

The background of the slide is a light gray gradient with several realistic water droplets of various sizes scattered across it. The droplets have highlights and shadows, giving them a three-dimensional appearance. The main title is centered in the upper half of the slide.

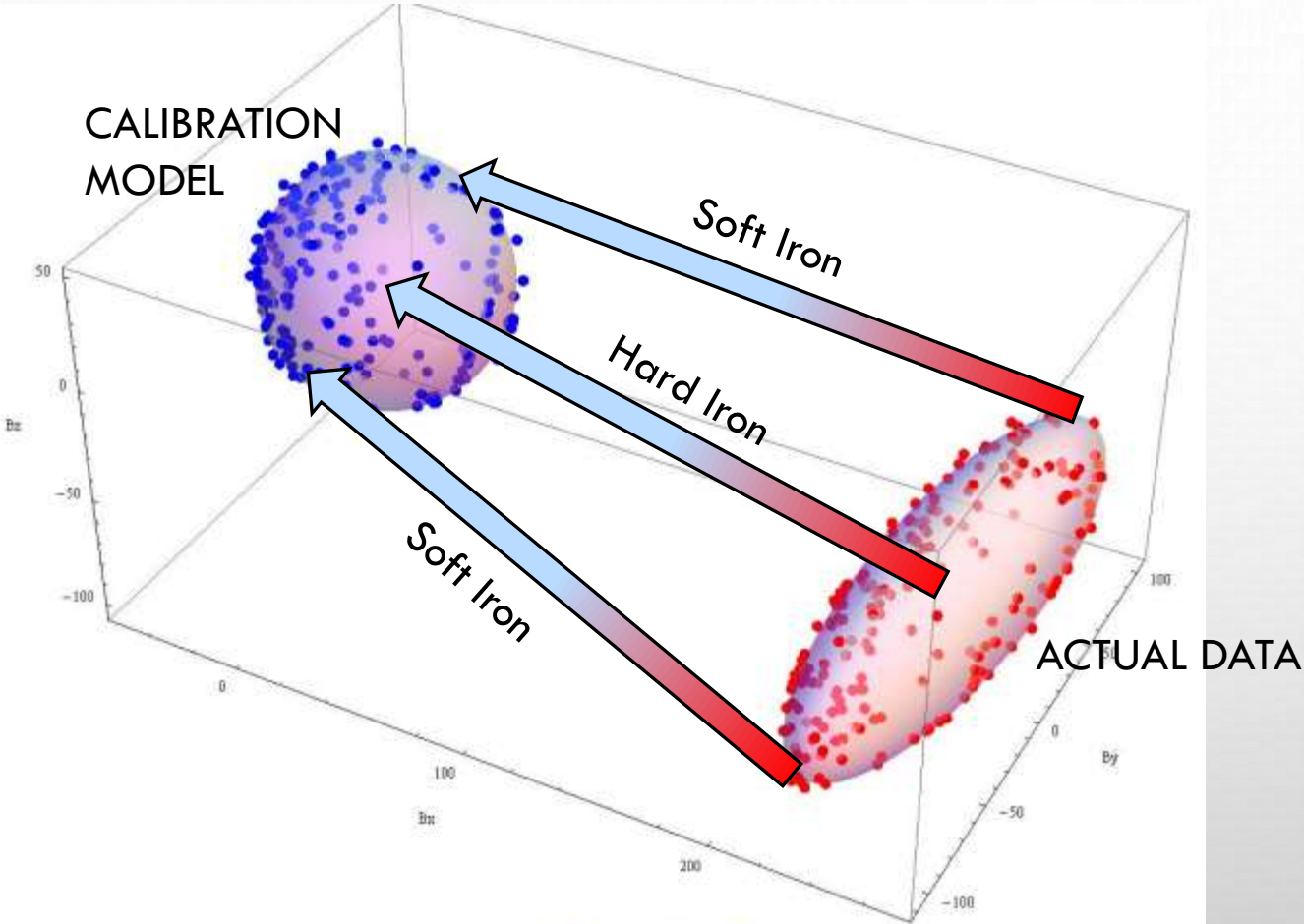
RIVERSURVEYOR M9/S5 COMPASS UPGRADE AND NEW FEATURES

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TOPICS TO BE DISCUSSED

- OBJECTIVE OF COMPASS CALIBRATIONS
- ISSUES WITH OLDER COMPASS
- G3 COMPASS IMPLEMENTATION
 - HARDWARE
 - USGS TESTING
 - SOFTWARE
 - COMPASS CALIBRATION
 - REAL-TIME WARNINGS
 - POST-PROCESSING – TIME SERIES
 - UPGRADE PROCEDURES
- OTHER NEW FEATURES IN RIVERSURVEYOR LIVE 3.8
 - COMPRESS FILES
 - FILE MANAGER
 - CHANGES TO MATLAB OUTPUT

COMPASS CALIBRATION



HARD IRON: Origin Offset
SOFT IRON: Shape Correction

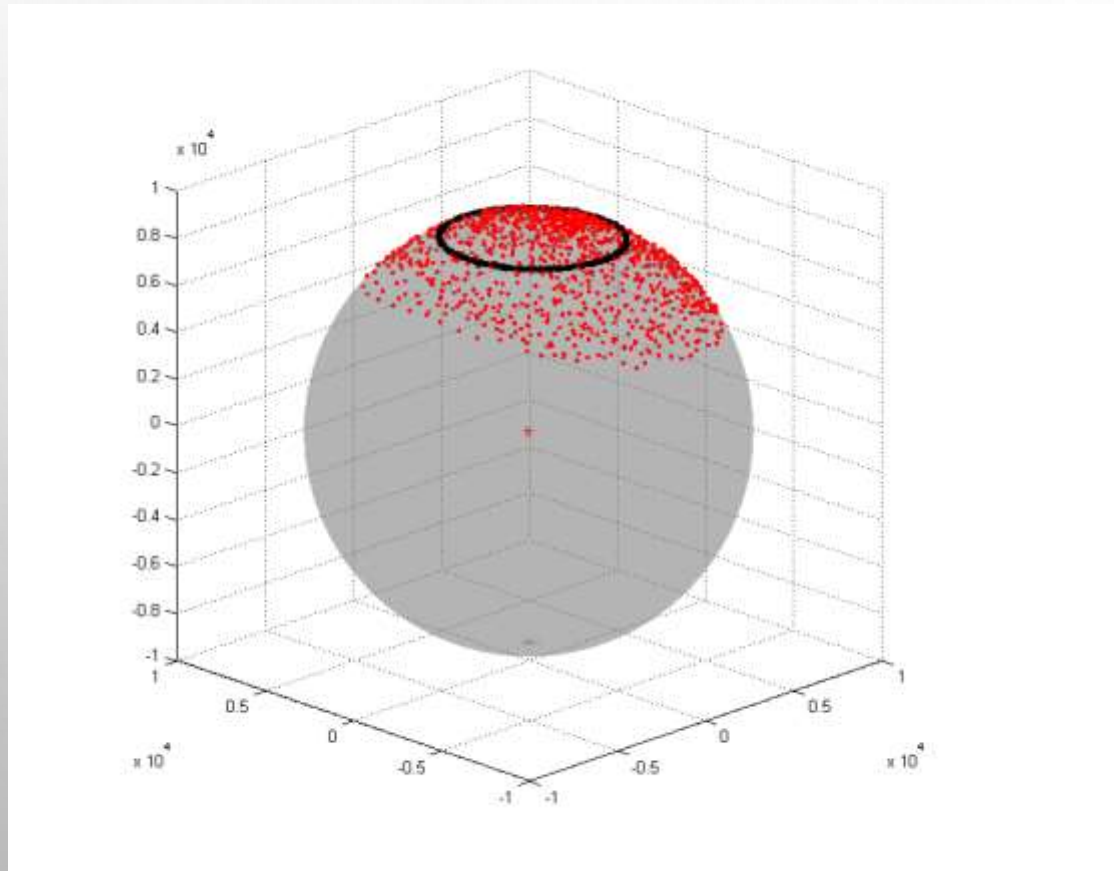
Figure 3. Combination plot showing Figures 1 and 2 showing uncalibrated and calibrated magnetometer measurements.

