Temperature: No independent temperature reading;
 User Input: Station name not entered;
 User Input: Station number not entered;
 bt-All: The percentage of invalid ensembles in a transect exceeds 5%;
 gga-All: The percentage of invalid ensembles in a transect exceeds 5%;
 GGA-All: Interpolated discharge for consecutive invalid ensembles exceeds 5%;
 GGA-All: Interpolated discharge for invalid ensembles in a transect exceeds 25%;
 gga-Original: The percentage of invalid ensembles in a transect exceeds 5%;
 gga-DGPS: The percentage of invalid ensembles in a transect exceeds 5%;
 Altitude: The percentage of invalid ensembles in a transect exceeds 5%.

Color coded buttons

QRev - 2.80 C:\dsm\dsm_downloads\0211139110_131\

Select Data

Display Units

ADCP / Processing

System Test

Compass

Temperature

Moving-bed Test

User Input

BT Filters

GPS Filters

Select Reference

Depth Filters

WT Filters

Extrapolation

Edges

View Comments

Save

Close

Measurement Details (Units: English)

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End Time (03/16/2016)	10:52:54	10:32:16	10:36:35	10:40:05	10:43:5
REFERENCE					
Navigation Ref		BT	BT	BT	BT
Composite Tracks		Off	Off	Off	Off
Depth Ref		BT	BT	BT	BT
MOVING-BED					
Moving-bed	No				
Correction	No				

Measurement Quality Assessment

	COV %		% Q
Q:	3.03	Left/Right Edge:	0.45 / 0.35
Width:	0.84	Invalid Cells:	0.06
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Parameter	Automatic	User
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Invalid Data Uncertainty	0.8	
Edge Q Uncertainty	0.2	
Extrapolation Uncertainty	0.9	
Moving-Bed Test Uncertainty	1.0	
Systematic Uncertainty	1.5	
Estimated 95% Uncertainty	4.7	4.7

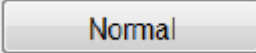


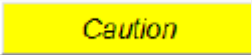

User Rating:

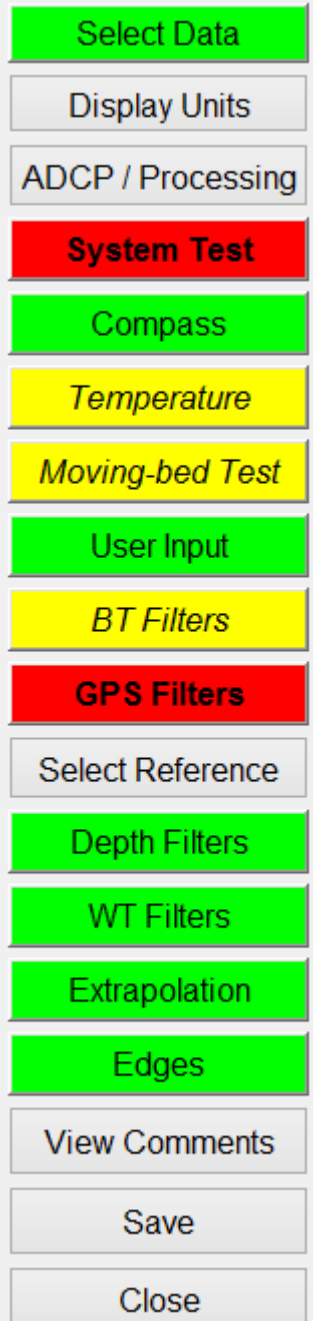
Profile Extrapolation

Messages

SYSTEM TEST: No system test;
 Temperature: No independent temperature reading;
 User Input: Station name not entered;
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 gga-Original: The percentage of invalid ensembles in a transect exceeds 5%;
 gga-DGPS: The percentage of invalid ensembles in a transect exceeds 5%;
 Altitude: The percentage of invalid ensembles in a transect exceeds 5%.

Buttons on Main Window

- Arranged from top to bottom to lead user through steps loading, reviewing and finalizing a measurement.
- Button look helps guide the user
 -  No quality checks done associated with button, but access to other functions or windows
 -  Loaded measurement does not have data associated with feature
 -  Date checks performed passed all quality checks
 -  Data quality checks have identified potential issue but likely not critical. Message panel will contain any issues identified
 -  Data quality checks identified an issue that could have significant impact on measurement or violates USGS policy. Message panel will contain any issues identified



Red and yellow buttons have associated messages

The screenshot displays the QRev - 2.80 software interface. On the left is a vertical toolbar with various colored buttons: green (Select Data, Display Units, ADCP / Processing, Compass, Moving-bed Test, Edges), yellow (Temperature, User Input, BT Filters, Extrapolation), and red (System Test, GPS Filters). The main area is divided into several panels:

- Measurement Details (Units: English):** A table with columns for PARAMETERS, MEASUREMENT, and five station identifiers (60316102847r, 60316103..., 60316103..., 60316103..., 60316103...). Rows include DISCHARGE (Total Q, Top Q, Middle Q, Bottom Q, Left Q, Right Q), TIME (Duration, Start Time, End Time), REFERENCE (Navigation Ref, Composite Tracks, Depth Ref), and MOVING-BED (Moving-bed, Correction).
- Measurement Quality Assessment:** A table showing COV % and % Q for Q, Width, and Area. It also lists various uncertainty parameters (Random, Invalid Data, Edge Q, Extrapolation, Moving-Bed Test, Systematic) and an Estimated 95% Uncertainty of 4.7.
- User Rating:** A dropdown menu currently set to "Not Rated".
- Profile Extrapolation:** A graph plotting Normalized Distance from Streambed (0 to 1) against Normalized Unit Q (0 to 1.5). It shows two data series: "Auto" (green line) and "Selected" (black line with error bars).
- Messages:** A text box at the bottom, highlighted with a red border, containing system messages such as "SYSTEM TEST: No system test;", "Temperature: No independent temperature reading;", "User Input: Station name not entered;", "User Input: Station number not entered;", and several warnings about invalid ensembles and interpolated discharge percentages.

Measurement Details

QRev - 2.80 C:\dsm\dsm_documents\ADCP Training\Basic_Orlando_2016\Data\SCT\

Measurement Details (Units: English)

PARAMETERS	MEASUREMENT	PB-C3A_0_000	PB-C3A_0_...	PB-C3A_0_...	PB-C3A_0_...
DISCHARGE					
Use		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Total Q (ft3/s)	134.256	137.178	133.303	133.590	135.083
Top Q (ft3/s)	34.122	34.605	33.665	33.590	34.311
Middle Q (ft3/s)	91.299	93.562	91.121	90.457	92.711
Bottom Q (ft3/s)	7.090	7.027	6.905	7.740	6.561
Left Q (ft3/s)	1.533	1.817	1.288	1.417	1.231
Right Q (ft3/s)	0.213	0.167	0.324	0.387	0.111
TIME					
Duration (s)	8416.1	1710.1	1719.9	1552.7	1105.1
Start Time (05/20/2015)	10:13:45	10:13:45 R	10:43:34 L	11:13:57 R	11:40:51
End Time (05/20/2015)	12:41:27	10:42:15	11:12:14	11:39:50	11:59:21
REFERENCE					
Navigation Ref		BT	BT	BT	BT
Composite Tracks		Off	Off	Off	Off
Depth Ref		BT	BT	BT	BT
MOVING-BED					
Moving-bed	No				
Correction	No				

Measurement Quality Assessment

	COV %		% Q
Q:	2.99	Left/Right Edge:	1.14 / 0.16
Width:	0.60	Invalid Cells:	1.45
Area:	0.69	Invalid Ens:	34.29

Parameter	Automatic	User
Random Uncertainty	2.8	
Invalid Data Uncertainty	7.1	
Edge Q Uncertainty	0.4	
Extrapolation Uncertainty	1.1	
Moving-Bed Test Uncertainty	1.0	
Systematic Uncertainty	1.5	
Estimated 95% Uncertainty	8.4	8.4

User Rating:

Profile Extrapolation

Messages

TRANSECTS: Transects selected are not reciprocal transects;
 SYSTEM TEST: All system test sets have at least one test that failed;
 TEMPERATURE: Temperature range is 3.1 degrees C which is greater than 2 degrees;
 Temperature: No independent temperature reading;
 bt-All: The percentage of invalid ensembles in a transect exceeds 5%;
 BT-All: Interpolated discharge for invalid ensembles in a transect exceeds 25%;
 bt-ErrorVel: The percentage of invalid ensembles in a transect exceeds 5%;
 bt-VertVel: The percentage of invalid ensembles in a transect exceeds 5%;
 BT-VertVel: Interpolated discharge for invalid ensembles in a transect exceeds 25%;
 gga-All: The percentage of invalid ensembles in a transect exceeds 5%;
 C3A-All: Interpolated discharge for invalid ensembles in a transect exceeds 25%.

Select Data

Display Units

ADCP / Processing

System Test

Compass

Temperature

Moving-bed Test

User Input

BT Filters

GPS Filters

Select Reference

Depth Filters

WT Filters

Extrapolation

Edges

View Comments

Save

Close

Quick Review of Extrapolation

QRev - 2.80 C:\dsm\dsm_downloads\0211139110_131\

Select Data

Display Units

ADCP / Processing

System Test

Compass

Temperature

Moving-bed Test

User Input

BT Filters

GPS Filters

Select Reference

Depth Filters

WT Filters

Extrapolation

Edges

View Comments

Save

Close

Measurement Details (Units: English)

PARAMETERS	MEASUREMENT	60316102847r	60316103...	60316103...	60316103...
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End Time (03/16/2016)	10:52:54	10:32:16	10:36:35	10:40:05	10:43:5
REFERENCE					
Navigation Ref		BT	BT	BT	BT
Composite Tracks		Off	Off	Off	Off
Depth Ref		BT	BT	BT	BT
MOVING-BED					
Moving-bed	No				
Correction	No				

Measurement Quality Assessment

	COV %		% Q
Q:	3.03	Left/Right Edge:	0.45 / 0.35
Width:	0.84	Invalid Cells:	0.06
Area:	1.00	Invalid Ens:	3.77

Parameter	Automatic	User
Random Uncertainty	3.2	
Invalid Data Uncertainty	0.8	
Edge Q Uncertainty	0.2	
Extrapolation Uncertainty	0.9	
Moving-Bed Test Uncertainty	1.0	
Systematic Uncertainty	1.5	
Estimated 95% Uncertainty	4.7	4.7

User Rating: Not Rated

Profile Extrapolation

Normalized Distance from Streambed

Normalized Unit Q

Legend: Auto (green line), Selected (black line)

Messages

SYSTEM TEST: No system test;
 Temperature: No independent temperature reading;
 User Input: Station name not entered;
 User Input: Station number not entered;
 bt-All: The percentage of invalid ensembles in a transect exceeds 5%;
 gga-All: The percentage of invalid ensembles in a transect exceeds 5%;
 GGA-All: Interpolated discharge for consecutive invalid ensembles exceeds 5%;
 GGA-All: Interpolated discharge for invalid ensembles in a transect exceeds 25%;
 gga-Original: The percentage of invalid ensembles in a transect exceeds 5%;
 gga-DGPS: The percentage of invalid ensembles in a transect exceeds 5%;
 Altitude: The percentage of invalid ensembles in a transect exceeds 5%.

Measurement Quality Assessment

QRev - 2.80 C:\dsm\dsm_downloads\0211139110_131\

Select Data

Display Units

ADCP / Processing

System Test

Compass

Temperature

Moving-bed Test

User Input

BT Filters

GPS Filters

Select Reference

Depth Filters

WT Filters

Extrapolation

Edges

View Comments

Save

Close

Measurement Details (Units: English)

PARAMETERS	MEASUREMENT	60316102847r	60316103...	60316103...	60316103...
DISCHARGE					
Use		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Total Q (ft3/s)	768.420	808.451	740.996	760.008	775.603
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Left Q (ft3/s)	3.451	4.581	4.709	3.211	1.7
Right Q (ft3/s)	2.669	1.870	2.512	2.708	3.1
TIME					
Duration (s)	1279.0	207.0	234.0	185.0	215
Start Time (03/16/2016)	10:28:49	10:28:49 R	10:32:41 L	10:37:00 R	10:40:2
End Time (03/16/2016)	10:52:54	10:32:16	10:36:35	10:40:05	10:43:5
REFERENCE					
Navigation Ref		BT	BT	BT	BT
Composite Tracks		Off	Off	Off	Off
Depth Ref		BT	BT	BT	BT
MOVING-BED					
Moving-bed	No				
Correction	No				

Messages

SYSTEM TEST: No system test;
 Temperature: No independent temperature reading;
 User Input: Station name not entered;
 User Input: Station number not entered;
 bt-All: The percentage of invalid ensembles in a transect exceeds 5%;
 gga-All: The percentage of invalid ensembles in a transect exceeds 5%;
 GGA-All: Interpolated discharge for consecutive invalid ensembles exceeds 5%;
 GGA-All: Interpolated discharge for invalid ensembles in a transect exceeds 25%;
 gga-Original: The percentage of invalid ensembles in a transect exceeds 5%;
 gga-DGPS: The percentage of invalid ensembles in a transect exceeds 5%;
 Altitude: The percentage of invalid ensembles in a transect exceeds 5%.

Measurement Quality Assessment

	COV %		% Q
Q:	3.03	Left/Right Edge:	0.45 / 0.35
Width:	0.84	Invalid Cells:	0.06
Area:	1.00	Invalid Ens:	3.77

Parameter	Automatic	User
Random Uncertainty	3.2	
Invalid Data Uncertainty	0.8	
Edge Q Uncertainty	0.2	
Extrapolation Uncertainty	0.9	
Moving-Bed Test Uncertainty	1.0	
Systematic Uncertainty	1.5	
Estimated 95% Uncertainty	4.7	4.7

User Rating:

Profile Extrapolation

Common - Comment

The screenshot displays the QRev software interface with a 'COMMENT' dialog box open. The dialog box contains the following text:

Enter Comment:
QRev Main 09/08/2015 16:25:28: This is an example comment for class.

Red brackets and labels 'Automatic' and 'User' are overlaid on the dialog, pointing to the date and time portion of the comment text.

The background interface includes a 'Measurement Details (Units: English)' table, a 'Measurement Quality Assessment' table, and a 'Messages' section.

