



COLLECTION REPORT – USGS LIDAR ACQUISITION

Kidder County, North Dakota LiDAR

27 May 2015

Prepared for

United States Geological Survey
One Denver Federal Center
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303.202.4419

Prepared by

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Fugro EarthData, Inc. (Fugro) was tasked with planning, acquiring, processing, and producing derivative products of LiDAR data collected at a nominal pulse spacing (NPS) of 0.7 meters, including overlap, for an Area of Interest (AOI) that includes the majority of Kidder County, North Dakota. The AOI covers approximately 1,167 square miles. A 100-meter buffer was added to the AOI covering approximately 1,178 square miles; all products will be generated to the limit of this buffered boundary.

LiDAR data, and derivative products produced in compliance with the task order will be based on the “**U.S. Geological Survey National Geospatial Program Lidar Base Specification Version 1.0**”. In addition to the Specification Requirements, the task order will meet NEEA QL2.

All acquisition occurred during leaf off conditions between April 23 and May 18, 2015 by Fugro’s approved ID/IQ subcontractor, Richard Crouse & Associates, Inc. (RC&A).

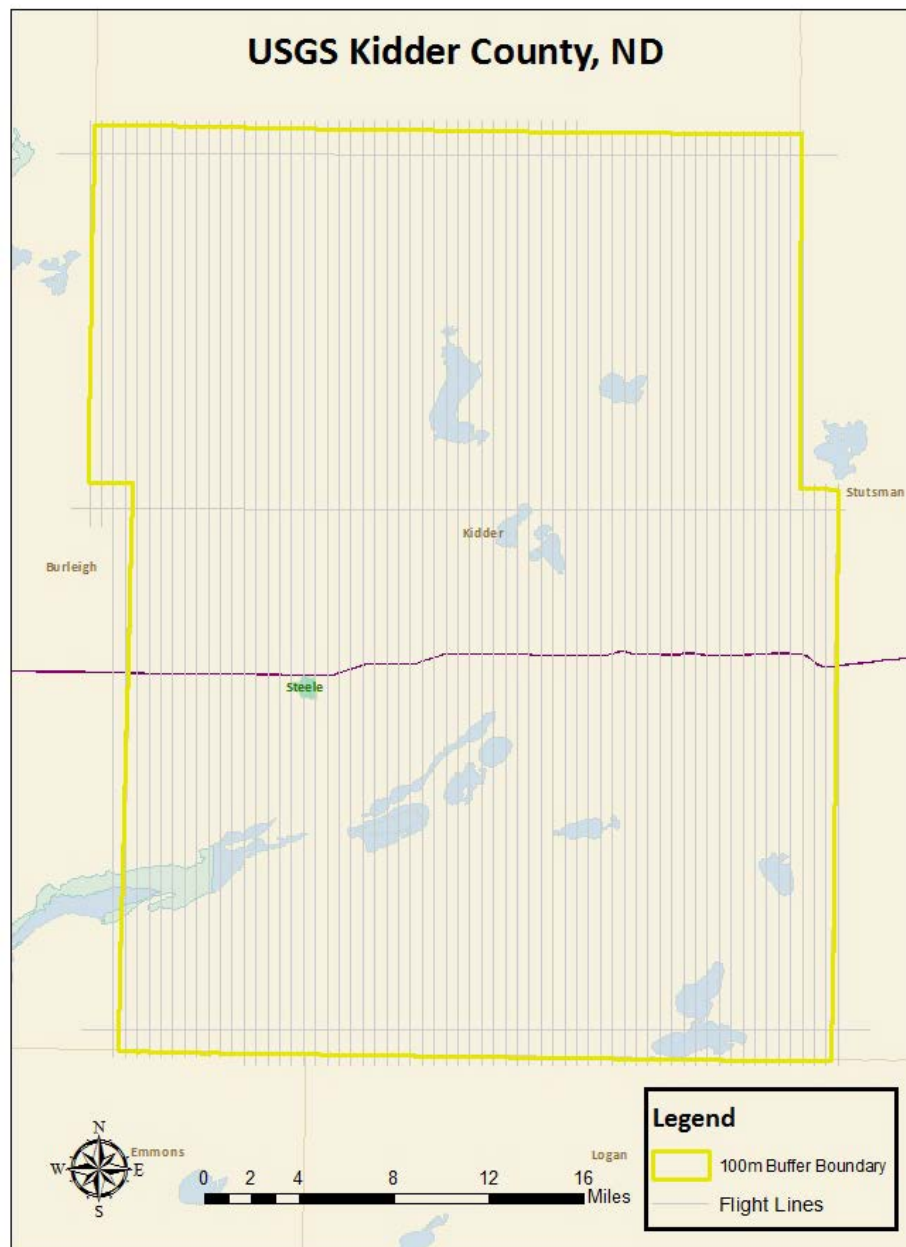


Figure 1: Flight plan

The following is detail on the LiDAR acquisition covering the Kidder County, North Dakota LiDAR buffered boundary.

Collections:	10
Collection Dates:	April 23 rd - May 18 th , 2015
Field of View (FOV):	60 degrees
Average Point Density (planned):	2 pts/m ²
Flight Level(s) AMT:	3281 ft, 1600 ft
Sensor Type:	Riegl Q-680i
Sensor Serial Number(s):	165



Figure 2: Executed Collection Footprints

All acquired LiDAR data was QC'd and accepted for processing.

Below are the acquisition logs and GPS plots from all collections covering the Kidder County, North Dakota LiDAR buffered boundary.



Acquisition and Processing details ----- Collection 1 (April 23, 2015)

Log:

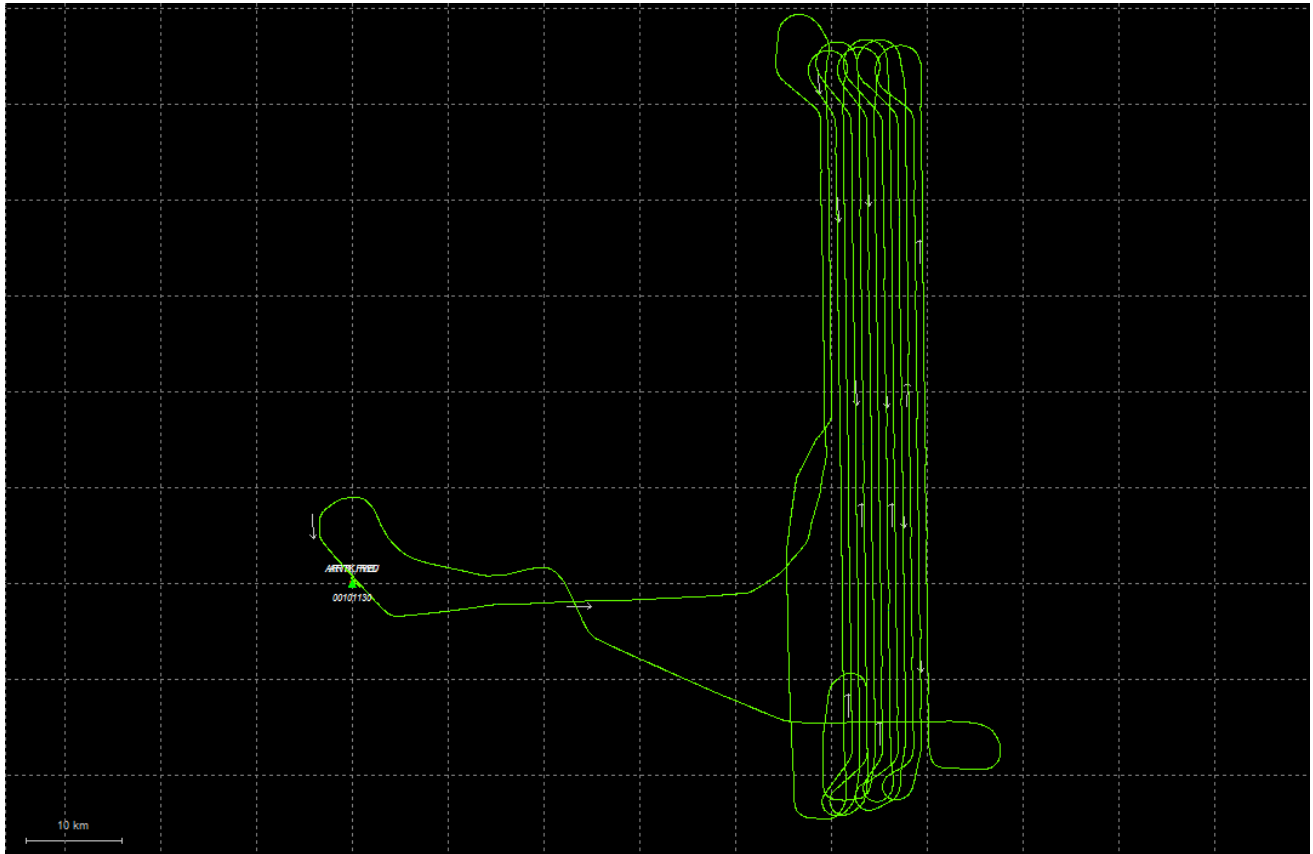


15.2	Lift Begin			Lift End			Fit Duration	Fit Hrs	Hobbs Hrs	Activity
	Airport	Chocks	Hobbs	Airport	Chocks	Hobbs				
1										0900-Production
2										
3										

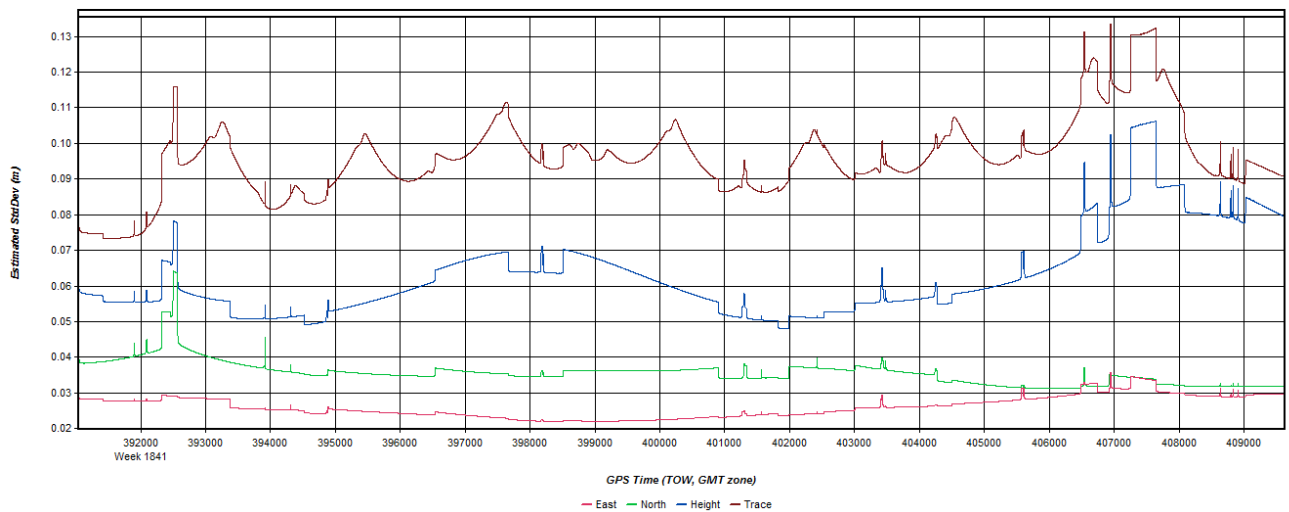
**Q680i
Flight Log**

FGL Job #		Project Name			Operator		Unit		IMU		Ground Temp °C		Min Range'		Data Logger Drives			
22.14005700		Kidder Co			Cody Buhrmeister		165				6.0		2018		#2 & #4			
Flight Date		GPS Day		Lift	System		Pilot		Sun*		Solar Times (UTC)		Flying Temp °C		Max Range'		Download Drive	
23-Apr-15		15-113		1	R680i		Jay Reno		N/A		N/A		-6.0		3888		AP1TB#46	
Mission ID (yyymmdd_Sen_Job_Lift)				Aircraft		Airport ID	FMS	UTC	AMT (ft)	Speed	FOV	Scan Rate (Hz)	MTA	km/WPT	Alt. Setting	Humidity @ Alt	Shipping Track	
150423_165_14005700_01				N7139C		KBIS		-5	3281	150	60	95	2	0.601	29.96	53.5		
Base 1 ID		Location		Rec ID		Ant ID		ARP (m)		Start Time (UTC)		Stop Time (UTC)		GPS Filename		Operator		Data
		Bismarck, ND		Novatel		702GG		1.5										With AB
Area	Flight #		Wpt		Distance		UTC		Fit Dir	Altitude (GPS)	Speed (knots)	Scan Rate	Comments and Conditions				SVs	PDOF
	FGL	RCA	From	To	Begin	End	Start	End										
													Ground static at KBIS					
	1	1	1	47	0	27.6	13:04:00	13:10:00	N	4,971	149						19	1.0
	2	2	47	1	27.6	0	13:16:00	13:22:00	S	5,005	149						18	1.1
	3	3	1	107	0	63.7	13:34:00	13:48:00	N	4,954	145						17	1.03
	4	4	107	1	63.7	0	13:52:00	14:06:00	S	4,972	149						20	1.1
	5	5	1	107	0	63.7	14:10:00	14:24:00	N	4,978	146						20	1.19
	6	6	107	1	63.7	0	14:28:00	14:42:00	S	4,904	151						19	1.13
	6	6	1	107	0	63.7	14:46:00	14:47:00	N	4,906	150		Calibration Line 2.5 miles long					1.1
	7	7	1	107	0	63.7	14:53:00	15:07:00	N	4,918	148						20	1.03
	8	8	107	1	63.7	0	15:11:00	15:26:00	S	4,927	149						19	1.13
	9	9	1	107	0	63.7	15:29:00	15:43:00	N	4,970	149						20	0.99
	10	10	107	1	63.7	0	15:47:00	16:01:00	S	4,998	146						19	0.99
	11	11	1	107	0	63.7	16:05:00	16:19:00	N	5,000	149						17	1.1
	12	12	107	1	63.7	0	16:23:00	16:37:00	S	4,962	147						17	1.04
	13	13	1	107	0	63.7	16:41:00	16:55:00	N	4,980	142						18	0.96
	14	14	108	1	64.3	0	16:59:00	17:13:00	S	4,991	147						20	0.93
	67	67	1	24	0	13.8	17:17:00	17:19:00	W	4,920	144		Cross line at the end of the lift					1.24

Trajectory and GPS Plots:

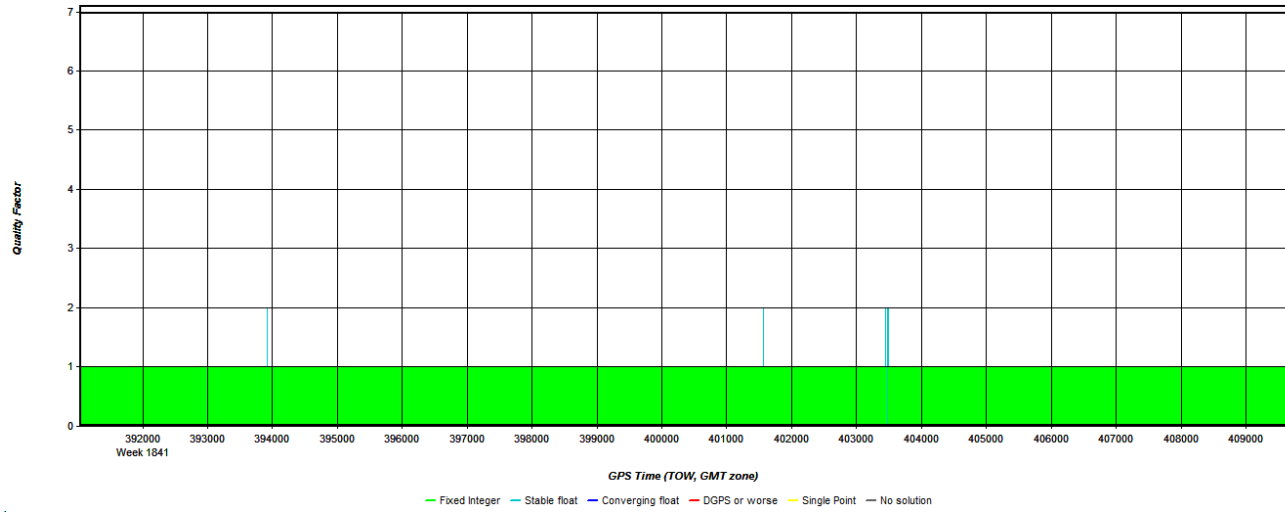


Estimated Accuracy

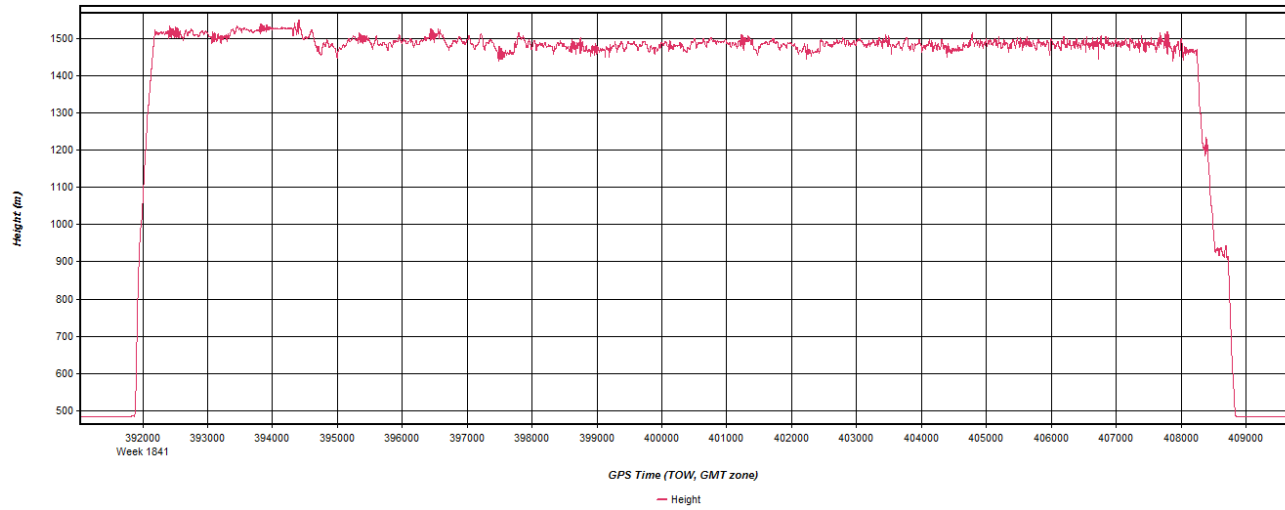




Quality Factor

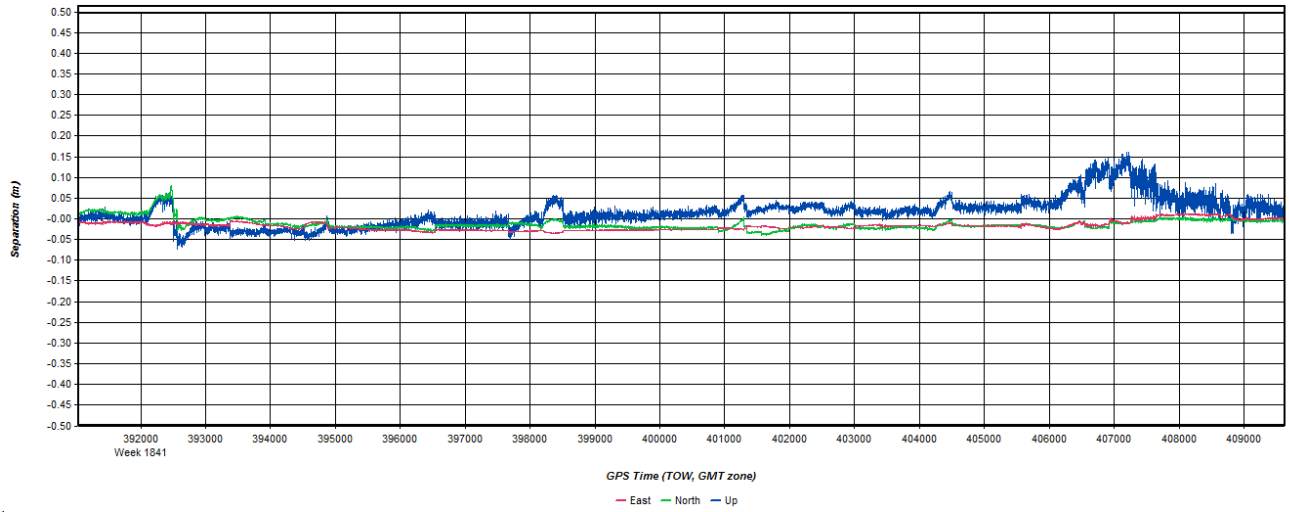


Height

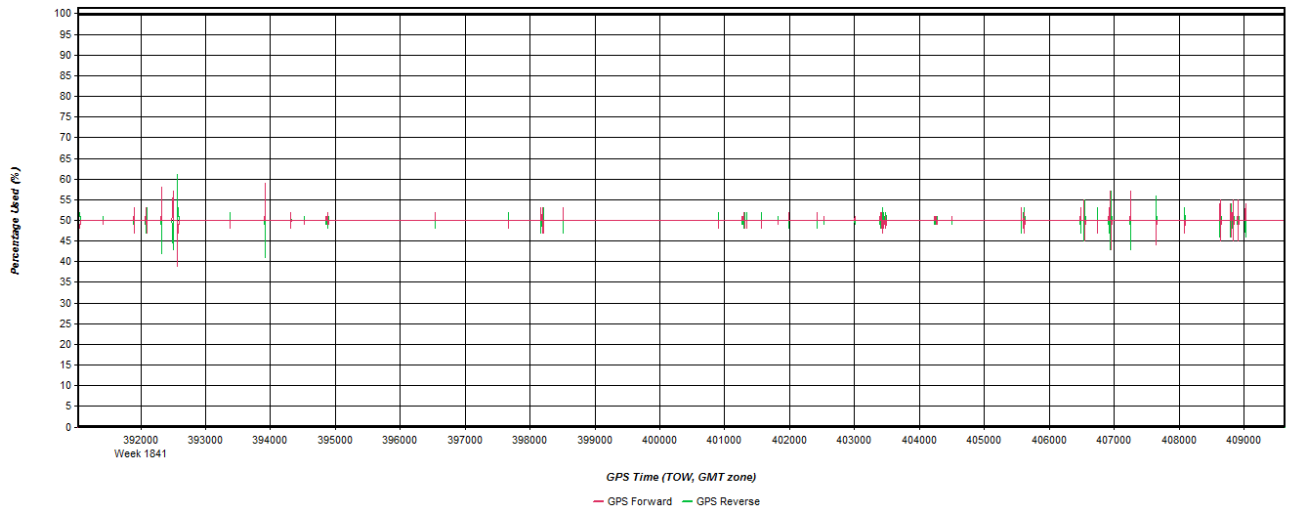




Combined Forward/Reverse Separation



Combined Forward/Reverse Weighting

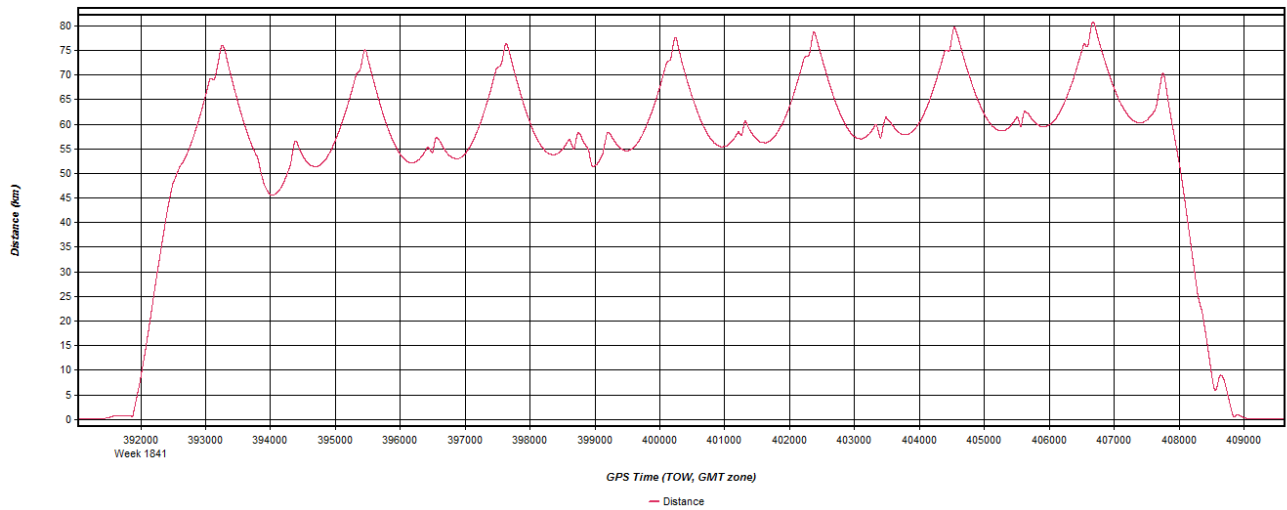




PDOP

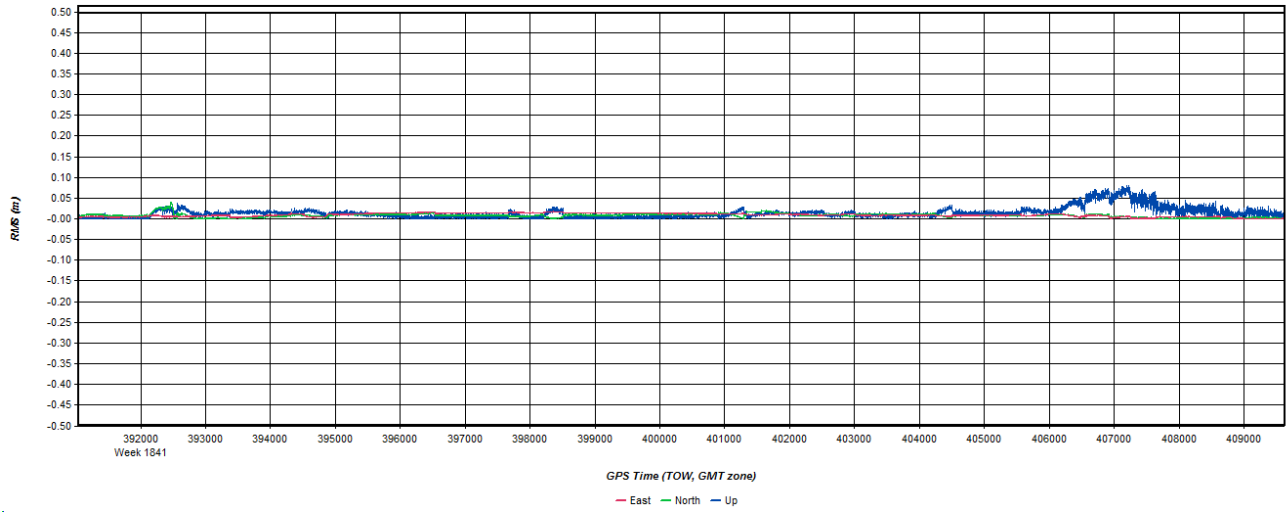


Distance from Base

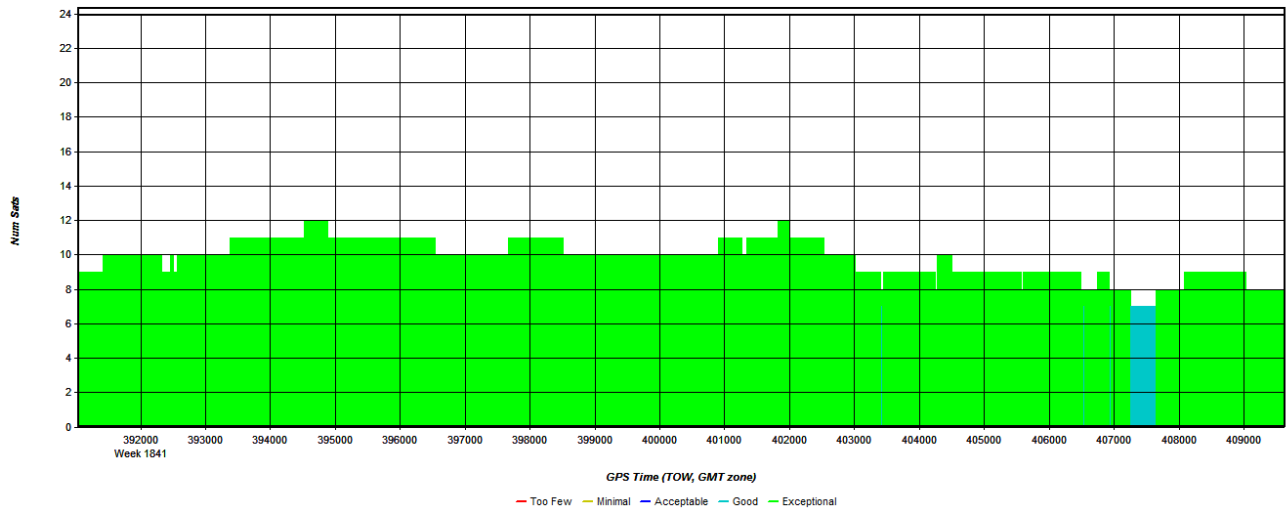




Combined RMS



SVs





Acquisition and Processing details ----- Collection 2 (April 24, 2015)