GOAL OF COMPASS CALIBRATIONS

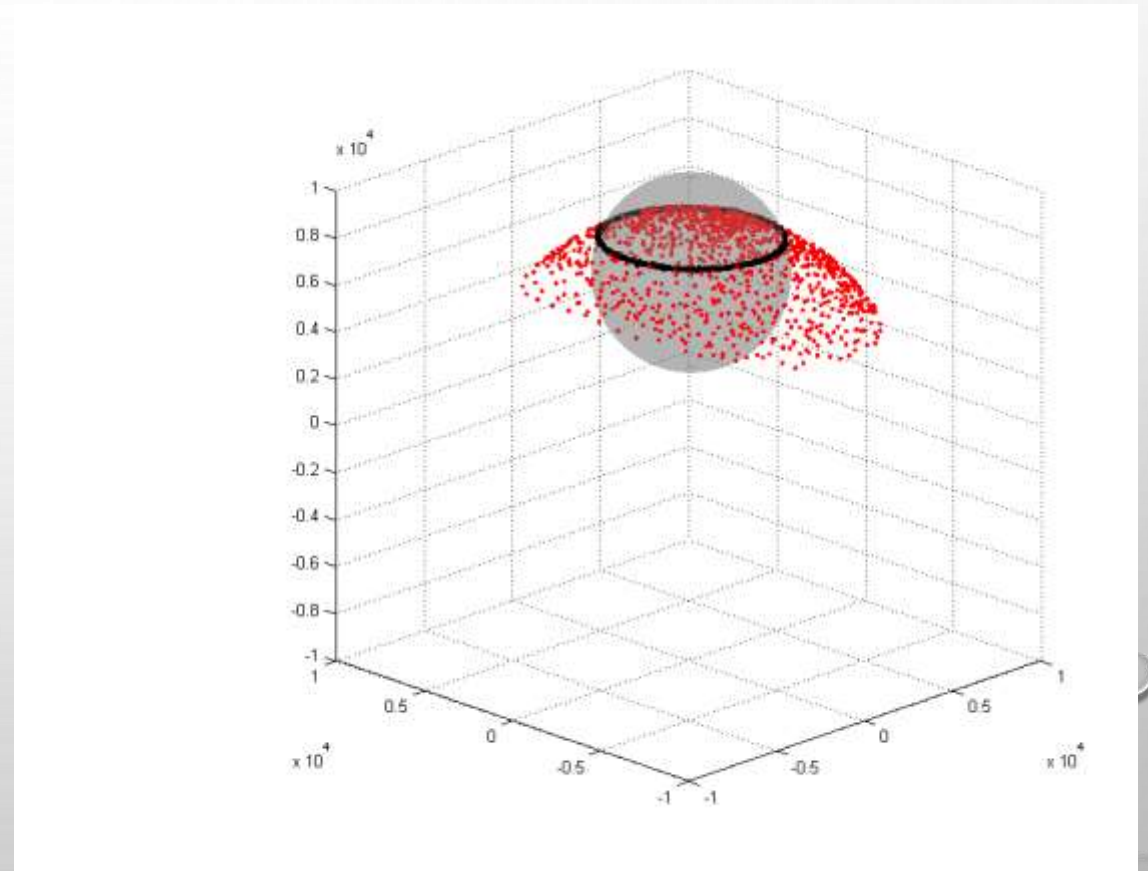
- COLLECT SUFFICIENT DATA TO ACCURATELY FIT AN ELLIPSOID TO THE RAW DATA AND DETERMINE THE APPROPRIATE X, Y, AND Z OFFSETS AND SCALE FACTORS TO TRANSFORM THE RAW DATA INTO A “PERFECT” SPHERE CENTERED AT 0, 0, 0
- PROBLEM: WE DON'T COLLECT DATA ALL THE WAY AROUND THE SPHERE, MAKING THE FIT QUESTIONABLE.

WHAT WAS HAPPENING

Mean Mag Field (raw): 8761.9



Mean Mag Field (raw): 8745.7



OLDER COMPASS CALIBRATION ISSUES

Calibration score: M14.00Q9H9V2

Passed Calibration

Calibration duration = 85 seconds

M14.00 = Magnetic influence is acceptable

Q9 = Magnetic field is uniform

H9 = Complete horizontal rotation

V2 = Low pitch/roll

Value was HIGHLY dependent on pitch and roll, less dependent on magnetic field. It is a measure of how well distributed your data were about the sphere.

Recommendation(s):

Measurements should be made with low pitch/roll OR repeat calibration with more pitch/roll.

Avoid any changes to the instrument setup or its orientation to the magnetic influences detected during the compass calibration.

Measurements should be made in locations with similar magnetic influences as the location of the compass calibration.

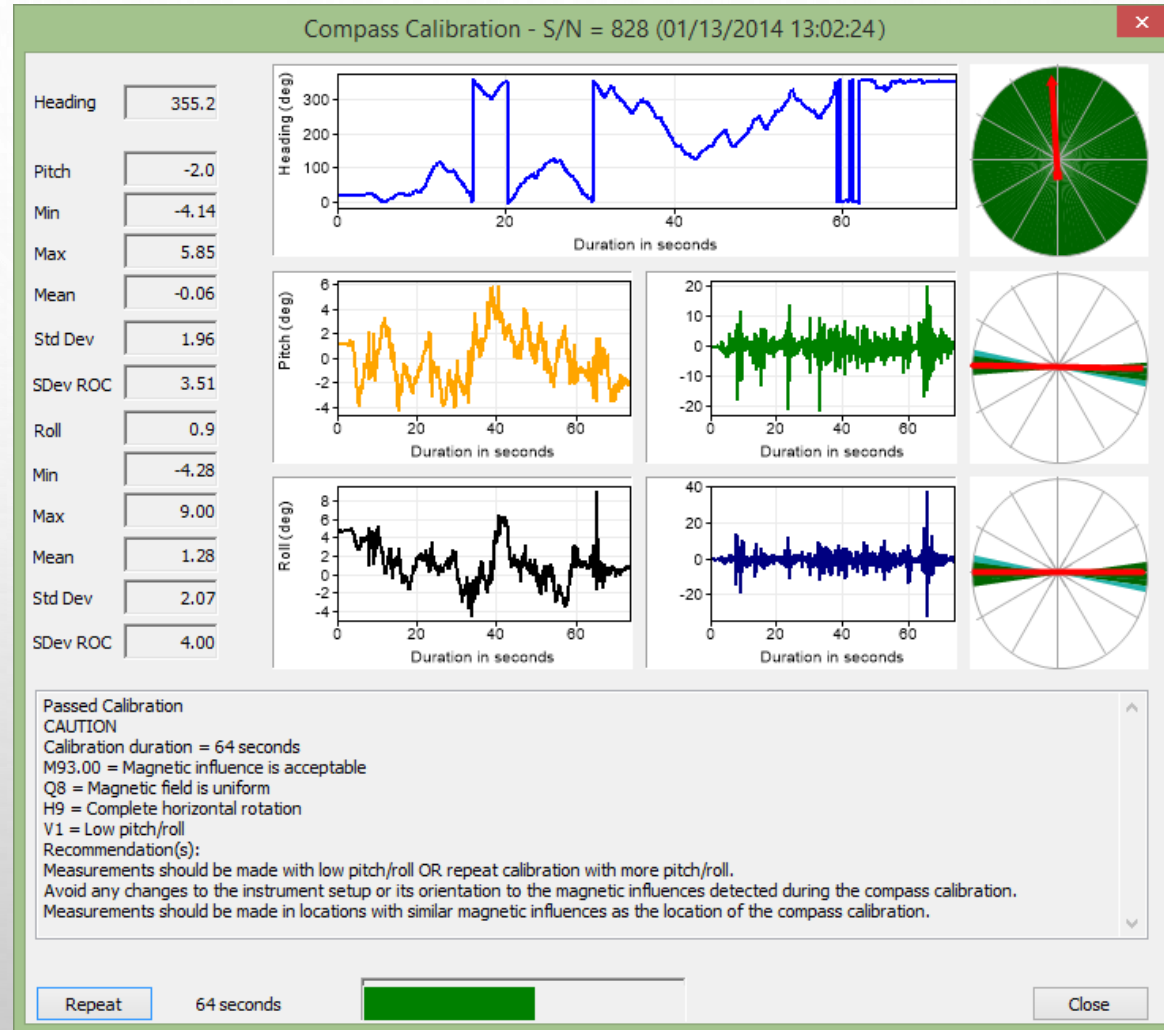
COMPASS CALIBRATION (PRE GEN3)