PARAMETERS	MEASUREMENT	60316102847r	60316103...	60316103...	60316103...
DISCHARGE					
Use		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Total Q (ft ³ /s)	768.420	808.451	740.996	760.008	775.603
Top Q (ft ³ /s)	180.345	188.383	173.576	178.056	182.2
Middle Q (ft ³ /s)					
Bottom Q (ft ³ /s)					
Left Q (ft ³ /s)					
Right Q (ft ³ /s)					
TIME					
Duration (s)					
Start Time (03/)					
End Time (03/)					
REFERENCE					
Navigation Re					
Composite Tra					
Depth Ref					
MOVING-BED					
Moving-bed					
Correction					

	COV %		% Q
Q:	3.03	Left/Right Edge:	0.45 / 0.35
Width:	0.84	Invalid Cells:	0.06
Area:	1.00	Invalid Ens:	3.77
Parameter	Automatic	User	
Form Uncertainty	3.2		
Data Uncertainty	0.8		
Q Uncertainty	0.2		
Resolution Uncertainty	0.9		
g-Bed Test Uncertainty	1.0		
Automatic Uncertainty	1.5		
Rated 95% Uncertainty	4.7	4.7	

The 'Messages' section contains the following text:

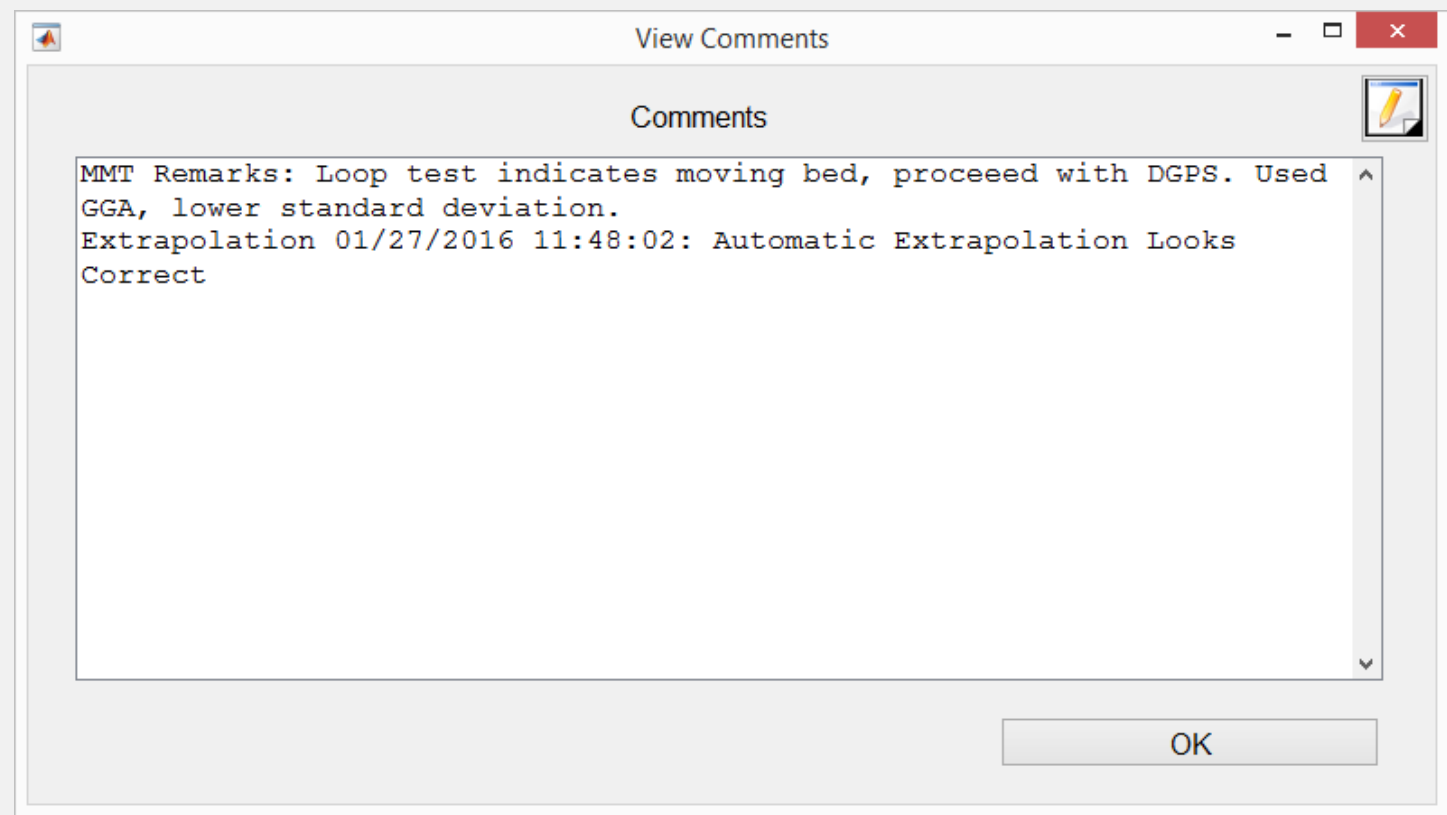
SYSTEM TEST: No system test;
Temperature: No independent temperature reading;
User Input: Station name not entered;
User Input: Station number not entered;
bt-All: The percentage of invalid ensembles in a transect exceeds 5%;
gga-All: The percentage of invalid ensembles in a transect exceeds 5%;
GGA-All: Interpolated discharge for consecutive invalid ensembles exceeds 5%;
GGA-All: Interpolated discharge for invalid ensembles in a transect exceeds 25%;
gga-Original: The percentage of invalid ensembles in a transect exceeds 5%;
gga-DGPS: The percentage of invalid ensembles in a transect exceeds 5%;
Altitude: The percentage of invalid ensembles in a transect exceeds 5%.

The 'Extrapolation' section shows a graph with 'Normalized Distance from S' on the y-axis and 'Normalized Unit Q' on the x-axis. The graph displays a curve with data points and error bars. A legend indicates 'Auto' (green line) and 'Selected' (black line).

View Comments

- Select Data
- Display Units
- ADCP / Processing
- System Test
- Compass
- Temperature
- Moving-bed Test
- User Input
- BT Filters
- GPS Filters
- Select Reference
- Depth Filters
- WT Filters
- Extrapolation
- Edges
- View Comments**
- Save
- Close

Comments cannot be deleted or edited. If you need to correct a comment do so with another comment.



Common - Help

The screenshot displays the QRev software interface. On the left is a vertical toolbar with various function buttons. The central window shows a PDF document titled "QRev—Software for Computation and Quality Assurance of Acoustic Doppler Current Profiler Moving-Boat Streamflow Measurements—User's Manual" by David S. Mueller. On the right, a data table and a graph are visible. A red box highlights a question mark icon in the top right corner of the software window.

QRev - 2.80 C:\dsm\dsm_download

Select Data
Display Units
ADCP / Processing
System Test
Compass
Temperature
Moving-bed Test
User Input
BT Filters
GPS Filters
Select Reference
Depth Filters
WT Filters
Extrapolation
Edges
View Comments
Save
Close

QRev_Users_Manual.pdf - Adobe Acrobat Pro

File Edit View Window Help

Open Create [Icons] Customize

1 / 56 74.5% [Icons] Tools Fill & Sign Comment

USGS
science for a changing world

QRev—Software for Computation and Quality Assurance of Acoustic Doppler Current Profiler Moving-Boat Streamflow Measurements—User's Manual

By David S. Mueller

Report Series 2016-1052
Version 2.80, March 2016

U.S. Department of the Interior
U.S. Geological Survey

% Q	
Edge:	0.45 / 0.35
	0.06
	3.77
Automatic	User
3.2	
0.8	
0.2	
0.9	
1.0	
1.5	
4.7	4.7

1 1.5
Unit Q

Common Features in QRev Windows

Select Data

Select Data

Display Units

ADCP / Processing

System Test

Compass

Temperature

Moving-bed Test

User Input

BT Filters

GPS Filters

Select Reference

Depth Filters

WT Filters

Extrapolation

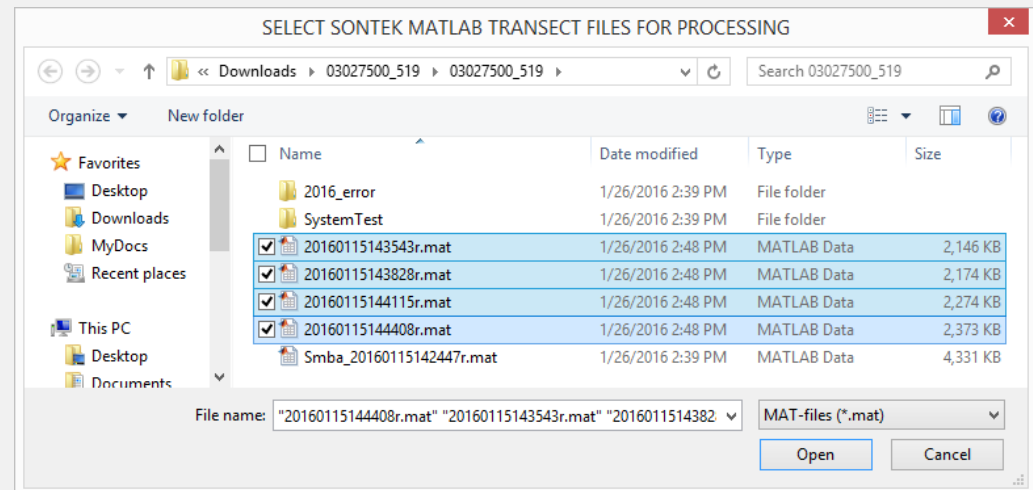
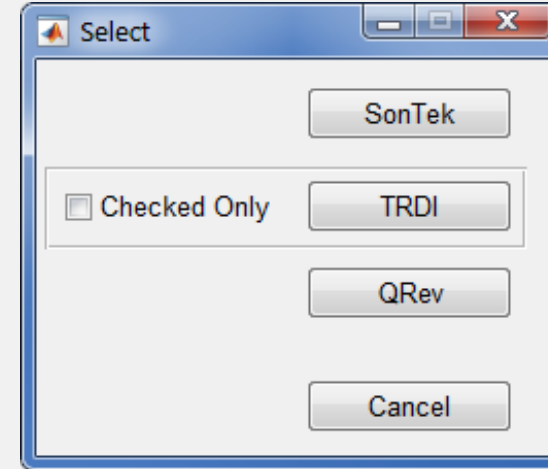
Edges

View Comments

Save

Close

- **SonTek: Transect**
 - *.mat files only
 - not the moving-bed tests
 - CompassCal folder in default location
 - SystemTest folder in default location
- **TRDI: *.mmt file**
 - Option for Checked Only
- **QRev: *.mat file saved by QRev**



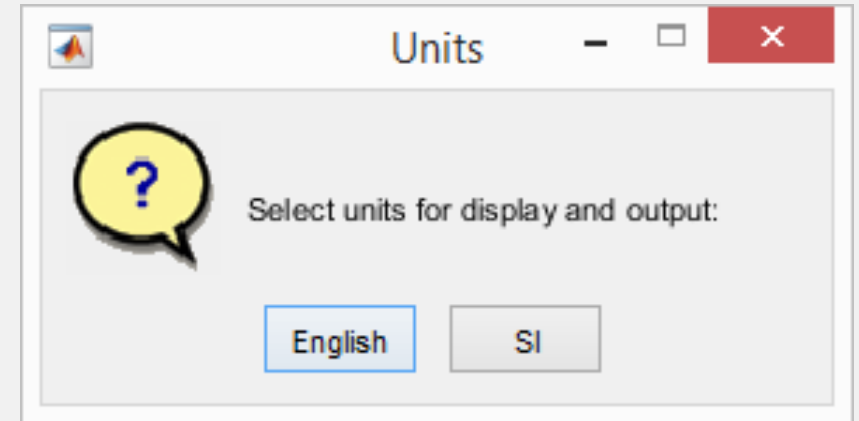
QRev Processing

- User loads data
- QRev processes data
 - Use loaded boat velocity reference (BT, GGA, VTG) with composite tracks off
 - Use 4-beam average depths with composite depths on
 - Apply automated filters
 - Use automated extrapolation methods
 - Compute discharge
 - Complete quality assessment
 - Display data to user
- User reviews messages, makes necessary changes, and adds comments
- User saves data

Display Units

- Select Data
- Display Units**
- ADCP / Processing
- System Test
- Compass
- Temperature
- Moving-bed Test
- User Input
- BT Filters
- GPS Filters
- Select Reference
- Depth Filters
- WT Filters
- Extrapolation
- Edges
- View Comments
- Save
- Close

- Sets the units used for values displayed in Qrev
 - English (default)
 - SI
- Option chosen will continue to be used when QRev is restarted
- Internally all processing is in SI units.



ADCP / Processing

- Select Data
- Display Units
- ADCP / Processing**
- System Test
- Compass
- Temperature
- Moving-bed Test
- User Input
- BT Filters
- GPS Filters
- Select Reference
- Depth Filters
- WT Filters
- Extrapolation
- Edges
- View Comments
- Save
- Close

ADCP	
Serial Number:	527
Manufacturer:	TRDI
Model:	StreamPro
Firmware:	31.1300
Frequency:	2000 kHz
Water Mode:	12
Bottom Mode:	10
Depth Cell Size:	5 cm

Processing Setting

SonTek
 TRDI
 QRev

Filter Setting

Original as Loaded
Automatic

OK

To process like WR2 or RSL:

- 1) Select SonTek or TRDI
- 2) Click Original as Loaded

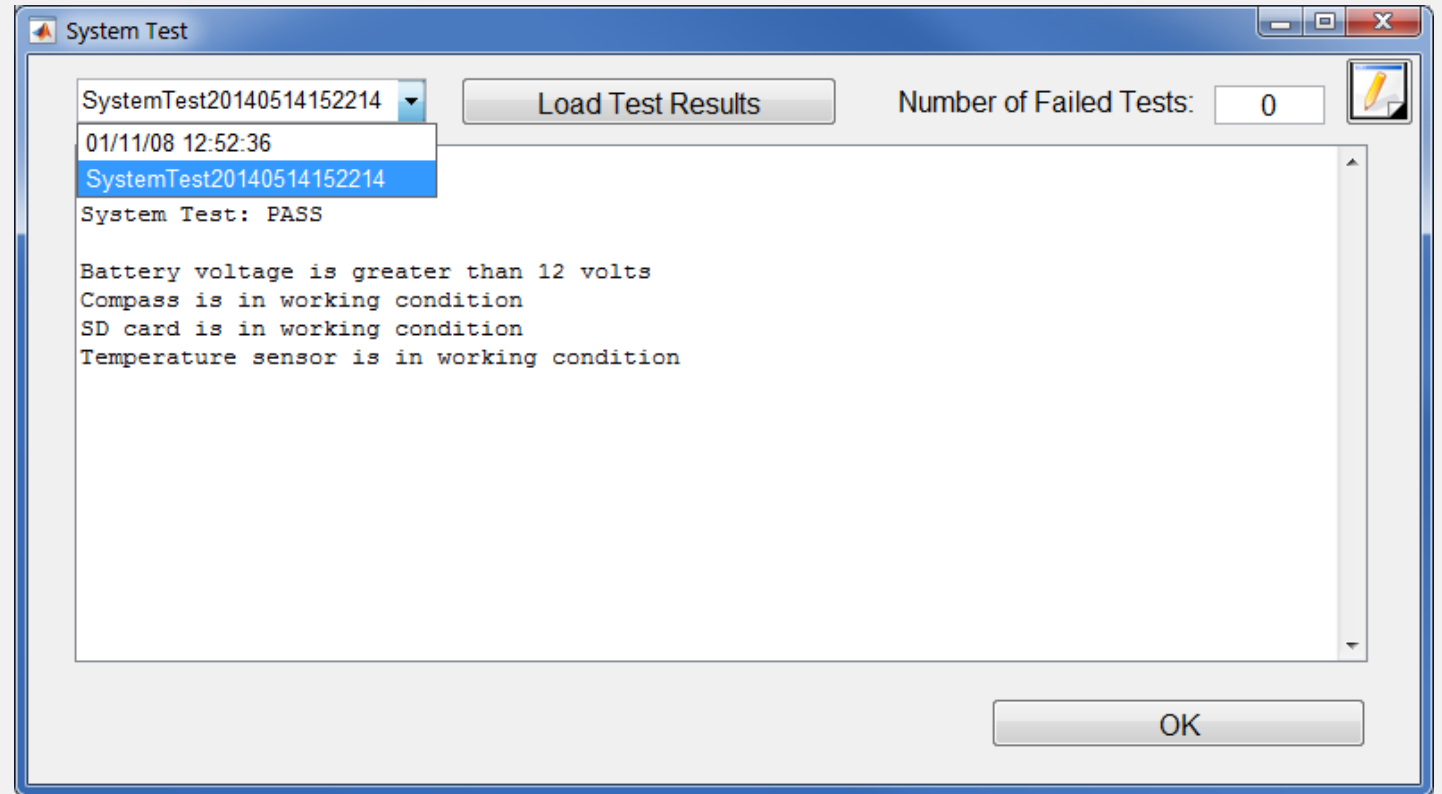
Note: QRev always uses the automated extrapolation method by default.