Log:



15.2	Lift Begin			Lift End			Fit Duration	Fit Hrs	Hobbs Hrs	Activity
	Airport	Chocks	Hobbs	Airport	Chocks	Hobbs				
1	KBIS		3031.6	KBIS		3035.5			3.9	
2										
3										

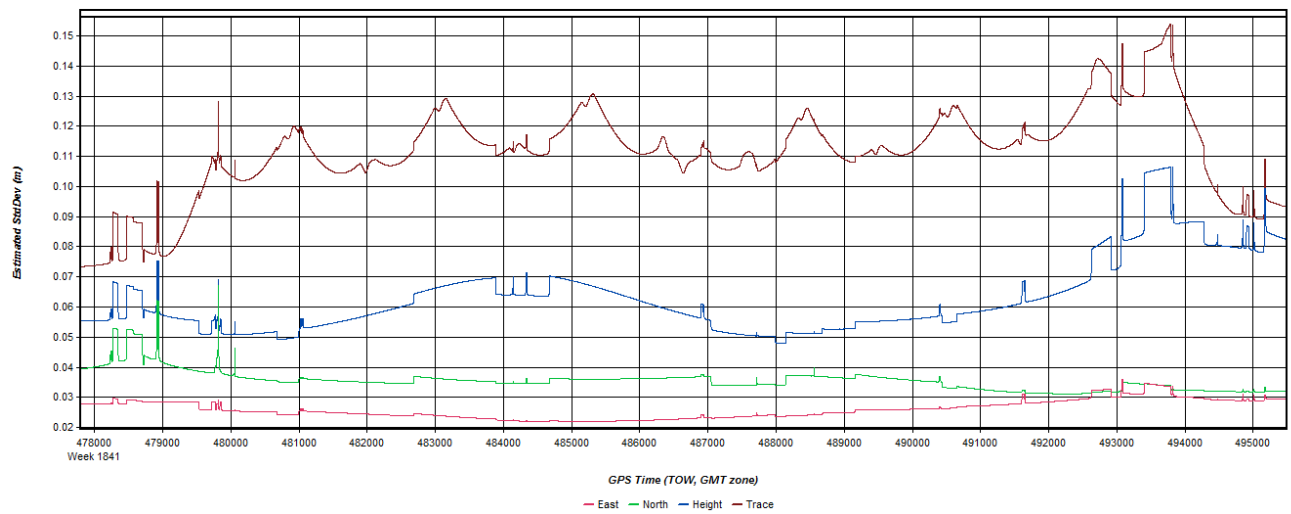
**Q680i
Flight Log**

FGL Job #		Project Name			Operator		Unit		IMU		Ground Temp °C		Min Range'		Data Logger Drives					
22.14005700		Kidder Co			Cody Buhrmeister		165				46.0 8.0		2018		#1 & #6					
Flight Date		GPS Day		Lift	System		Plot		Sun*		Solar Times (UTC)		Flying Temp °C		Max Range'		Download Drive			
24-Apr-15		15-114		2	R680i		Jay Reno		N/A		N/A		50.0 10.0		3888		AP1TB#46			
Mission ID (yyymmdd_Sen_Job_Lift)				Aircraft		Airport ID	FMS	UTC	AMT (ft)	Speed	FOV	Scan Rate (Hz)	MTA	km/WPT	Altitude Setting		Humidity @ Alt		Shipping Track	
150424_165_14005700_02				N7139C		KBIS		-5	3281	150	60	95	2	29.68	60.2					
Base 1 ID		Location		Rec ID		Ant ID		ARP (m)		Start Time (UTC)		Stop Time (UTC)		GPS Filename		Operator		Data		
		Bismarck, ND		Novatel		702GG		1.5		24/24/2015 12:24:00 PM		24-Apr-15 23:45				Cody Buhrmeister		With AB		
Area	Flight #		Wpt		Distance		UTC		Fit Dir	Altitude (GPS)	Speed (knots)	Scan Rate	Comments and Conditions				SVs	PDOF		
	FGL	RCA	From	To	Begin	End	Start	End												
													Static observation @ KBIS							
													360 turn before frst line							
KIDDER	15	15			0	34.6	13:18:00	13:32:00	N	4,968	150	95.0					19	1.1		
	16	16			0	34.6	13:36:00	13:51:00	S	4,862	14	95.0					21	1.04		
	17	17			0	34.6	13:55:00	14:09:00	N	4,935	150	95.0					20	1.1		
	18	18			0	34.6	14:13:00	14:26:00	S	4,908	148	95.0					18	1.19		
	19	19			0	34.6	14:31:00	14:45:00	N	4,889	151	95.0					20	1.07		
	20	20			0	3.6	14:49:00	15:03:00	S	4,880	147	95.0					20	1.07		
	18	18			0	2.5	15:07:00	15:08:00	N	4,886	150	95.0	Calibration line				19	1.08		
	18	18			0	1.5	15:12:00	15:13:00	S	4,886	150	95.0	missed last mile of line refly that portion				19	1.03		
	21	21			0	11	15:17:00	15:23:00	N	4,859	151	95.0					19	1.03		
	21	21			0	23.6	15:29:00	15:38:00	N	4,998	150	95.0					19	1		
	22	22			0	34.6	15:42:00	15:56:00	S	4,910	151	95.0					17	0.99		
	23	23			0	34.6	15:59:00	16:14:00	N	4,863	151	95.0					19	1.16		
	24	24			0	34.6	16:17:00	16:31:00	S	4,906	150	95.0					18	1.03		
	25	25			0	34.6	16:34:00	16:49:00	N	4,879	153	95.0					17	0.92		
	26	26			0	34.6	16:52:00	17:07:00	S	4,920	150	95.0					19	1.03		
	67	67			0	13.1	17:11:00	17:16:00	W	4,916	150	95.0	cross track of lift lines				17	1.1		
							17:32:00	17:37:00					Post lift static observation							

Trajectory and GPS Plots:

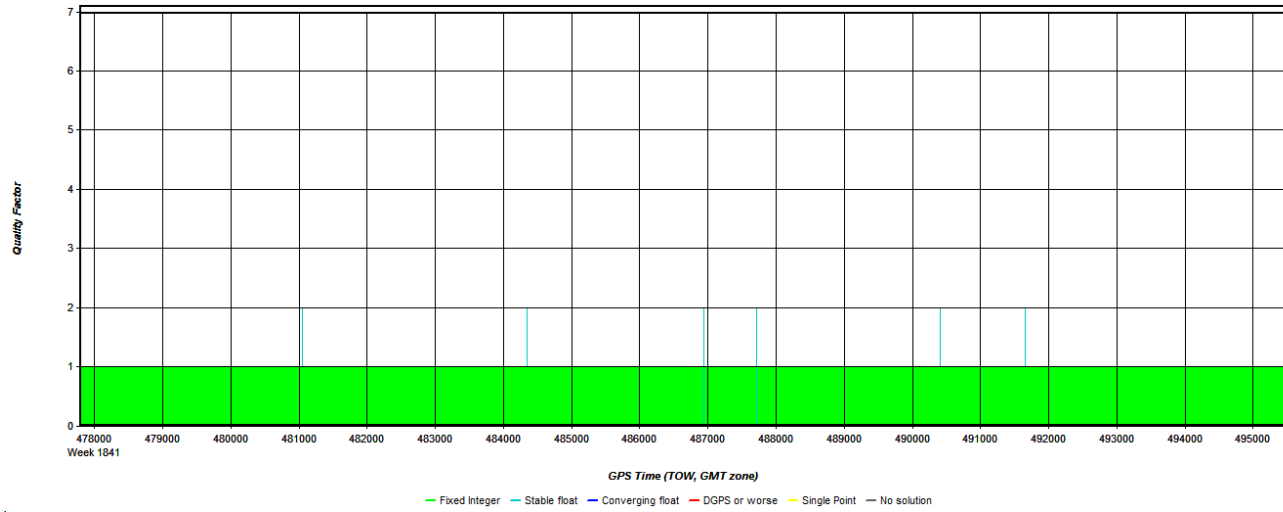


Estimated Accuracy

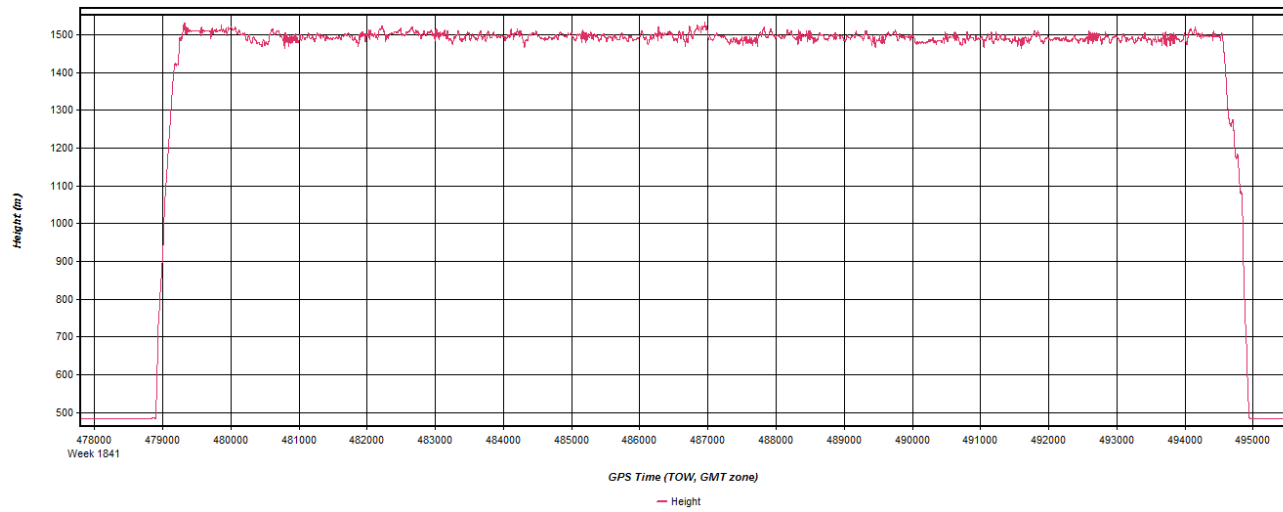




Quality Factor

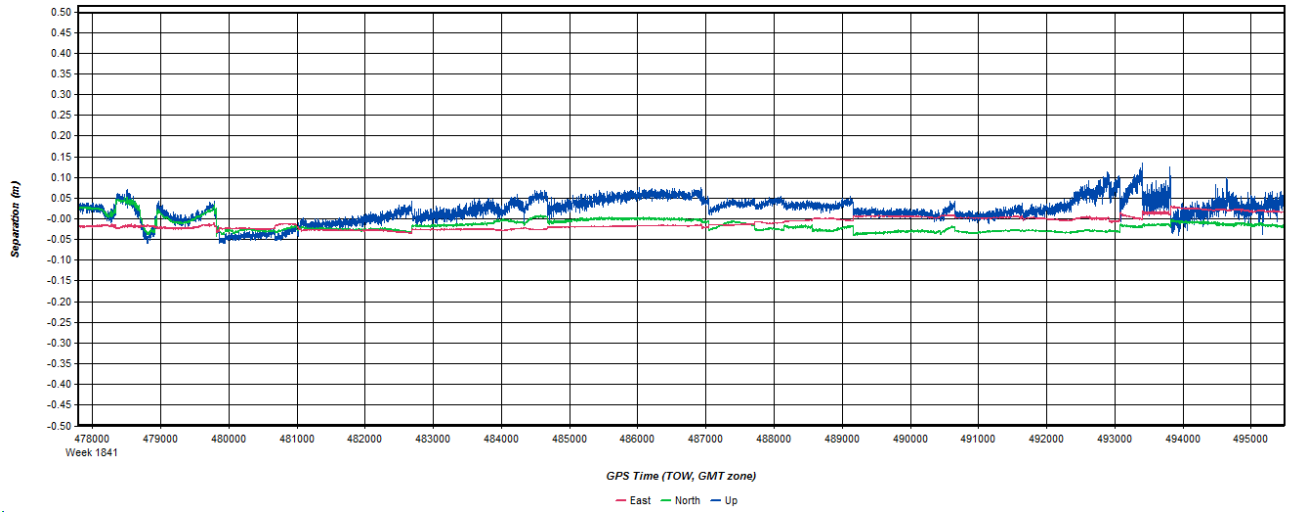


Height

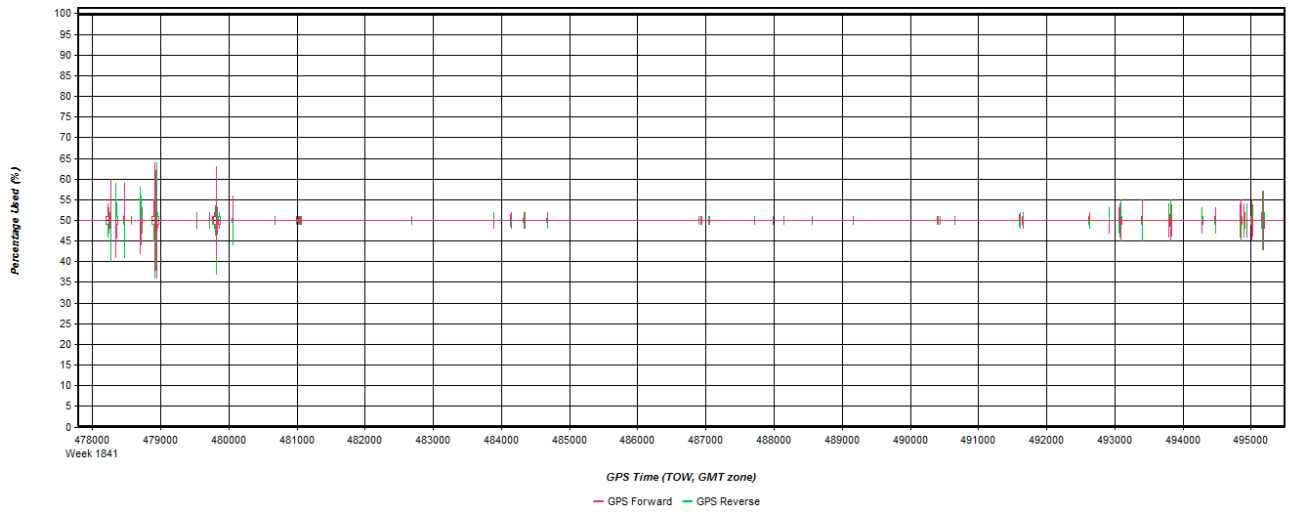




Combined Forward/Reverse Separation

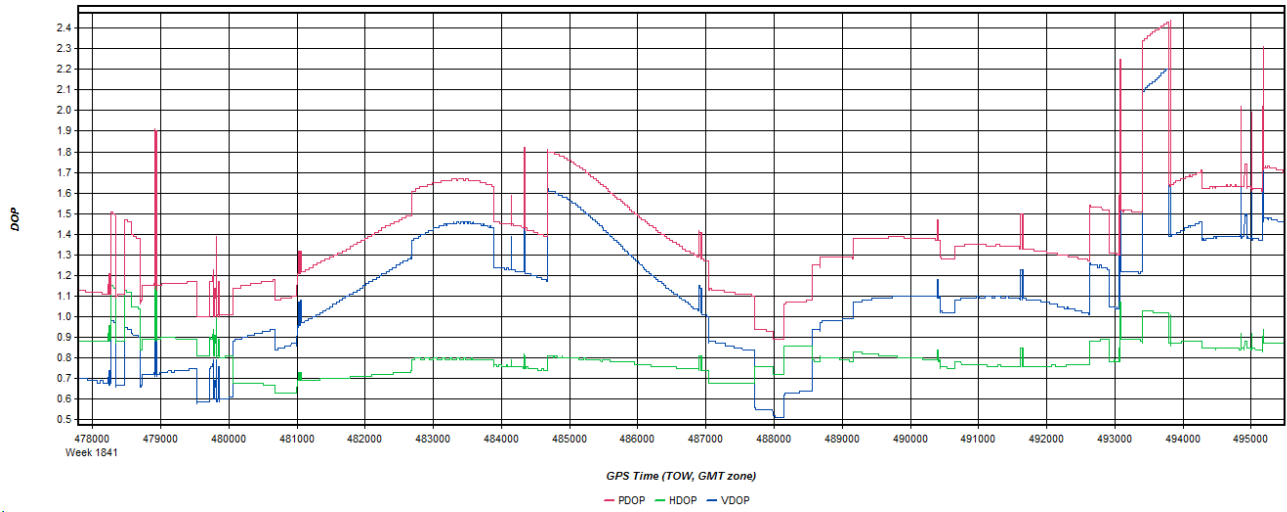


Combined Forward/Reverse Weighting

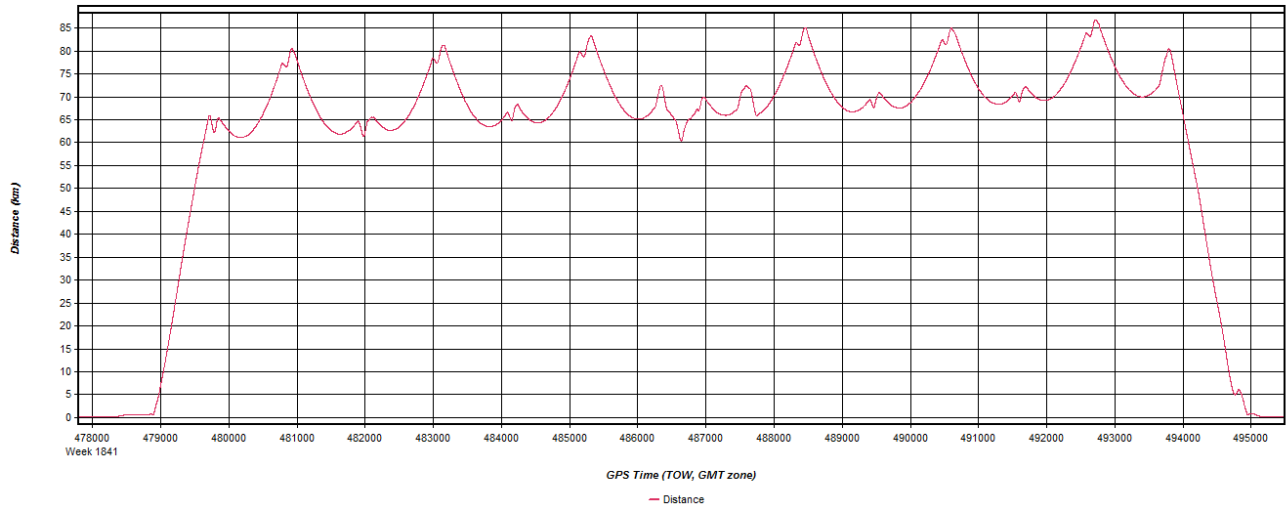




PDOP

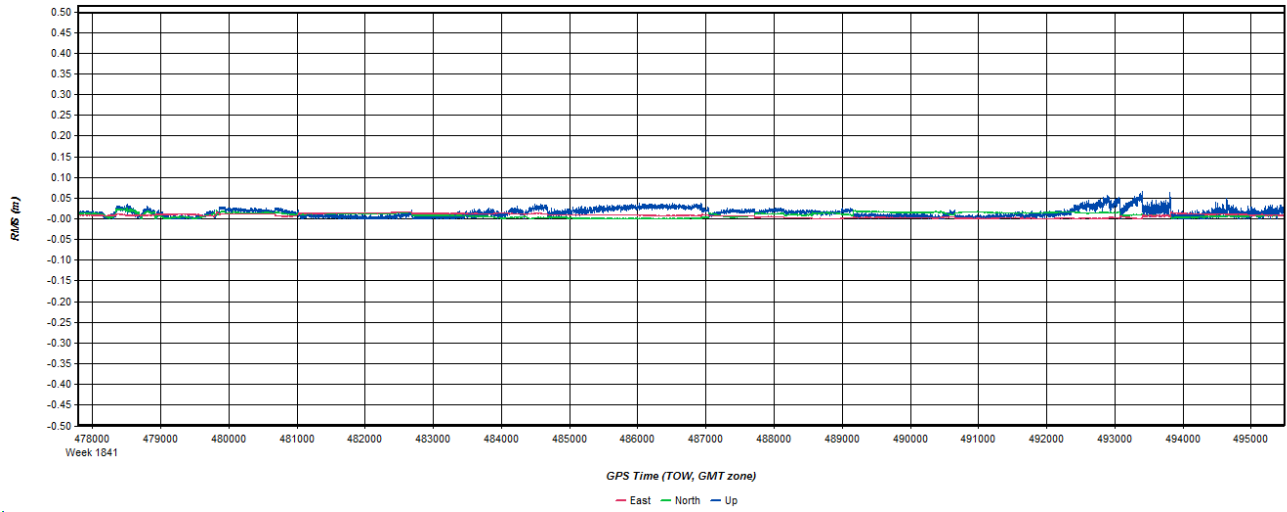


Distance from Base

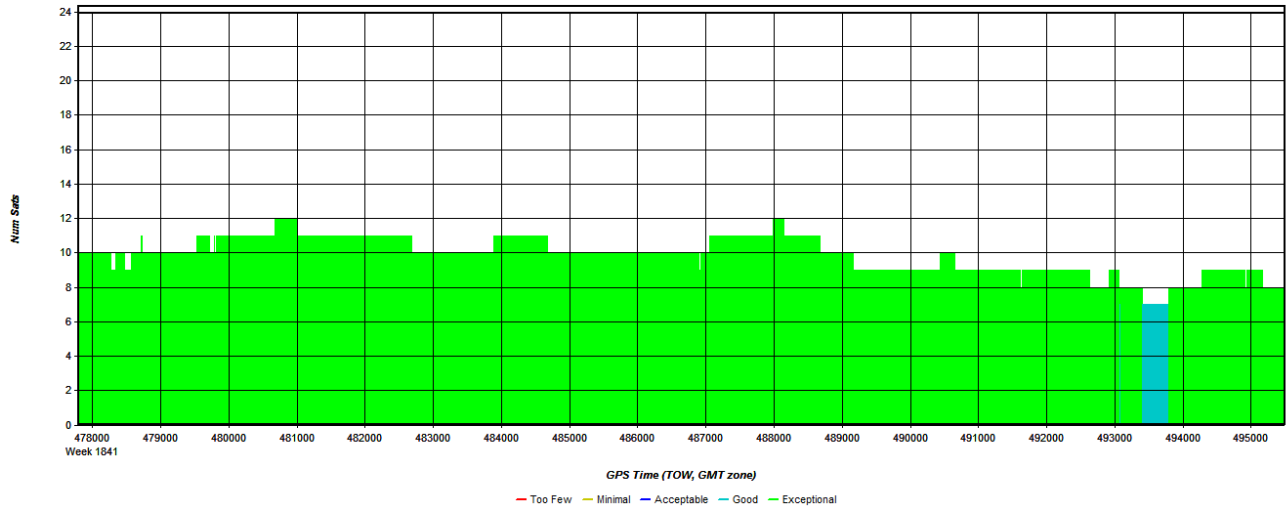




Combined RMS



SVs





Acquisition and Processing details ----- Collection 3 (April 24, 2015)

Log:

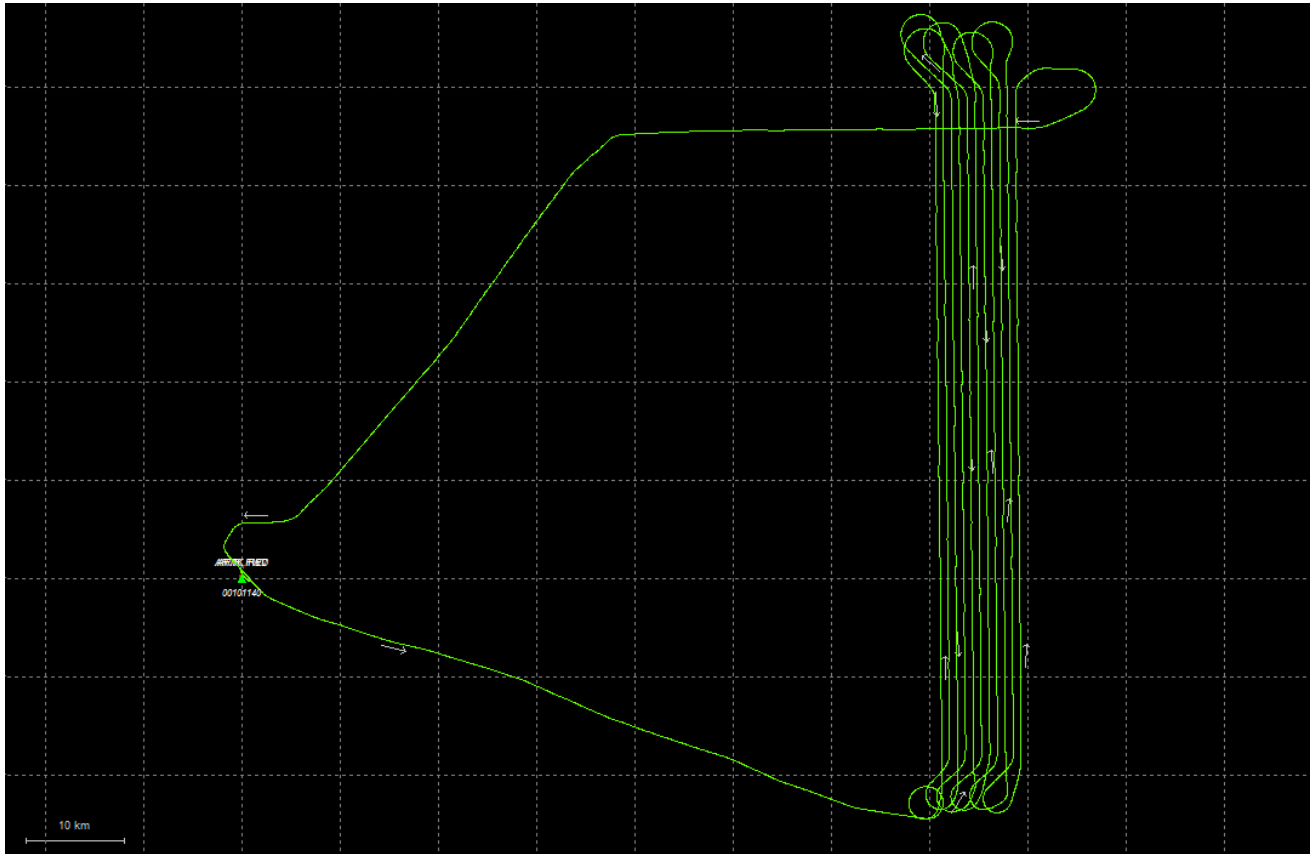


15.2	Lift Begin			Lift End			Fit Duration	Fit Hrs	Hobbs Hrs	Activity
	Airport	Chocks	Hobbs	Airport	Chocks	Hobbs				
1	KBIS		3035.5	KBIS		3039.6			4.1	
2										
3										