PitchRoll

Expected Min/Max Pitch (deg)

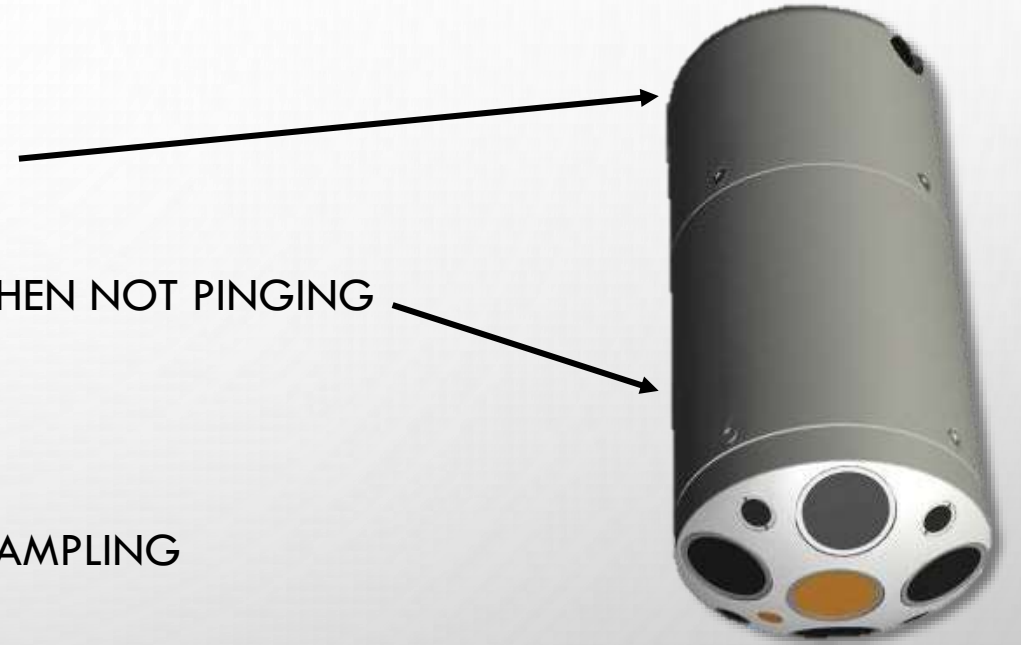
Expected Min/Max Roll (deg)

- PITCH/ROLL DIALOG INFO NOT USED??



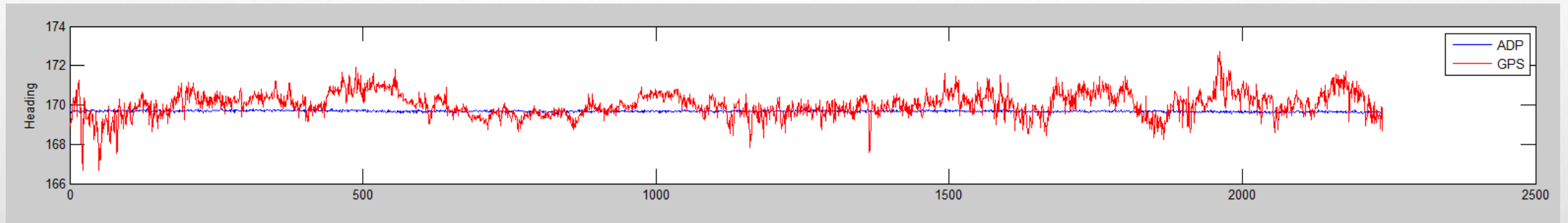
G3 COMPASS HARDWARE

- LOCATION WITHIN ADCP
 - ORIGINALLY LOCATED HIGH IN THE INSTRUMENT – PROCESSING AND COMMUNICATION INTERFERENCE
 - NOW LOCATED NEAR THE TRANSDUCERS – SAMPLES WHEN NOT PINGING
- FASTER MAGNETOMETERS
 - THERE IS A LIMITED AMOUNT OF TIME BETWEEN PINGS WHERE THE MAGNETOMETERS MUST COMPLETE THEIR SAMPLING WITH MINIMAL MAGNETIC INTERFERENCE