System Test

- Select Data
- Display Units
- ADCP / Processing
- System Test**
- Compass
- Temperature
- Moving-bed Test
- User Input
- BT Filters
- GPS Filters
- Select Reference
- Depth Filters
- WT Filters
- Extrapolation
- Edges
- View Comments
- Save
- Close

System Test QA

- System test completed
- All tests passed

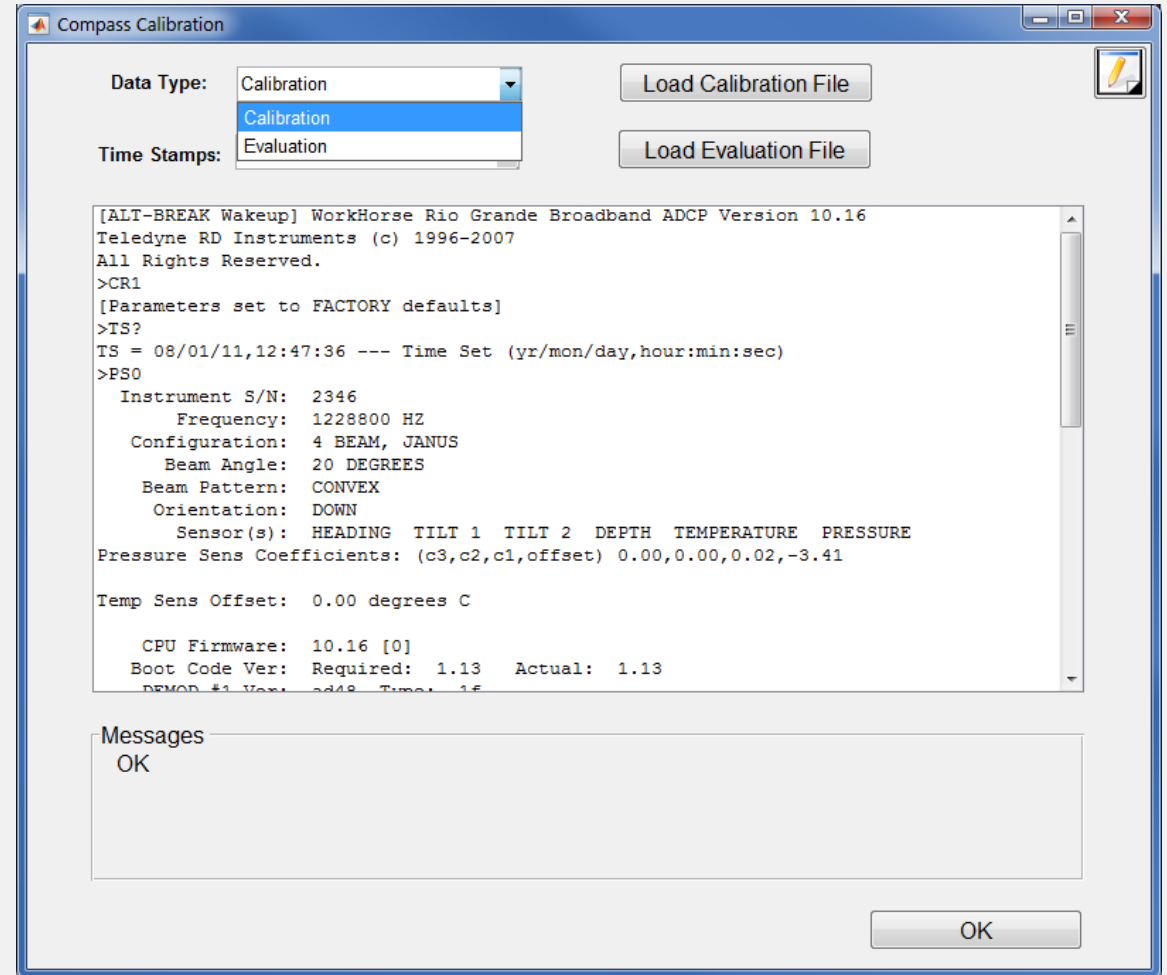


Compass

- Select Data
- Display Units
- ADCP / Processing
- System Test
- Compass**
- Temperature
- Moving-bed Test
- User Input
- BT Filters
- GPS Filters
- Select Reference
- Depth Filters
- WT Filters
- Extrapolation
- Edges
- View Comments
- Save
- Close

Compass QA

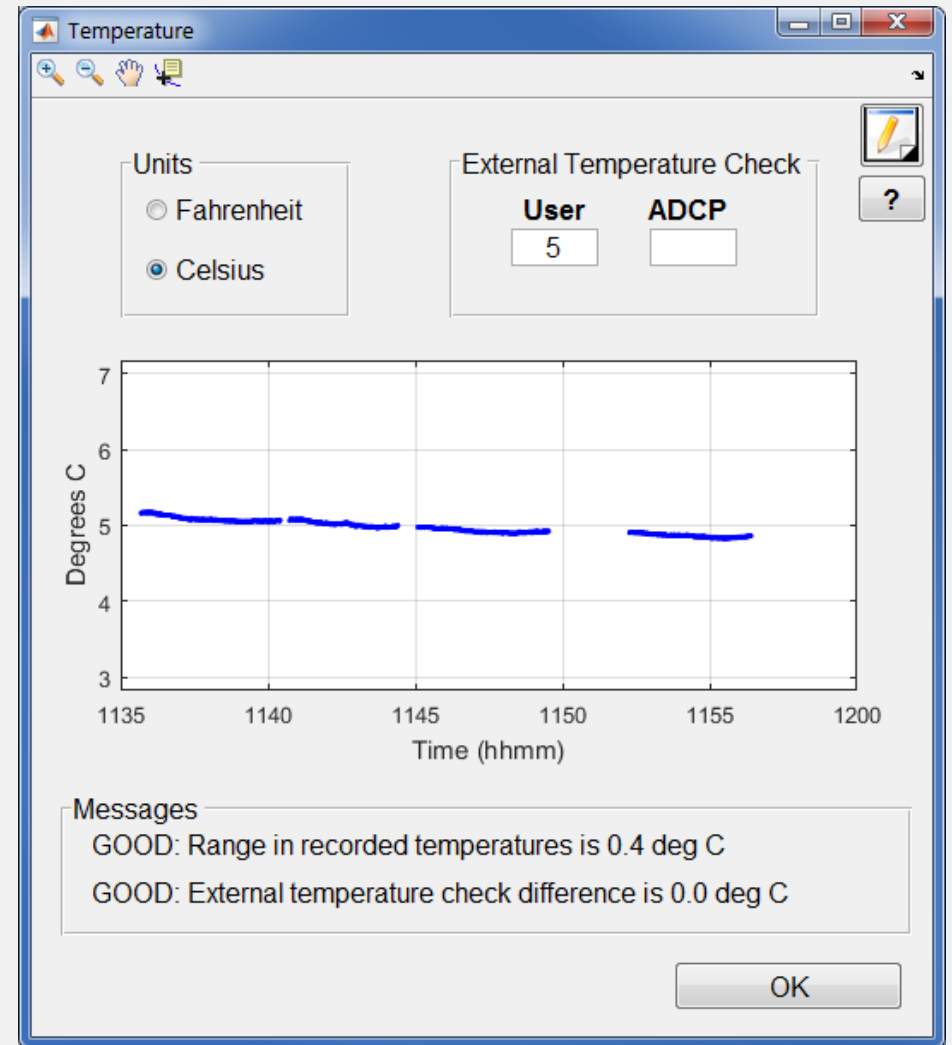
- Compass required (Loop or GPS)
- Calibration completed
- Evaluation completed (for TRDI ADCPs)



Temperature

Temperature QA

- Range during measurement
 - > 1 degrees C
- Difference from user's measurement
 - > 2 degrees C
 - If no ADCP temperature entered, the mean for the whole measurement is used.



- Select Data
- Display Units
- ADCP / Processing
- System Test
- Compass
- Temperature**
- Moving-bed Test
- User Input
- BT Filters
- GPS Filters
- Select Reference
- Depth Filters
- WT Filters
- Extrapolation
- Edges
- View Comments
- Save
- Close

Moving-bed Test (Loop Test)

- Select Data
- Display Units
- ADCP / Processing
- System Test
- Compass
- Temperature
- Moving-bed Test
- User Input
- BT Filters
- GPS Filters
- Select Reference
- Depth Filters
- WT Filters
- Extrapolation
- Edges
- View Comments
- Save
- Close

Moving-Bed Tests and Correction

User Valid	Use for Correction	Filename	Type	Duration (sec)	Distance Upstream (m)	Moving-Bed Speed (m/s)	Moving-Bed Direction	Flow Speed ...	Flow Direction	% Invalid BT	Compass Error	% Moving Bed	Moving Bed	Quali
<input checked="" type="checkbox"/>	<input type="checkbox"/>	GreenValley_0_001_L...	Loop	213.9100	52.4614	0.2452	188.2339	1.0529	282.1977	8.7755	0.9003	18.8923	Unknown	Errors
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Mackinaw River near G...	Loop	199.7700	11.4826	0.0575	121.5842	1.0558	279.3863	8.8496	1.3338	5.1629	Yes	Warning
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Mackinaw River near G...	Stationary	309.1300	8.0255	0.0282		1.2804		7.4020		2.1992	Yes	Good
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Mackinaw River near G...	Stationary	308.1400	16.9645	0.0696		1.3967		20.5397		4.9834	Yes	Warning
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Mackinaw River near G...	Stationary	330.4800	0.3824	0.0014		0.0500		0.1206		0.0000	No	Good

Messages

GreenValley_0_001_LBT.PD0
 WARNING: Percent invalid bottom track exceeds 5 percent. Loop may not be accurate. PLEASE REVIEW DATA.
 ERROR: Loop closure error not in upstream direction. REPEAT LOOP or USE STATIONARY TEST

Mackinaw River near Green Valley_0_001_LBT.PD0
 WARNING: Percent invalid bottom track exceeds 5 percent. Loop may not be accurate. PLEASE REVIEW DATA.

Mackinaw River near Green Valley_0_001_LBT.PD0

ShipTrack

Moving-bed Test (Stationary Test)

- Select Data
- Display Units
- ADCP / Processing
- System Test
- Compass
- Temperature
- Moving-bed Test
- User Input
- BT Filters
- GPS Filters
- Select Reference
- Depth Filters
- WT Filters
- Extrapolation
- Edges
- View Comments
- Save
- Close

Moving-bed Test

Moving-Bed Tests and Correction

User Valid	Use for Correction	Filename	Type	Duration (sec)	Distance Upstream (m)	Moving-Bed Speed (m/s)	Moving-Bed Direction	Flow Speed ...	Flow Direction	% Invalid BT	Compass Error	% Moving Bed	Moving Bed	Quality
<input checked="" type="checkbox"/>	<input type="checkbox"/>	GreenValley_0_001_L...	Loop	213.9100	52.4614	0.2452	188.2339	1.0529	282.1977	8.7755	0.9003	18.8923	Unknown	Errors
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Mackinaw River near G...	Loop	199.7700	11.4826	0.0575	121.5842	1.0558	279.3863	8.8496	1.3338	5.1629	Yes	Warning
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Mackinaw River near G...	Stationary	309.1300	8.0255	0.0282		1.2804		7.4020		2.1992	Yes	Good
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Mackinaw River near G...	Stationary	308.1400	16.9645	0.0696		1.3967		20.5397		4.9834	Yes	Warning
<input type="checkbox"/>	<input type="checkbox"/>	Mackinaw River near G...	Stationary	320.4800	0.2824	0.0011		0.9500		0.1206		0.0000	No	Good

Messages

```

GreenValley_0_001_LBT.PD0
WARNING: Percent invalid bottom track exceeds 5 percent. Loop may not be accurate. PLEASE REVIEW DATA.
ERROR: Loop closure error not in upstream direction. REPEAT LOOP or USE STATIONARY TEST
Mackinaw River near Green Valley_0_001_LBT.PD0
WARNING: Percent invalid bottom track exceeds 5 percent. Loop may not be accurate. PLEASE REVIEW DATA.
    
```

Mackinaw River near Green Valley_0_005_SBT.PD0

Average Moving-Bed Speed (m/s)

Ensemble

ShipTrack

Distance Upstream (m)

Distance Cross Stream (m)

Load File

OK

Moving-bed Test Auto Selection for Multiple Tests

- Used to determine if there is a moving-bed
- Used to correct for a moving-bed if applicable
- **Priority**
 - Last loop test which does not have critical errors
 - If not valid loop, all stationary tests that do not have critical errors
- QRev will not use a mix of loop and stationary tests

Moving-Bed QA

- Moving-bed test(s) completed
- Moving-bed test(s) valid (no critical errors)
- If stationary tests, a moving-bed, no GPS data: are there 3 stationary test?
- Loop test QA
 - Flow speed < 0.8 fps
 - % invalid BT > 20%, > 5%
 - Consecutive invalid BT > 10
 - Flow direction and compass evaluation
- Stationary test QA
 - Duration < 300 seconds
 - Equilibrium conditions reached
 - Invalid BT > 50%, > 10%

User Input

- Select Data
- Display Units
- ADCP / Processing
- System Test
- Compass
- Temperature
- Moving-bed Test
- User Input**
- BT Filters
- GPS Filters
- Select Reference
- Depth Filters
- WT Filters
- Extrapolation
- Edges
- View Comments
- Save
- Close

User Input

User Supplied Settings

User Settings

Station Name:

Station Number:

	Filename	Draft (ft)	Magnetic Variation	Temperature Source	Temperature Units	Average Temperature	Average Salinity (ppt)	Speed of Sound Source	Speed of Sound (ft/s)	Discharge (ft ³ /s)
	All Transects									
	20140514155114r.mat	0.21	15.0	Internal (ADCP)	Celsius	20.2	0	Internal (ADCP)	4862.7	1174.72
	20140514155923r.mat	0.21	15.0	Internal (ADCP)	Celsius	19.6	0	Internal (ADCP)	4856.7	1177.14

Internal (ADCP) Manual

Celsius Fahrenheit

Internal (ADCP) Manual Computed

OK

Entries in the first row apply to all transects.

Use Input QA

- **Draft = 0**
- **Draft consistent for all transects**
- **Magvar consistent for all transects**
- **If GPS, magvar = 0**
- **Station name and number provided**

BT Filters

- Select Data
- Display Units
- ADCP / Processing
- System Test
- Compass
- Temperature
- Moving-bed Test
- User Input
- BT Filters**
- GPS Filters
- Select Reference
- Depth Filters
- WT Filters
- Extrapolation
- Edges
- View Comments
- Save
- Close

BT Filter

Bottom Track Filter & Interpolation Settings

Filename	# Ensembles	#<4 Beam	# Invalid Total	# Invalid Orig Data	# Invalid <4 Beam	# Invalid Error Vel	# Invalid Vert Vel	# Invalid Other	Discharge Prev. (ft3/s)	Discharge Now (ft3/s)	Discharge % Change
14366000_571_000.PD0	327	0	8	0	0	2	8	0	184.91	184.91	0.00
14366000_571_001.PD0	241	0	2	0	0	2	1	0	284.78	284.78	0.00
14366000_571_002.PD0	265	0	2	0	0	2	0	0	289.36	289.36	0.00
14366000_571_003.PD0	230	5	6	5	5	1	0	0	284.73	284.73	0.00

14366000_571_001.PD0

Graphics

3 Beam Solutions
 Error Velocity
 Vertical Velocity
 Other
 All

Number of Beams vs Ensembles

Distance North (ft) vs Distance East (ft)

BT Speed (ft/s) vs Ensembles

Filters

3 Beam Solutions:

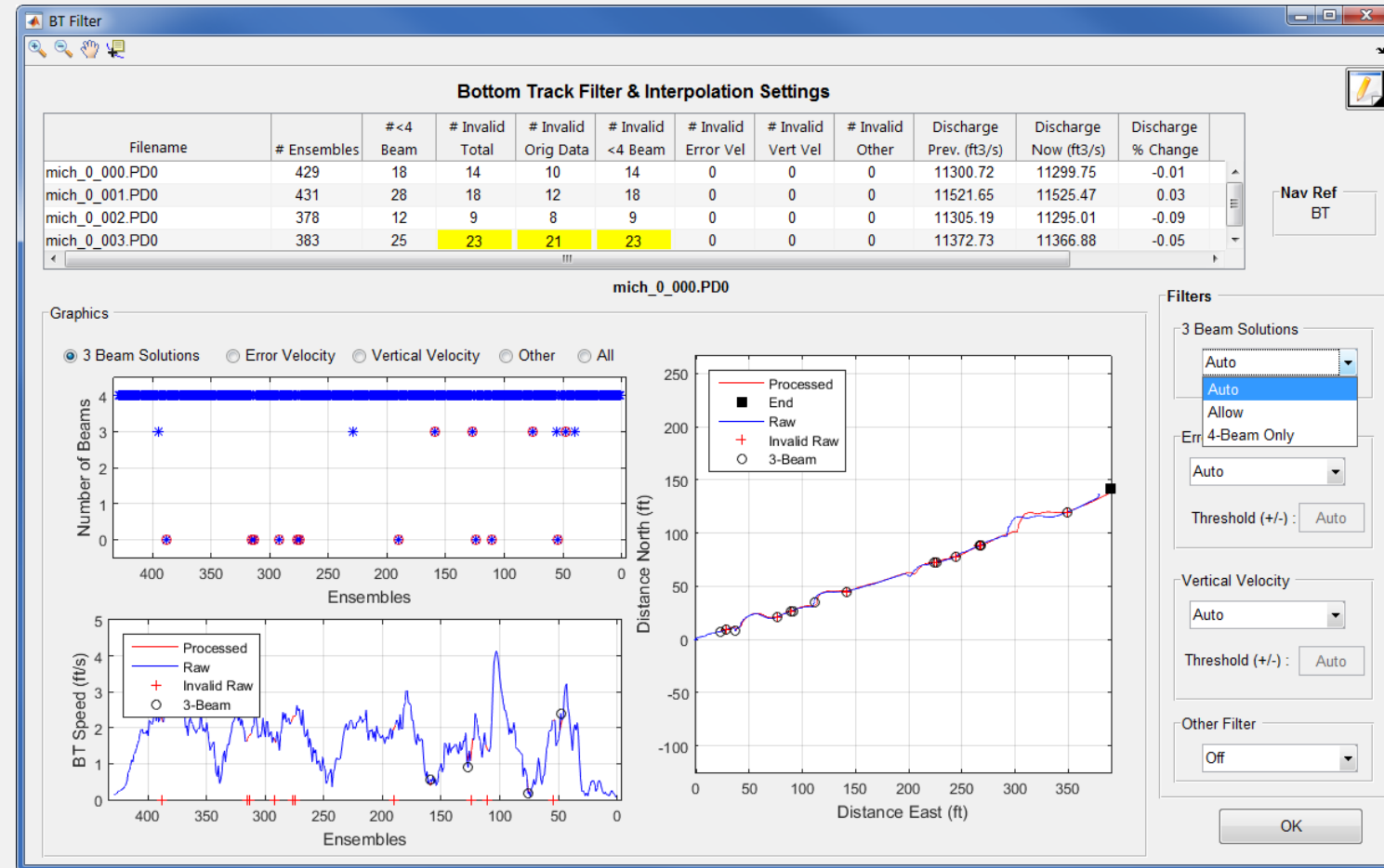
Error Velocity: Threshold (+/-):