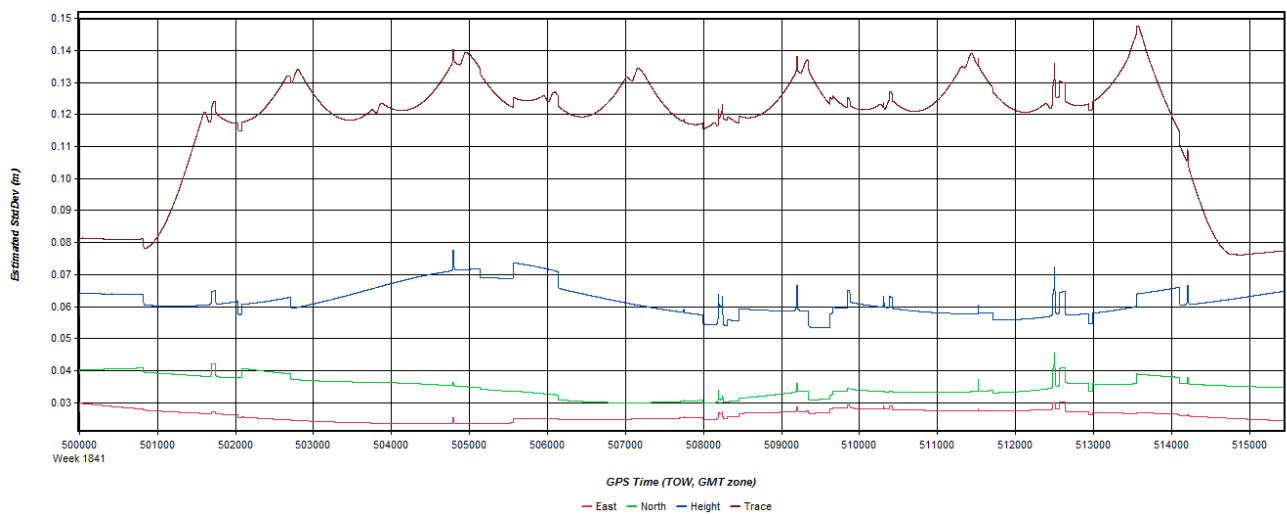
**Q680i
Flight Log**

FGL Job #		Project Name			Operator		Unit	IMU	Ground Temp °C		Min Range'	Data Logger Drives				
22.14005700		Kidder Co			Cody Buhrmeister		165		10.0		2018	#3 & #7				
Flight Date		GPS Day	Lift	System	Pilot		Sun*	Solar Times (UTC)		Flying Temp °C	Max Range'	Download Drive				
24-Apr-15		15-114	3	R680I	Jay Reno		N/A	N/A		3888	3888	AP1TB#46				
Mission ID (yyymmdd_Sen_Job_Lift)				Aircraft	Airport ID	FMS	UTC	AMT (ft)	Speed	FOV	Scan Rate (Hz)	MTA	km/WPT	Altm Setting	Humidity @ Alt	Shipping Track
150424_165_14005700_03				N7139C	KBIS		-5	3281	150	60	95	2		29.68	60.2	
Base 1 ID	Location		Rec ID	Ant ID	ARP (m)	Start Time (UTC)		Stop Time (UTC)		GPS Filename		Operator	Data			
	Bismarck, ND		Novatel	702GG	1.5	24/24/2015 12:24:00 PM		24-Apr-15 23:45				Cody Buhrmeister	With AB			
Area	Flight #	Wpt	Distance		UTC		Dir	Altitude (GPS)	Speed (knots)	Scan Rate	Comments and Conditions		SVs	PDOP		
	FGL	RCA	From	To	Begin	End									Start	End
											Static observation @ KBIS					
											360 turn before frst line					
KIDDER	27	27			0	34.6	19:23:00	19:37:00	N	4,874	151	95.0		20 1.0		
	28	28			0	34.6	19:41:00	19:55:00	S	4,851	146	95.0		18 1.27		
	29	29			0	34.6	19:58:00	20:12:00	N	4,856	151	95.0		19 1.31		
	30	30			0	34.6	20:17:00	20:32:00	S	4,872	146	95.0		20 1.1		
	31	31			0	34.6	20:35:00	20:49:00	N	4,847	149	95.0		20 1.05		
	32	32			0	34.6	20:54:00	21:08:00	S	4,850	149	95.0		20 1.08		
	33	33			0	34.6	21:11:00	21:26:00	N	4,934	150	95.0		20 1.04		
	34	34			0	34.6	21:29:00	21:43:00	S	4,870	148	95.0		21 0.96		
	35	35			0	34.6	21:47:00	22:01:00	N	4,907	152	95.0		18 1.14		
	36	36			0	34.6	22:05:00	22:19:00	S	4,897	144	95.0		18 1.12		
	37	37			0	34.6	22:22:00	22:36:00	N	4,899	152	95.0		19 1.02		
	65	65			0	17.7	22:40:00	22:48:00	W	4,893	151	95.0		21 0.96		
							23:05:00	23:10:00					Static observation @ KBIS			

Trajectory and GPS Plots:

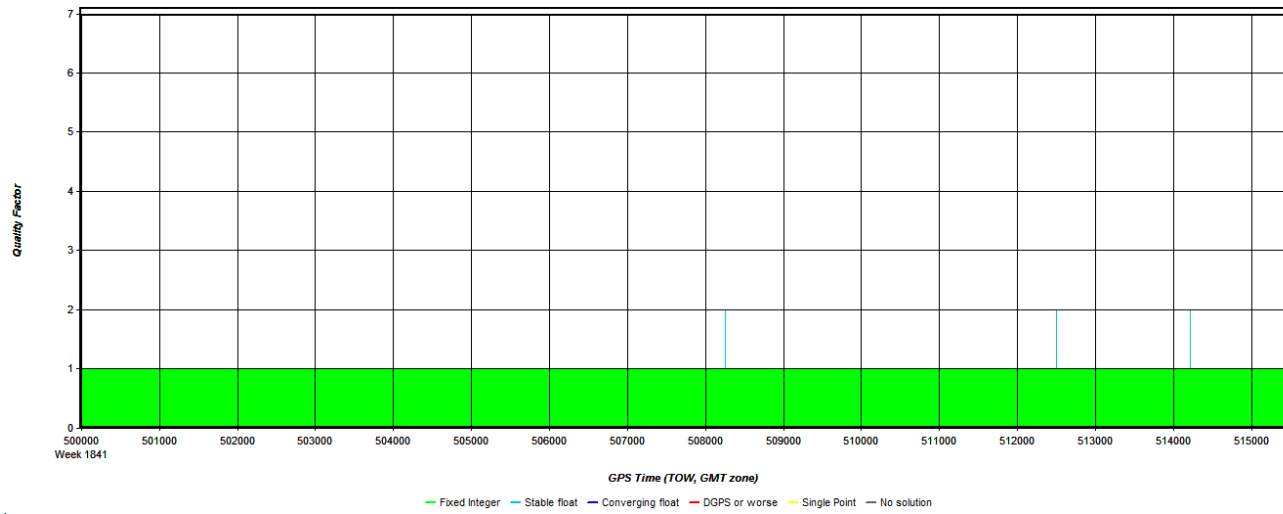


Estimated Accuracy

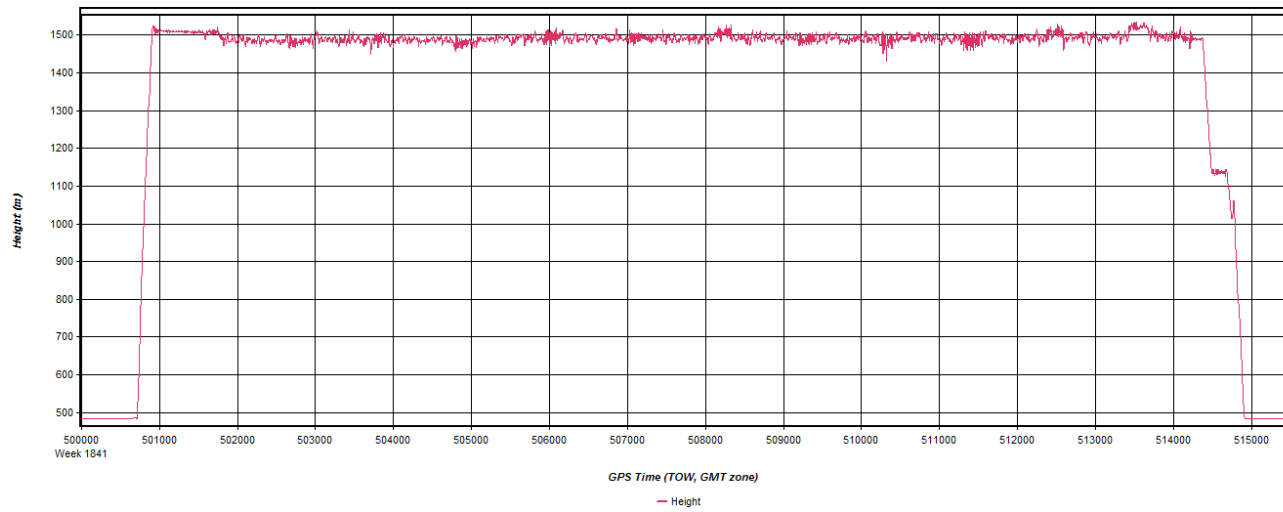




Quality Factor

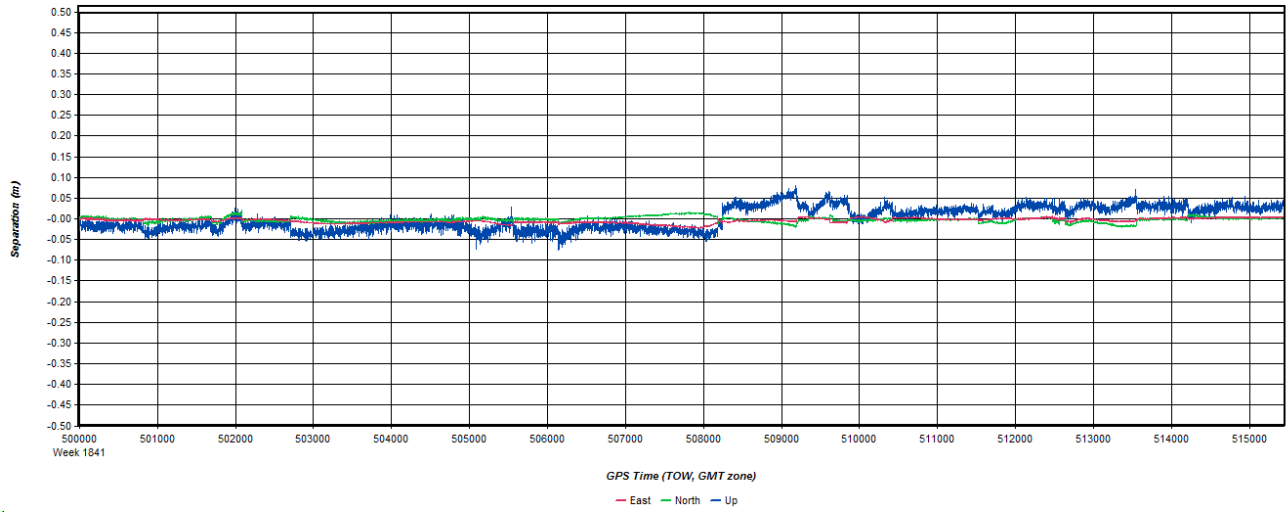


Height

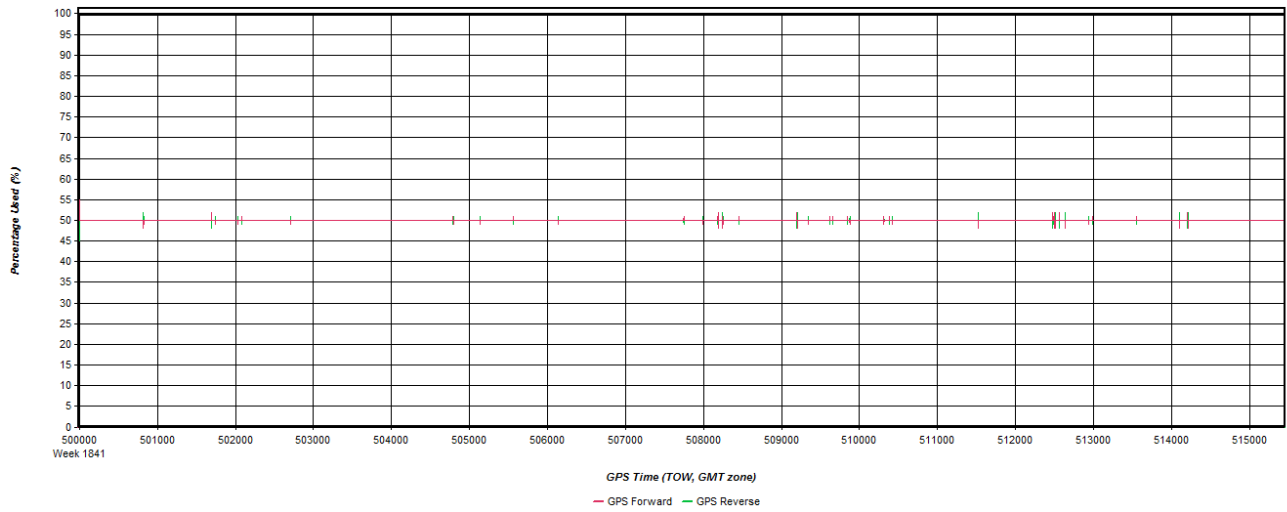




Combined Forward/Reverse Separation

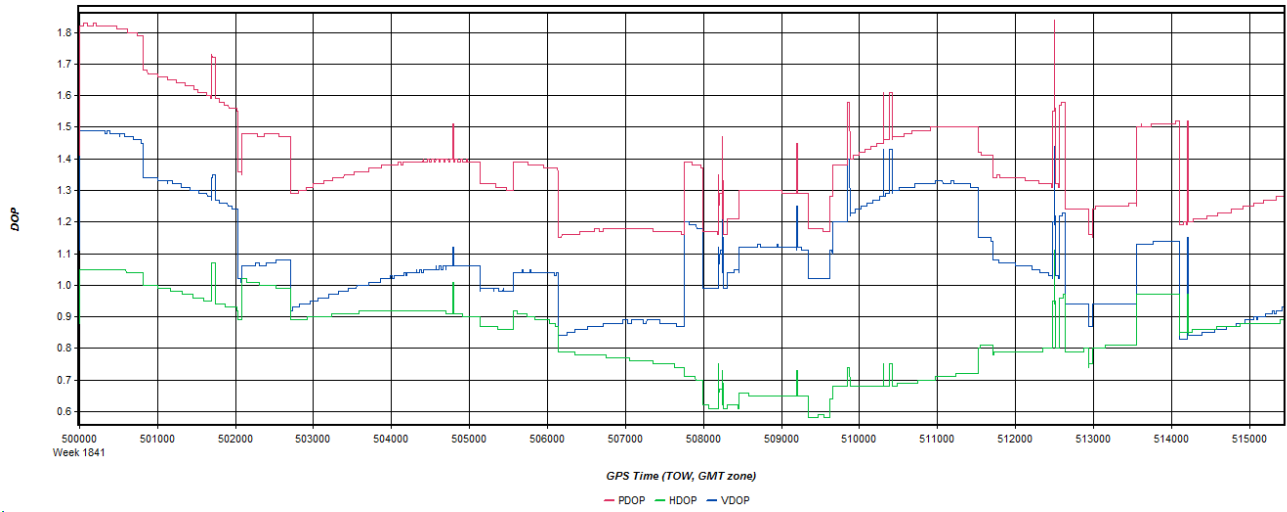


Combined Forward/Reverse Weighting

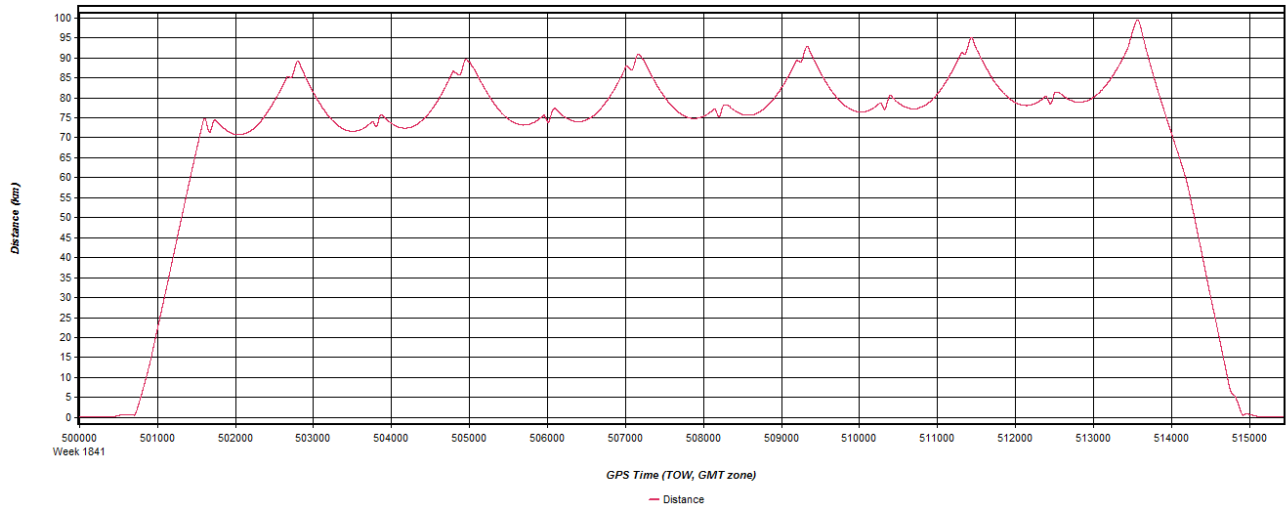




PDOP

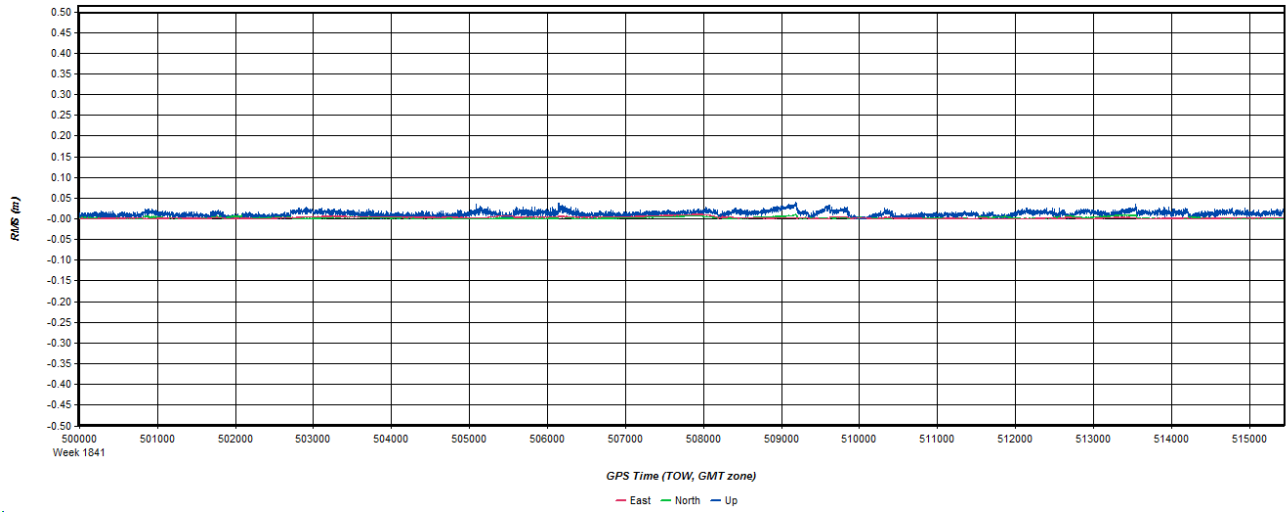


Distance from Base

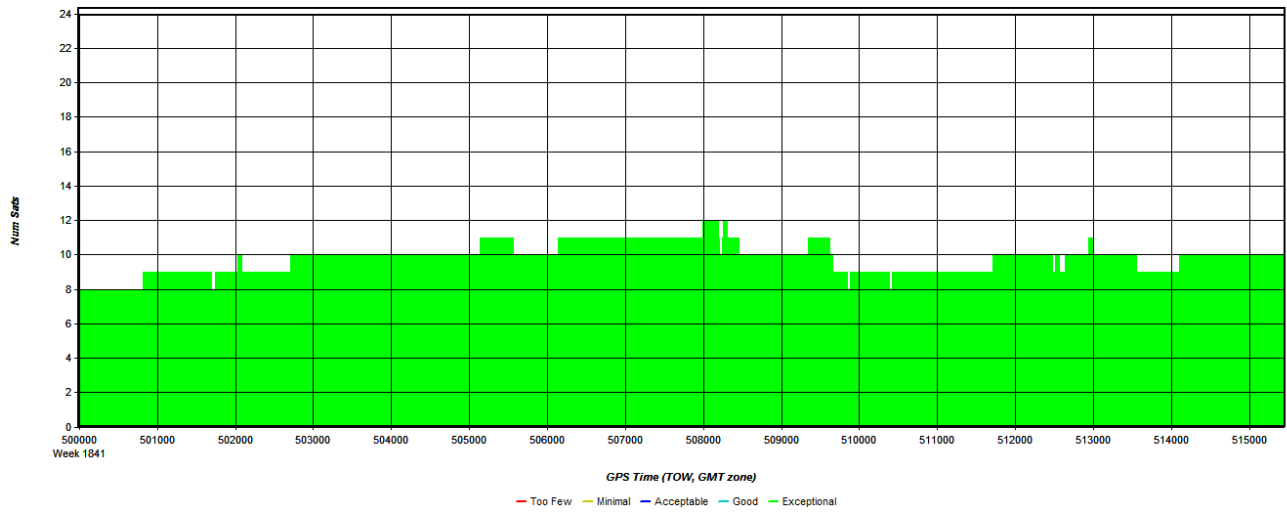




Combined RMS



SVs





Acquisition and Processing details ----- Collection 4 (April 26, 2015)

Log:

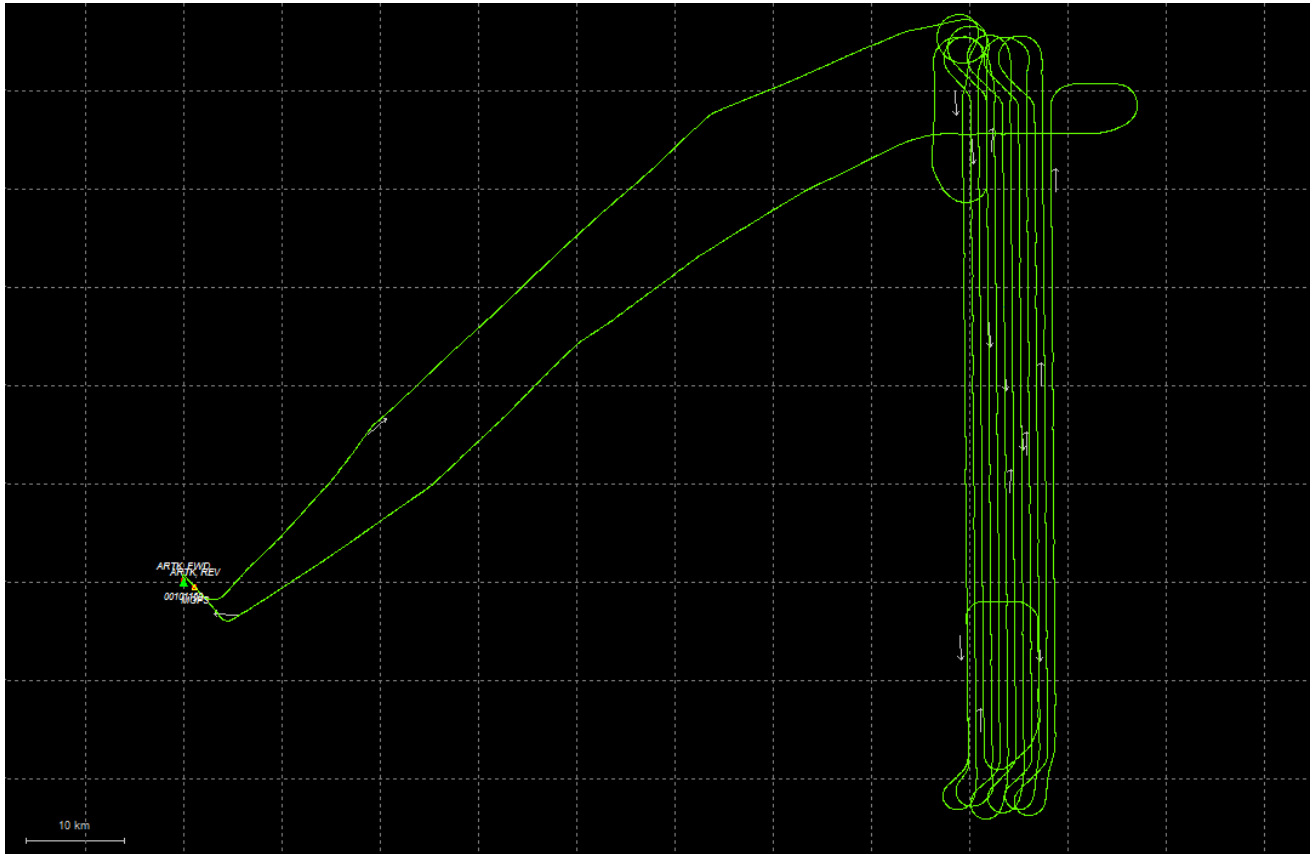


15.2	Lift Begin			Lift End			Flt	Flt	Hobbs	Activity
	Airport	Chocks	Hobbs	Airport	Chocks	Hobbs	Duration	Hrs	Hrs	
1	KBIS		3039.6	KBIS		3044.1			4.5	
2										
3										