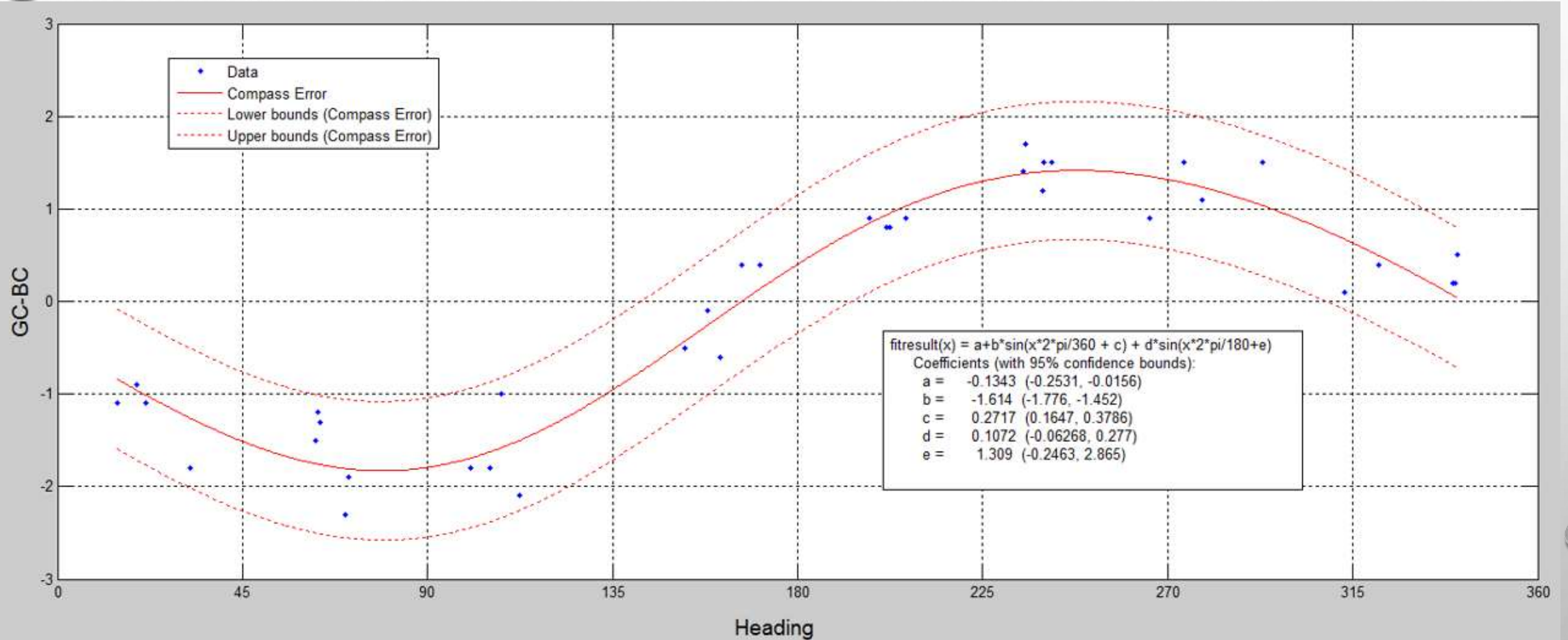
TESTING

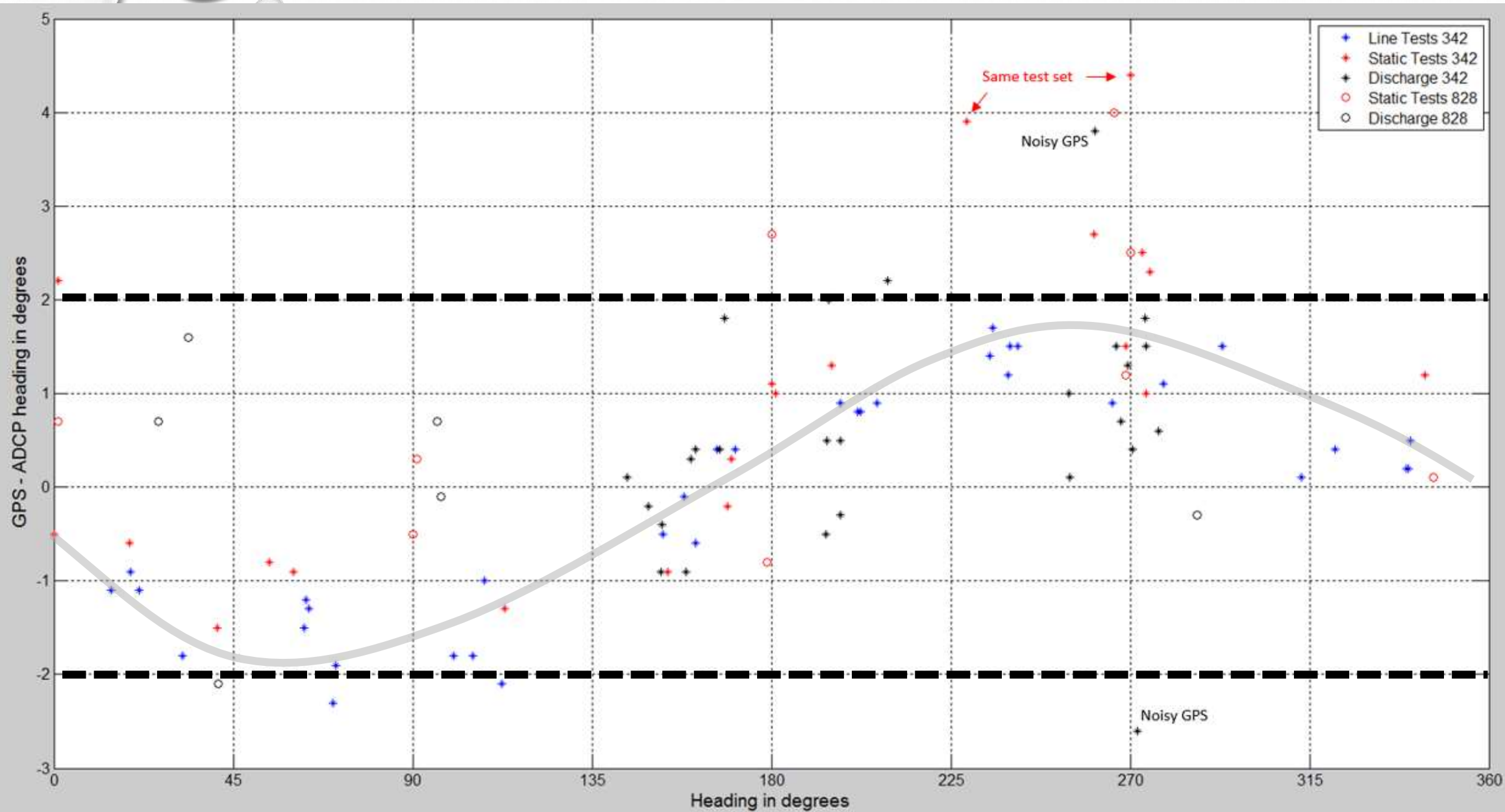
- COMPARISONS TO GPS COMPASS – STATIC TESTS

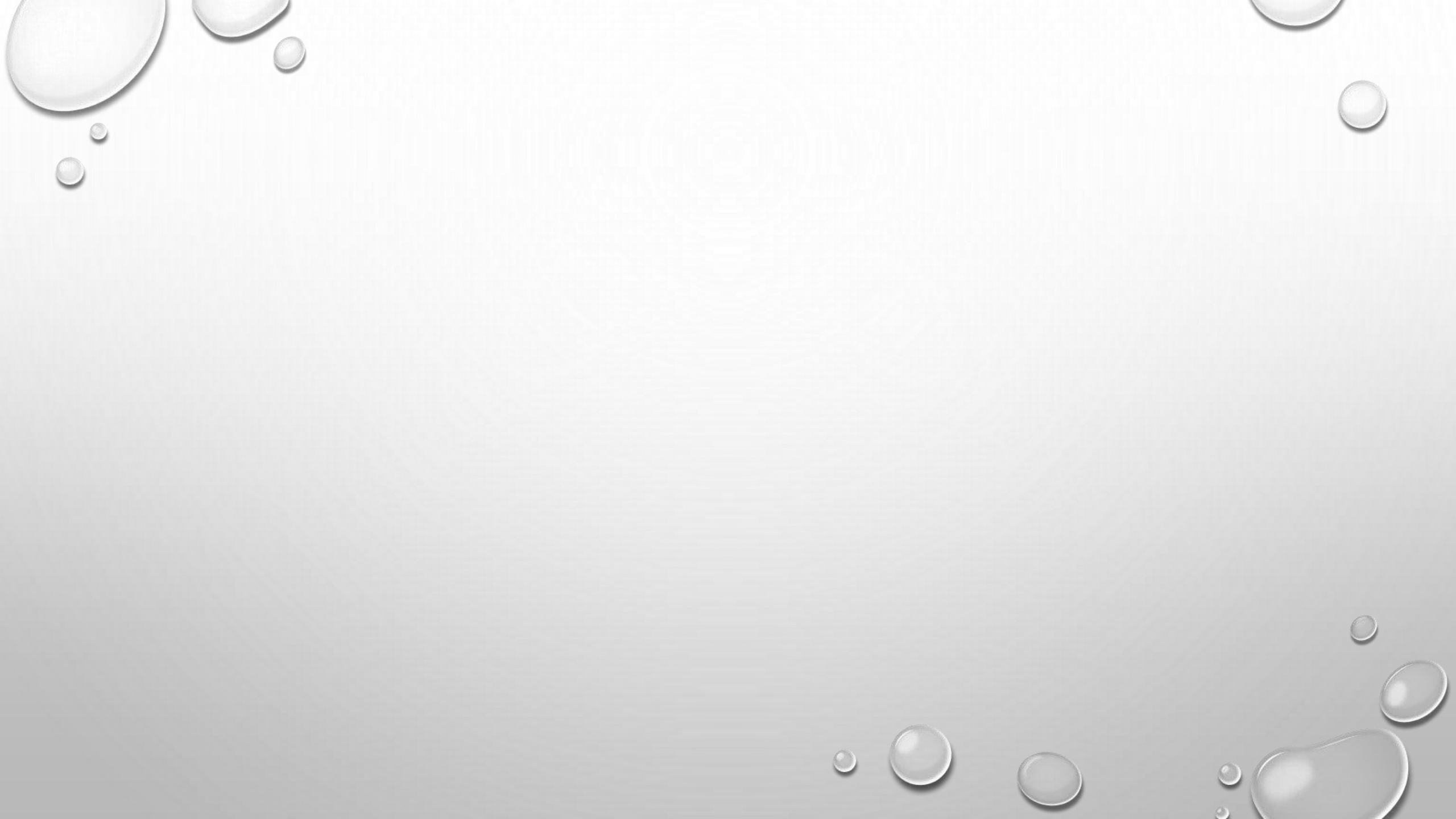


- DISCHARGE COMPARISONS DIDN'T WORK WELL DUE TO LOW VELOCITIES BUT NO PROBLEMS WITH THE COMPASS WERE IDENTIFIED
- COMPARISON OF COURSE MADE GOOD (GPS) TO COURSE MADE GOOD (BT-COMPASS). THIS IS GC-BC.