Vertical Velocity: Threshold (+/-):

Other Filter:

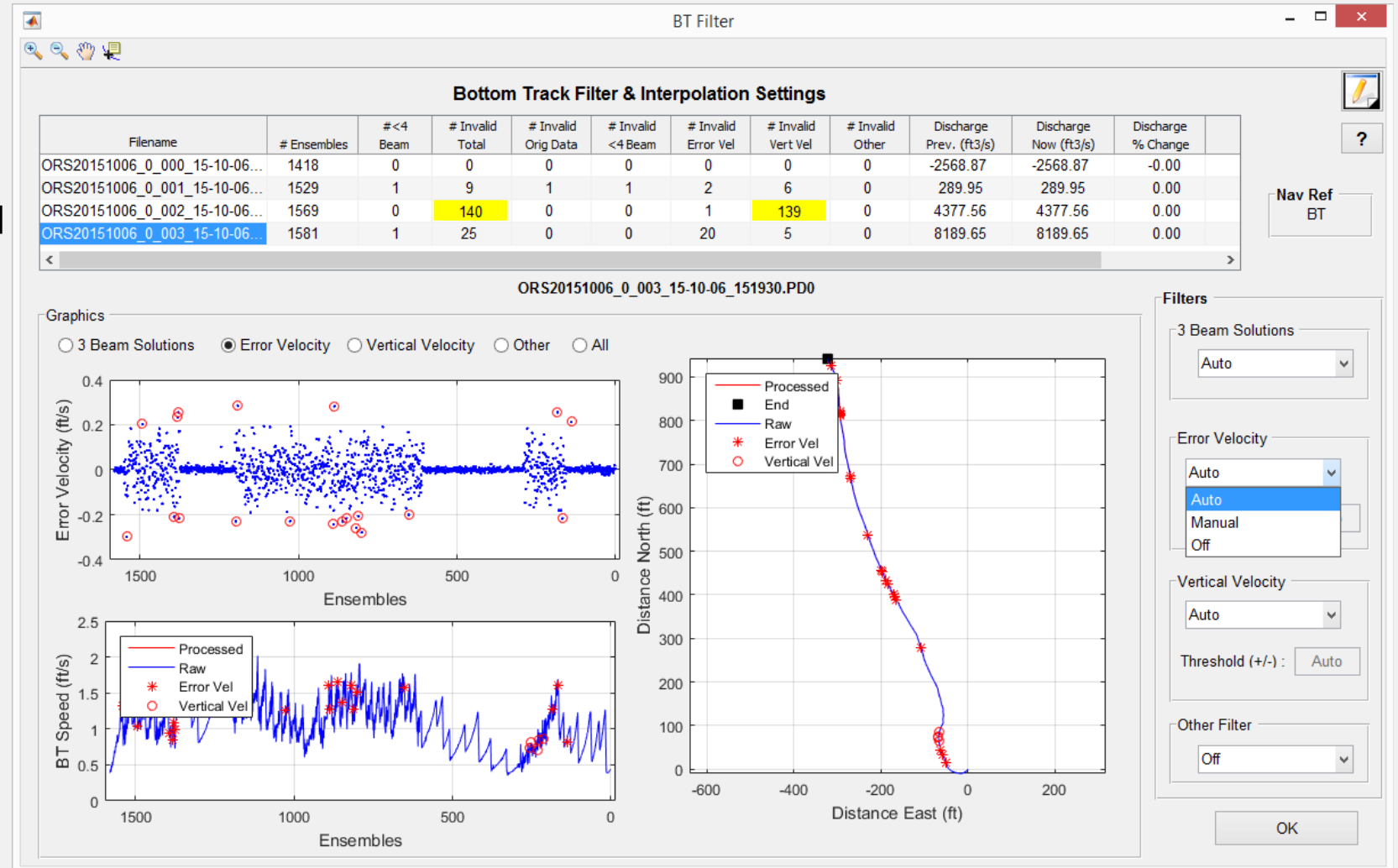
BT Filters – 3-Beam Solutions

- Auto
 - Default
 - Evaluates 3-beam solutions using neighboring data if within 50% uses as valid
- Allow - will use 3-beam solutions
- 4-Beam Only – requires all 4 beams to have valid velocity



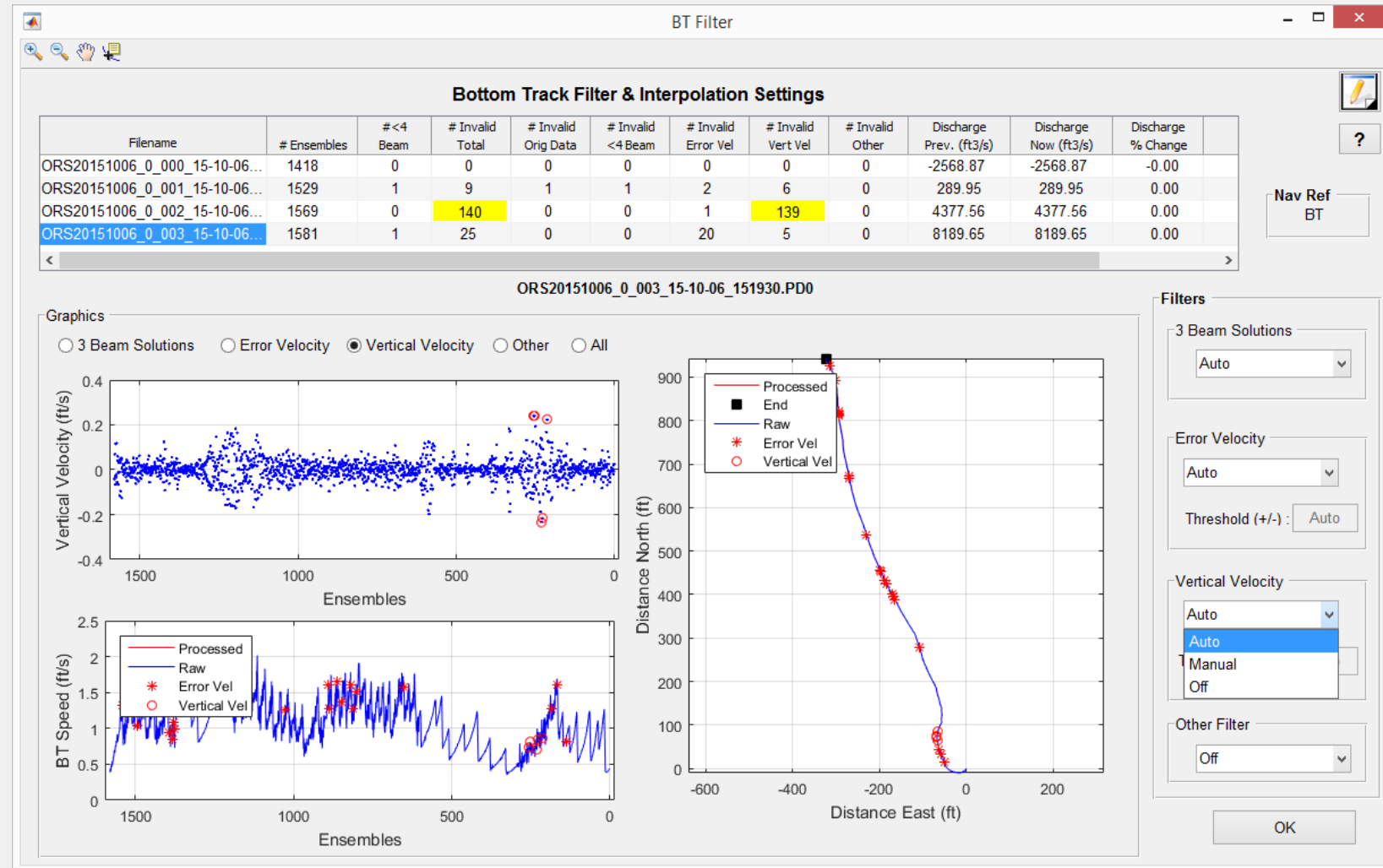
BT Filters - Error Velocity

- Auto
 - Default
 - Use variance of error velocity data to automatically set threshold limits for each transect
- Manual
 - Users enters value that is applied to all transects
- Off
 - No error velocity filter applied



BT Filters – Vertical Velocity

- Auto
 - Default
 - Use variance of vertical velocity data to automatically set threshold limits for each transect
- Manual
 - User enters value that is applied to all transects
- Off
 - No vertical velocity filter applied



BT Filters – Other Filters

- Smooth
 - LOWESS smooth filter with dynamic moving window applied to detect and remove spikes
- Off
 - Default
 - No spike detection filter applied

BT Filter

Bottom Track Filter & Interpolation Settings

Filename	# Ensembles	#<4 Beam	# Invalid Total	# Invalid Orig Data	# Invalid <4 Beam	# Invalid Error Vel	# Invalid Vert Vel	# Invalid Other	Discharge Prev. (ft3/s)	Discharge Now (ft3/s)	Discharge % Change
ORS20151006_0_000_15-10-06...	1418	0	6	0	0	0	0	6	-2568.87	-2569.22	0.01
ORS20151006_0_001_15-10-06...	1529	1	15	1	1	2	6	6	289.95	289.37	-0.20
ORS20151006_0_002_15-10-06...	1569	0	149	0	0	1	139	9	4377.56	4379.89	0.05
ORS20151006_0_003_15-10-06...	1581	1	36	0	0	20	5	11	8189.65	8185.11	-0.06

ORS20151006_0_003_15-10-06_151930.PD0

Graphics

3 Beam Solutions
 Error Velocity
 Vertical Velocity
 Other
 All

Filters

3 Beam Solutions: Auto

Error Velocity: Auto
Threshold (+/-): Auto

Vertical Velocity: Auto
Threshold (+/-): Auto

Other Filter: Smooth
Off
Smooth
OK

GPS Filters

- Select Data
- Display Units
- ADCP / Processing
- System Test
- Compass
- Temperature
- Moving-bed Test
- User Input
- BT Filters
- GPS Filters
- Select Reference
- Depth Filters
- WT Filters
- Extrapolation
- Edges
- View Comments
- Save
- Close

GPS Filter & Interpolation Settings

Filename	Ensembles	Invalid GGA	Invalid VTG	Unfiltered Diff Quality	Unfiltered Delta Alt.	Unfiltered Max HDOP	Unfiltered Delta HDOP	Unfiltered # Sat Chg	Discharge Prev. (ft3/s)	Discharge Now (ft3/s)	Discharge % Change
MissR_Vburg_20160113_0_...	785	1	0	2	1.67	0.8	0.0	0	1879157.12	1879157.12	0.00
MissR_Vburg_20160113_0_...	564	1	0	2	0.84	1.1	0.3	0	1942595.45	1942595.45	0.00
MissR_Vburg_20160113_0_...	717	1	0	2	1.29	1.1	0.2	0	1886910.11	1886910.11	0.00
MissR_Vburg_20160113_0_...	513	1	0	2	1.10	1.2	0.1	0	1908151.64	1908151.64	0.00

MissR_Vburg_20160113_0_004.PD0

GPS Characteristics

Diff Quality
 Altitude
 HDOP
 # Sats

Speed

GGA
 VTG
 BT

ShipTrack

GGA
 VTG
 BT
 Vectors

Nav Ref

GGA

Filters

Minimum Diff Quality (GGA): 2 - Differential

Altitude Change (GGA): Auto

Threshold (+/-):

HDOP: Auto

Maximum:

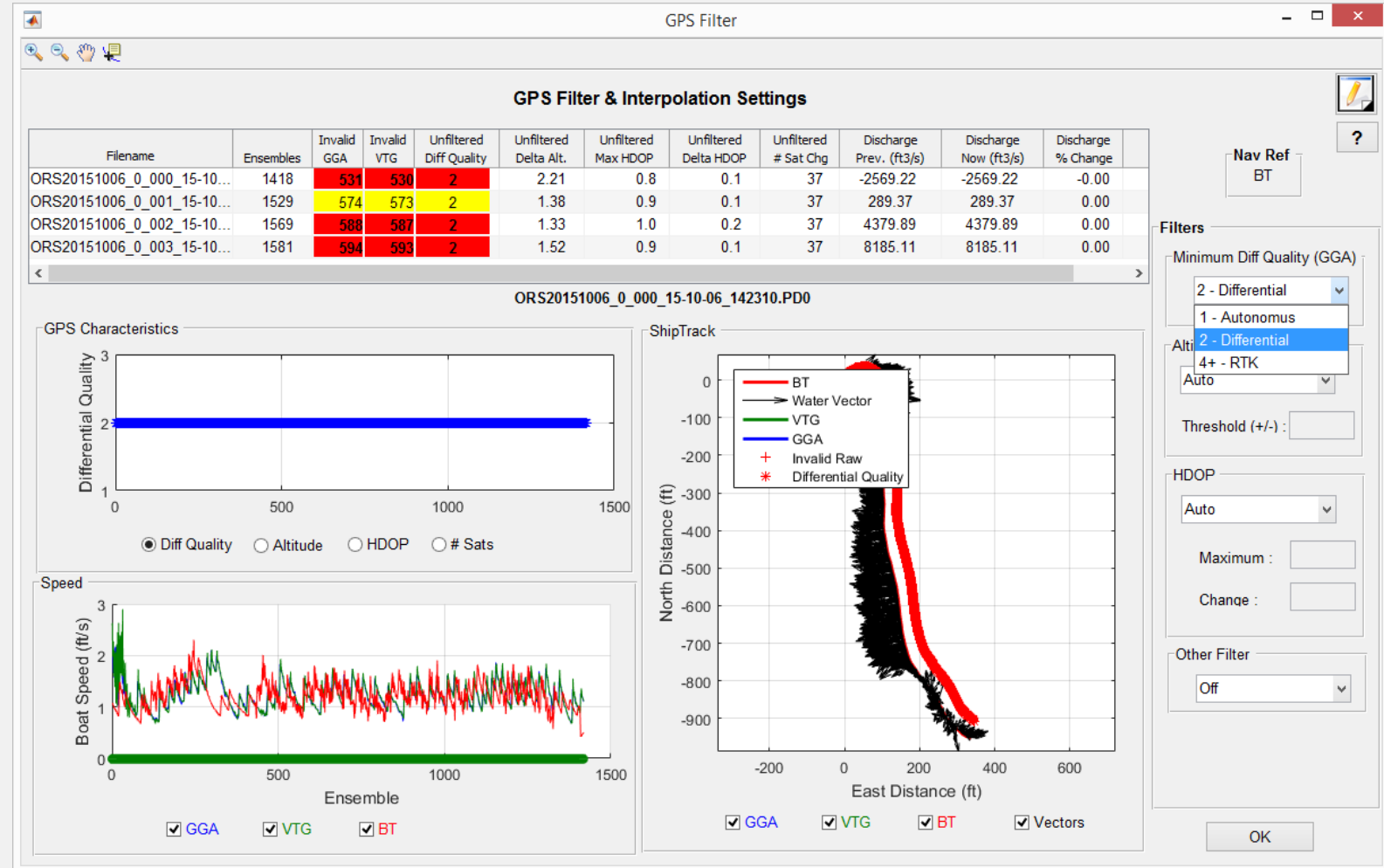
Change:

Other Filter: Off

OK

GPS - Minimum Diff Quality (GGA)

- Minimum quality of GPS GGA data required
 - 1 - Autonomous
 - 2 - Differential
 - Default
 - 4+ - RTK
- Does not affect VTG



GPS Filters – Altitude Change (GGA)

- Auto
 - Default
 - Set to 3 meters (9.84 ft)
- Manual
 - User specified
- Off
 - No Altitude Filter

The screenshot displays the 'GPS Filter' application window. At the top, the title bar reads 'GPS Filter'. Below it is the 'GPS Filter & Interpolation Settings' section, which contains a table with the following data:

Filename	Ensembles	Invalid GGA	Invalid VTG	Unfiltered Diff Quality	Unfiltered Delta Alt.	Unfiltered Max HDOP	Unfiltered Delta HDOP	Unfiltered # Sat Chg	Discharge Prev. (ft3/s)	Discharge Now (ft3/s)	Discharge % Change
ORS20151006_0_000_15-10...	1418	531	530	2	2.21	0.8	0.1	37	-2569.22	-2569.22	-0.00
ORS20151006_0_001_15-10...	1529	574	573	2	1.38	0.9	0.1	37	289.37	289.37	0.00
ORS20151006_0_002_15-10...	1569	588	587	2	1.33	1.0	0.2	37	4379.89	4379.89	0.00
ORS20151006_0_003_15-10...	1581	594	593	2	1.52	0.9	0.1	37	8185.11	8185.11	0.00

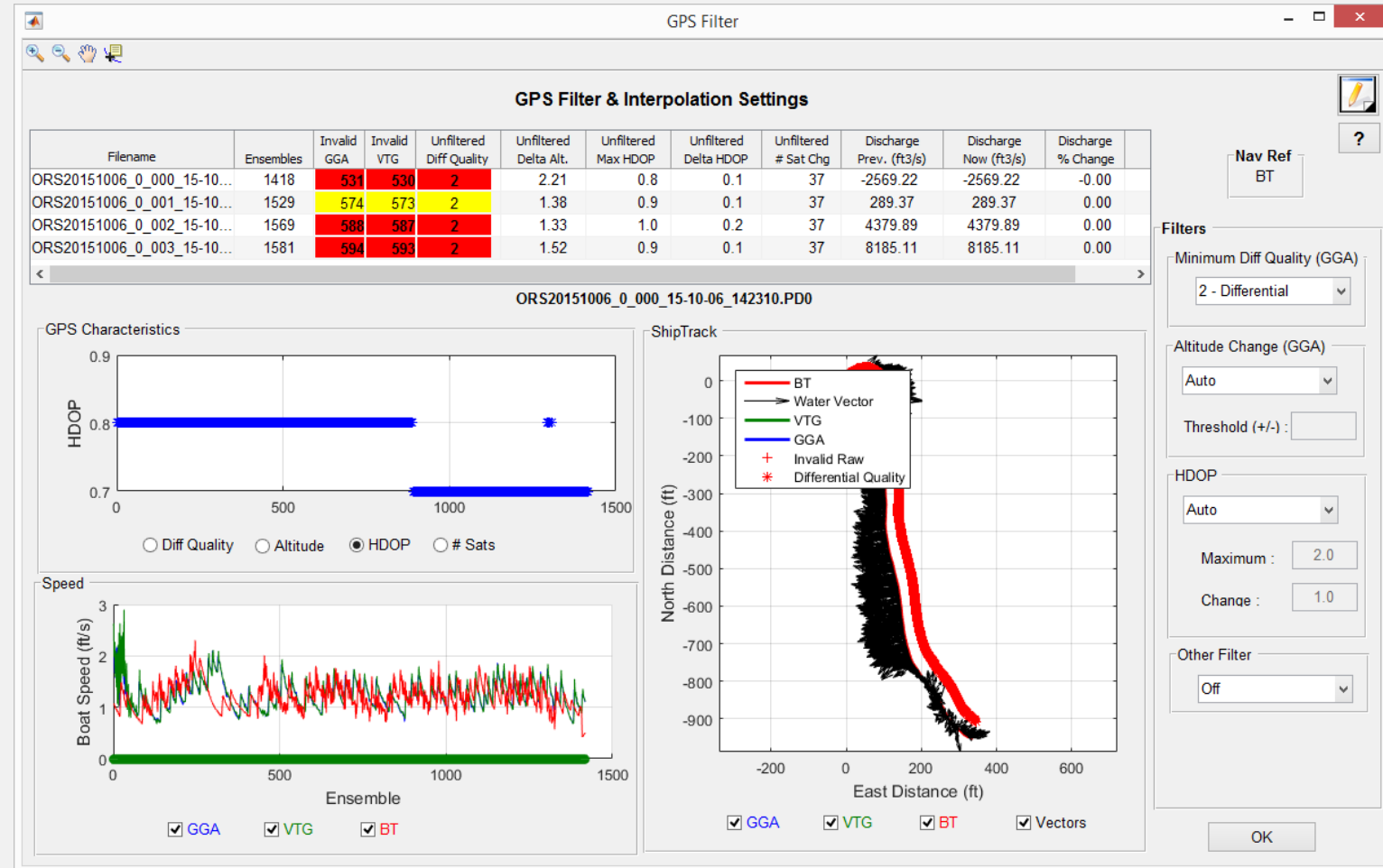
Below the table, the filename 'ORS20151006_0_000_15-10-06_142310.PD0' is displayed. The interface includes three main plots:

- GPS Characteristics:** A line graph showing Altitude (ft) on the y-axis (8 to 12) versus Ensemble on the x-axis (0 to 1500). The altitude fluctuates around 9-10 feet, with a peak near 12 feet. The 'Altitude' filter is selected.
- Speed:** A line graph showing Boat Speed (ft/s) on the y-axis (0 to 3) versus Ensemble on the x-axis (0 to 1500). The speed fluctuates between 1 and 2 ft/s. The 'GGA', 'VTG', and 'BT' filters are checked.
- ShipTrack:** A 2D plot showing North Distance (ft) on the y-axis (-900 to 0) versus East Distance (ft) on the x-axis (-200 to 600). It displays a track with a red line for BT, a green line for VTG, and a blue line for GGA. The track shows a sharp turn and then a straight path.

On the right side, the 'Filters' panel is visible, showing the 'Altitude Change (GGA)' filter set to 'Auto'. Other filters like 'Minimum Diff Quality (GGA)' and 'HDOP' are also shown.

GPS Filters - HDOP

- Auto
 - Default
 - Sets maximum HDOP to 2 and maximum change to 1
 - This may filter out data that is needed
- Manual
 - User selected
 - Maximum HDOP
 - Change in HDOP
- Off
 - No HDOP Filter



HDOP – Horizontal Dilution of Precision: Measure of possible error (GPS accuracy) due to the geometry of the satellites visible to the GPS receiver (lower is better, < 2 preferred)

GPS Filters - Other

- Smooth
 - LOWESS smooth filter with dynamic moving window applied to detect and remove spikes
- Off
 - Default
 - No spike detection filter applied

GPS Filter

GPS Filter & Interpolation Settings

Filename	Ensembles	Invalid GGA	Invalid VTG	Unfiltered Diff Quality	Unfiltered Delta Alt.	Unfiltered Max HDOP	Unfiltered Delta HDOP	Unfiltered # Sat Chg	Discharge Prev. (ft3/s)	Discharge Now (ft3/s)	Discharge % Change
ORS20151006_0_000_15-10...	1418	531	530	2	2.21	0.8	0.1	37	-2569.22	-2569.22	-0.00
ORS20151006_0_001_15-10...	1529	574	573	2	1.38	0.9	0.1	37	289.37	289.37	0.00
ORS20151006_0_002_15-10...	1569	588	587	2	1.33	1.0	0.2	37	4379.89	4379.89	0.00
ORS20151006_0_003_15-10...	1581	594	593	2	1.52	0.9	0.1	37	8185.11	8185.11	0.00

ORS20151006_0_000_15-10-06_142310.PDO

GPS Characteristics

Diff Quality
 Altitude
 HDOP
 # Sats

ShipTrack

GGA
 VTG
 BT
 Vectors

Filters

Minimum Diff Quality (GGA): 2 - Differential

Altitude Change (GGA): Auto

Threshold (+/-):

HDOP: Auto

Maximum: 2.0

Change: 1.0

Other Filter: Off

OK

Select Reference

- Select Data
- Display Units
- ADCP / Processing
- System Test
- Compass
- Temperature
- Moving-bed Test
- User Input
- BT Filters
- GPS Filters
- Select Reference**
- Depth Filters
- WT Filters
- Extrapolation
- Edges
- View Comments
- Save
- Close

Select Reference

Navigation Reference Selection

	Filename	# Ensembles	# Ref BT	# Ref GGA	# Ref VTG	# Ref INT	Discharge Prev. (ft3/s)	Discharge Now (ft3/s)	Discharge % Change
1	20160115143543r.mat	149	149	0	0	0	170.71	170.71	0.00
2	20160115143828r.mat	151	149	0	0	2	175.39	175.39	0.00
3	20160115144115r.mat	158	158	0	0	0	173.82	173.82	0.00
4	20160115144408r.mat	165	165	0	0	0	170.01	170.01	0.00

20160115144115r.mat

Reference Used (INT=Interpolated, INV=Invalid)

Speed

ShipTrack

Selected Reference

- BT
- GGA
- VTG

Composite Tracks

- On
- Off

OK

Depths

- Select Data
- Display Units
- ADCP / Processing
- System Test
- Compass
- Temperature
- Moving-bed Test
- User Input
- BT Filters
- GPS Filters
- Select Reference
- Depth Filters**
- WT Filters
- Extrapolation
- Edges
- View Comments
- Save
- Close

Depth Filter

Depth Filter & Interpolation Settings

Filename	# Ensembles	# Invalid Beam 1	# Invalid Beam 2	# Invalid Beam 3	# Invalid Beam 4	# Invalid Vert Beam	# Invalid External	Discharge Prev. (ft3/s)	Discharge Now (ft3/s)	Discharge % Change
20140514155114r.mat	472	1	0	1	2	27		1189.99	1189.99	0.00
20140514155923r.mat	432	17	13	20	6	57		1192.25	1192.25	0.00

20140514155114r.mat

Individual beams

Cross Section

Depth Reference: Comp 4-Beam Pref...

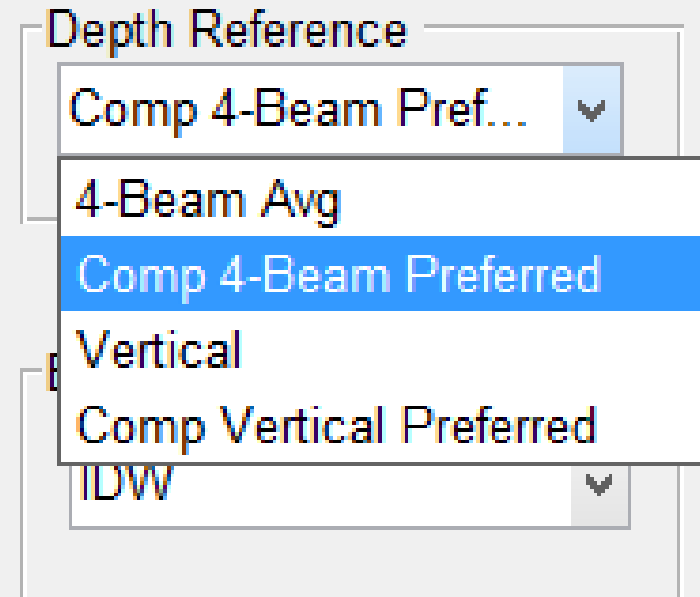
BT Beam Averaging: IDW

Filter: Smooth

OK

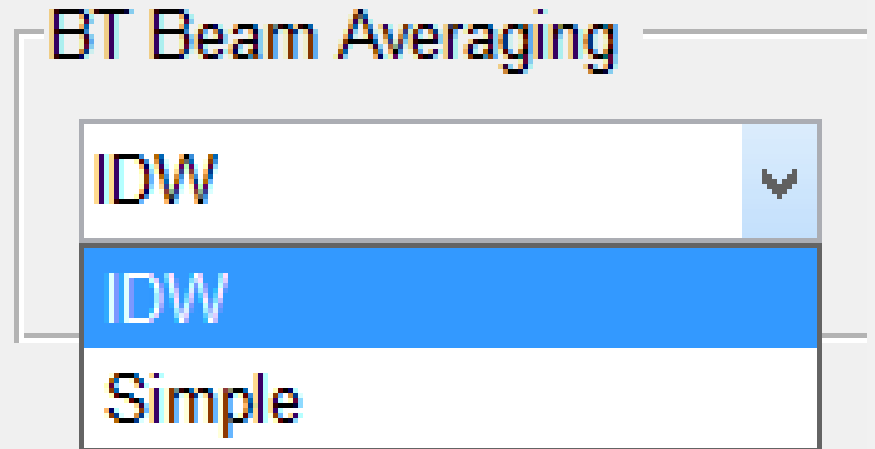
Depth Reference Options

- **Comp 4-Beam Preferred**
 - Default
 - Uses 4-beam average when available, if not uses depth sources
- **4-Beam Avg**
 - Will only use the average of the 4-beam bottom track depths
- **Vertical**
 - Will only use vertical beam depths
- **Comp Vertical Preferred**
 - Uses vertical beam when available, if not uses other depth sources



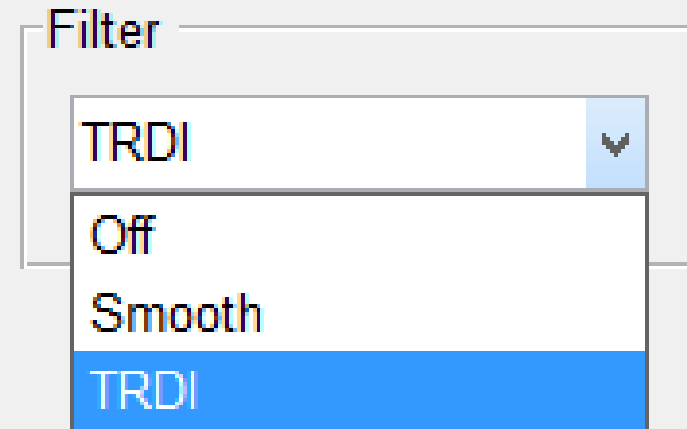
Bottom Track Depth Averaging Options

- IDW – Inverse Depth weighted Average - default
- Simple – Simple average of beam depths



Depth Options to Filter out spikes

- **Smooth:** uses a LOWESS smooth filter
 - Default
 - Can have issues with large gaps
- **TRDI** – Filter out a beam depth in an ensemble if it is > 1.75 time other beam depth
- **Off** – No filtering of depth data



WT Filters

- Select Data
- Display Units
- ADCP / Processing
- System Test
- Compass
- Temperature
- Moving-bed Test
- User Input
- BT Filters
- GPS Filters
- Select Reference
- Depth Filters
- WT Filters
- Extrapolation
- Edges
- View Comments
- Save
- Close

WT Filter
- □ ×

Water Track Filter & Interpolation Settings
📄

Filename	# Depth Cells	% 3 Beams	% Invalid Total	% Invalid Orig	% Invalid 3 Beam	% Invalid Error Vel	% Invalid Vert Vel	% Invalid Other	% Invalid SNR	Discharge Prev. (ft ³ /s)	Discharge Now (ft ³ /s)	Discharge % Change
20160115143543r.mat	3008	0.0	1.8	1.8	0.0	0.0	0.0	0.0	0.0	170.71	170.71	0.00
20160115143828r.mat	3079	0.0	1.9	1.8	0.0	0.1	0.1	0.0	0.0	175.39	175.39	0.00
20160115144115r.mat	3197	0.0	2.0	1.9	0.0	0.0	0.1	0.0	0.0	173.82	173.82	0.00
20160115144408r.mat	3441	0.0	1.5	1.4	0.0	0.0	0.0	0.0	0.0	170.01	170.01	0.00

Nav Ref
BT

20160115143828r.mat

Graphics

3 Beam Solutions All Time Series
 Vertical Velocity Other
 Error Velocity Contour showing invalid
 SNR Range

Filters

Excluded Distance Below Xducer:

3 Beam Solutions:

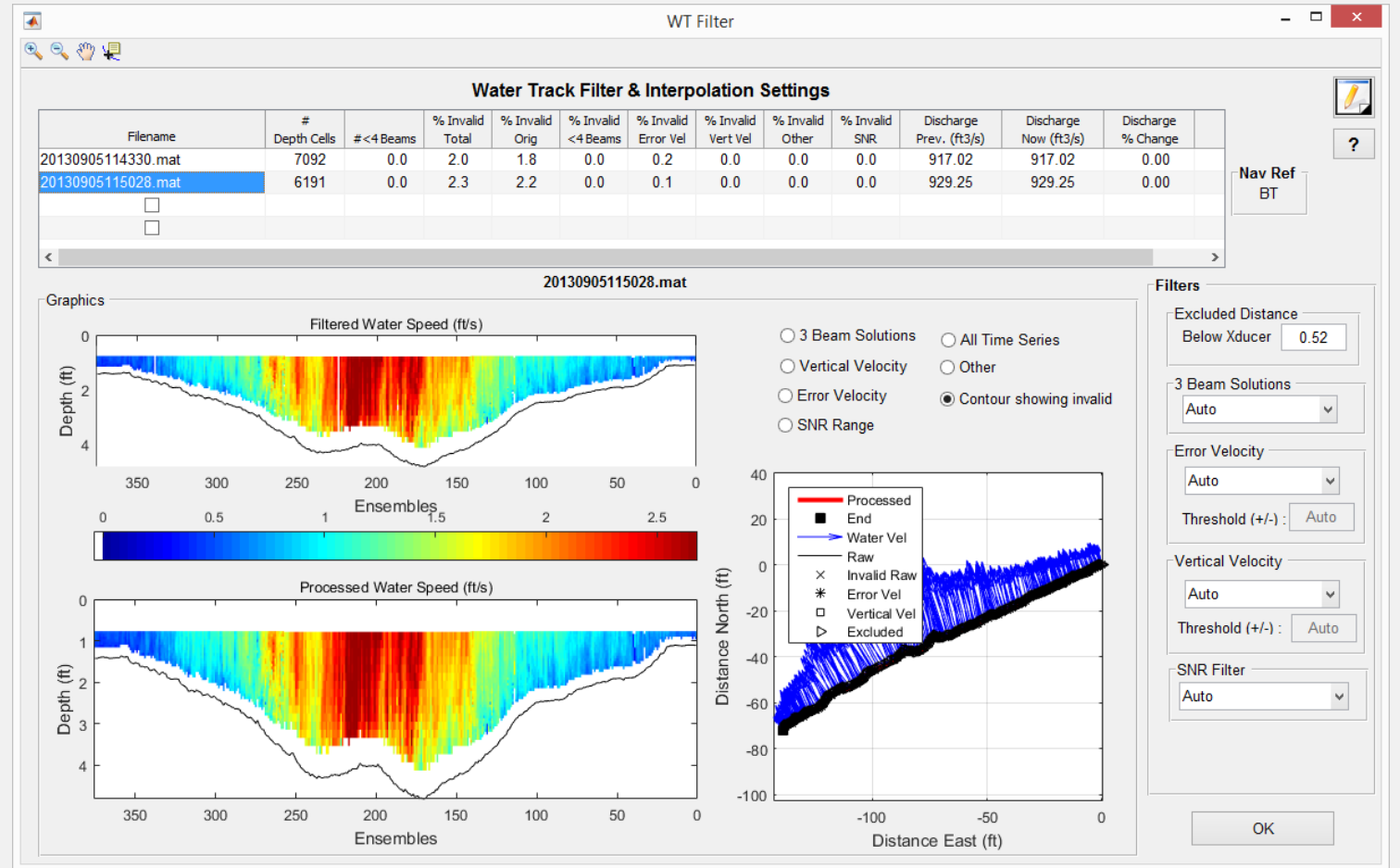
Error Velocity: Threshold (+/-):

Vertical Velocity: Threshold (+/-):

SNR Filter:

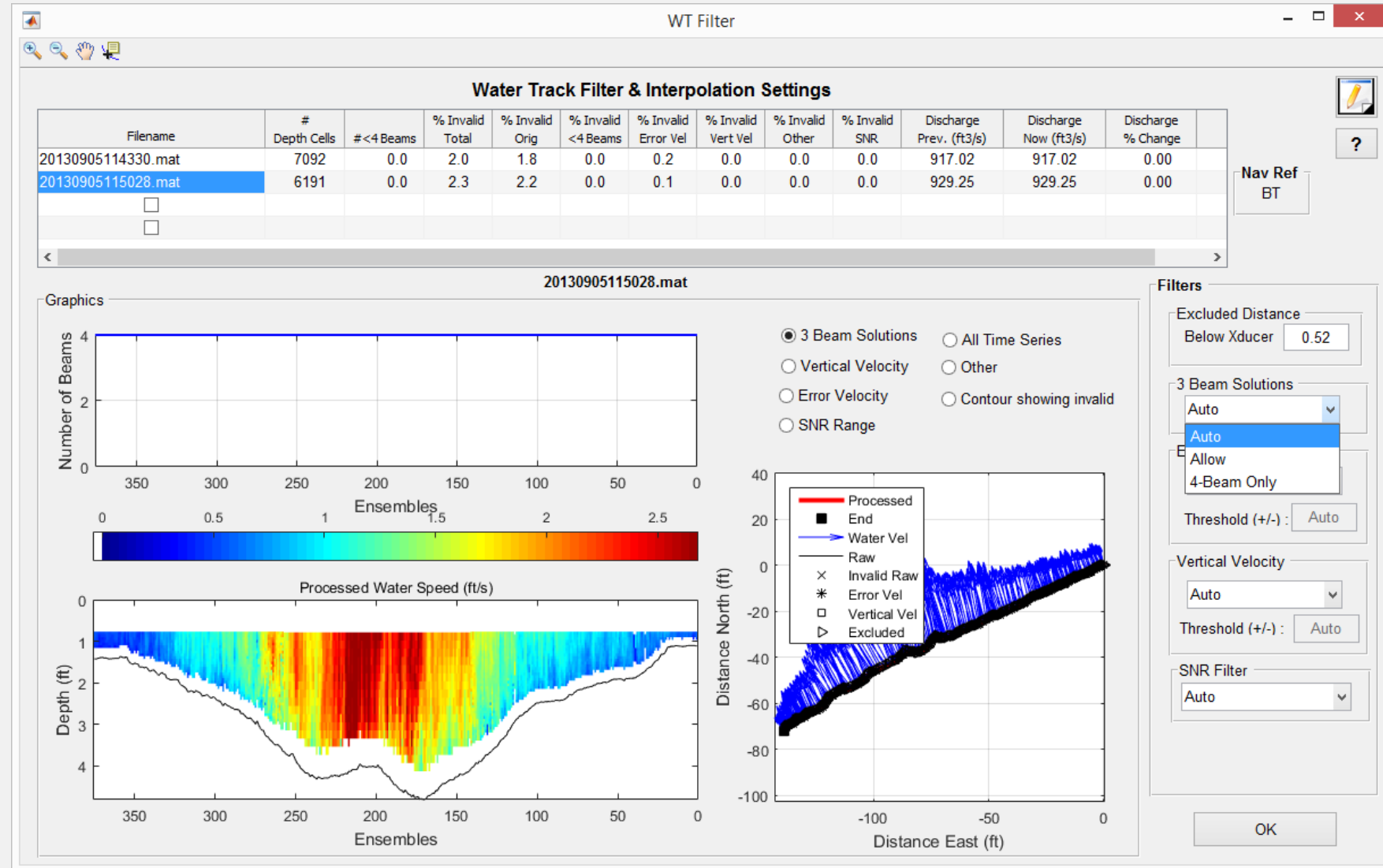
WT Filter – Excluded Distance

- Will exclude any data down to this distance below the ADCP
- For M9 defaults to .52 ft (to screen out water velocities possibly affected by flow disturbance)



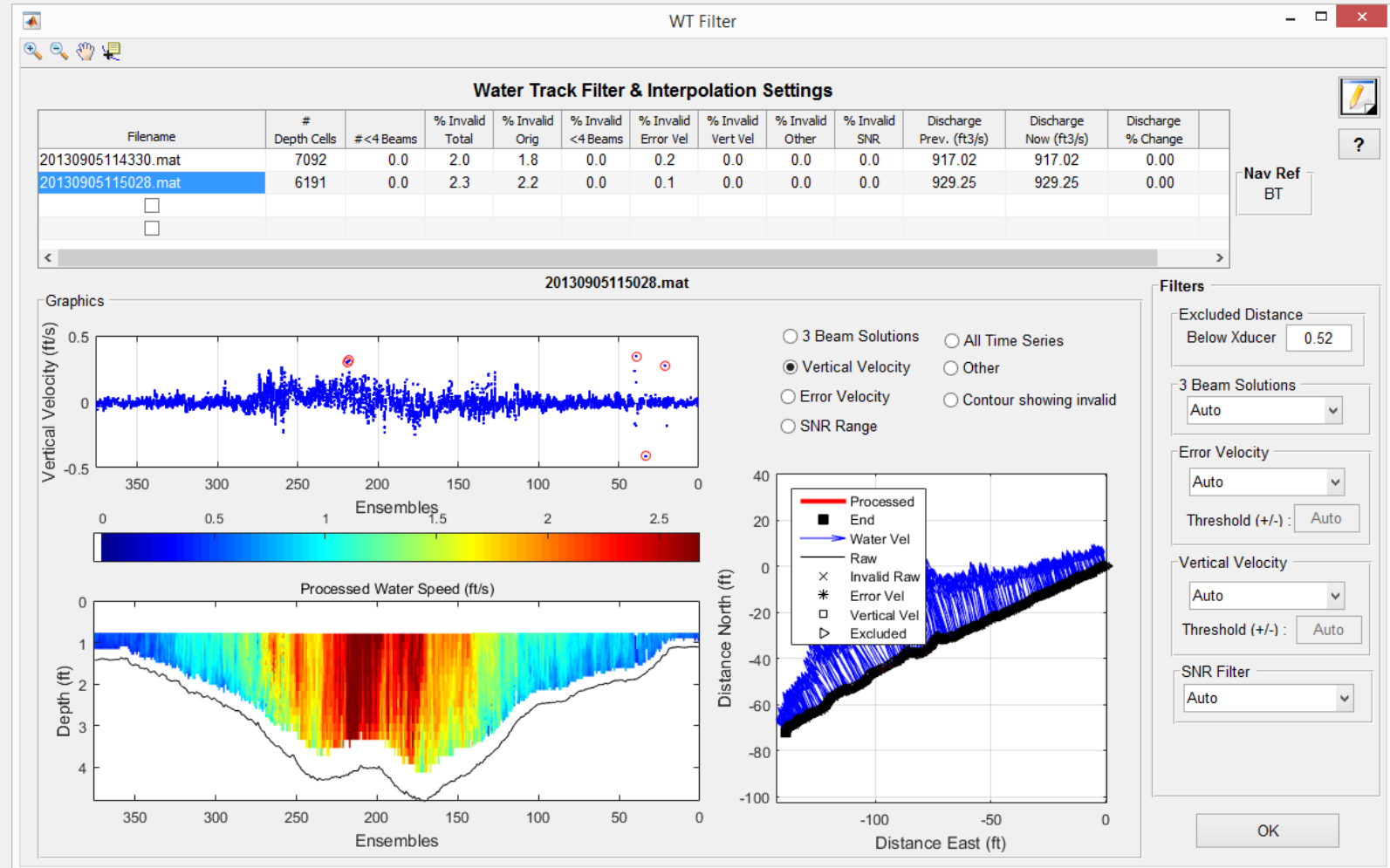
WT Filters – 3-Beam Solutions

- **Auto**
 - Default
 - Evaluates 3-beam solutions using neighboring data
- **Allow** - will use 3-beam solutions
- **4-Beam Only** – requires all 4 beams to have valid velocity



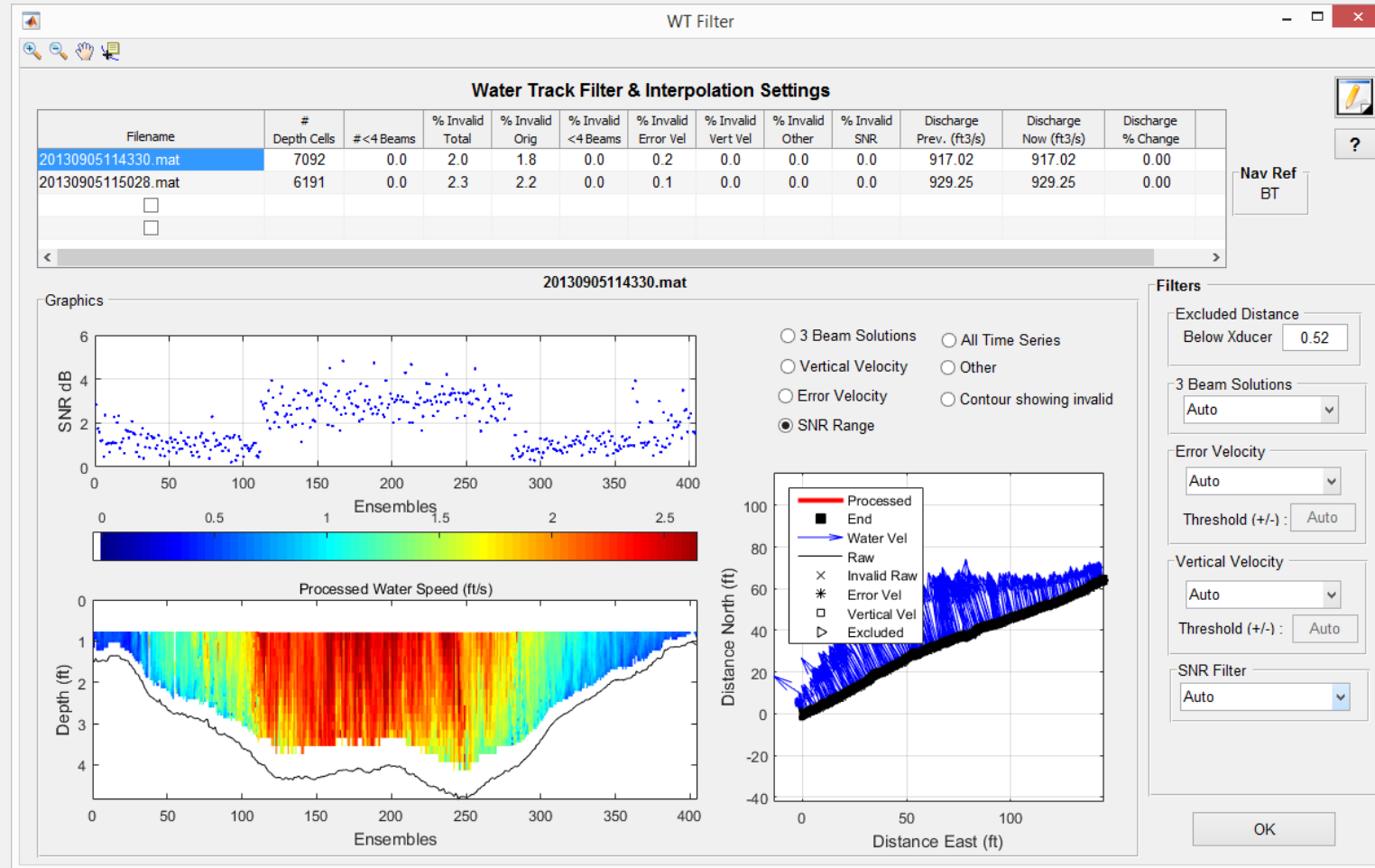
WT Filters – Vertical Velocity

- Auto
 - Default
 - Use variance of vertical velocity data to automatically set threshold limits for each transect
- Manual
 - User enters value that is applied to all transects
- Off
 - No vertical velocity filter applied
- For water track, these are the vertical velocities in each depth cell