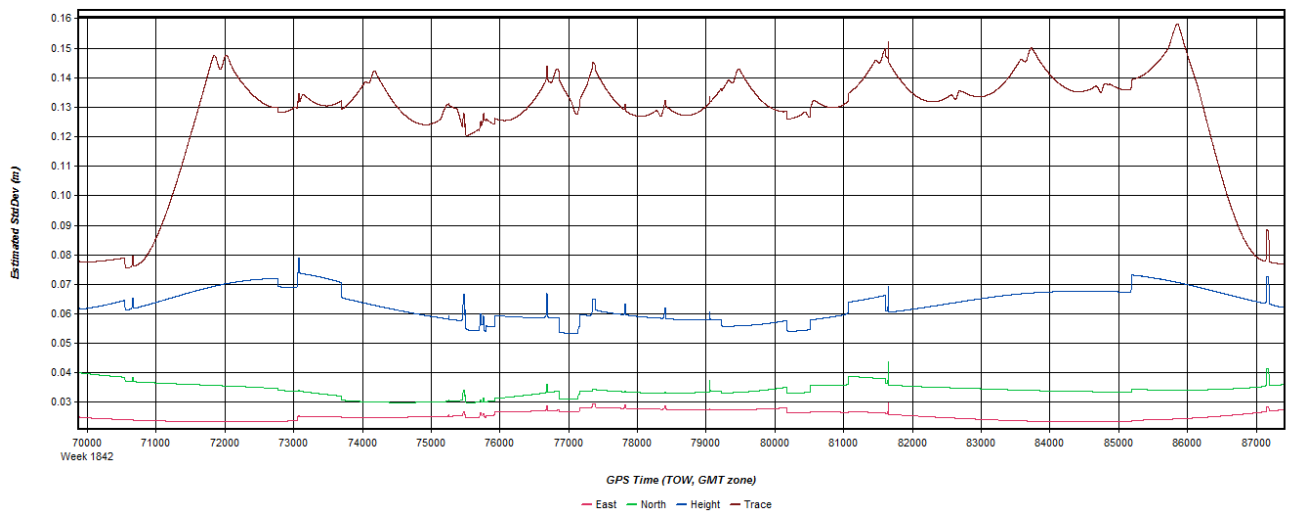
**Q680i
Flight Log**

FGI Job # 22.14005700		Project Name Kidder Co			Operator Cody Buhmeister		Unit 165	IMU				Ground Temp °C 53.0 12.0	Mn Range' 2018	Data Logger Drives #3 & #8			
Flight Date 26-Apr-15		GPS Day 15-116	Lift 4	System R680i	Pilot Jay Reno		Sun° N/A	Solar Times (UTC) N/A		Flying Temp °C 49.0 9.0			Max Range' 3888	Download Drive AP1TB#01			
Mission ID (yyymmdd_Sen_Job_Lift) 150426_165_14005700_04				Aircraft N7139C	Airport ID KBIS	FMS 702GG	ARP (m) 1.5	UTC -5	AMT (ft) 3281	Speed 150	FOV 60	Scan Rate (Hz) 95	MTA 2	km/WPT 30.05	Humidity @ Alt 73.1	Shipping Track	
Base 1 ID	Location Bismarck, ND		Rec ID Novatel	Ant ID 702GG	Start Time (UTC) 24/26/2015 19:10	Stop Time (UTC) 26-Apr-15 00:25	GPS Filename 00101160	Operator Cody Buhmeister		Data With AB							
Area	Flight #	Wpt	Distance		UTC		Flt	Altitude	Speed	Scan	Comments and Conditions				SVs	PDOF	
	FGI	RCA	From	To	Begin	End	Dir	(GPS)	(knots)	Rate							
					19:25:00	19:30:00					Static observation @ KBIS						
					19:56:00	20:00:00					360 turn before frst line						
KIDDER	38	38		0	34.6	20:01:00	20:16:00	S	4,888	143	95.0	off track at 32.1 miles				20	1.2
	39	39		0	34.6	20:19:00	20:33:00	N	4,887	153	95.0					21	1.04
	40	40		0	34.6	20:37:00	20:57:00	S	4,899	145	95.0					21	1.18
	38	38		0	2.5	20:58:00	21:00:00	S	4,900	146	95.0	refly 2.5 miles				20	1.08
	41	41		0	34.6	21:03:00	21:17:00	N	4,900	147	95.0					20	1.14
	41	41		0	2.5	21:21:00	21:23:00	S	4,899	148	95.0	calibration line 2.5 miles					0.96
	42	42		0	34.6	21:30:00	21:44:00	S	4,853	150	95.0					20	1
	43	43		0	34.6	21:47:00	22:01:00	N	4,853	153	95.0					19	1.09
	44	44		0	34.6	22:05:00	22:20:00	S	4,835	145	95.0					18	1.13
	45	45		0	34.6	22:23:00	22:37:00	N	4,890	150	95.0					19	1.08
	46	46		0	34.6	22:41:00	22:55:00	S	4,849	150	95.0					19	1.16
	47	47		0	34.6	22:58:00	23:12:00	N	4,895	153	95.0					18	1.18
	48	48		0	34.6	23:16:00	23:30:00	S	4,932	150	95.0					18	1.1
	49	49		0	34.6	23:34:00	23:48:00	N	4,897	148	95.0					17	1.2
	65	65		0	5.3	23:52:00	23:54:00	W	4,896	150	95.0	5.3 miles of cross track				16	1.18
					00:13:00	00:17:00					Static observation @ KBIS						

Trajectory and GPS Plots:

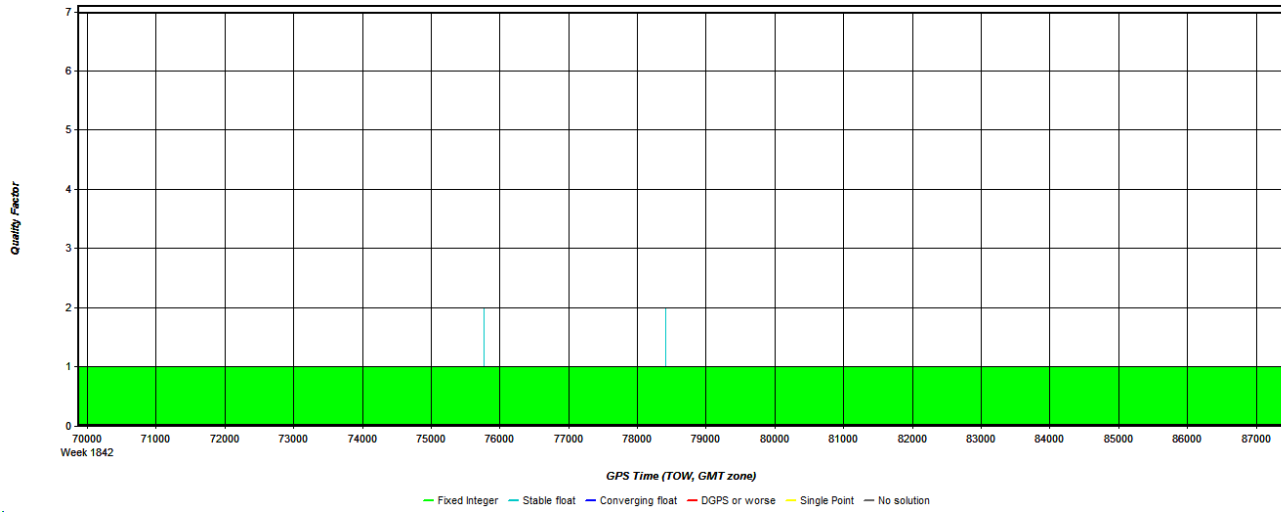


Estimated Accuracy

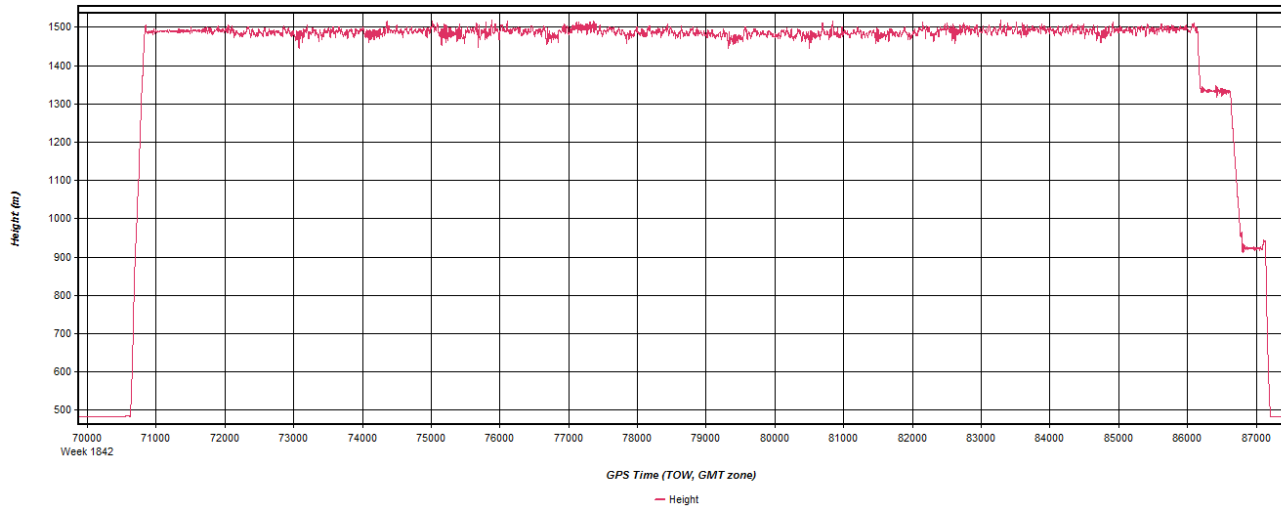




Quality Factor

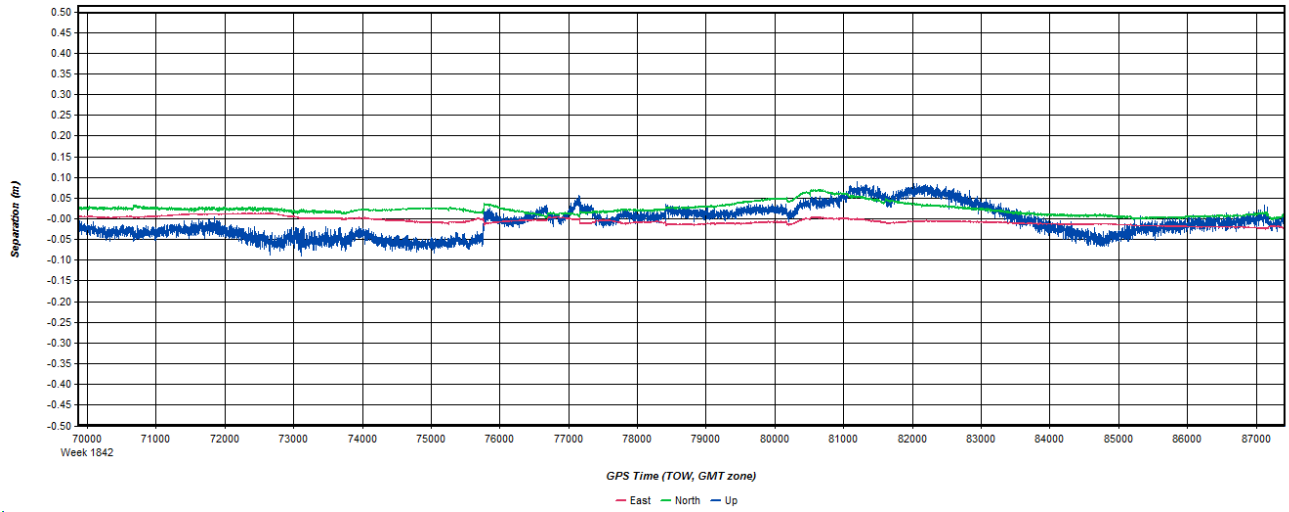


Height

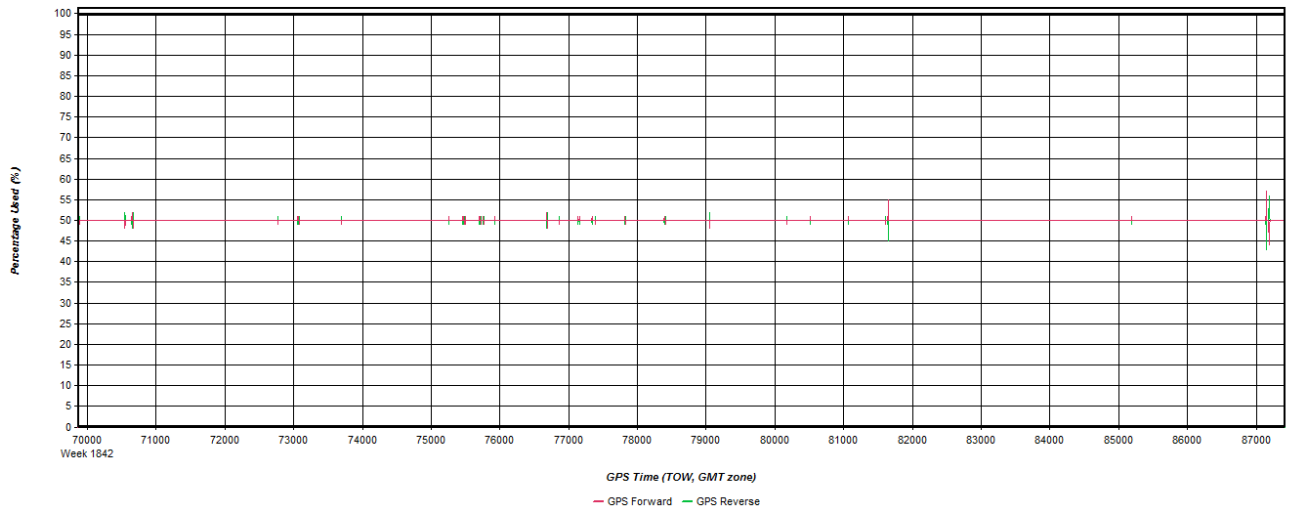




Combined Forward/Reverse Separation

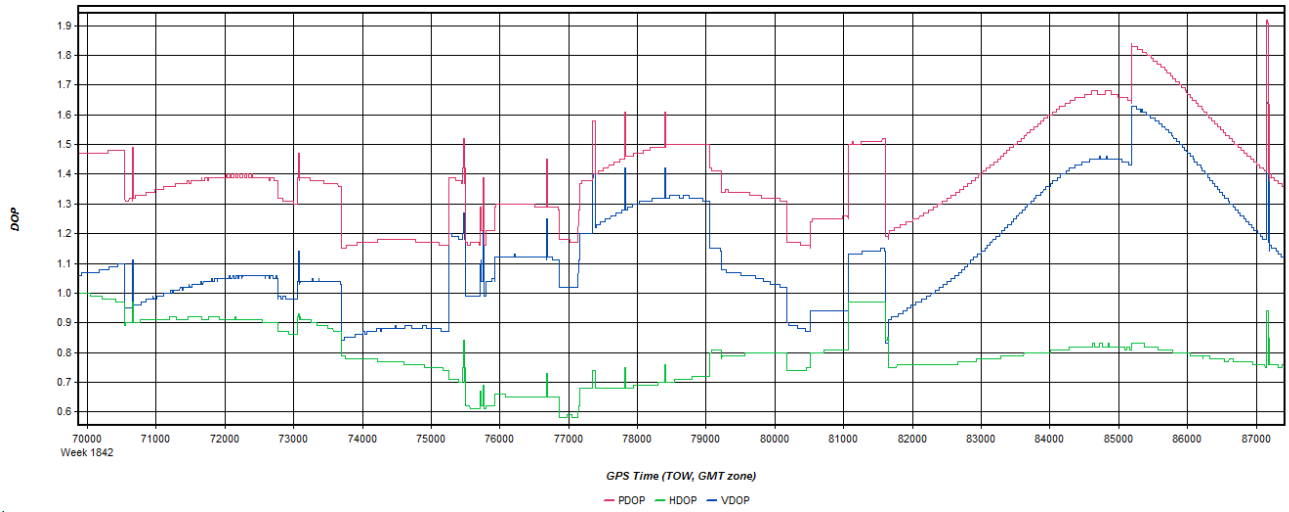


Combined Forward/Reverse Weighting

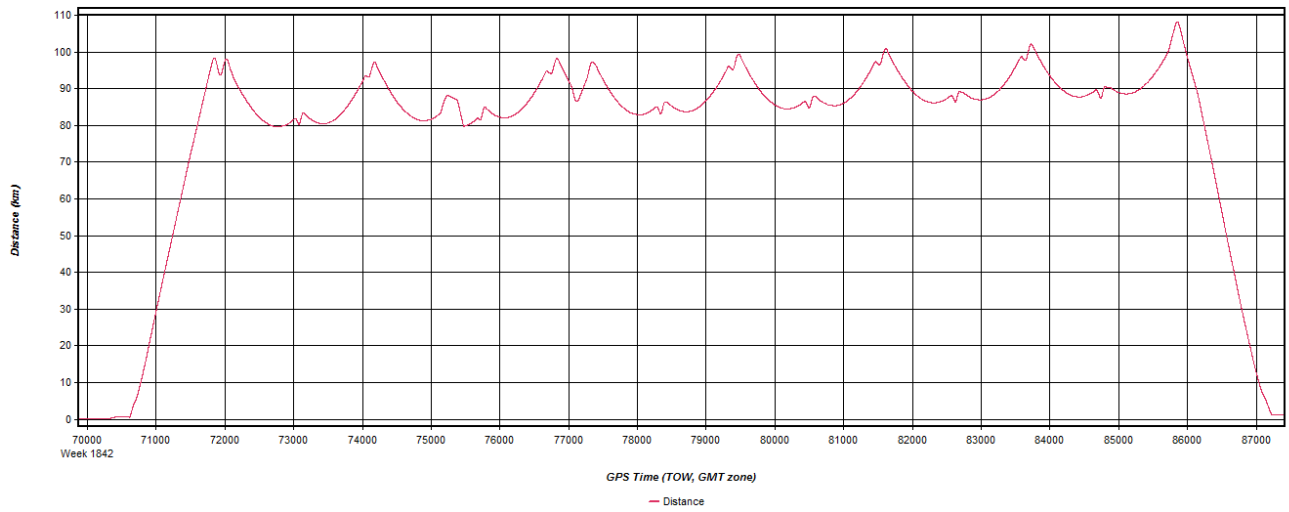




PDOP

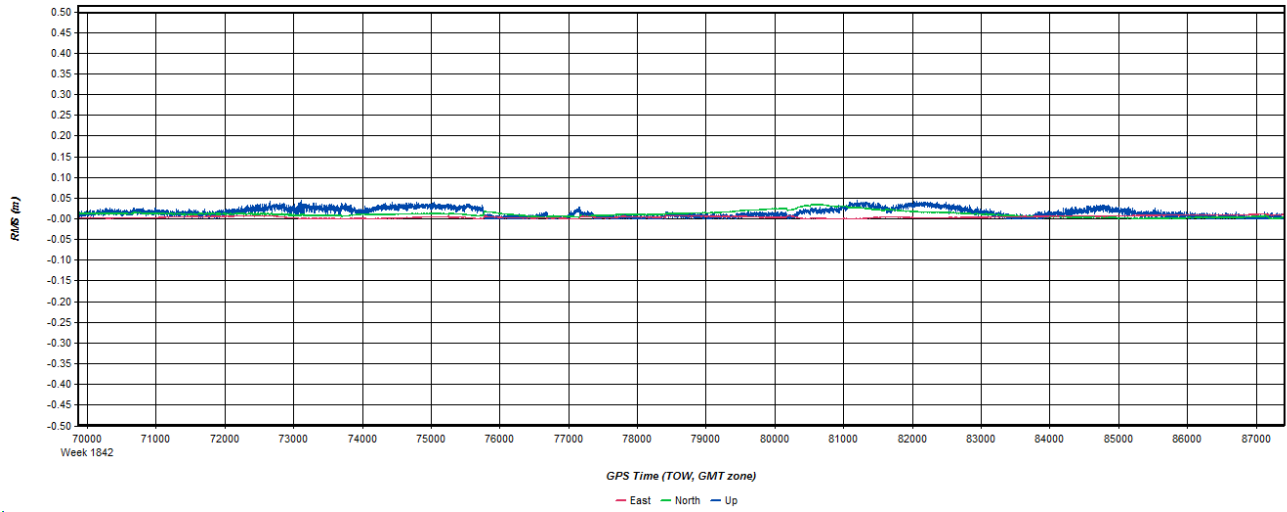


Distance from Base

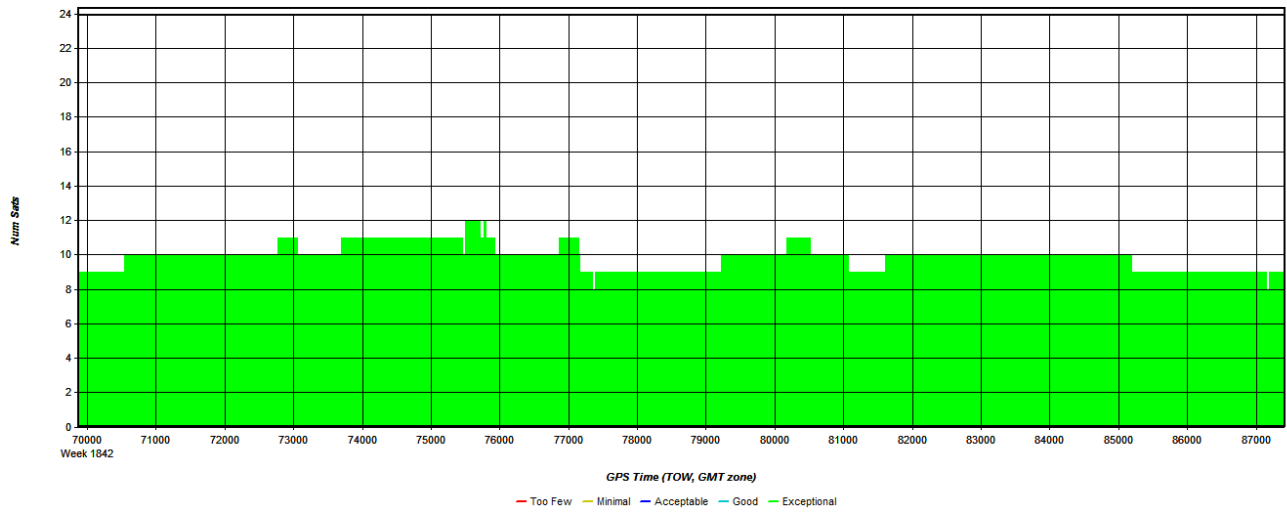




Combined RMS



SVs





Acquisition and Processing details ----- Collection 5 (April 28, 2015)

Log:

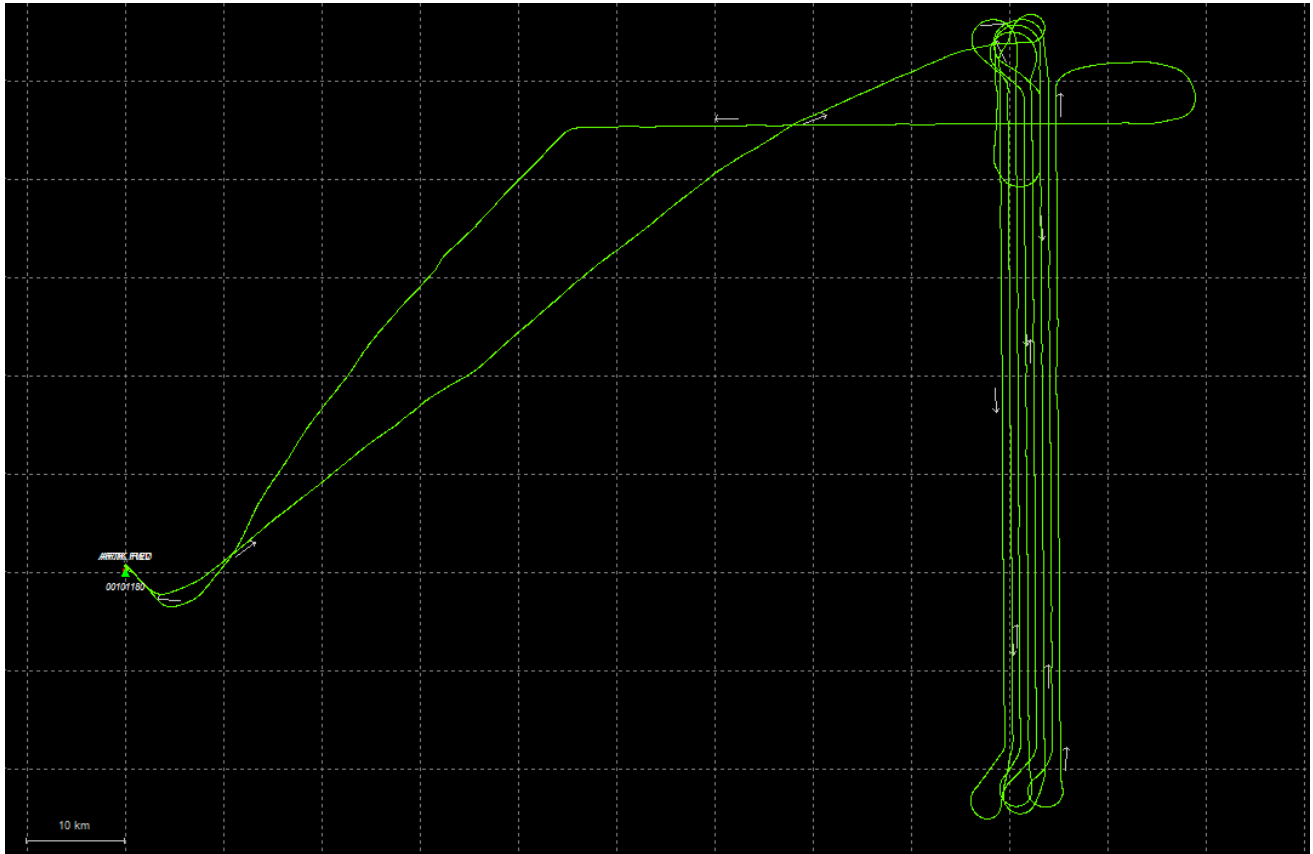


15.2	Lift Begin			Lift End			Fit Duration	Fit Hrs	Hobbs Hrs	Activity
	Airport	Chocks	Hobbs	Airport	Chocks	Hobbs				
1	KBIS		3044.1	KBIS		3047.5			3.4	
2										
3										

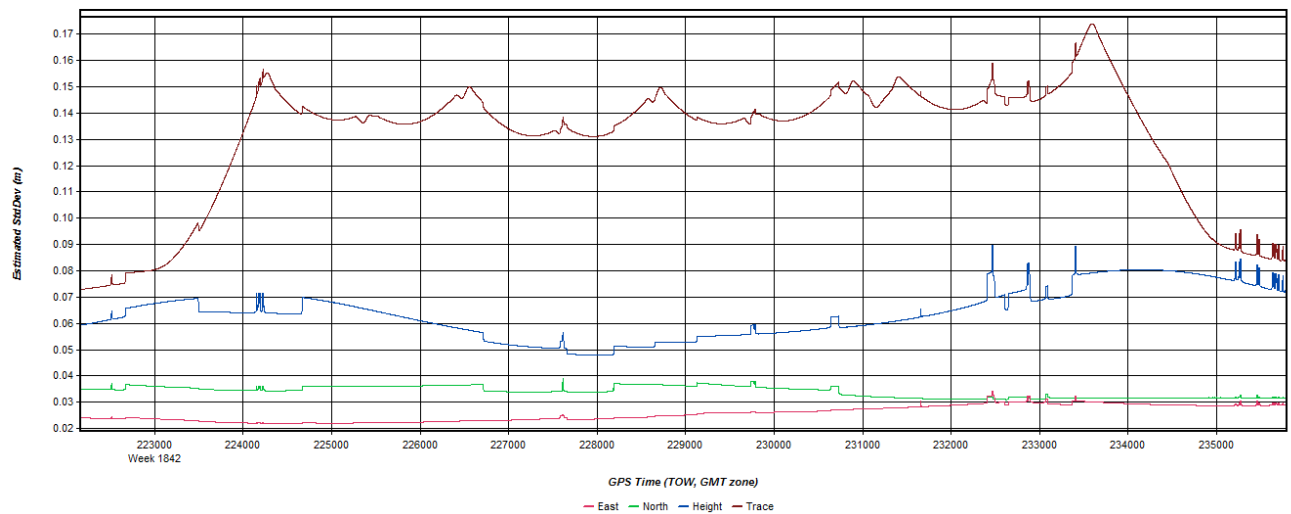
**Q680i
Flight Log**

FGL Job #		Project Name			Operator		Unit		IMU		Ground Temp °C		Mn Range'		Data Logger Drives					
22.14005700		Kidder Co			Cody Buhmeister		165				35.0 2.0		2018		#9					
Flight Date		GPS Day		Lift	System		Plot		Sun*		Solar Times (UTC)		Flying Temp °C		Max Range'		Download Drive			
28-Apr-15		15-118		5	R680I		Jay Reno		N/A		N/A		43.0 6.0		3888		AP1TB#05			
Mission ID (yyymmdd_Sen_Job_Lift)				Aircraft		Airport ID	FMS	UTC	AMT (ft)	Speed	FOV	Scan Rate (Hz)	MTA	km/WPT	Altm Setting		Humidity @ Alt		Shipping Track	
150428_165_14005700_05				N7139C		KBIS		-5	3281	150	60	95	2		30.24		59.9			
Base 1 ID		Location		Rec ID	Ant ID	ARP (m)	Start Time (UTC)		Stop Time (UTC)		GPS Filename		Operator		Data					
		Bismarck, ND		Novatel	702GG	1.5	4/28/2015 13:42 AM		4/28/2015 17:29:00 AM		00101160		Cody Buhmeister		With AB					
Area	Flight #		Wpt		Distance		UTC		Dir	Altitude (GPS)	Speed (knots)	Scan Rate	Comments and Conditions				SVs	PDOP		
	FGL	RCA	From	To	Begin	End	Start	End												
							13:43:00	19:30:00					Static observation @ KBIS							
KIDDER							14:16:00	20:00:00					360 turn before frst line							
	50	50			0	34.6	14:19:00	14:34:00	S	4,936	148	95.0					20	1.0		
	51	51			0	34.6	14:38:00	14:52:00	N	4,946	148	95.0					20	1.03		
	52	52			0	34.6	14:57:00	15:11:00	S	4,926	147	95.0					19	1.03		
	53	53			0	2.5	15:14:00	15:29:00	N	4,938	149	95.0					20	0.98		
	54	54			0	34.6	15:32:00	15:47:00	S	4,974	144	95.0					18	1.06		
	55	55			0	34.6	15:50:00	16:05:00	N	4,912	146	95.0					18	0.98		
	55	55			0	3	16:09:00	16:10:00	S	4,890	146	95.0	CALIBRATION LINE				19	1.02		
	56	56			0	34.6	16:17:00	16:32:00	S	4,895	149	95.0					19	0.98		
	57	57			0	34.6	16:35:00	16:49:00	N	4,879	148	95.0	HIT A CLOUD AT 16 MILES TO THE END				19	1.03		
	65	65			0	28	16:54:00	17:06:00	E	4,937	150	95.0	CROSS FLIGHT OF LINES				16	1.23		
							17:24:00	17:29:00					SATIC OBSERVATIONS @ KBIS							