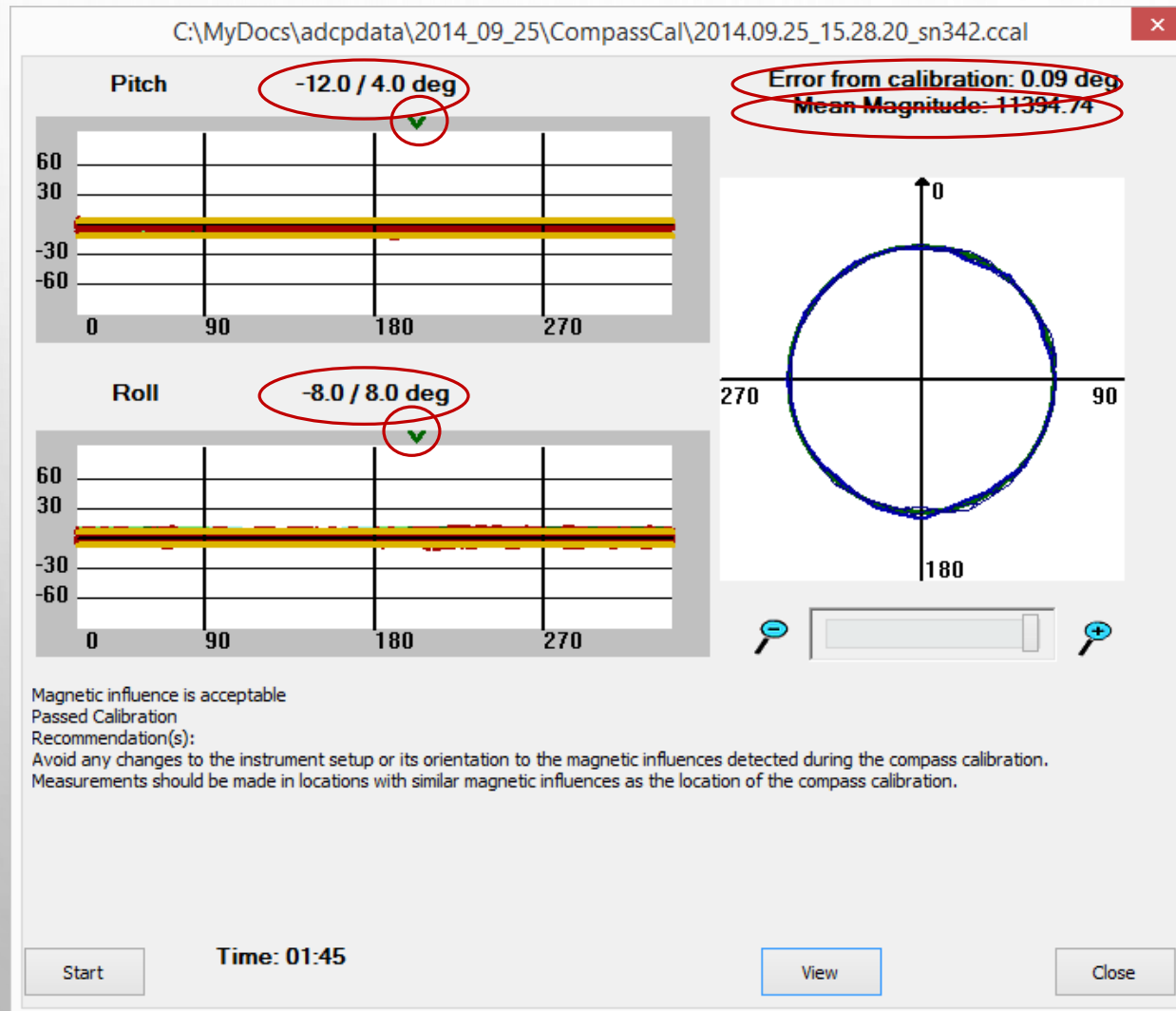
1 CYCLE ERROR







G3 - COMPASS CALIBRATION (RIVERSURVEYOR LIVE 3.8)



Marks starting point of calibration

Acceptable range of pitch based on calibration data

Acceptable range of roll based on calibration data

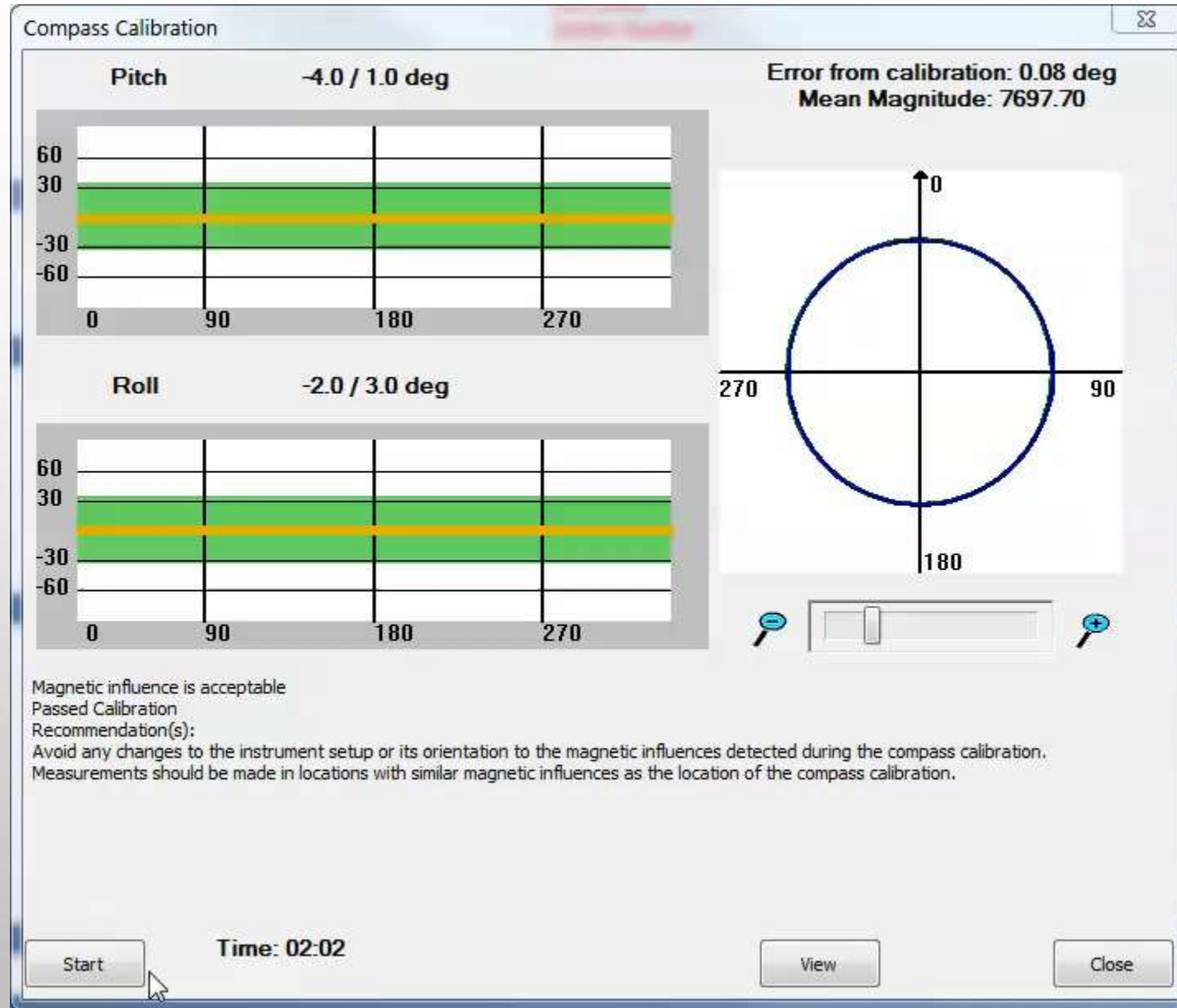
The earth's mean magnetic field at this location

A statistical measure of the quality of the calibration. (RMS)
This is not comparable to TRDI reported error.