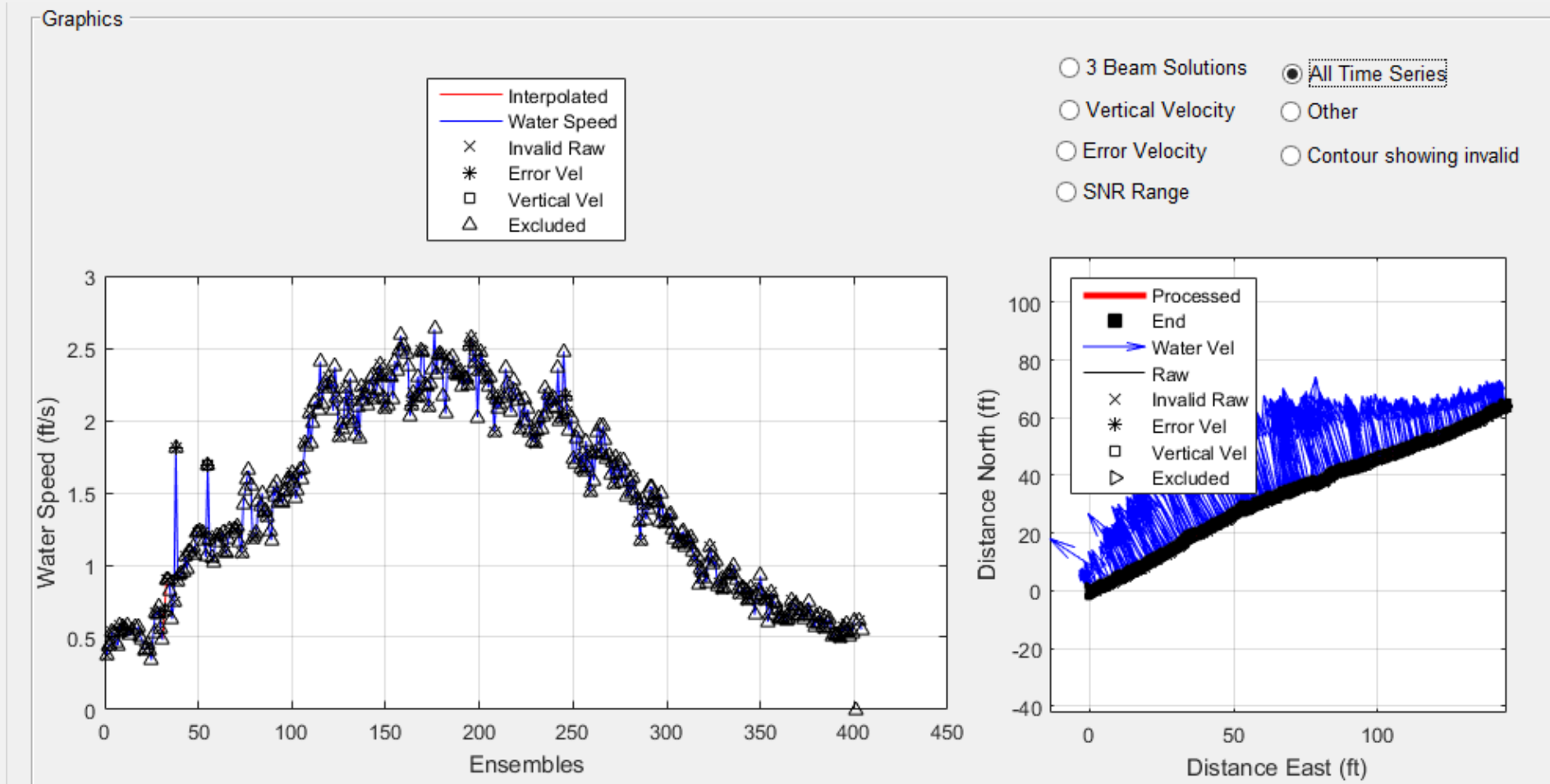


WT Filters – SNR Filter

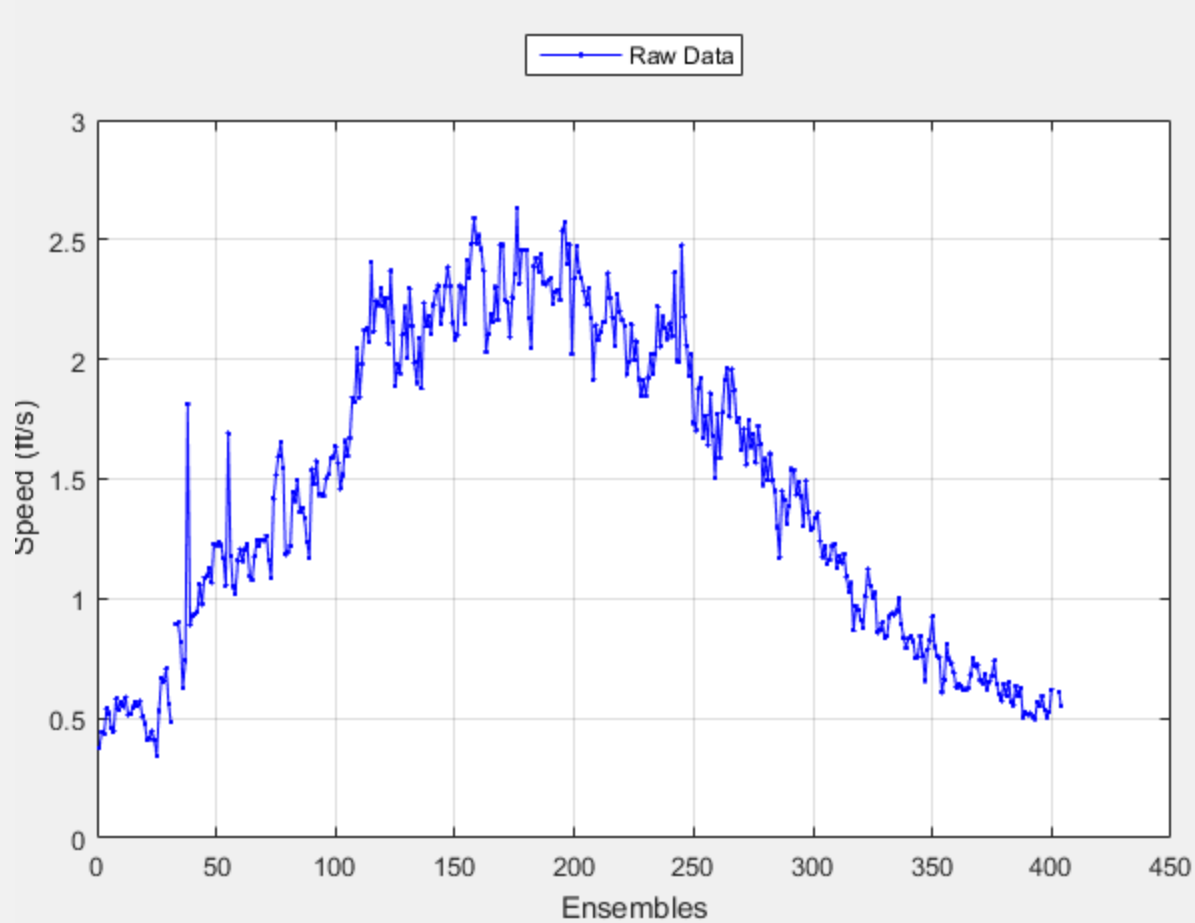
- Currently can only be applied to SonTek Data
- Looks for differences between beam SNR in an attempt to filter out data that might be affected by air/bubbles in front of transducers
- Defaults on Auto with no Manual setting (SonTek Only)



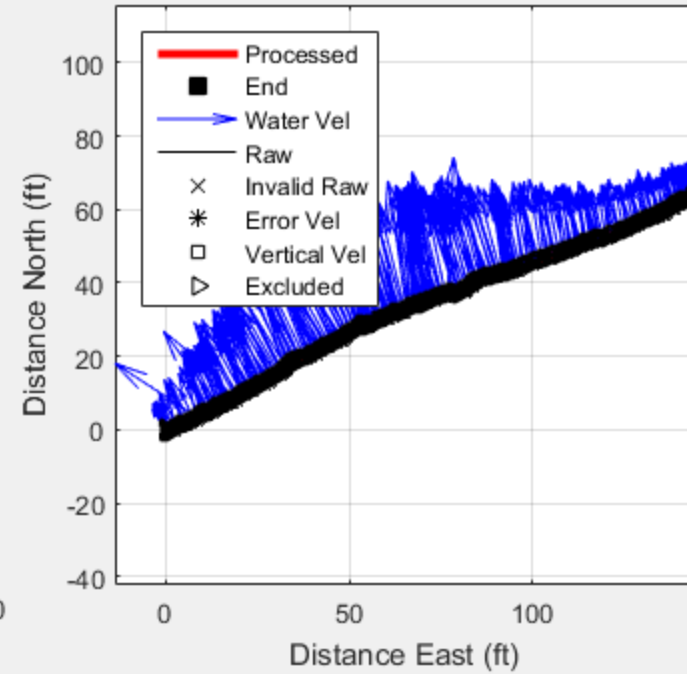
WT Filters – “All Time Series” Graph



WT Filters – “Other” Graph

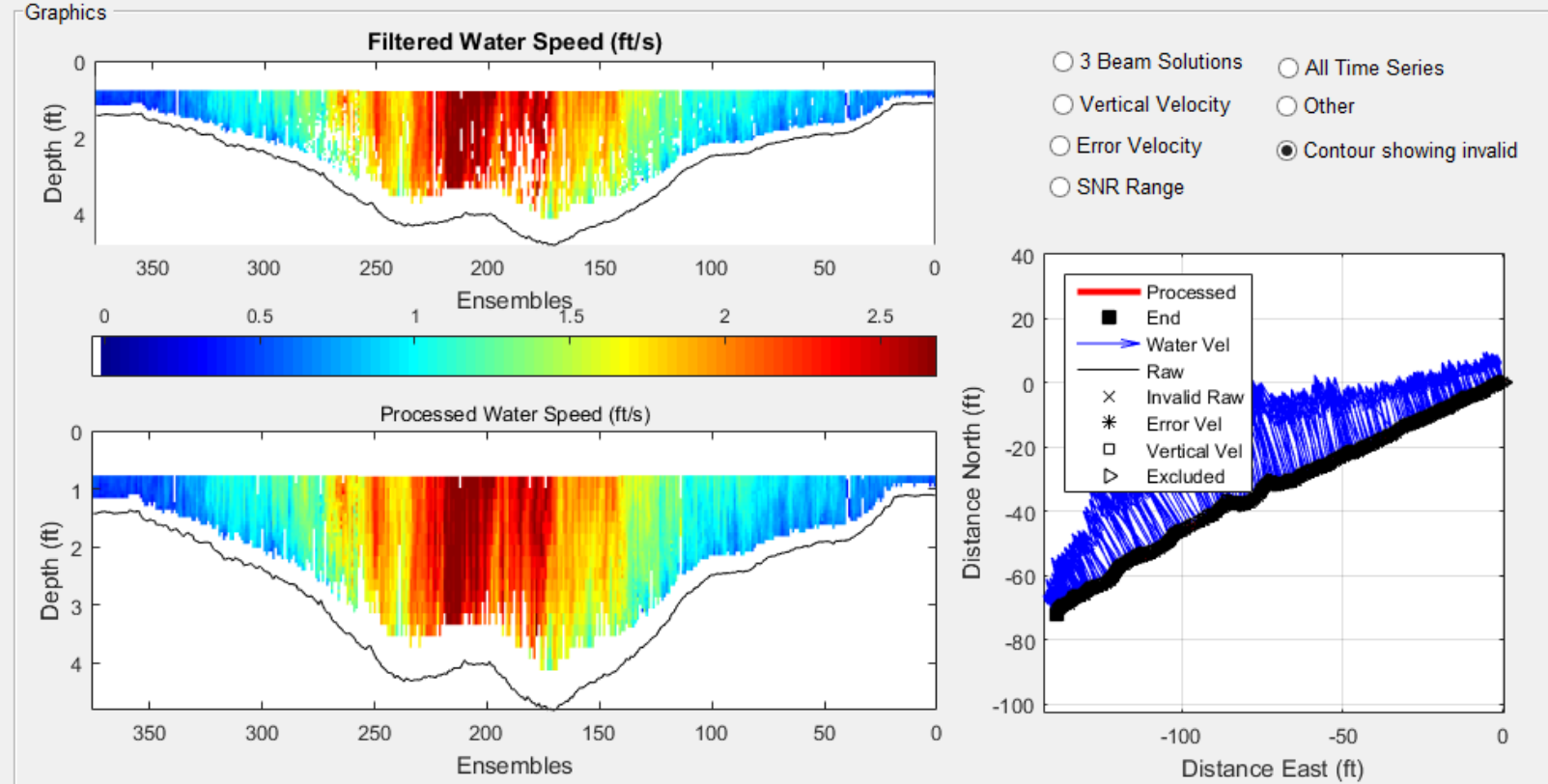


- 3 Beam Solutions
- All Time Series
- Vertical Velocity
- Other
- Error Velocity
- Contour showing invalid
- SNR Range



WT Filters – “Contour Showing Invalid” Graph

- Default view when entering WT Filters dialog
- Top graph shows contour with white space for invalid data
- Bottom graph is contour including interpolated velocities



QRev Checks: BT, GPS, Depths, WT

- **Percent of ensembles with invalid (5%)**
- **Percent of discharge interpolated for consecutive ensembles (3%, 5%)**
- **Overall percent of discharge interpolated (25%)**

Extrapolation

- Select Data
- Display Units
- ADCP / Processing
- System Test
- Compass
- Temperature
- Moving-bed Test
- User Input
- BT Filters
- GPS Filters
- Select Reference
- Depth Filters
- WT Filters
- Extrapolation**
- Edges
- View Comments
- Save
- Close

Extrapolation

Data

Z	No. Pts.
NaN	0
NaN	0
NaN	0
NaN	0
NaN	0
NaN	0
0.6675	81
0.6208	373
0.5725	815
0.5249	1006
0.4752	1043
0.4247	1025
0.3748	1031
0.3246	1022
0.2751	1015
0.2254	997
0.1771	798
0.1400	189
NaN	0

Change Threshold

Subsection

Discharge

Profile

Depth Cell: Data, Surface Cells

Transects: Medians, Fit

Measurement: Medians, Fit

Start edge: Left Right

Fit

20160115143543r.mat
20160115143828r.mat
20160115144115r.mat
20160115144408r.mat
Measurement

Fit: Automatic

Top: Power

Bottom: Power

Exponent: 0.2196

Previous Extrapolation Settings

Top: Power
Bottom: Power
Exponent: 0.2196

Discharge Sensitivity

Top	Bottom	Exponent	% Difference
Power	Power	0.1667	Reference
Power	Power	0.2196	0.92
Constant	No Slip	0.1667	-2.06
Constant	No Slip	0.1667	-2.06
3-Point	No Slip	0.1667	0.15
3-Point	No Slip	0.1667	0.15

Cancel OK

Edges

- Select Data
- Display Units
- ADCP / Processing
- System Test
- Compass
- Temperature
- Moving-bed Test
- User Input
- BT Filters
- GPS Filters
- Select Reference
- Depth Filters
- WT Filters
- Extrapolation
- Edges**
- View Comments
- Save
- Close

Edges

Edge Settings

	Filename	Start Edge	Left Type	Left Coef	Left Distance (ft)	Left # Ens	Left # Valid	Left Discharge (ft ³ /s)	Right Type	Right Coef	Right Distance (ft)	Right # Ens	Right # Valid	Right Discharge (ft ³ /s)
1		All Tra												
2	20160115143543r.mat	Right	Triangular	0.3535	5.0	8	8	1.62	Triangular	0.3535	7.0	11	11	1.66
3	20160115143828r.mat	Left	Triangular	0.3535	5.0	10	10	1.85	Triangular	0.3535	7.0	5	5	2.37
4	20160115144115r.mat	Right	Triangular	0.3535	5.0	4	4	1.81	Triangular	0.3535	7.0	6	6	1.87
5	20160115144408r.mat	Left	Triangular	0.3535	5.0	6	6	1.33	Triangular	0.3535	7.0	4	4	2.42

20160115143828r.mat

Left Edge

Water Speed (ft/s) heatmap showing velocity distribution across Depth (ft) and Ensemble. The color scale ranges from 0 (blue) to 0.8 (red). The Distance North (ft) vs Distance East (ft) profile shows a red line with blue arrows indicating flow direction.