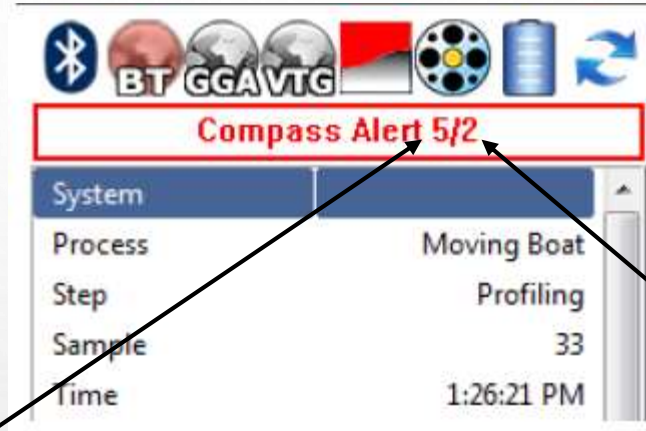
CALIBRATION PROCEDURE / CRITERIA

- **WHERE** – NEAR DATA COLLECTION SITE BUT AWAY FROM SOURCES OF MAGNETIC INTERFERENCE.
- **WHAT** – ROTATE THE ENTIRE DEPLOYMENT. IF USING A MANNED BOAT BOTH THE MANNED BOAT AND THE ADCP TOGETHER.
- **HOW** – MAKE AT LEAST TWO SLOW ROTATIONS (**SONTEK RECOMMENDS ONE CLOCKWISE AND THE OTHER COUNTERCLOCKWISE**) USING ABOUT 1 MINUTE FOR EACH ROTATION.
- **PITCH/ROLL** – PITCH AND ROLL THE INSTRUMENT ABOUT THE SAME AMOUNT AS YOU EXPECT TO OCCUR DURING THE ACTUAL DISCHARGE MEASUREMENT.
- **ERROR** – THE “ERROR FROM CALIBRATION” BASED ON USGS EXPERIENCE TO DATE SHOULD BE LESS THAN 0.2 DEGREES. NOTE: SONTEK’S MANUAL SAYS 0.5. IF YOU DON’T ACHIEVE < 0.2 REPEAT THE CALIBRATION. I AFTER 3 ATTEMPTS YOU STILL CANNOT ACHIEVE < 0.2 , MAKE A NOTE AND PROCEED WITH THE MEASUREMENT.

CALIBRATION DEMONSTRATION



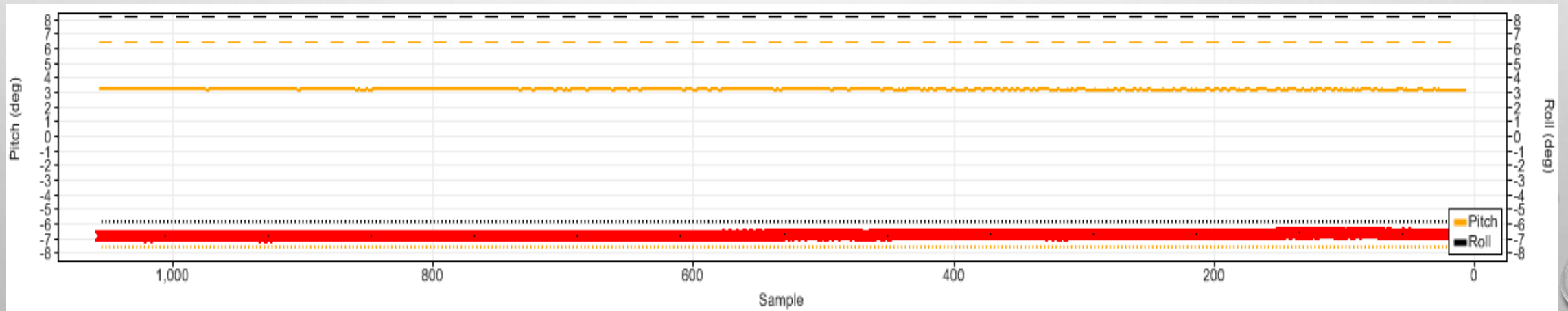
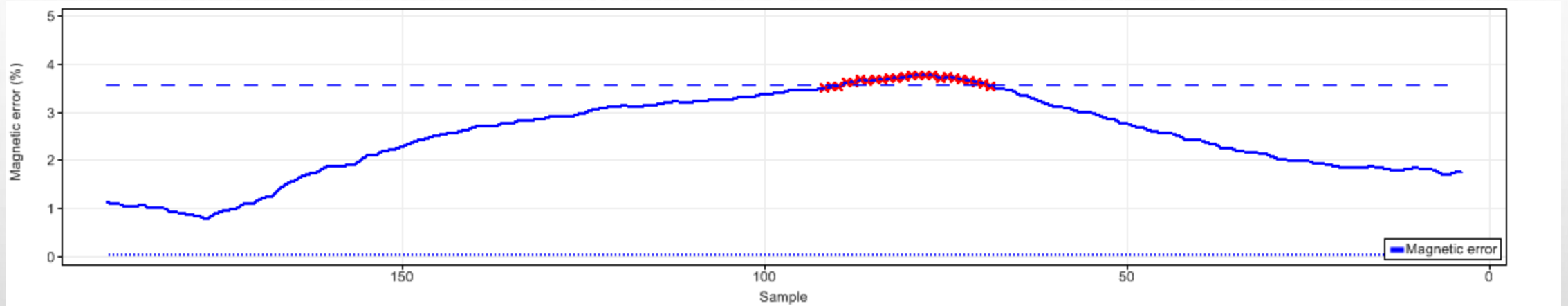
REAL-TIME FEEDBACK



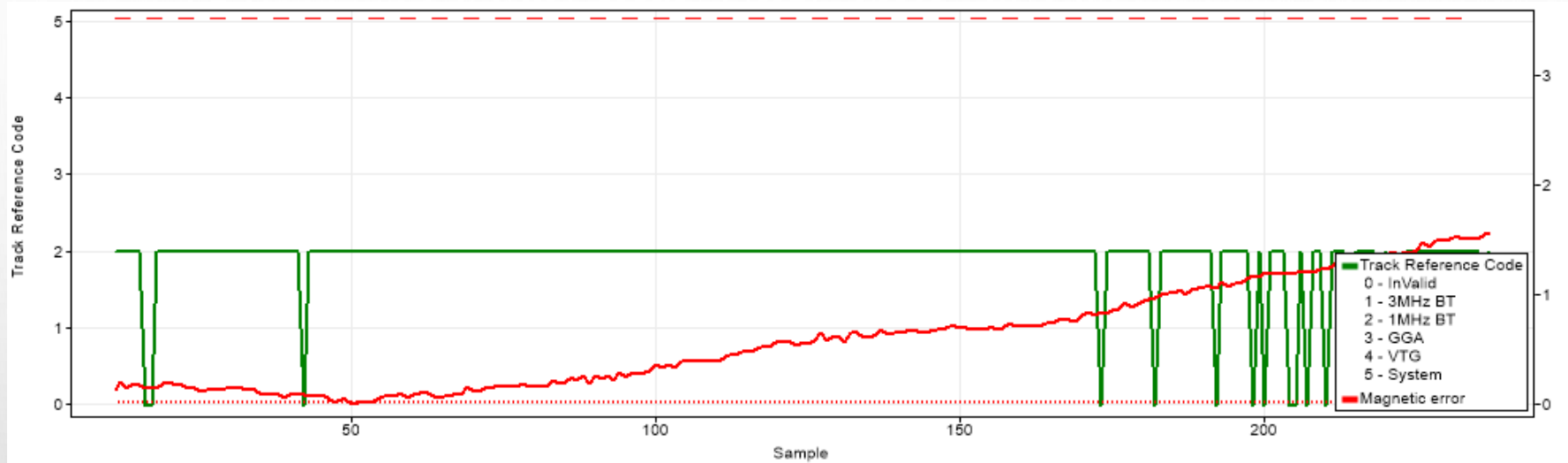
Number of ensembles (samples) with a change from the mean magnetic field exceeds 3.5%.