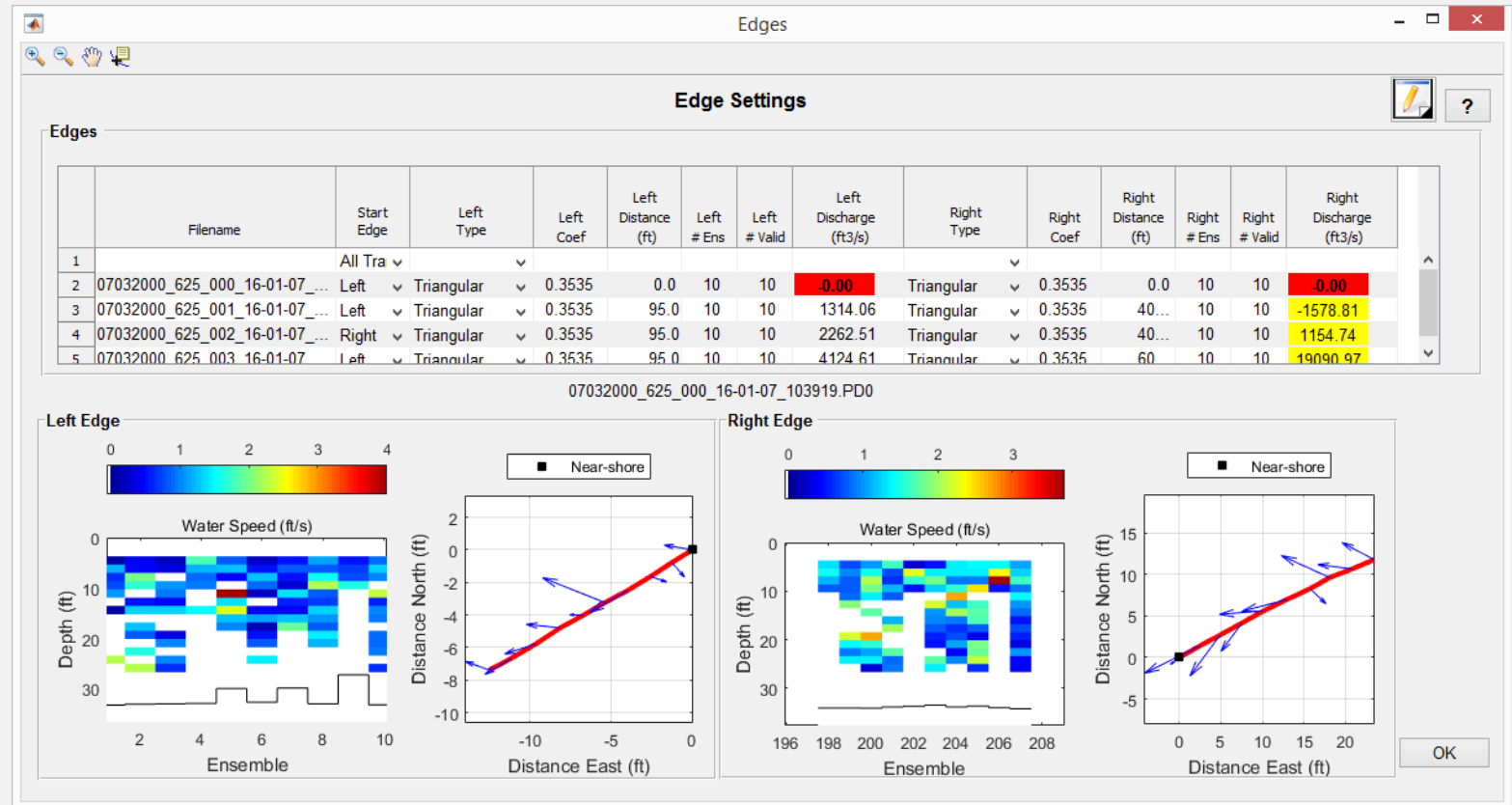
Right Edge

Water Speed (ft/s) heatmap showing velocity distribution across Depth (ft) and Ensemble. The color scale ranges from 0 (blue) to 0.6 (red). The Distance North (ft) vs Distance East (ft) profile shows a red line with blue arrows indicating flow direction.

OK

QRev Edges Check

- Sign of edge discharge consistent
- Consistent edge type for each edge
- Edge discharge $> 5\%$
- Edge discharge = 0



Measurement Quality Assessment – Main Window

- Tables to assist in rating in quality and uncertainty of measurement
 - COV % of: total discharge, width, area
 - % discharge in: left/right edge, invalid cells, invalid ensembles
 - Automatic and any User estimated uncertainty of various aspects of the measurement.
 - User can enter estimates in right column
 - Last row = overall estimated uncertainty of measurement

Measurement Quality Assessment

	COV %		% Q
Q:	1.48	Left/Right Edge:	0.96 / 1.21
Width:	0.93	Invalid Cells:	0.11
Area:	0.75	Invalid Ens:	0.24
Parameter		Automatic	User
Random Uncertainty		2.4	
Invalid Data Uncertainty		0.1	
Edge Q Uncertainty		0.6	
Extrapolation Uncertainty		1.3	
Moving-Bed Test Uncertainty		1.0	
Systematic Uncertainty		1.5	
Estimated 95% Uncertainty		4.2	4.2

QRev Measurement Quality Assessment Summed Up

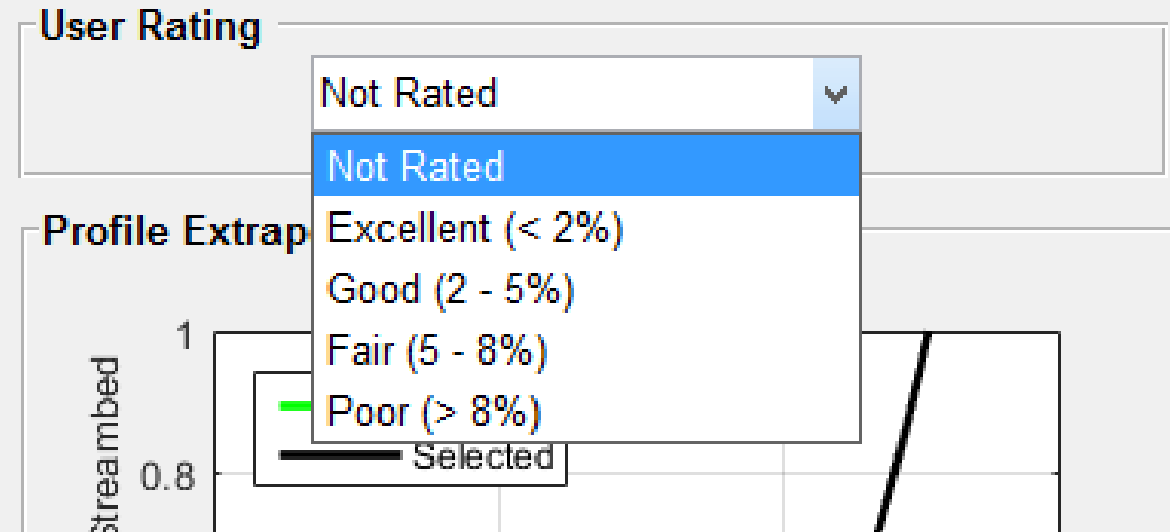
- Random – uses the Q COV and # transects
- Invalid – 20% of the sum % discharge for invalid cells and ensembles
- Edge - 30% of total discharge in edges
- Extrapolation – % difference in Q from selected extrap to other extrap methods and average of best 4 options
- Moving-Bed –
 - Bottom track not reference = 0%
 - bottom track used
 - valid moving bed test with no moving bed = 1%.
 - moving bed present and correction applied = 1.5%.
 - moving bed test warnings, invalid, or not done = 3%
- Systematic – 1.5% (for biases in ADCPs and beam misalignment)
- User column for adjusting Automatic computed uncertainties

Measurement Quality Assessment

	COV %		% Q
Q:	5.37	Left/Right Edge:	0.14 / 0.07
Width:	2.62	Invalid Cells:	0.14
Area:	2.30	Invalid Ens:	42.57
Parameter		Automatic	User
Random Uncertainty		8.5	
Invalid Data Uncertainty		8.5	
Edge Q Uncertainty		0.1	
Extrapolation Uncertainty		0.5	
Moving-Bed Test Uncertainty		1.5	
Systematic Uncertainty		1.5	
Estimated 95% Uncertainty		12.5	12.5

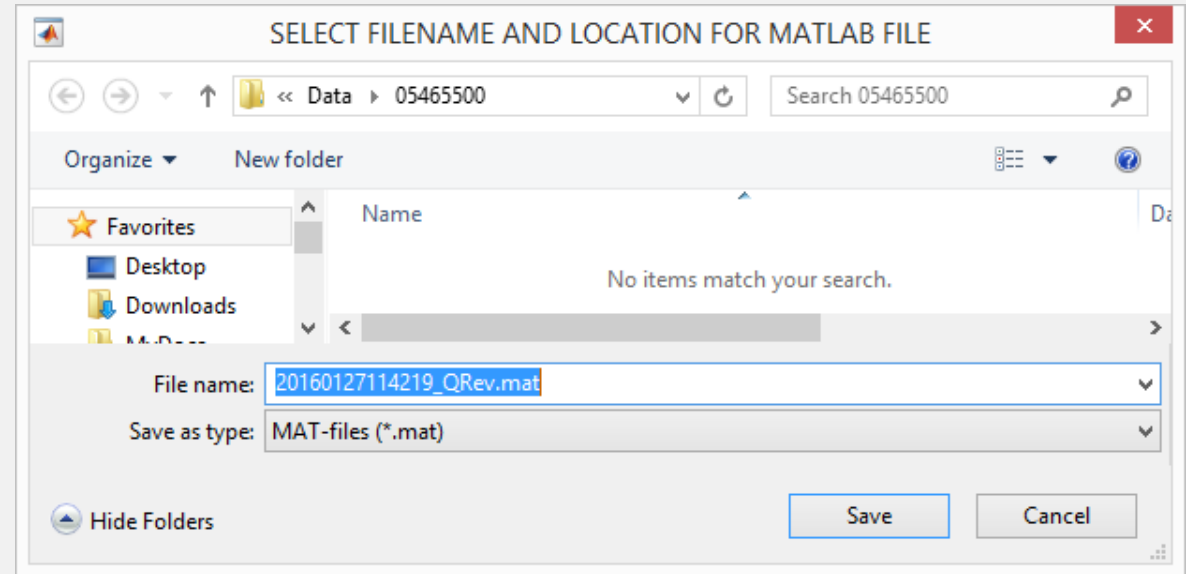
User Rating – Main Window

- Provides dropdown menu for user to rate the measurement
- Consider
 - Measurement Quality Assessment uncertainty value
 - Quality of stage measurement
 - Any other factors that might affect overall quality of measurement



Save

- Opens Save Dialog box for saving QRev Matlab file (*_QRev.mat) and QRev xml file (*_QRev.xml)
- If data are later reviewed or reprocessed the *_QRev.mat file should be loaded in QRev
- The *_QRev.xml summary file is for loading into SVMobile
- Defaults to folder where data was loaded
- The default QRev naming format which is YYYYMMDDHHMMSS_QRev.mat where date and time is current date and time

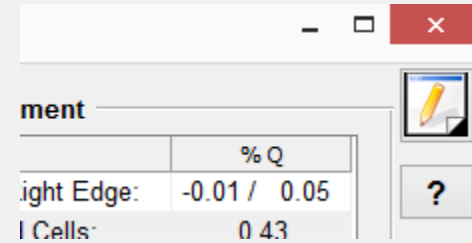


- Select Data
- Display Units
- ADCP / Processing
- System Test
- Compass
- Temperature
- Moving-bed Test
- User Input
- BT Filters
- GPS Filters
- Select Reference
- Depth Filters
- WT Filters
- Extrapolation
- Edges
- View Comments
- Save**
- Close

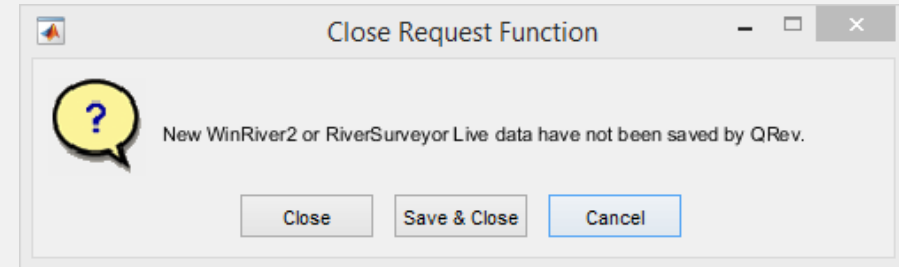
Close

- Select Data
- Display Units
- ADCP / Processing
- System Test
- Compass
- Temperature
- Moving-bed Test
- User Input
- BT Filters
- GPS Filters
- Select Reference
- Depth Filters
- WT Filters
- Extrapolation
- Edges
- View Comments
- Save
- Close**

- Exits QRev
- Any changes made that have not saved will be lost
- If you have imported a new measurement from WinRiver II or RSLive and not saved QRev will prompt
- No prompt while closing if
 - If you have already saved an imported Qm in QRev – even if changes made after save
 - If you open a QRev file – even if changes made without save



- Pressing the X button on the QRev main window also exits QRev



Workflow

- **Collect data in field using manufacturer software**
 - WinRiver II
 - RiverSurveyor Live
 - Use USGS procedures as before
- **Postprocess data in field using QRev**
 - For current versions of RSL you will need to reprocess the data in RSL to create the Matlab files.
 - Once data are loaded into QRev the manufacturer's software should not longer be used for processing.
- **Load data into SV Mobile**
 - *_QRev.xml
- **Office checking and review must be done in QRev using saved QRev file**
 - *_QRev.mat

Loading Acoustic Data

- Channel is “staged”; has documentation & notes, but no discharge.
- Import is used to load acoustic measurement data from file
- Summarize is used to manually enter flow info. Generally not used.

SensorsQE

DISCHARGE MEASUREMENT

IMPORT CHANNEL NEW CHANNEL

Name	QmMethod	Qm
Main	ADCP	staged

GH: Total Q:

Unshifted Q: % Diff:

Shifted Q: % Diff:

Rating #: Plot Rating

CANCEL DONE

File Type

This file has been identified as a QRev output file. Would you like to continue loading this file?

Yes No

Check/Edit Acoustic Info/Notes

SensorsQE

ACOUSTIC INFORMATION

Instrument Time Synchronized? **YES** ▾

Time of Synchronization: **15:01:00** [Calculator]

Instrument Tested? **YES** ▾

Compass Cal/Eval? **YES** ▾

GPS Unit Used: **None** [Calculator]

Boat/Motor Used: **OceanScience** [Calculator]

Moving Bed Present? **YES** ▾

Temperature/Salinity Readings

Acoustic Channel Notes

CANCEL **DONE**

SensorsQE

*Title: **QRev - FileSave 02/29/2016 13:56:4** [Calculator] **ADD**

*Comment:
20160229135644_QRev by dmueller Q=22519.17 ft3/s [Calculator]

Title	Note
QRev - FileSave ...	20160229135644_QRev by dmueller Q=22519.1...

Characters Left: **1815** **DONE**

Note: A red arrow points to the empty space below the table.

Notes added to SVMobile from the notes made within WinRiver II, RiverSurveyor or QRev

Not currently reviewable in QRev

- Heading
- Pitch
- Roll
- Correlations
- Intensities
- SonTek: change in magnetic field
- Subsectioning

If these need to be reviewed, use the manufacture software to review these characteristics but ***continue to process the data in QRev.***

?????? Questions ????????

The screenshot displays the QRev - 2.80 software interface. The window title is "QRev - 2.80 C:\dsm\dsm_downloads\0211139110_131\". The interface is divided into several sections:

- Left Panel:** A vertical stack of buttons for system configuration: "Select Data", "Display Units", "ADCP / Processing", "System Test" (highlighted in red), "Compass", "Temperature", "Moving-bed Test", "User Input", "BT Filters", "GPS Filters" (highlighted in red), "Select Reference", "Depth Filters", "WT Filters", "Extrapolation", "Edges", "View Comments", "Save", and "Close".
- Measurement Details (Units: English):** A table with columns for "PARAMETERS" and "MEASUREMENT" across five stations. The "DISCHARGE" section includes "Total Q (ft3/s)" and "Top Q (ft3/s)" through "Right Q (ft3/s)". The "TIME" section includes "Duration (s)", "Start Time", and "End Time". The "REFERENCE" section includes "Navigation Ref", "Composite Tracks", and "Depth Ref". The "MOVING-BED" section includes "Moving-bed" and "Correction".
- Measurement Quality Assessment:** A table showing "COV %" and "% Q" for "Q:", "Width:", and "Area:". Below this is a table for "Parameter", "Automatic", and "User" values for various uncertainty types, including "Estimated 95% Uncertainty".
- User Rating:** A dropdown menu currently set to "Not Rated".
- Profile Extrapolation:** A graph with "Normalized Distance from Streambed" on the y-axis (0 to 1) and "Normalized Unit Q" on the x-axis (0 to 1.5). It shows two data series: "Auto" (green line) and "Selected" (black line with error bars).
- Messages:** A text area containing system test results and error messages, such as "SYSTEM TEST: No system test;" and "bt-All: The percentage of invalid ensembles in a transect exceeds 5%;".