Number of ensembles (samples) that have a pitch or roll exceeds limits from calibration

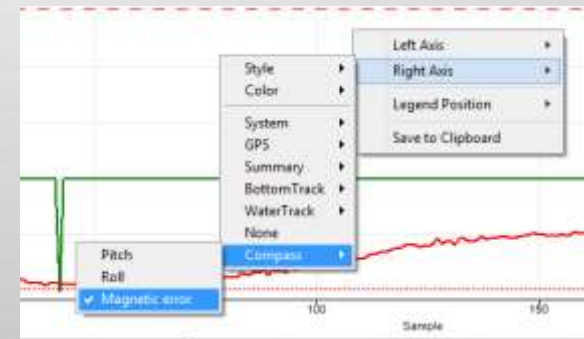
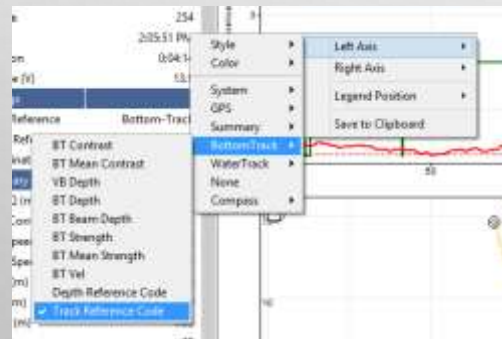
TIME SERIES



RECOMMENDED TIME SERIES PLOT IN TRANSECT TAB



- MAGNETIC ERROR (G3 COMPASS) AND TRACK REFERENCE CODE IN TRANSECT TAB TIME SERIES PLOT



POST PROCESSING CALIBRATION REVIEW

The screenshot shows the 'Compass Calibration' software window. At the top, it displays 'Pitch -4.0 / 5.0 deg' and 'Error from calibration: 2.09 deg Mean Magnitude: 9289.21'. The main interface features two vertical scales on the left, both ranging from -60 to 60, with a yellow bar indicating a value near 0. A green checkmark is visible on the top scale. Below the scales, there is a 'Magnetic info' section with text: 'Recommend Repeat calib Magnetic info a. Consider d concrete pie b. Check are or increase t'. At the bottom of the window, there are buttons for 'Start', 'View', and 'OK', along with a 'Time: 01:22' display.

An 'Open' file dialog box is overlaid on the main window, showing the 'Look in:' path as 'CompassCal'. The dialog lists four files in a table:

Name	Date m
2014.10.09_10.31.51_sn342.ccal	10/9/2014
2014.10.09_12.02.05_sn342.ccal	10/9/2014
2014.10.09_12.31.51_sn342.ccal	10/9/2014
2014.10.09_13.12.11_sn342.ccal	10/9/2014

The dialog also shows 'Recent Places' (Desktop, Libraries, Computer, Network), a 'File name:' field, and 'Files of type:' set to 'CCAL Files (*.ccal)'. Buttons for 'Open' and 'Cancel' are at the bottom right of the dialog.

STEPS TO UPGRADE YOUR ADCP

OSW Informational and Technical Note 2015.05

November 13, 2014

SUBJECT: Compass Upgrade for All USGS Owned SonTek RiverSurveyor M9 and S5 ADCPs

1. Schedule your upgrade with SonTek's Customer Service department by contacting support@sontek.com or 1-858-546-8327 and by following instructions provided by SonTek.
2. Record the transformation matrix prior to shipping the ADCP to SonTek, using RSMatrix.
3. Ship ADCP to SonTek.
4. After receiving the upgraded ADCP:
 - a. Record the transformation matrix of the newly upgraded ADCP using RS Matrix.
 - b. Collect a comparison measurement.
5. Upload the two transformation matrix files to:
https://xcollaboration.usgs.gov/wg/oswha/RiverSurveyor_TMatrix/Matrix_Repository/Forms/AllItems.aspx
6. Upload the comparison measurement to:
<https://xcollaboration.usgs.gov/wg/oswha/Testing/default.aspx>

<http://hydroacoustics.usgs.gov/movingboat/RSMatrix.shtml>

RSMatrix

Description

An ADCP measures the velocity parallel to each beam. Equations are used to compute the x,y, and z velocity components from the beam velocities. The application of these equations is through the use of matrices and they result in what is referred to as the transformation matrix. The transformation matrix may be a nominal matrix, meaning the values in the matrix assume perfect alignment of the beams according to the instrument specification or they may be a custom matrix created from measurements made to account for the actual orientations of the beams as manufactured. The SonTek¹ RiverSurveyor ADCPs do not provide the transformation matrix in a human readable format but rather present the matrix in a Matlab data file. Thus, only those with Matlab can read the transformation matrix. The purpose of RSMatrix is to provide an program that can be run outside Matlab and used by non-Matlab owners to read the transformation matrices from a RiverSurveyor Live generated Matlab file.

Application

1. Open a RiverSurveyor file in RiverSurveyor Live and create a Matlab output file.
2. Run RSMatrix.
3. Click Open and selected the Matlab file created by RiverSurveyor Live. The values of the transformation matrices should display in the RSMatrix Graphical User Interface (Fig. 1).
4. Click Save to save the transformation matrices to an ASCII text file.
5. Click Close to close the RSMatrix.

Serial Number: 1206

3 MHz

1.18174	-0.00534	-1.17570	0.00219
-0.01100	1.17996	0.00545	-1.17356
-0.27413	-0.27655	-0.27820	-0.27559
0.27500	-0.27478	0.27714	-0.27757

1 MHz

0.83836	-0.83270	-0.84113	0.84078
0.83560	0.83445	-0.83123	-0.84086
-0.27332	-0.27964	-0.27830	-0.27202
0.27587	-0.27759	0.27585	-0.27403

Vertical Beam

0.80994	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000

Versions

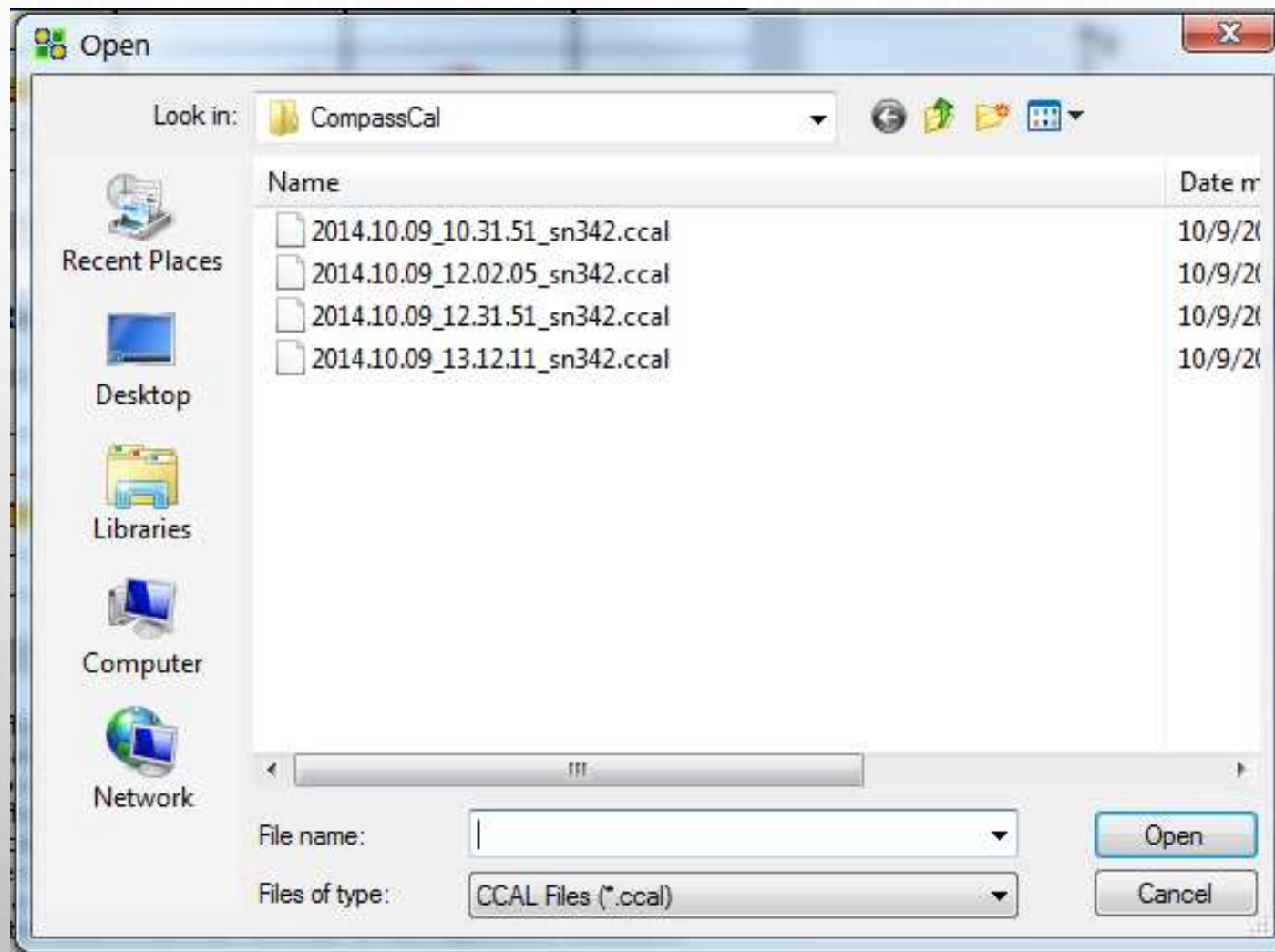
USGS Software Users Rights Notice

Version	Status	Changes and Known Issues
1.00	Recommended	- Requires Matlab Runtime Libraries Version 7.17, 32-bit version (even on 64-bit operating systems) - Initial Release

RIVERSURVEYOR LIVE 3.8

- REQUIRED FOR G3 COMPASS
- VERSION 3.8 FIRMWARE AND SOFTWARE IS COMPATIBLE WITH OLDER COMPASS
- ADDED INSTRUMENT SERIAL NUMBER TO COMPASS CALIBRATION FILE
- OPTION FOR SCREENING DISTANCE – REQUIRES A FILE IN RSLIVE PROGRAM FOLDER
- FILE COMPRESSION TOOL
- FILE MANAGER

COMPASS CALIBRATION FILE NAME



USGS SCREENING DISTANCE

- Name
- Resources
 - AppSettings.conf
 - Demo Data.riv
 - htmlayout.dll
 - Manual.pdf
 - Manual_Portuguese.pdf
 - QuickStart.pdf
 - RiverSurveyor.exe
 - SontekFileMgr.dll
 - SQLite.Interop.dll
 - System.Data.SQLite.dll
 - usgsScreen ←
 - Ysi.CtdProcessing.dll

The screenshot displays the RiverSurveyor Live software interface. On the left, a system information panel shows details for a 'Moving Boat' at 'End Edge (5)', with a sample number of 1,699 and a time of 3:25:01 PM. Below this, a summary table lists various parameters such as Voltage (13.7V), GPS coordinates, heading (183.6 deg), and temperature (94.2). The main area contains several data plots: 'VB Depth (ft)' showing a constant depth of 0.30; 'Boat Speed (ft/s)' showing fluctuating speed; 'Heading (deg)' showing a steady heading around 180 degrees; 'Magnetic error (%)' showing a constant error near 0; and 'Pitch (deg)' showing a steady pitch around 20 degrees. A 'Processing Toolbox' is overlaid on the right, with 'System Settings' expanded to show 'Transducer Depth (ft)' set to 0.30, 'Screening Distance (ft)' set to 0.82, 'Salinity (ppt)' set to 0.0, and 'Heading Source' set to 'SonTek Compass Heading'. A 'USGS override warning' dialog box is also present, stating: 'Screening distance will be Transducer Depth + 0.16 m, per USGS OSW Technical Memo 2014.02.' The bottom of the interface includes a 'Smart Page' menu with options for System, Samples, Navigation, Edges, Time Series, and Transect.

RiverSurveyor Live Software

Data collection and post processing software (Windows XP/Vista/7/8) for SonTek/YSI M9 and S5 ADPs.

Version	Status	Changes and Known Issues
3.80 Oct2014	Testing (needed for use with G3 compass)	<ul style="list-style-type: none">-Added ability to auto apply screening distance. To use, download file (right click, save as) "usgsScreen" and place in the RS Live program directory.-Added SonTek File Manager (for searching files)-Added SonTek File compression tool - creates a .zip file of measurement (does not include .mat files in zip)-Added support for G3 compass (new units shipped from SonTek after Oct 13 2014 or units that have been returned to SonTek for G3 compass update)-Added ability to manually specify communication settings, improving compatibility with older PCMs-Improved compass calibration feedback for ADCPs with G3 compass-Added ability to plot time series of compass % magnetic error (G3 compass required)-Added compass alerts during data collection for both: 1. Pitch/roll exceeds range during calibration and 2. Magnetic error > 3.5% from error magnetic error in calibration score-Added marks on time-series for samples where compass alerts were raised-Added option for for default screening distance - requires an addition text file be placed in the RSLive program directory-Added transmit length and blanking distance to matlab output-Added instrument serial number to compass calibration file-Changed color map display in plots-Fixed F5 button press issues <p>-Note: when using with bluetooth PCM's recommend:</p> <ul style="list-style-type: none">FTDI USB-to-Serial Drivers 2.08.30 or greaterParani SD1000 firmware 2.0.8 or greaterParani SD1000U firmware 2.0.3 or greater (Dip switches to left: SW Config with HW Flow Control: Off)

FILE COMPRESSION



Creates a zip file of all open *.riv or *.rivr files and compass calibration (3.8 only), and system test files.
DOES NOT INCLUDE *.MAT FILES



Name
20140925134915.riv
20140925140136.riv
20140925140607.riv
20140925141245.riv
Loop_20140925133734.riv
20140925134915.wsp
2014.09.25_13.04.08_sn342.ccal
2014.09.25_14.54.53_sn342.ccal
2014.09.25_15.28.20_sn342.ccal
SystemTest20140925130007.txt
SystemTest20140925133556.txt
SystemTest20140925144730.txt
SystemTest20140925152607.txt
20140925140136.wsp
20140925140607.wsp
20140925141245.wsp
Loop_20140925133734.wsp

FILE MANAGER

The screenshot shows the Sontek File Manager window. At the top, there is a search bar containing the number '3348'. To its right are two date pickers: the first is set to '2000/01/01' and the second to '2015/01/20'. Further right are three icons: a magnifying glass, a red 'X' (Delete Folder), and a green plus sign (Add Folder). Below the search bar is a tree view under the 'Data' folder, listing various sub-folders such as '2009_05_26_Good_M9_Data', 'CA_M9_Fort_Stewart', 'CA_M9_Problem', 'CA_WSC_M9', 'Clinton', 'Corrupt-M9_File', 'Dusty', 'FredBrogan', 'Hank_Niagra', 'HIF_M9', 'HIF_M9_Tests', and 'Hortness_SD_Review'. At the bottom of the window is a table with the following columns: Time, File Name, Site, Location, Serial #, Fw Version, and Comments. The table contains six rows of data, all with a Serial # of 3348 and a Fw Version of 3. The comments for all rows are 'field temper'. The status bar at the bottom left shows '6/648'.

Time	File Name	Site	Location	Serial #	Fw Version	Comments
2013/08/09 08:07:12	C:\dsm\dsm_docume	dry cr	dssb	3348	3	field temper
2013/08/09 08:10:17	C:\dsm\dsm_docume	dry cr	dssb	3348	3	field temper
2013/08/09 08:12:27	C:\dsm\dsm_docume	dry cr	dssb	3348	3	field temper
2013/08/09 08:14:52	C:\dsm\dsm_docume	dry cr	dssb	3348	3	field temper
2013/08/09 08:28:04	C:\dsm\dsm_docume	dry cr	dssb	3348	3	field temper
2013/08/09 08:33:55	C:\dsm\dsm_docume	dry cr	dssb	3348	3	field temper

SEARCH: specified date range by fields such as file name, site name, location, operator, comments, etc.

ADD FOLDER: Add a folder that contains RSL files to search. This must be done prior to entering any search criteria.

DELETE FOLDER: Delete all currently selected folders to search. Use this function to delete the currently specified folder add a new folder or sub-folder to restrict the search to this folder.

The image features a light gray background with a subtle radial gradient. In the top-left and bottom-right corners, there are several realistic water droplets of various sizes, rendered with soft shadows and highlights to give them a three-dimensional appearance. The word "QUESTIONS" is centered in the middle of the page in a large, bold, black, sans-serif font.

QUESTIONS