Trajectory and GPS Plots:

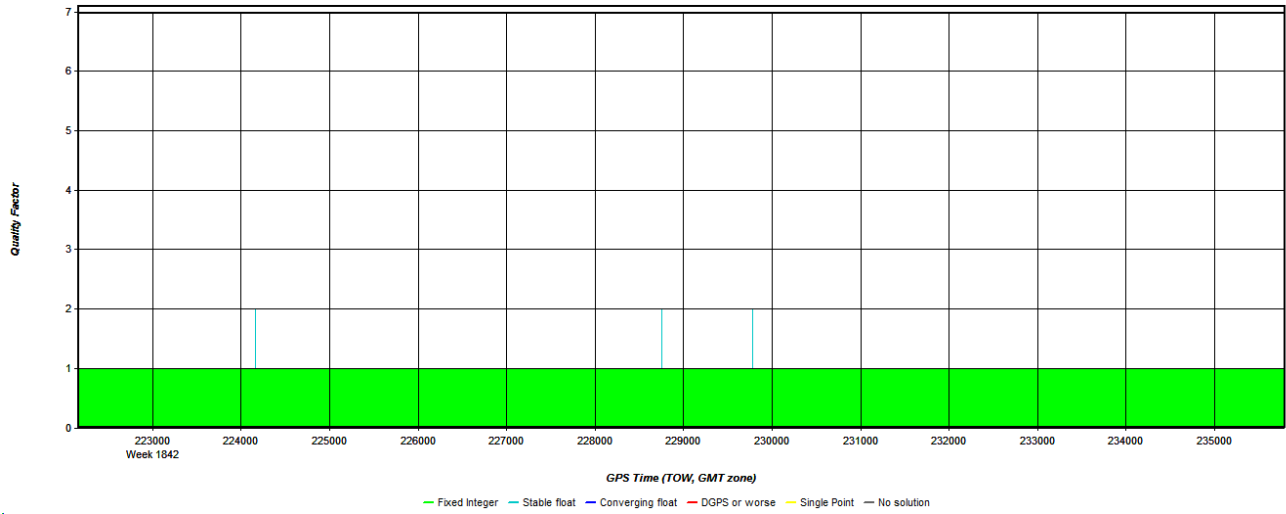


Estimated Accuracy

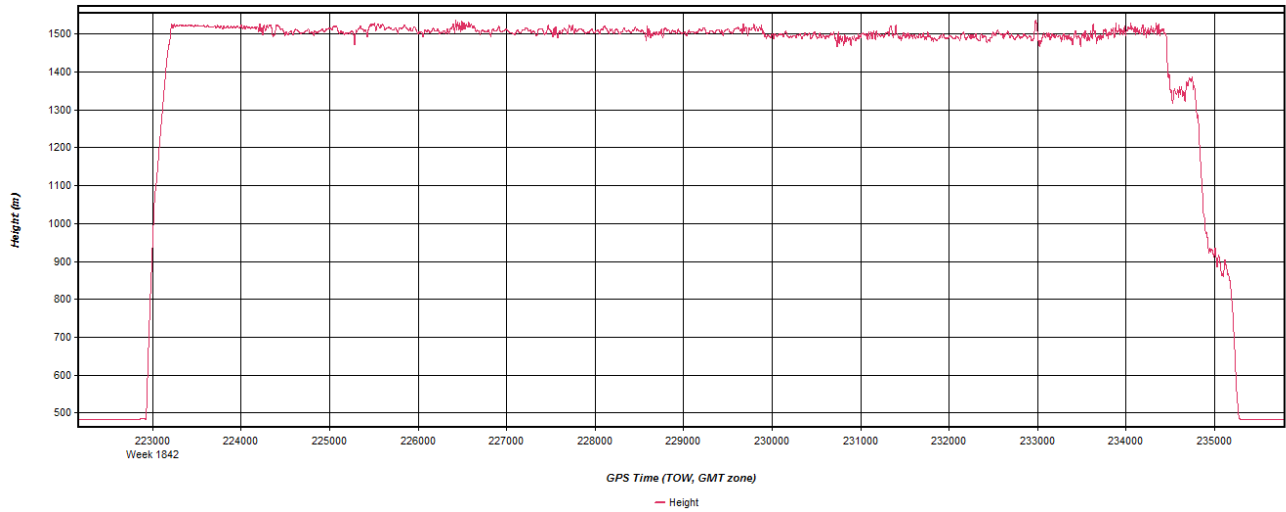




Quality Factor

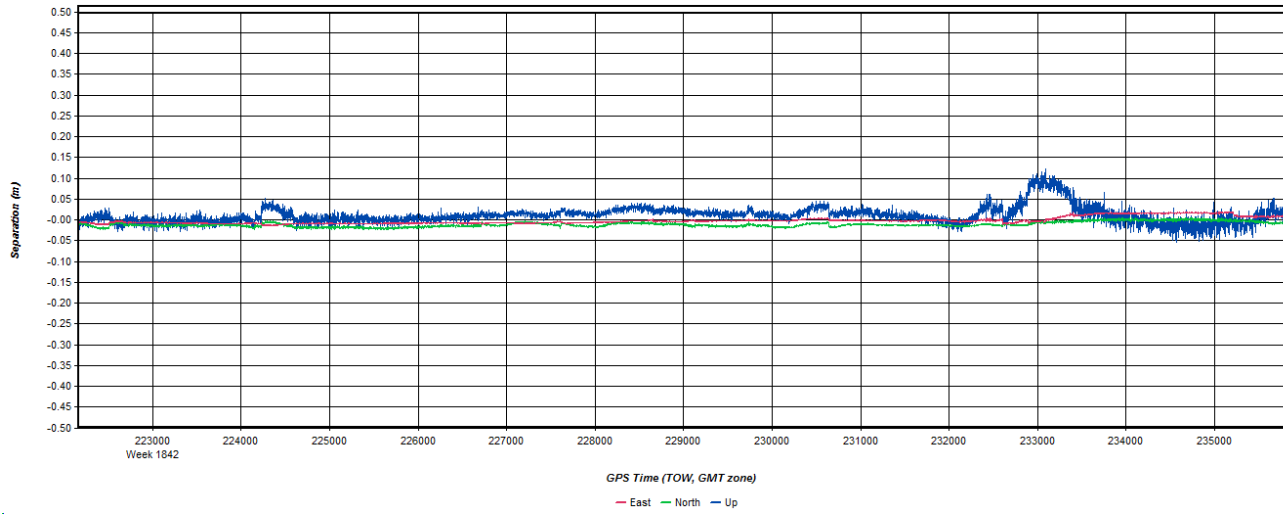


Height

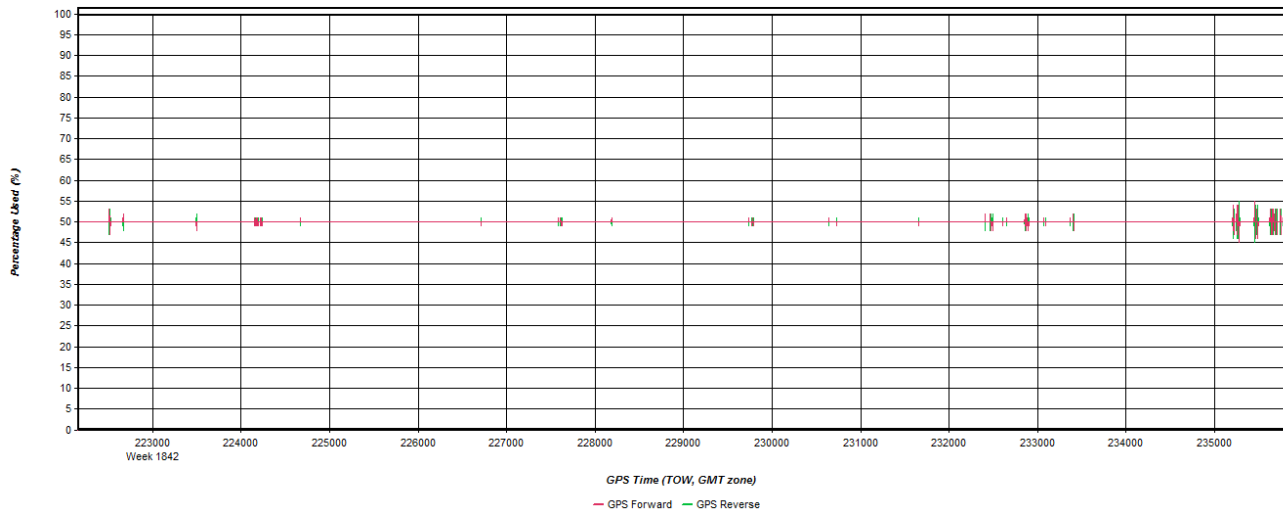




Combined Forward/Reverse Separation

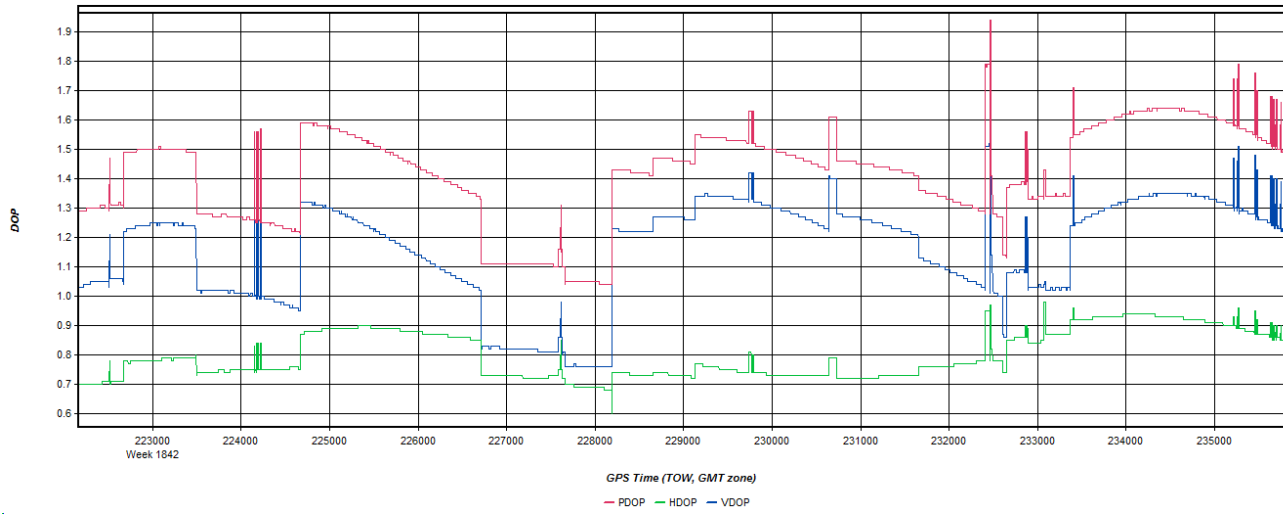


Combined Forward/Reverse Weighting

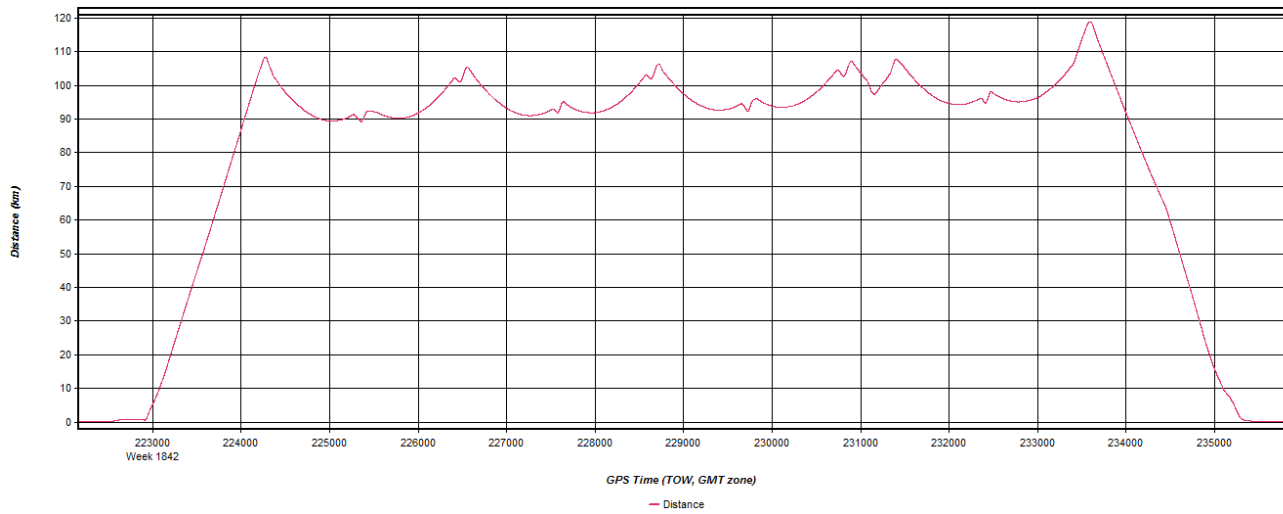




PDOP

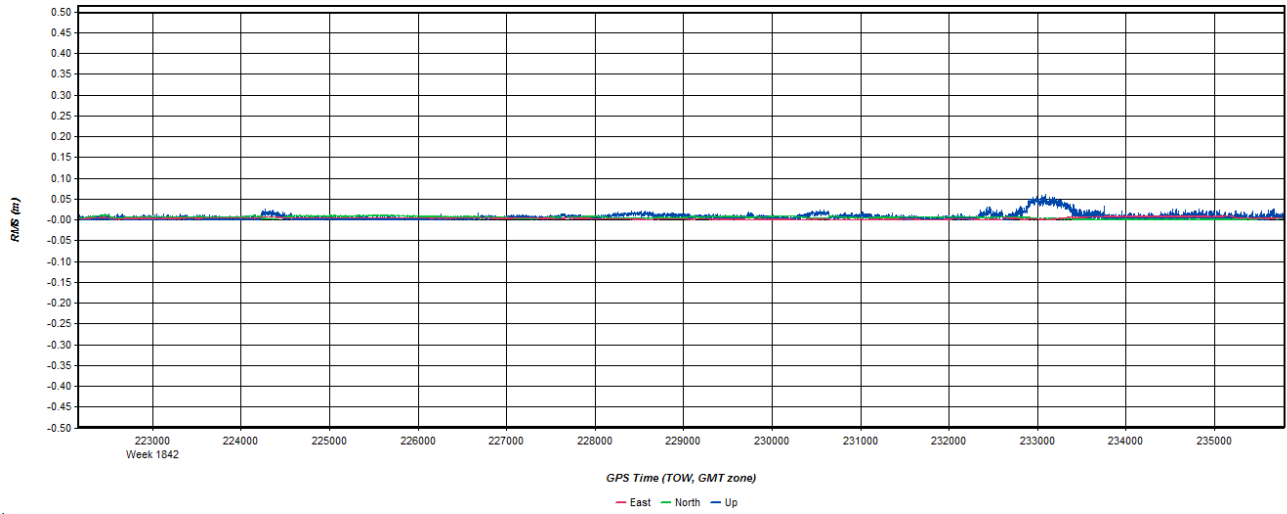


Distance from Base

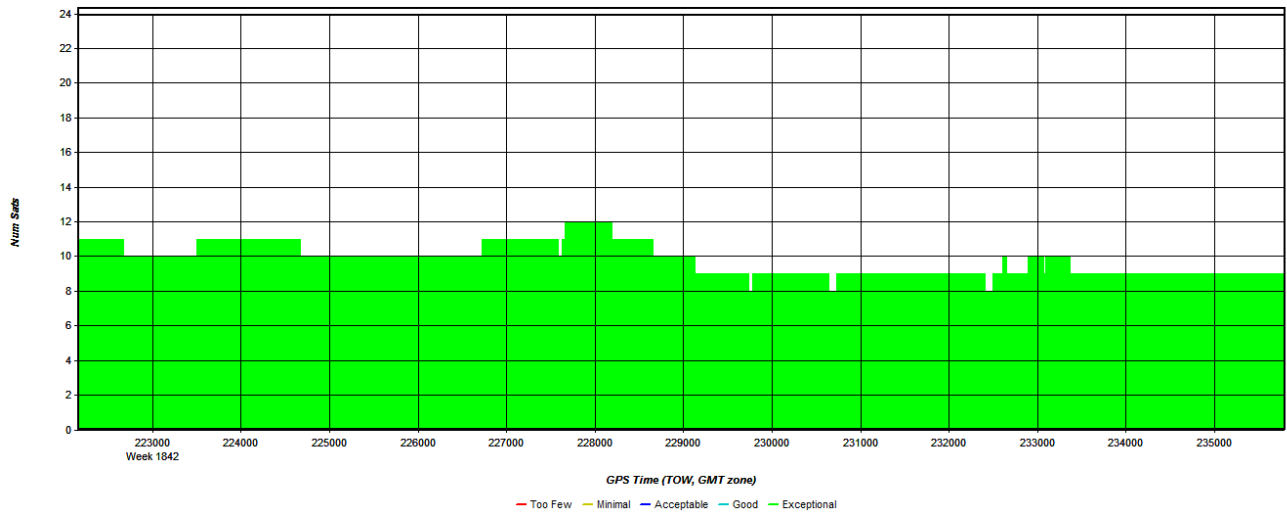




Combined RMS



SVs





Acquisition and Processing details ----- Collection 6 (April 28, 2015)

Log:

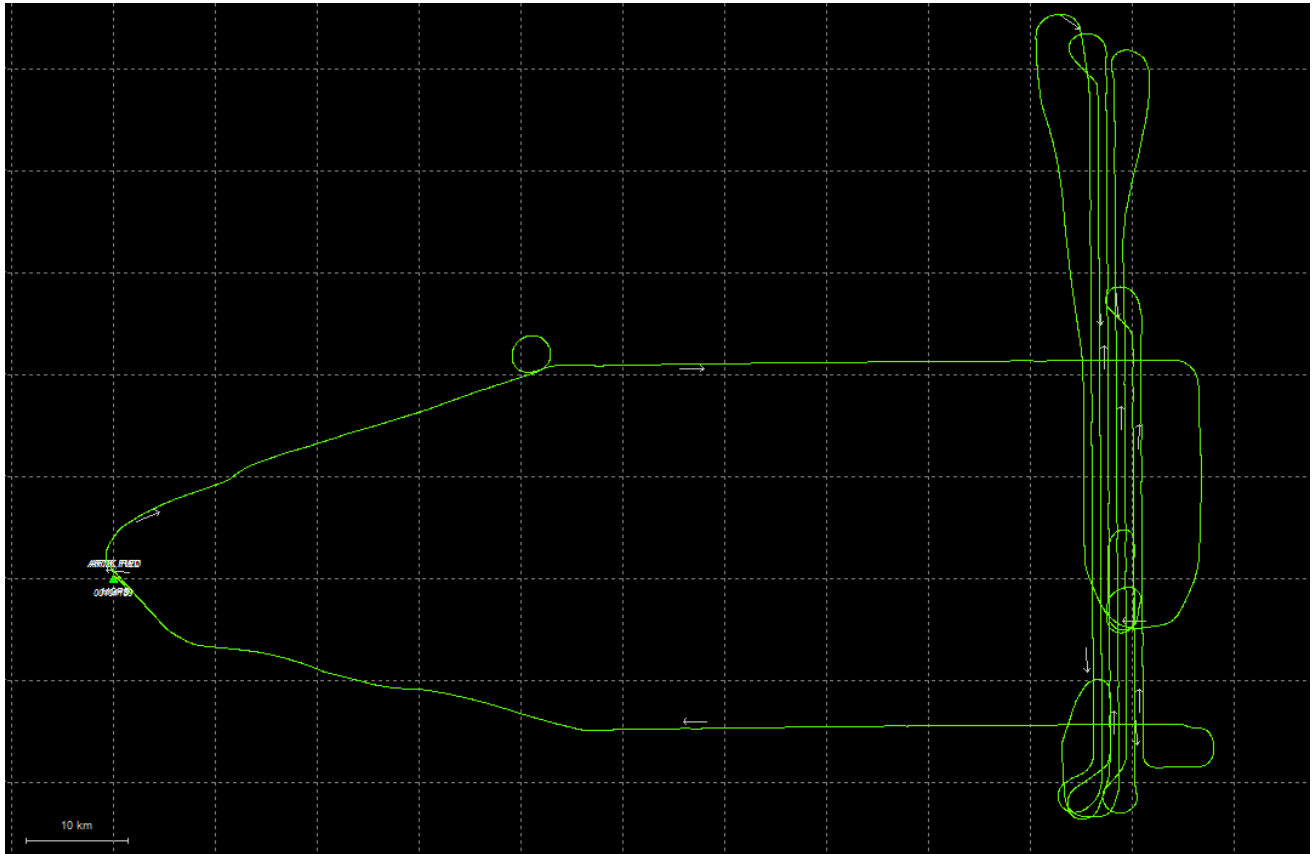


15.2	Lift Begin			Lift End			Fit Duration	Fit Hrs	Hobbs Hrs	Activity
	Airport	Chocks	Hobbs	Airport	Chocks	Hobbs				
1	KBIS		3047.1	KBIS		3050.8			3.7	
2										
3										

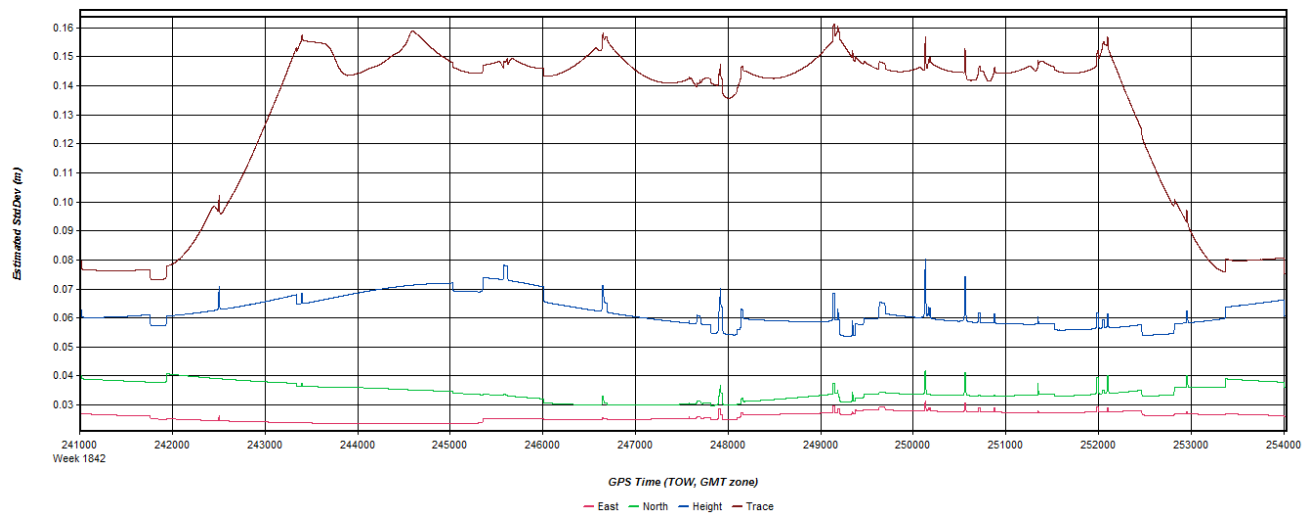
**Q680i
Flight Log**

FGL Job # 22.14005700		Project Name Kidder Co			Operator Cody Buhrmeister		Unit 165		IMU		Ground Temp °C 62.0 17.0		Min Range' 2018		Data Logger Drives #4 & #1														
Flight Date 28-Apr-15		GPS Day 15-118		Lift 6		System R680I		Plot Jay Reno		Sun° N/A		Solar Times (UTC) N/A		Flying Temp °C 3888		Download Drive AP1TB#05													
Mission ID (yyymmdd_Sen_Job_Lift) 150428_165_14005700_06				Aircraft N7139C		Airport ID KBIS		FMS 702GG		UTC -5		AMT (ft) 3281		Speed 150		FOV 60		Scan Rate (Hz) 95		MTA 2		km/WPT 30.24		Alt Setting 59.8		Humidity @ Alt		Shipping Track	
Base 1 ID		Location Bismarck, ND		Rec ID Novatel		Ant ID 702GG		ARP (m) 1.5		Start Time (UTC) 28-Apr-15 18:56			Stop Time (UTC) 28-Apr-15 22:34			GPS Filename 00101160		Operator Cody Buhrmeister		Data With AB									
Area	Flight #		Wpt		Distance		UTC		Fit Dir	Altitude (GPS)	Speed (knots)	Scan Rate	Comments and Conditions				SVs	PDOP											
	FGL	RCA	From	To	Begin	End	Start	End																					
													Static observation @ KBIS																
													360 turn before frst line																
KIDDER	66	66			0	28.4	19:23:00	19:33:00	E	4,919	146	95.0					18	1.2											
	57	57			0	2	19:46:00	19:47:00	N	4,893	147	95.0	PORTION OF 57 WHERE WE HAD A CLOUD IN THE AM FLIGHT				19	1.3											
	58	58			0	34.6	19:57:00	20:11:00	S	4,946	150	95.0					20	1.08											
	59	59			0	34.6	20:14:00	20:29:00	N	4,952	150	95.0					21	1											
	60	60			0	34.6	20:31:00	20:46:00	S	4,907	149	95.0					20	1.13											
	60	60			0	3	20:49:00	20:51:00	N	4,914	145	95.0	CALIBRATION LINE				19	1.17											
	61	61			0	34.6	20:56:00	21:11:00	N	4,911	143	95.0					21	1.16											
	62	62			0	21.4	21:18:00	21:27:00	S	4,927	146	95.0					21	0.96											
	63	63			0	12	21:30:00	21:39:00	N	4,912	145	95.0	BROKE LINE OFF AFTER TURB				19	1.09											
	63	63			0	13	21:41:00	21:47:00	N	4,912	146	95.0	CIRCLED BACK AND CONTINUED LINE TO COMPLETION				19	1.08											
	64	64			0	29	21:50:00	21:59:00	S	4,905	148	95.0					18	1.13											
	67	67					22:02:00	22:14:00	W	4,994	148	95.0					19	1.05											
							22:29:00	22:34:00					Static observation @ KBIS																

Trajectory and GPS Plots:

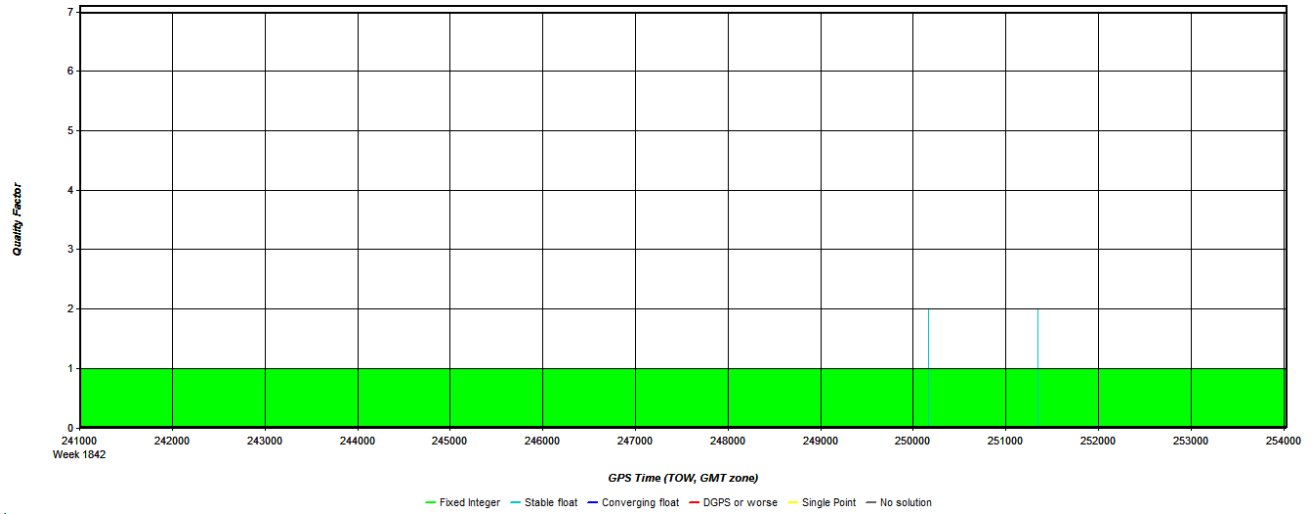


Estimated Accuracy

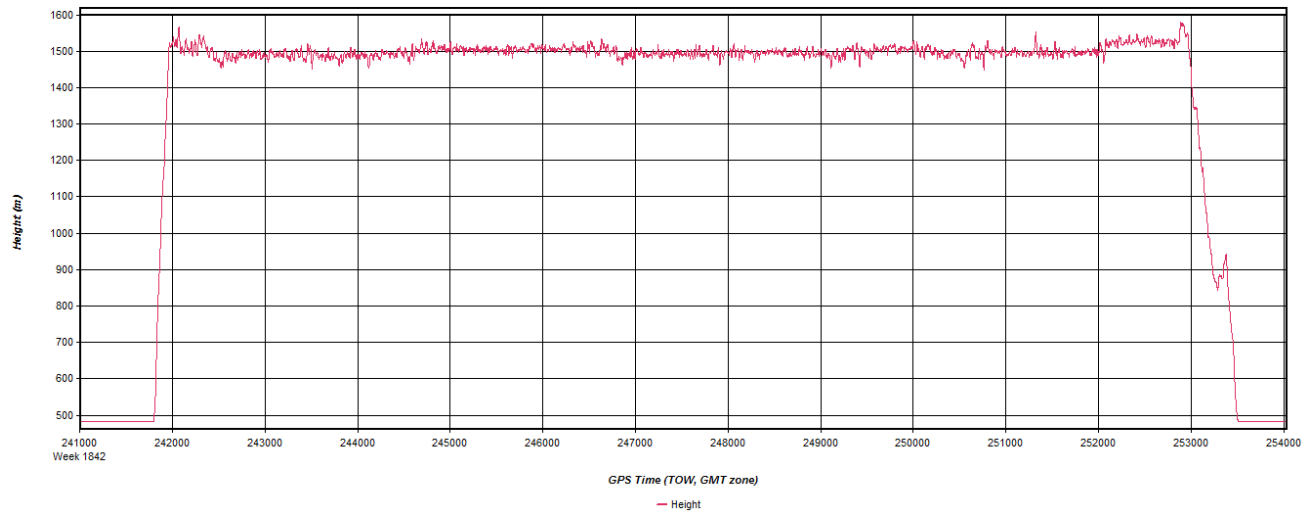




Quality Factor

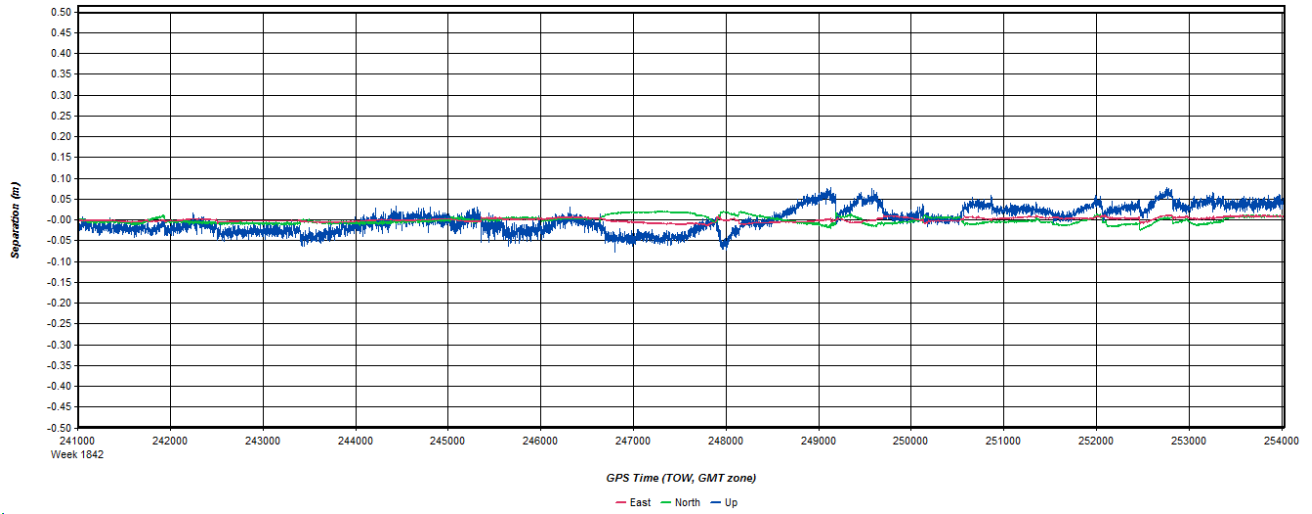


Height

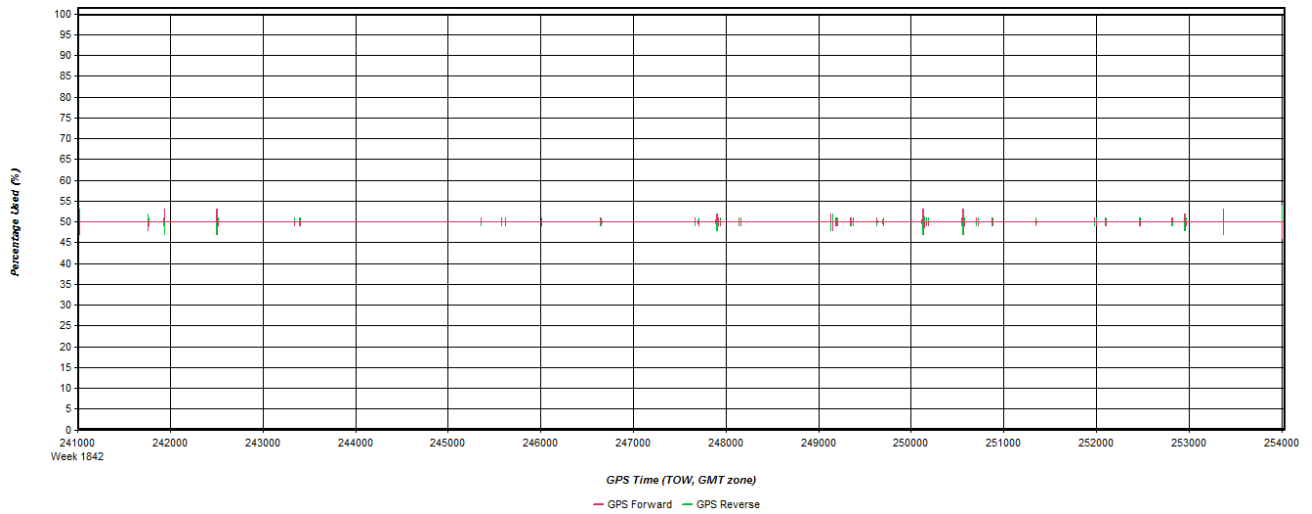




Combined Forward/Reverse Separation

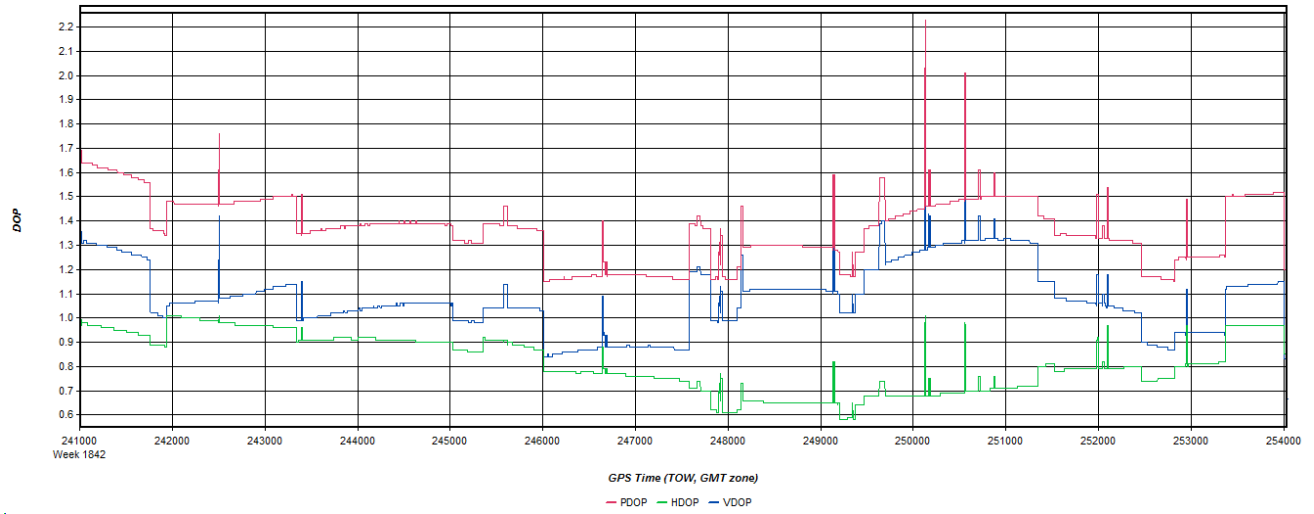


Combined Forward/Reverse Weighting

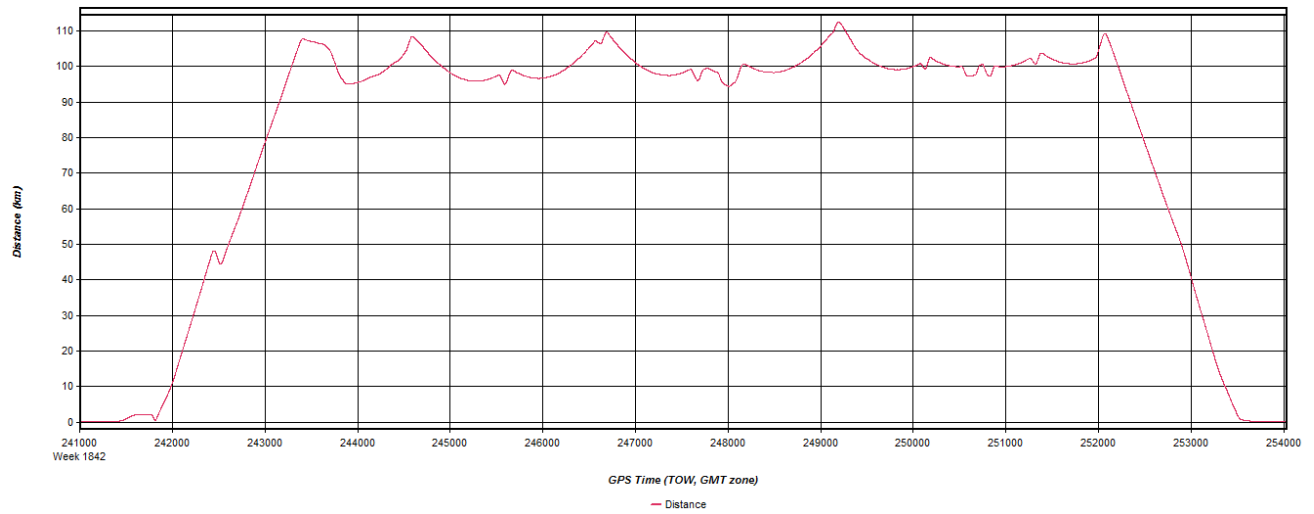




PDOP

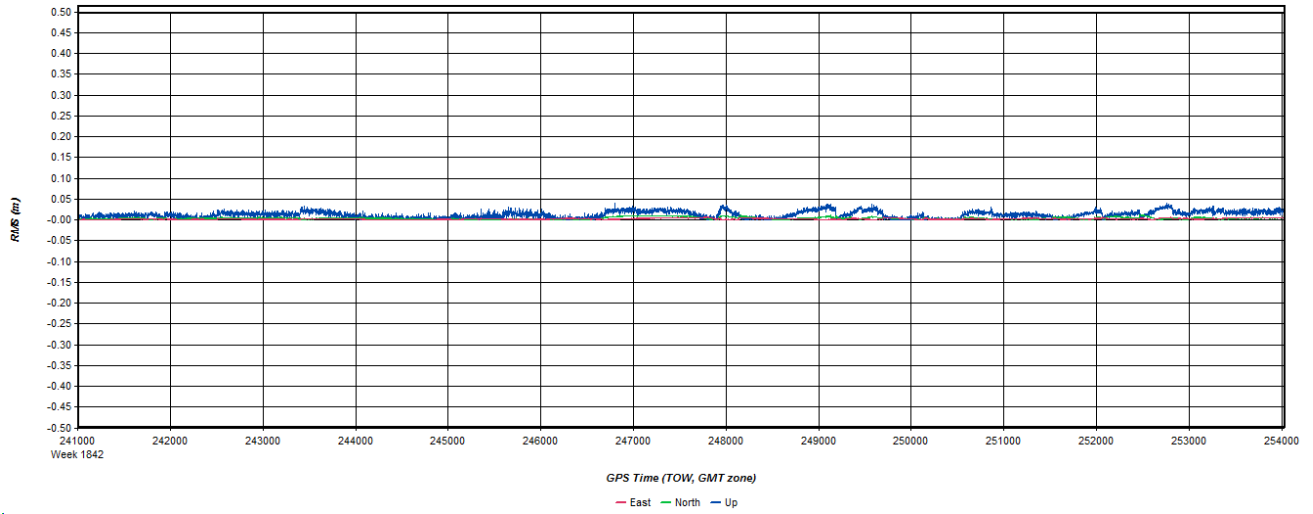


Distance from Base

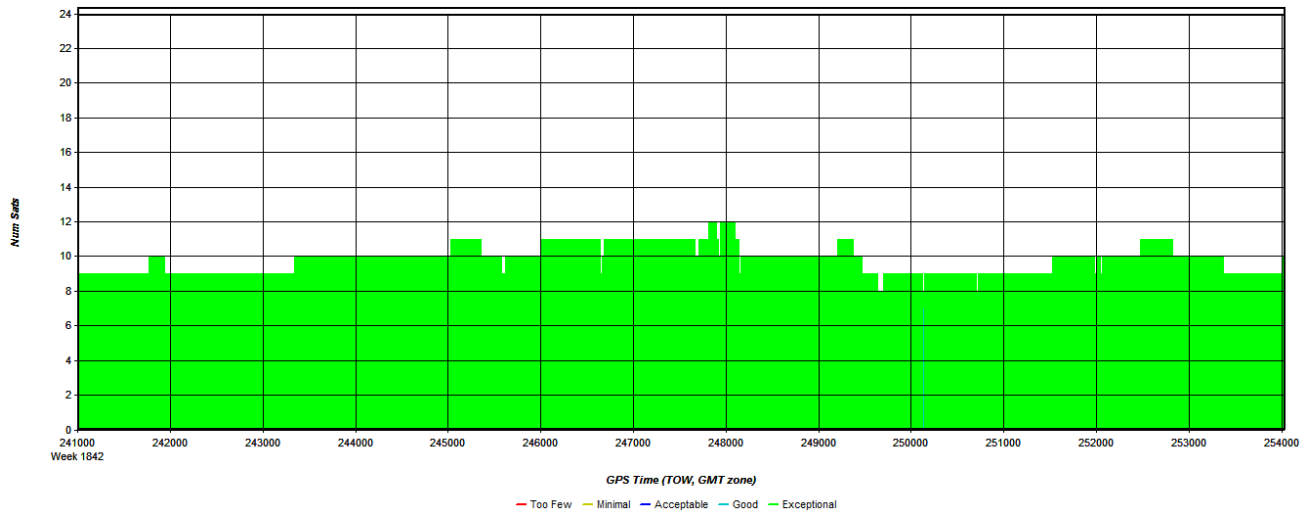




Combined RMS



SVs





Acquisition and Processing details ----- Collection 7 (April 29, 2015)

Log:

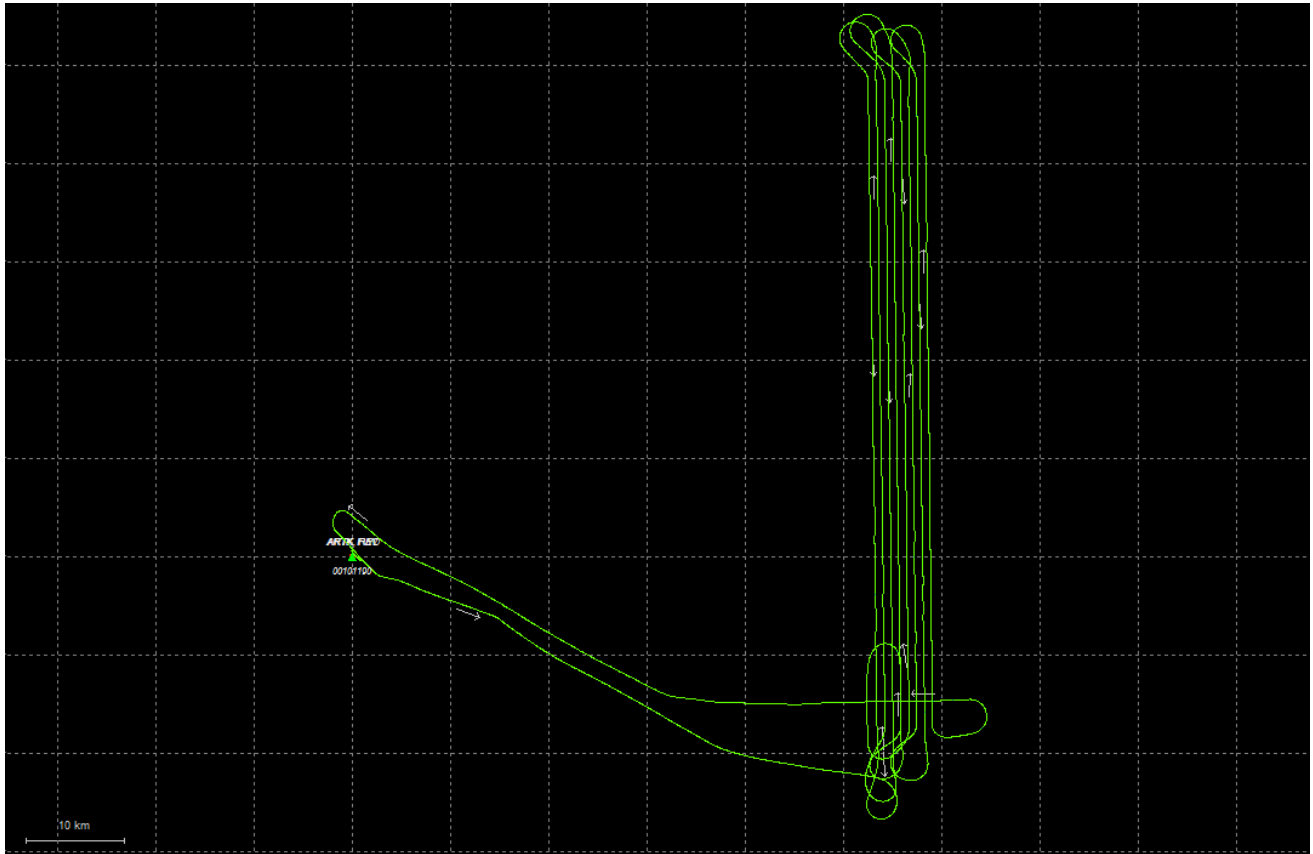


15.2	Lift Begin			Lift End			Fit Duration	Fit Hrs	Hobbs Hrs	Activity
	Airport	Chocks	Hobbs	Airport	Chocks	Hobbs				
1	KBIS		3050.8	KBIS		3054.5			3.7	
2										
3										

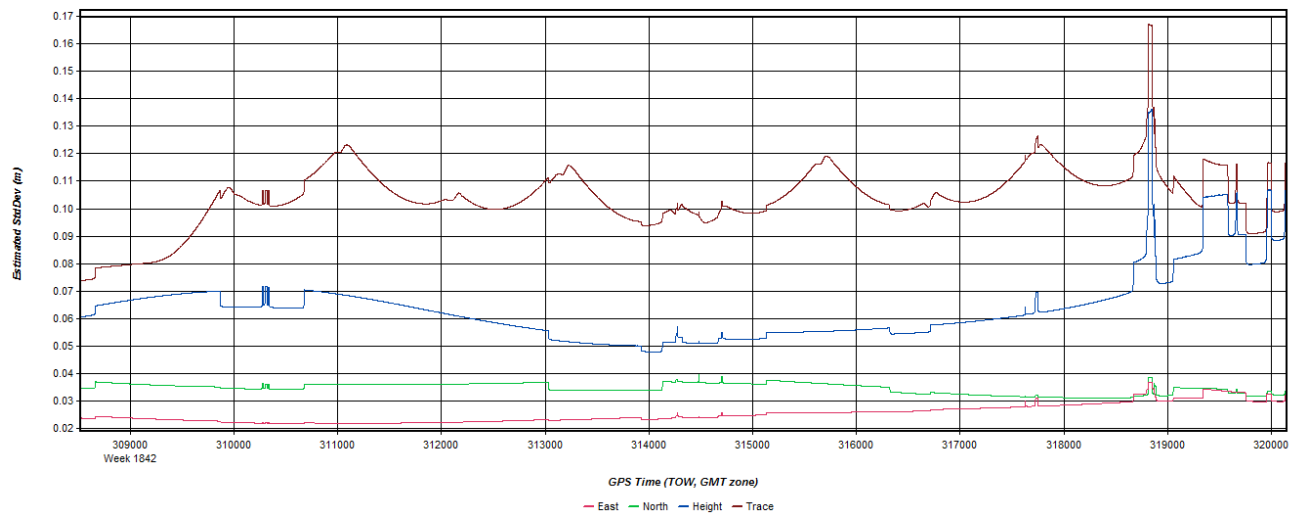
**Q680i
Flight Log**

FGL Job #		Project Name			Operator		Unit	IMU	Ground Temp °C			Min Range'	Data Logger Drives				
22.14005700		Kidder Co			Cody Buhrmeister		165		39.0	4.0	2018	#2					
Flight Date		GPS Day	Lift	System	Pilot		Sun*	Solar Times (UTC)		Flying Temp °C		Max Range'	Download Drive				
29-Apr-15		15-119	7	R680I	Jay Reno		N/A	N/A		43.0	6.0	3888	AP1TB#05				
Mission ID (yyymmdd_Sen_Job_Lift)				Aircraft	Airport ID	FMS	UTC	AMT (ft)	Speed	FOV	Scan Rate (Hz)	MTA	km/WPT	Alt. Setting	Humidity @ Alt	Shipping Track	
150429_165_14005700_07				N7139C	KBIS		-5	3281	150	60	95	2	30.03	49.2			
Base 1 ID	Location		Rec ID	Ant ID	ARP (m)	Start Time (UTC)		Stop Time (UTC)		GPS Filename		Operator		Data			
	Bismarck, ND		Novatel	702GG	1.5	29-Apr-15 12:15		29-Apr-15 18:45		00101190		Cody Buhrmeister		With AB			
Area	Flight #	RCA	Wpt	Distance		UTC		Fit	Altitude	Speed	Scan	Comments and Conditions			SVs	PDOF	
	FGL		From	To	Begin	End	Start	End	Dir	(GPS)	(knots)	Rate					
							13:41:00	13:46:00					Static observation @ KBIS				
							14:04:00	14:06:00					360 turn before frst line				
KIDDER	5	5			0	34.6	14:08:00	14:22:00	N	4,888	152	95.0				19	1.2
	6	6			0	34.6	14:25:00	14:40:00	S	4,907	146	95.0				20	1.11
	7	7			0	34.6	14:43:00	14:57:00	N	4,895	147	95.0				19	1.05
	8	8			0	34.6	15:01:00	15:16:00	S	4,879	150	95.0				20	1.01
	8	8			0	3	15:19:00	15:20:00	N	4,899	145	95.0	calibration line 3 miles			19	0.99
	9	9			0	34.6	15:25:00	15:39:00	N	4,900	146	95.0				18	1
	10	10			0	34.6	15:42:00	15:57:00	S	4,890	148	95.0				18	1.07
	11	11			0	34.6	16:00:00	16:14:00	N	4,886	148	95.0				17	1
	12	12			0	34.6	16:16:00	16:31:00	S	4,895	152	95.0				19	1.13
	67	67			0	5.6	16:34:00	16:36:00	W	4,885	146	95.0				20	0.95
							16:53:00	16:58:00		4,978	147	95.0	Static observation @ KBIS			18	0.94

Trajectory and GPS Plots:

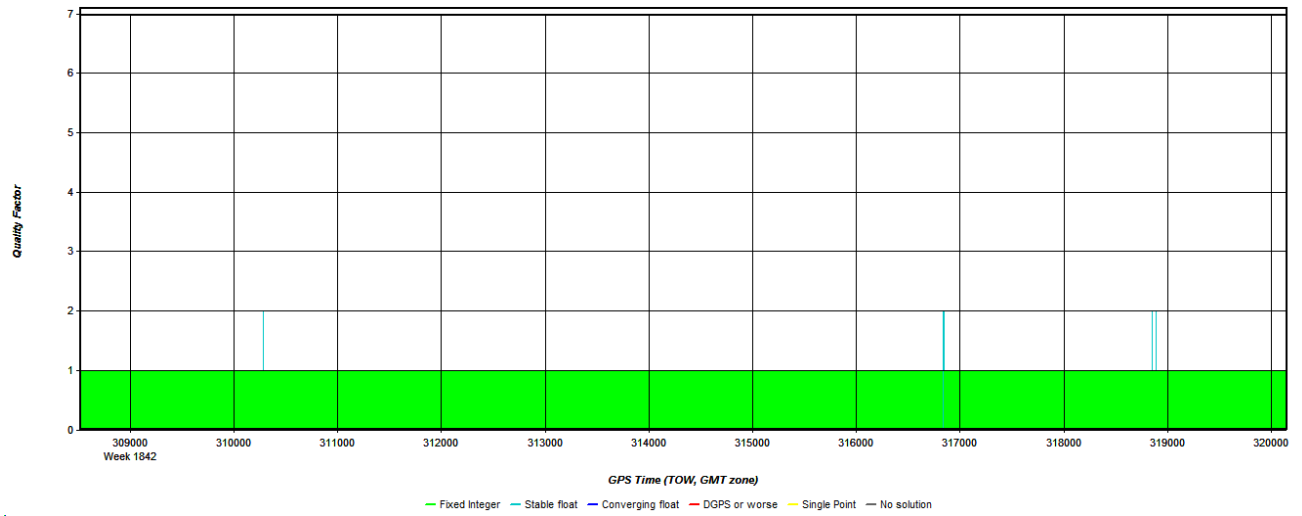


Estimated Accuracy

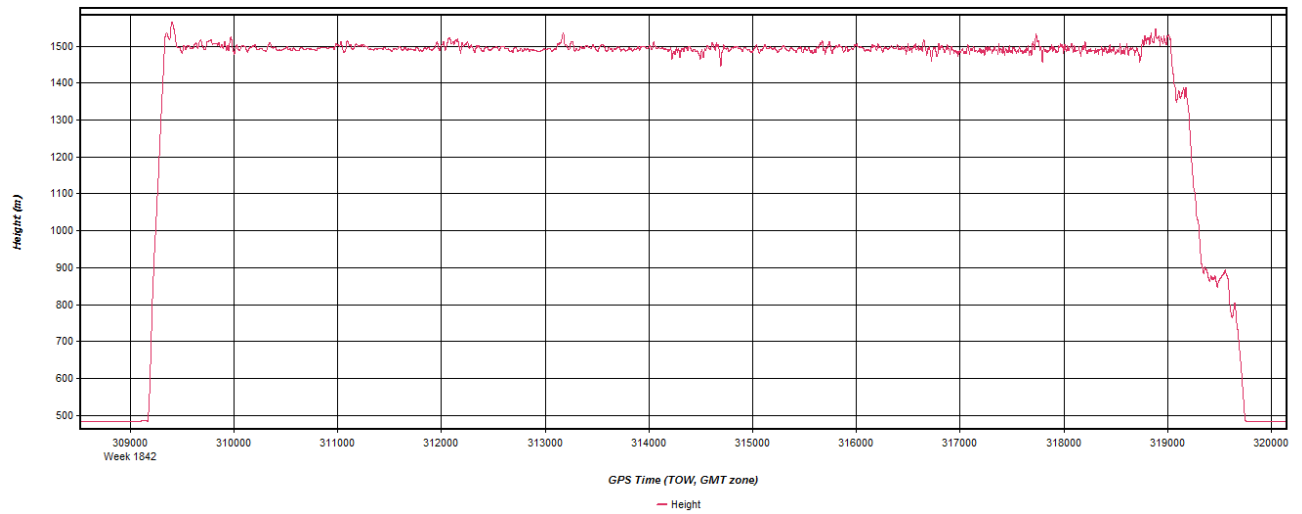




Quality Factor

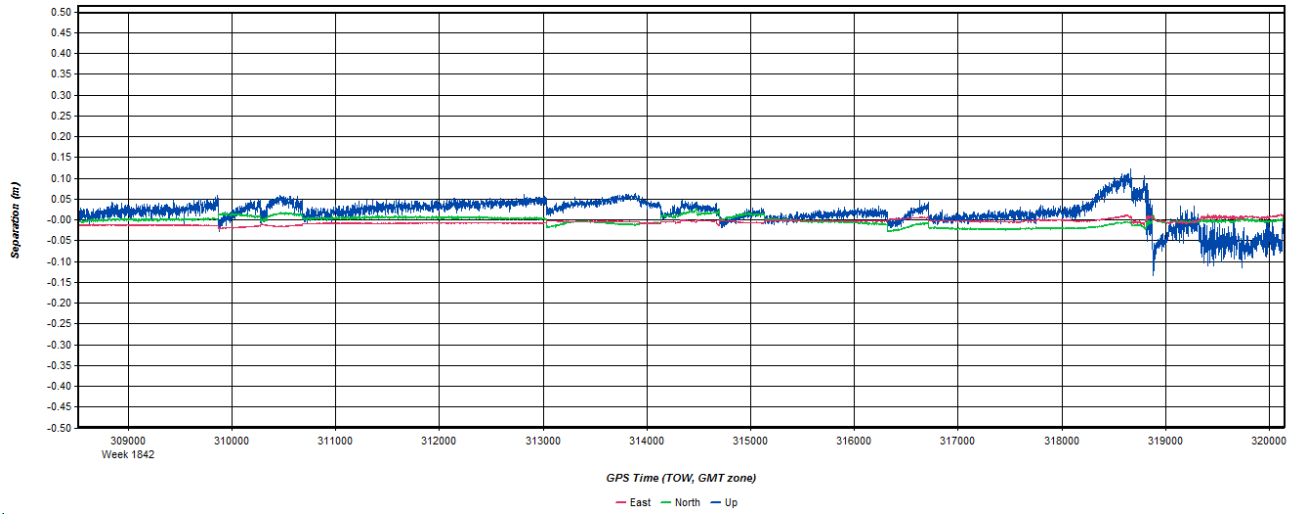


Height

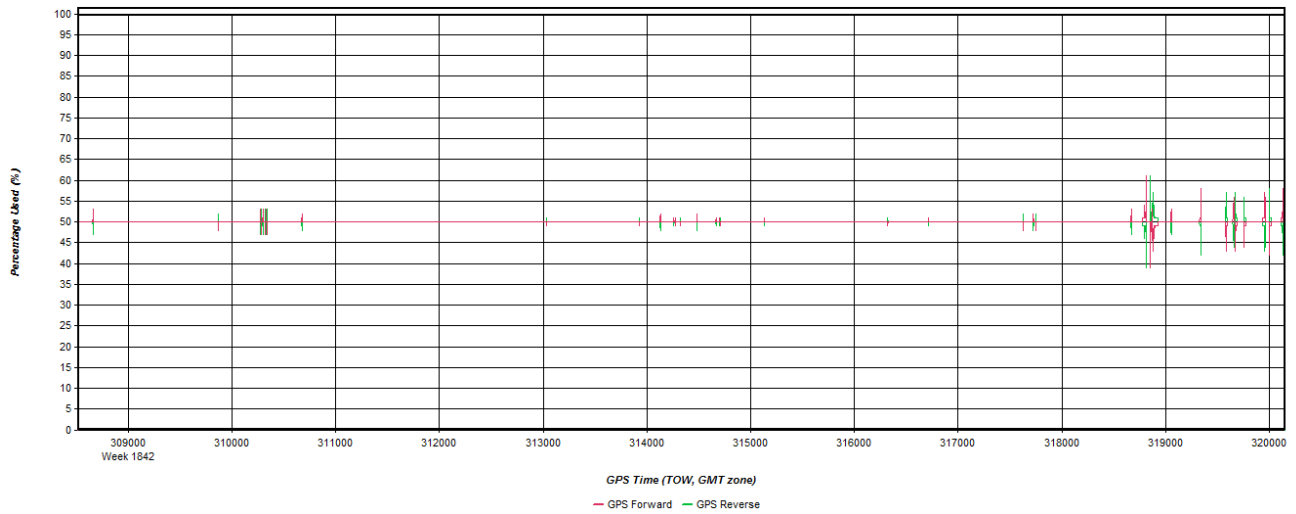




Combined Forward/Reverse Separation

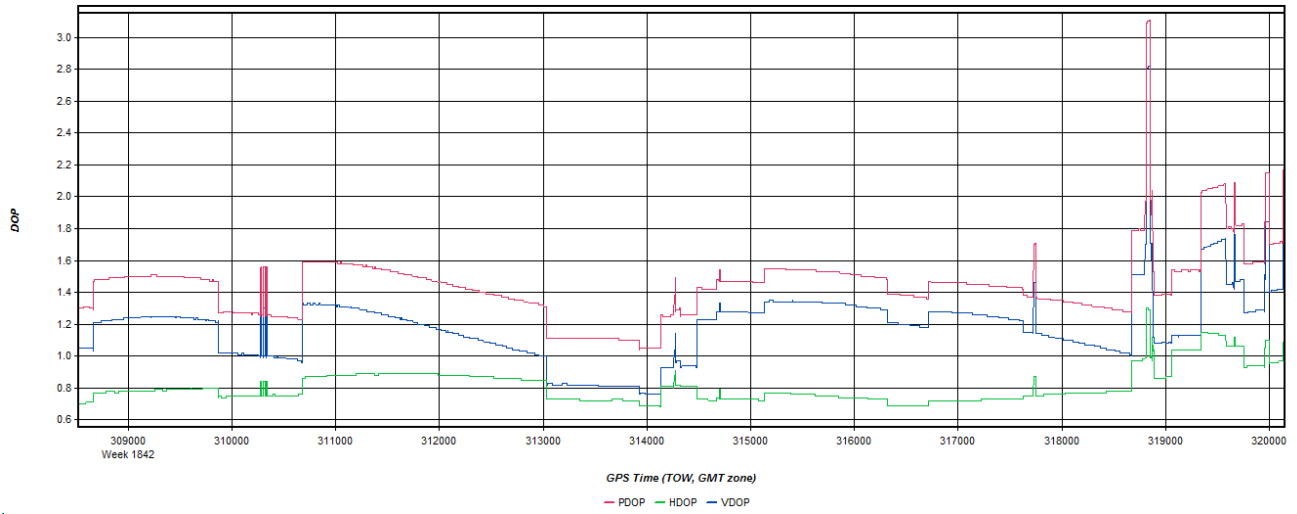


Combined Forward/Reverse Weighting

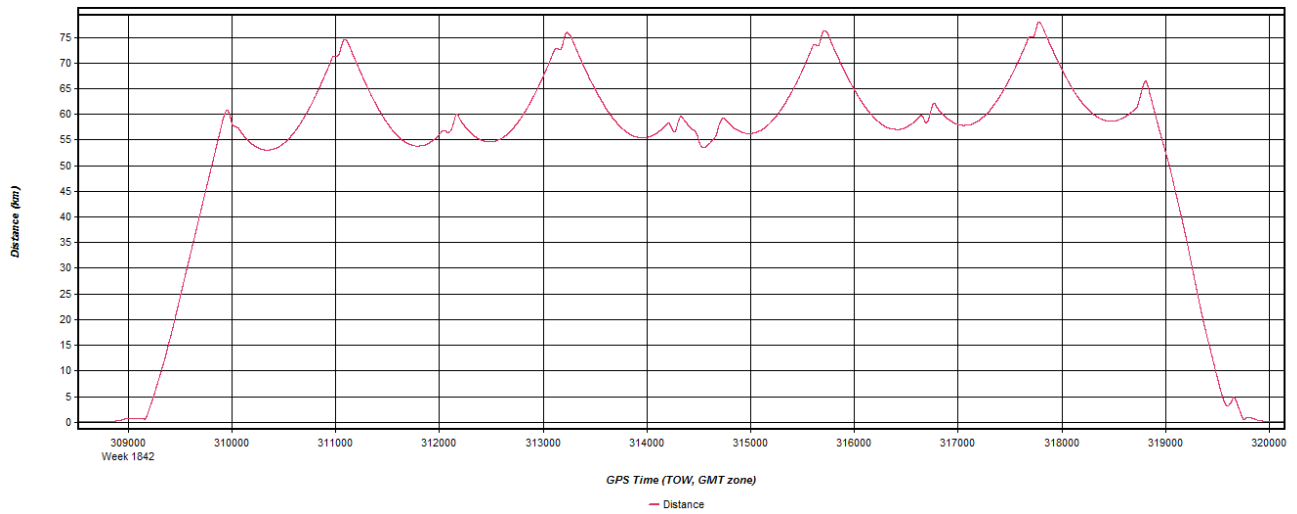




PDOP

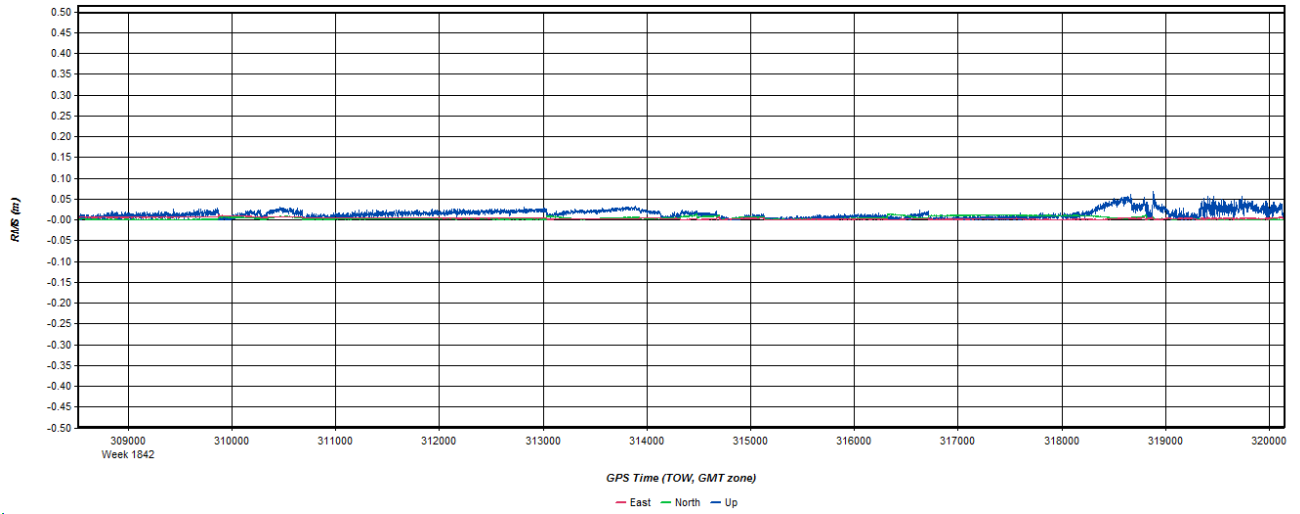


Distance from Base

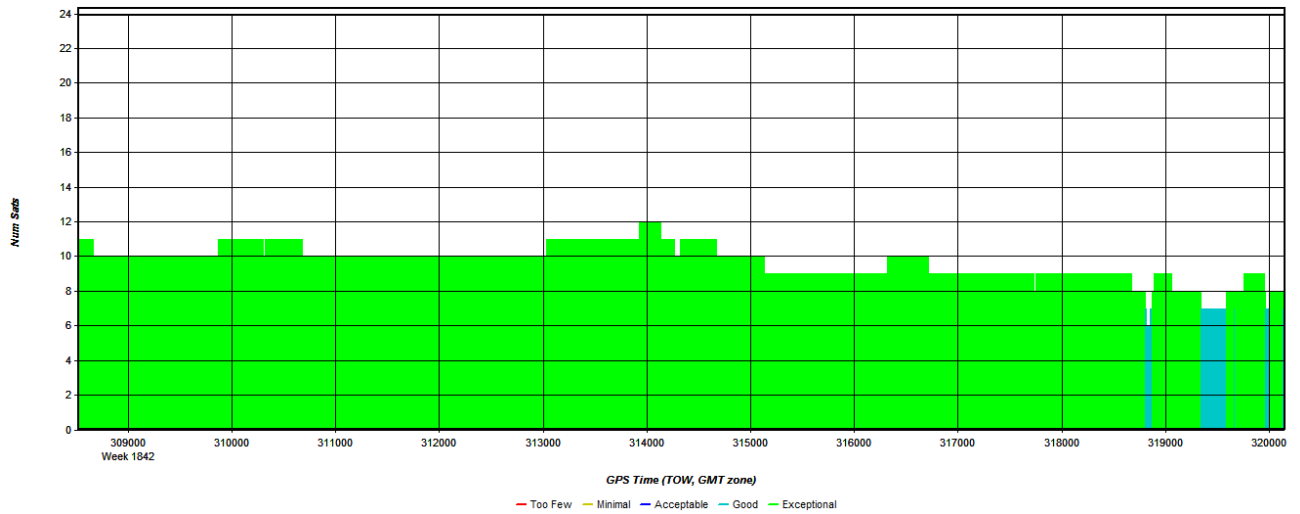




Combined RMS



SVs





Acquisition and Processing details ----- Collection 8 (May 4, 2015)

Log:

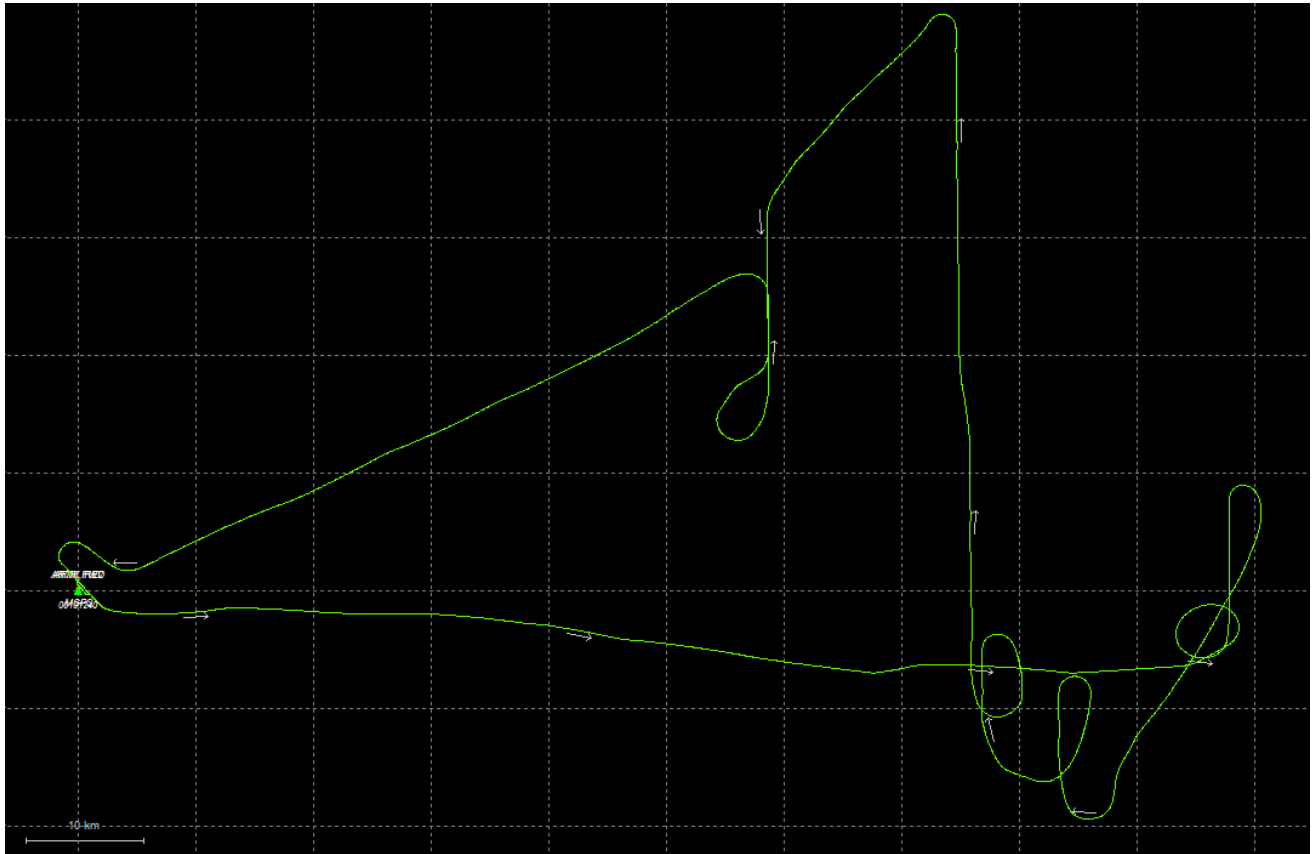


15.2	Lift Begin			Lift End			Flt Duration	Flt Hrs	Hobbs Hrs	Activity
	Airport	Chocks	Hobbs	Airport	Chocks	Hobbs				
1	KBIS		3053.7	KBIS		3055.1			1.4	
2										
3										

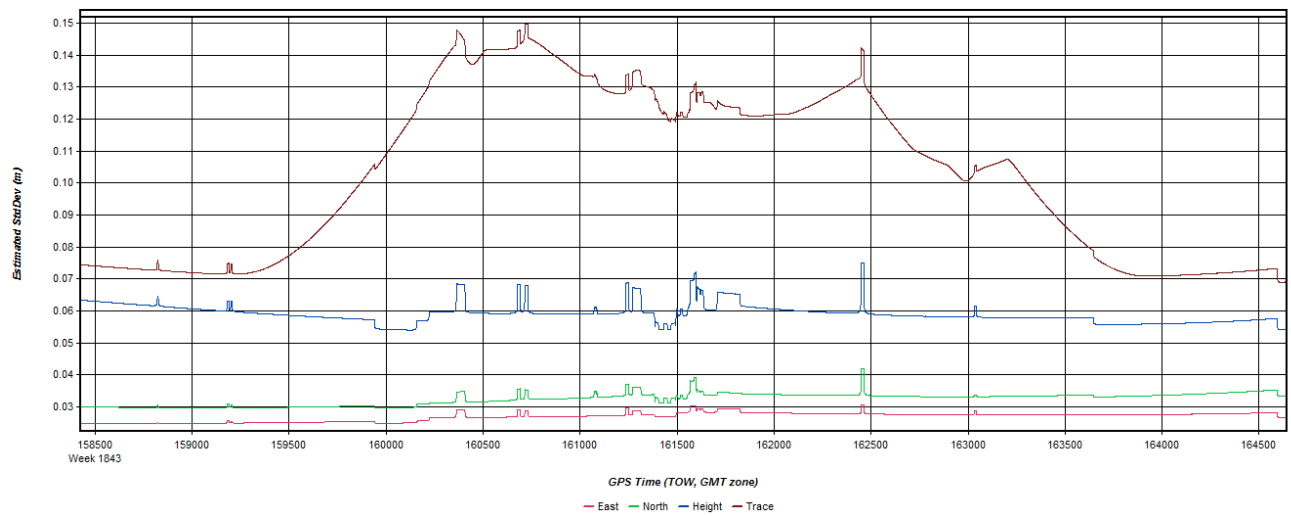
**Q680i
Flight Log**

FGL Job #		Project Name			Operator		Unit		IMU		Ground Temp °C		Min Range'		Data Logger Drives					
22.14005700		Kidder Co			Cody Buhrmeister		165				66.0 19.0		2018		#1					
Flight Date		GPS Day		Lift	System		Pilot		Sun°		Solar Times (UTC)		Flying Temp °C		Max Range'		Download Drive			
4-May-15		15-124		7	R680I		Jay Reno		N/A		N/A		61.0 16.0		3888		AP1.5TB#18			
Mission ID (yyymmdd_Sen_Job_Lift)				Aircraft		Airport ID	FMS	UTC	AMT (ft)	Speed	FOV	Scan Rate (Hz)	MTA	km/WPT	Altm Setting		Humidity @ Alt		Shipping Track	
150504_165_14005700_08				N7139C		KBIS		-5	3821	150	60	95	2		30.18		47.2			
Base 1 ID		Location		Rec ID		Ant ID		ARP (m)		Start Time (UTC)		Stop Time (UTC)		GPS Filename		Operator		Data		
		Bismarck, ND		Novatel		702GG		1.5		29-Apr-15 12:15		29-Apr-15 18:45		00101240		Cody Buhrmeister		With AB		
Area	Flight #		Wpt		Distance		UTC		Flt Dir	Altitude (GPS)	Speed (knots)	Scan Rate	Comments and Conditions						SVs	PDOP
	FGL	RCA	From	To	Begin	End	Start	End												
													Static observation @ KBIS							
kidder													360 turn before frst line							
	60	60			0	34.6	20:36:00	20:37:00	N	4,909	148	95.0	Moderate turbulence						20	1.1
	42	42			0	34.6	20:45:00	20:46:00	N	4,825	144	95.0	Moderate turbulence						23	0.89
	34	34			0	34.6	20:51:00	20:52:00	N	4,829	151	95.0	Moderate turbulence						21	0.96
	33	33			0	34.6	20:58:00	20:59:00	N	4,839	145	95.0	Moderate turbulence						21	0.96
	32	32			0	3	21:05:00	21:06:00	N	850	144	95.0	Moderate turbulence						19	1.09
	12	12			0	34.6	21:13:00	21:13:00	S	4,858	147	95.0	Moderate turbulence						18	1.15
	12	12			0	34.6	21:18:00	21:19:00	N	4,867	141	95.0	calibration line opposite direction/moderate turbulence						17	1.15
					0	34.6	21:38:00	21:43:00					Static observation @ KBIS							

Trajectory and GPS Plots:

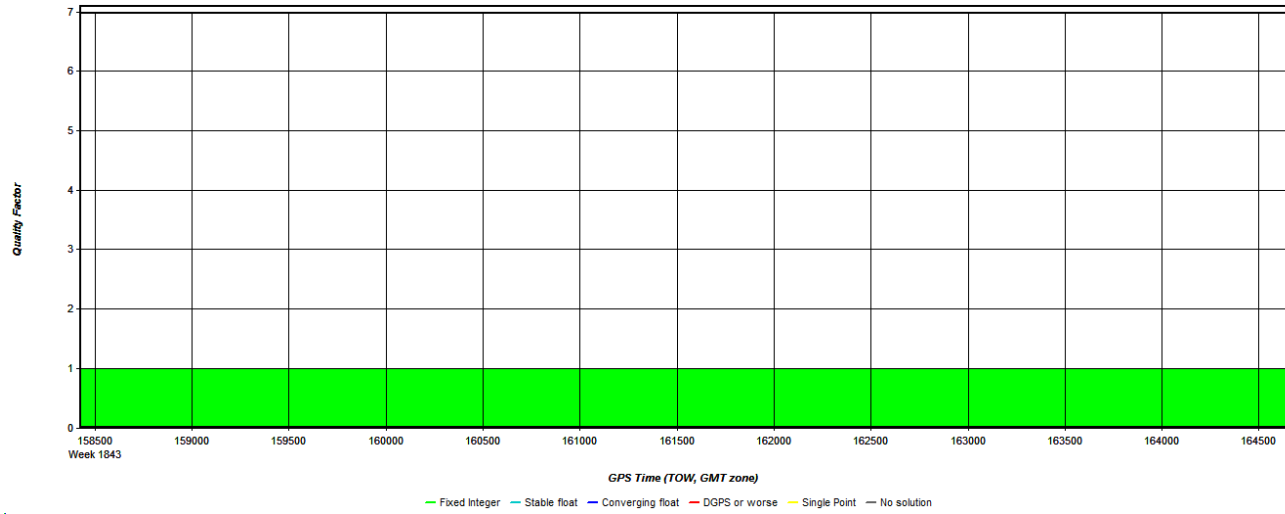


Estimated Accuracy

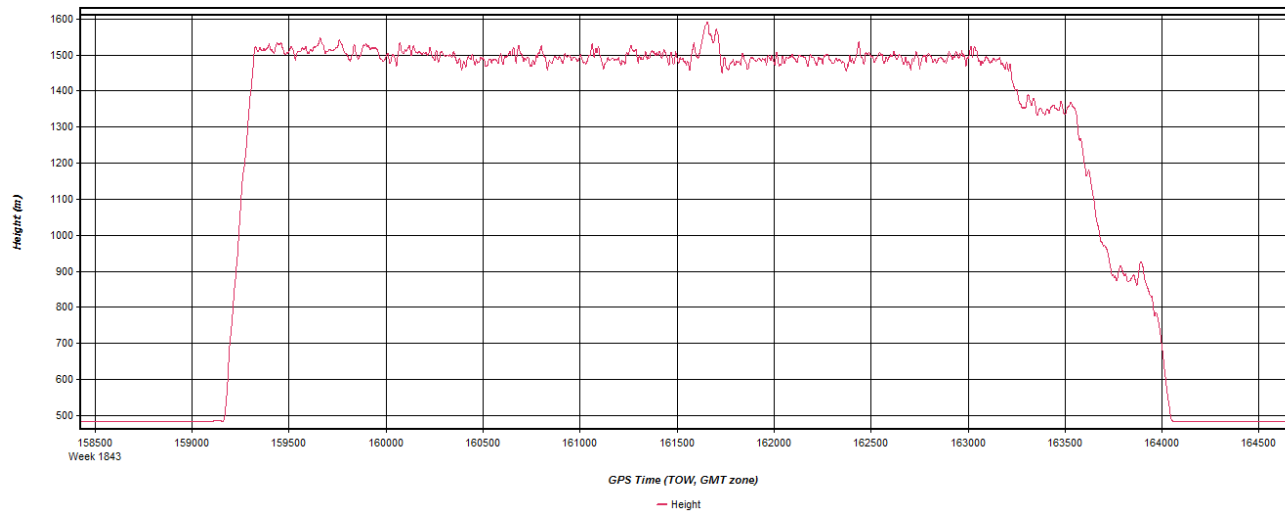




Quality Factor

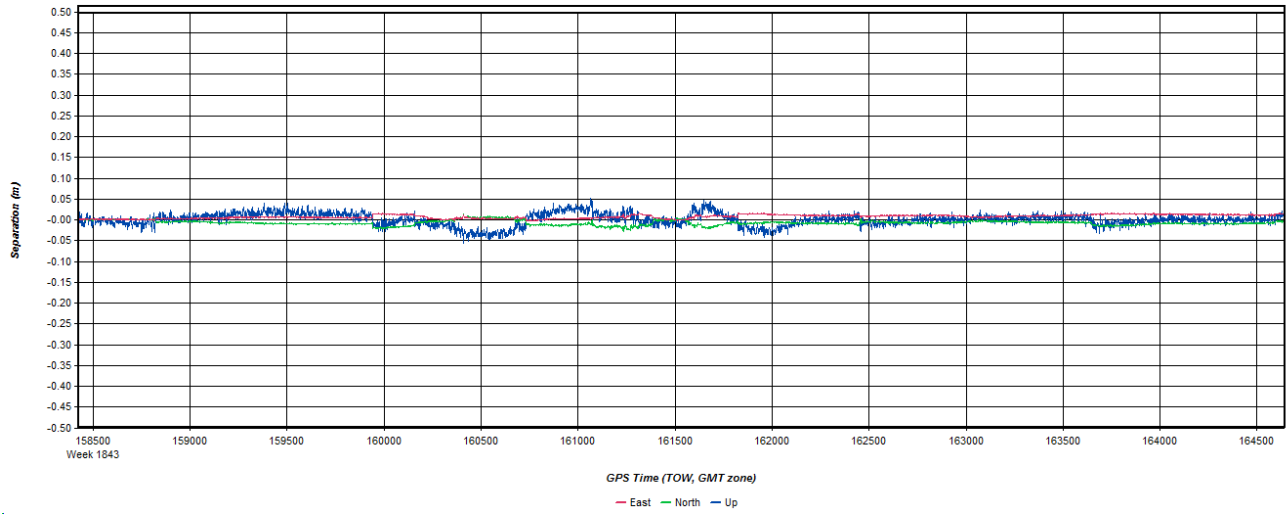


Height

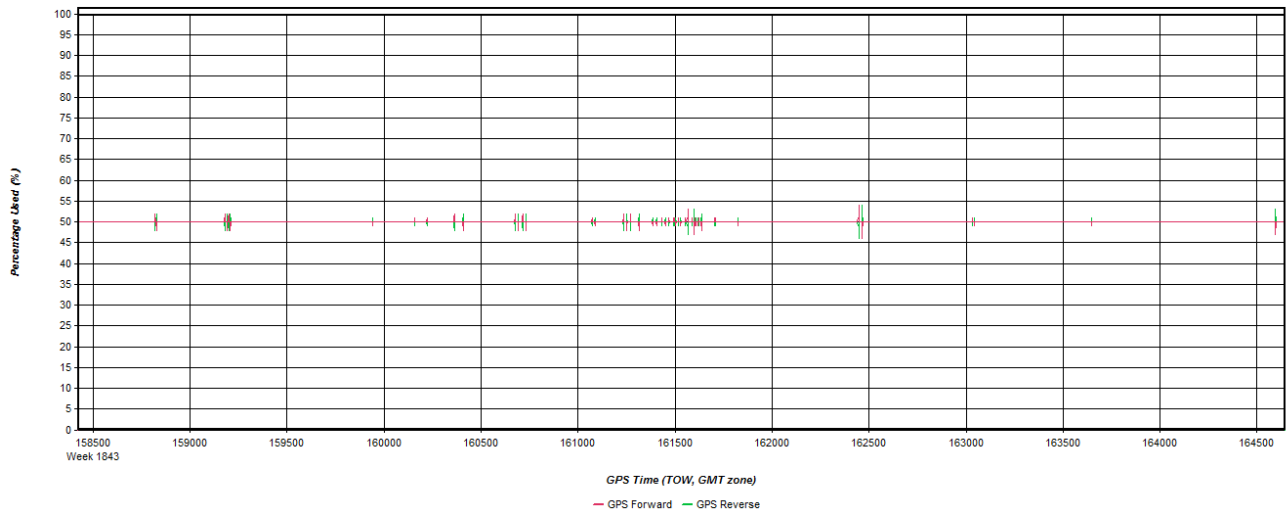




Combined Forward/Reverse Separation

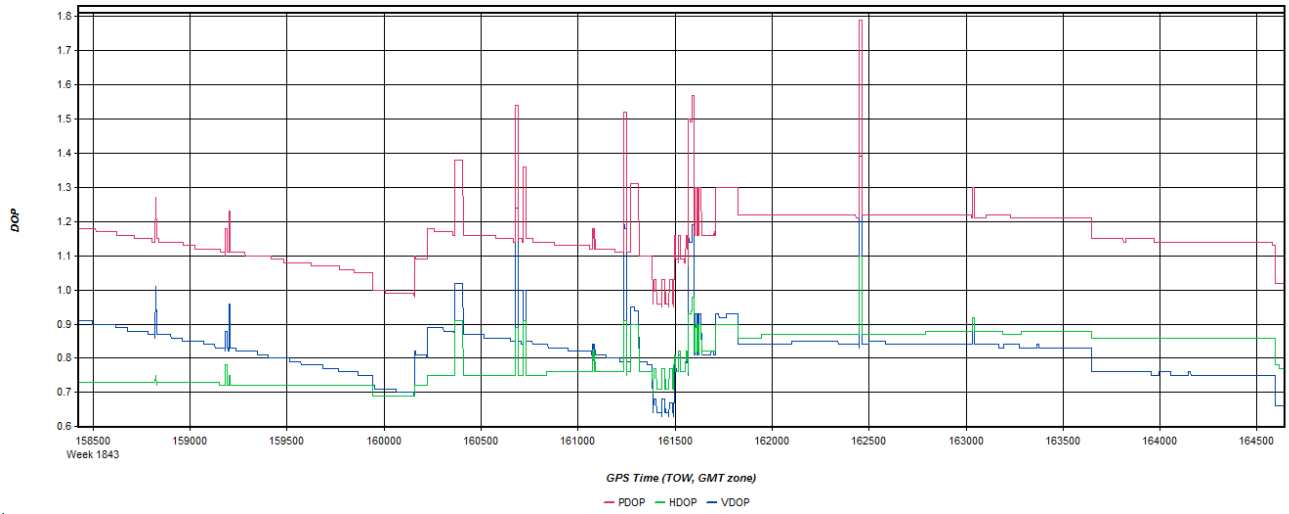


Combined Forward/Reverse Weighting

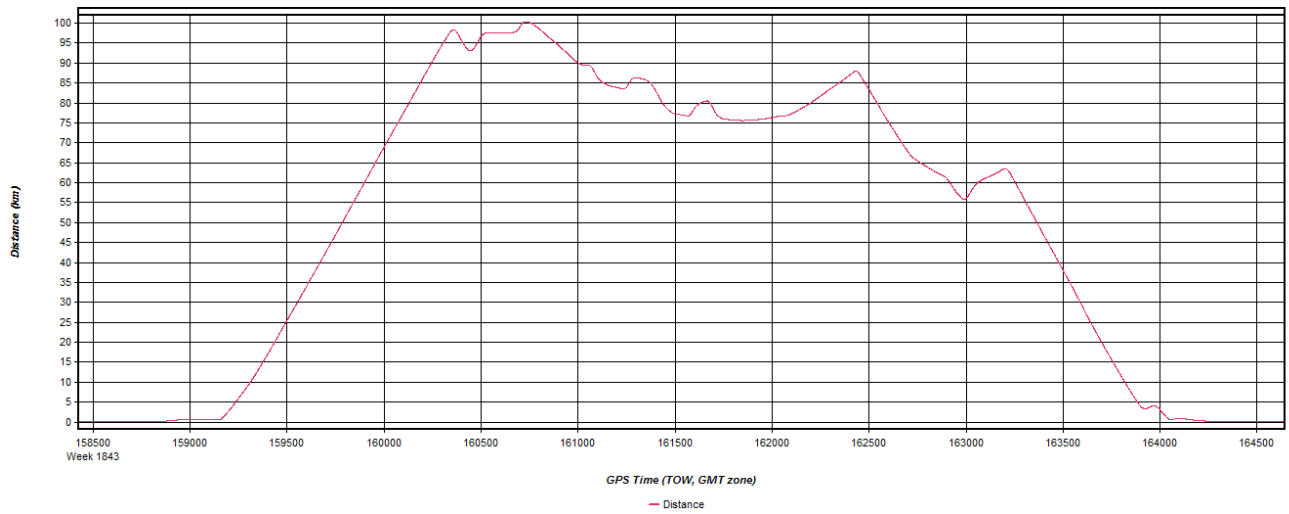




PDOP

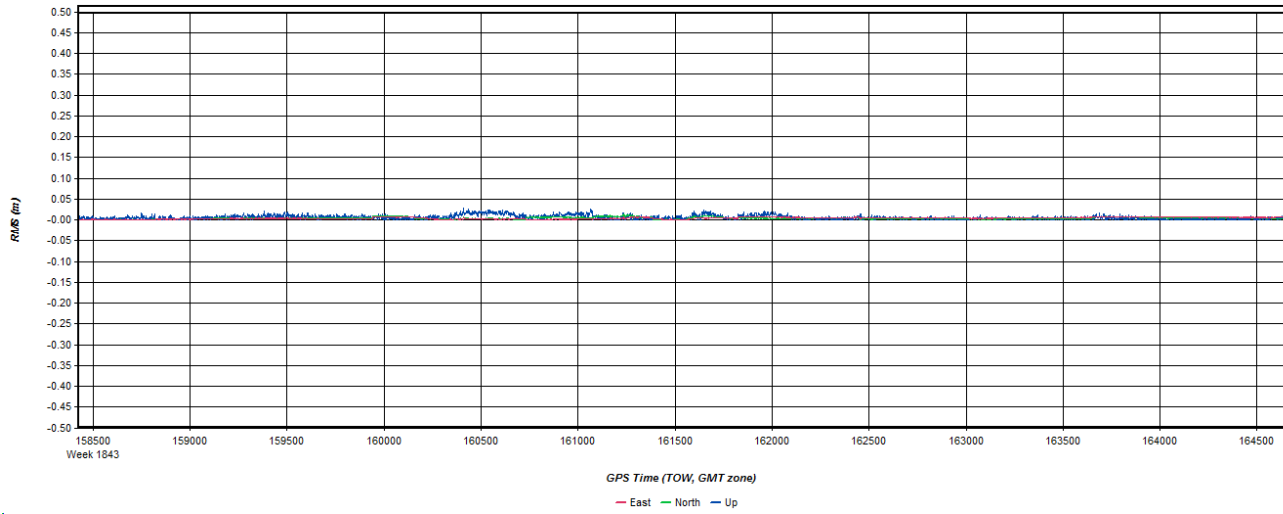


Distance from Base

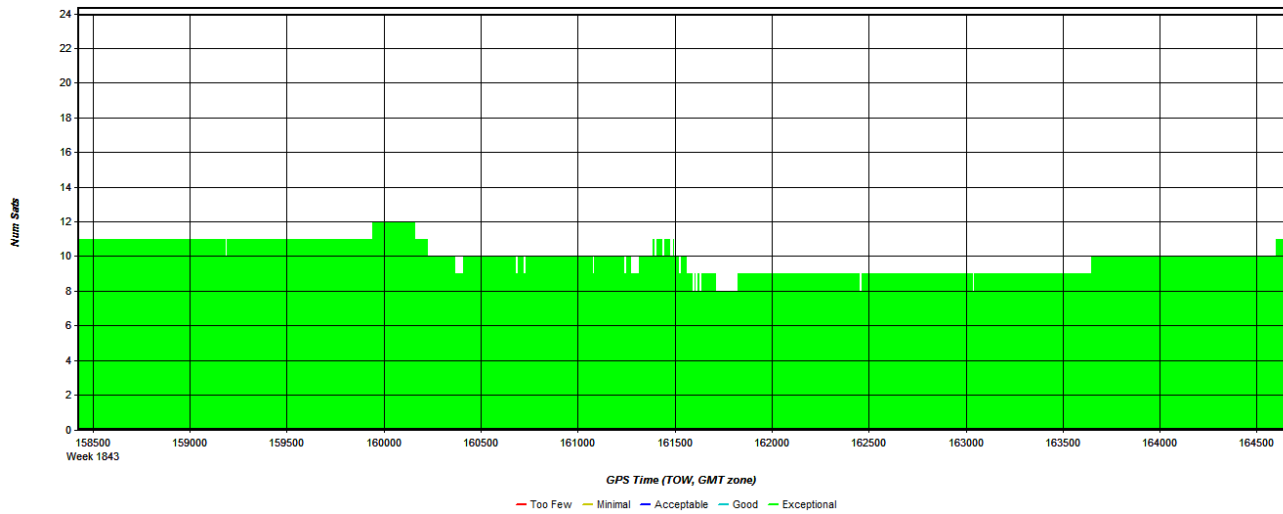




Combined RMS



SVs





Acquisition and Processing details ----- Collection 9 (May 5, 2015)

Log:

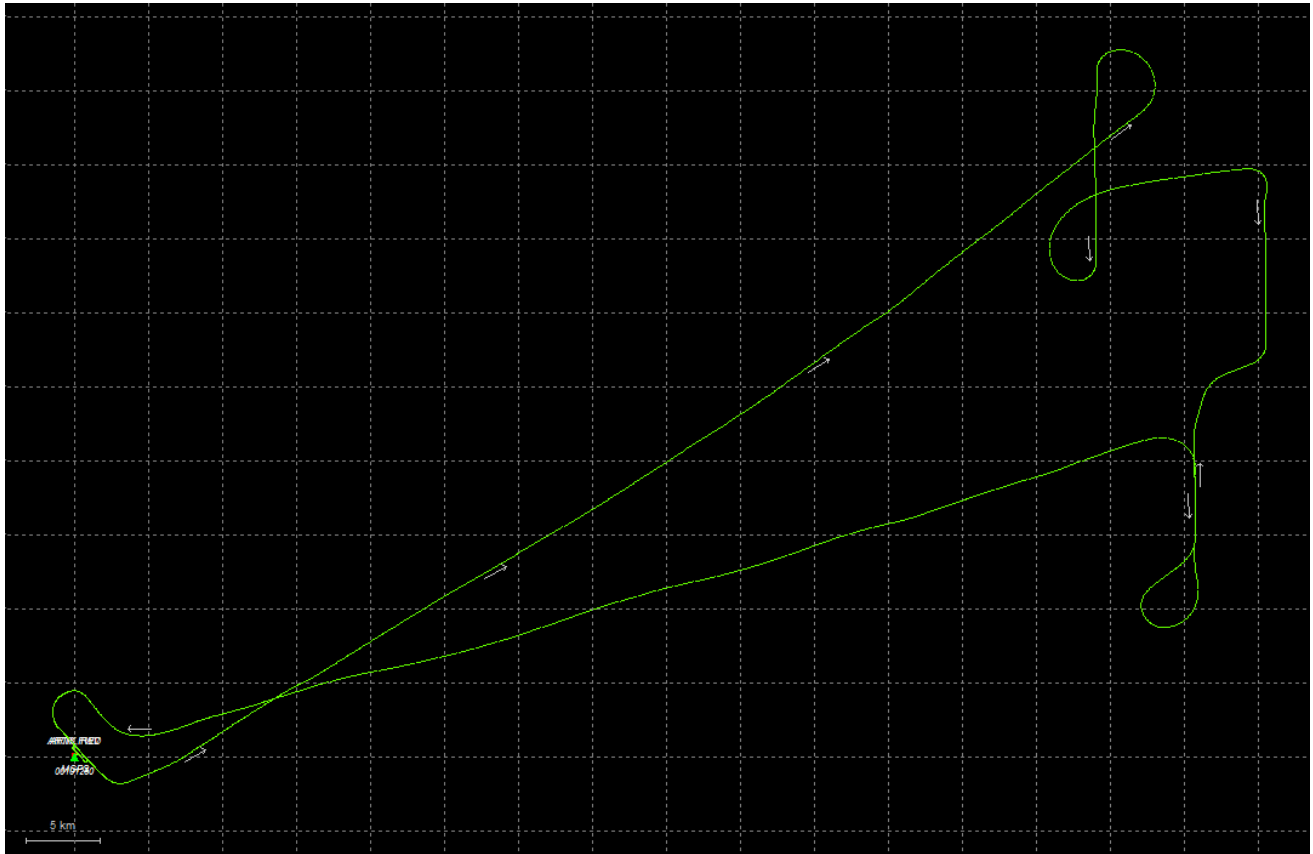


15.2	Lift Begin			Lift End			Flt Duration	Flt Hrs	Hobbs Hrs	Activity
	Airport	Chocks	Hobbs	Airport	Chocks	Hobbs				
1	KBIS		3055.1	KBIS		3056.0			0.9	
2										
3										

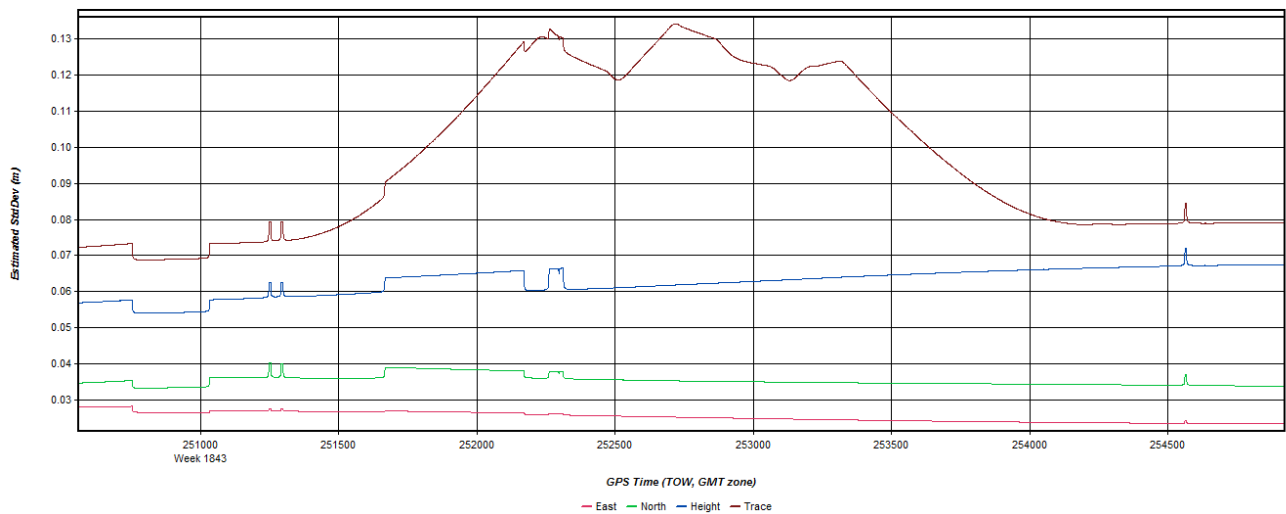
Q680i
Flight Log

FGI Job #	Project Name			Operator		Unit	IMU	Ground Temp °C				Min Range'	Data Logger Drives		
22.14005700	Kidder Co			Cody Buhmeister		165		78.0 26.0				2018	#1		
Flight Date	GPS Day	Lift	System	Pilot		Sun°	Solar Times (UTC)		Flying Temp °C				Max Range'	Download Drive	
5-May-15	15-125	7	R680i	Jay Reno		N/A	N/A		60.0 15.0				3888	AP1TB#37	
Mission ID (yyymmdd_Sen_Job_Lift)			Aircraft	Airport ID	FMS	UTC	AMT (ft)	Speed	FOV	Scan Rate (Hz)	MTA	km/WPT	Alt Setting	Humidity @ Alt	Shipping Track
150505_165_14005700_09			N7139C	KBIS		-5	3821	150	60	95	2	30.04	42.8		
Base 1 ID	Location		Rec ID	Ant ID	ARP (m)	Start Time (UTC)		Stop Time (UTC)		GPS Filename		Operator		Data	
	Bismarck, ND		Novatel	702GG	1.5	5/5/2015 21:22 PM		05-May-15 22:45		00101250		Cody Buhmeister		With AB	
Area	Flight #		Wpt	Distance		UTC		Flt Dir	Altitude	Speed	Scan Rate	Comments and Conditions		SVs	PDOP
	FGI	RCA	From	To	Begin	End	Start	End	(GPS)	(knots)					
							21:35:00	21:41:00				Static observation @ KBIS			
							22:03:00	22:04:00				360 turn before frst line			
KIDDER	25	25			0	2	22:06:00	22:07:00	S	4,885	144	95.0	Moderate turbulence	18	1.2
	39	39			0	2	22:12:00	22:13:00	S	4,896	148	95.0	Moderate turbulence	17	1.27
	33	33			0	2	22:16:00	22:17:00	S	4,879	147	95.0	Moderate turbulence	18	1.12
	33	33			0	2	22:20:00	22:21:00	N	4,857	152	95.0	Moderate turbulence	18	1.14
							22:42:00	22:47:00				Static observation @ KBIS			

Trajectory and GPS Plots:

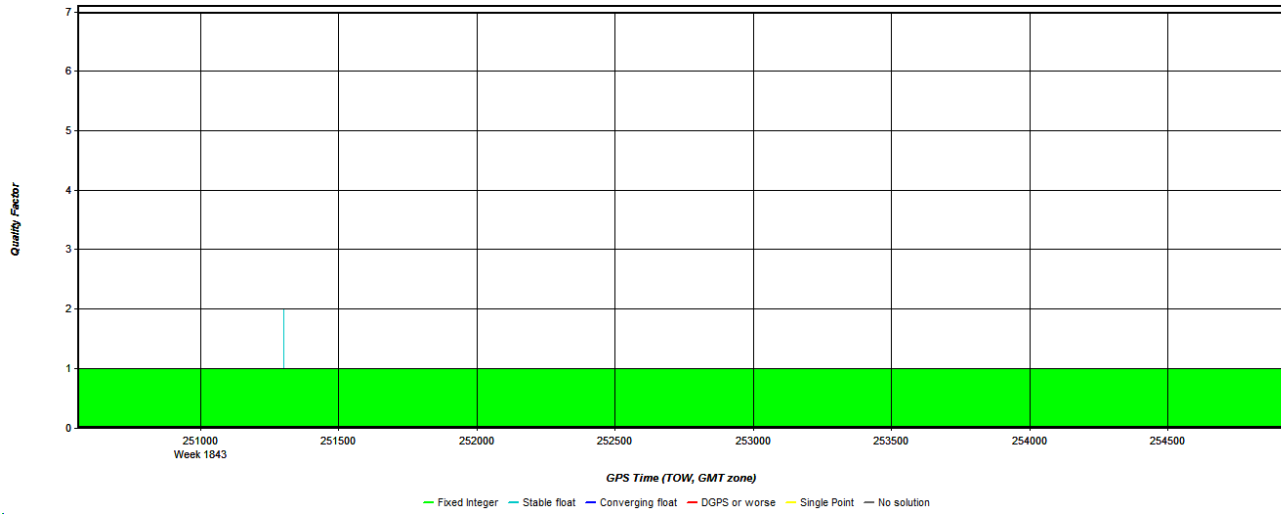


Estimated Accuracy

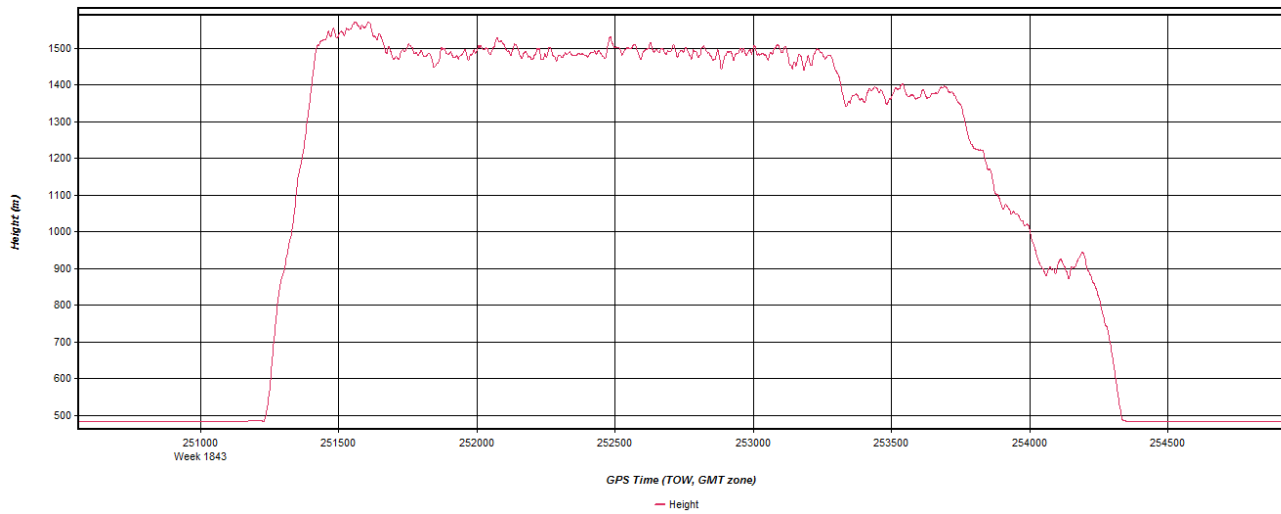




Quality Factor

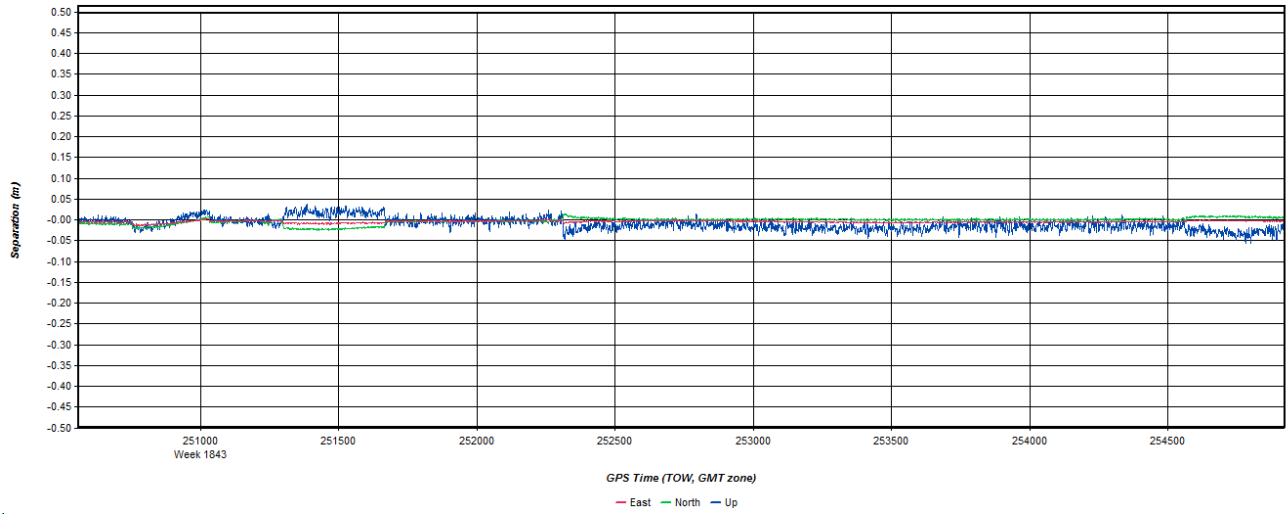


Height

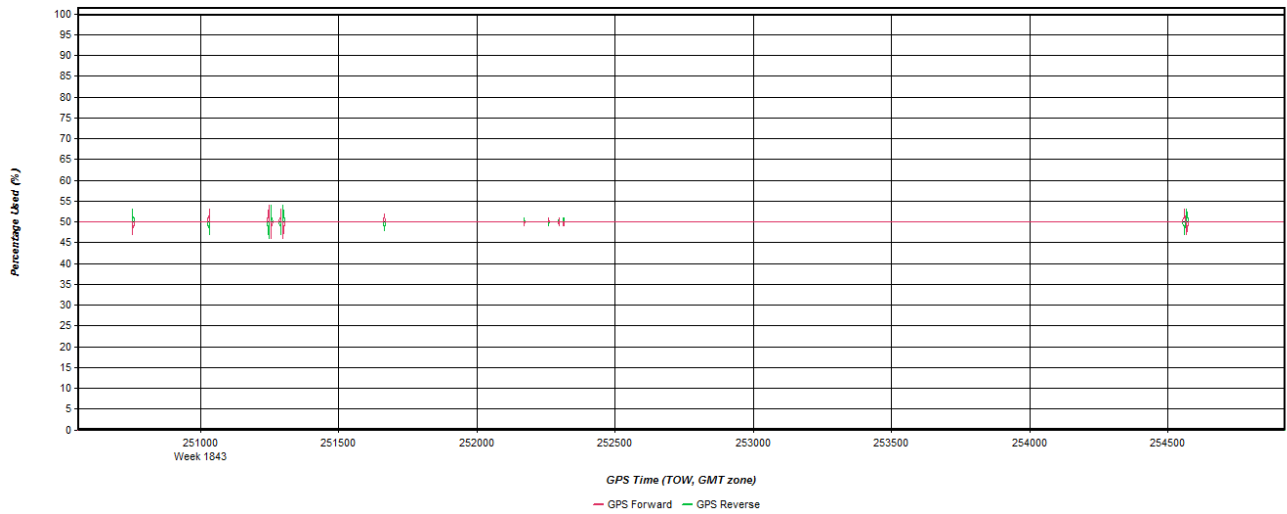




Combined Forward/Reverse Separation

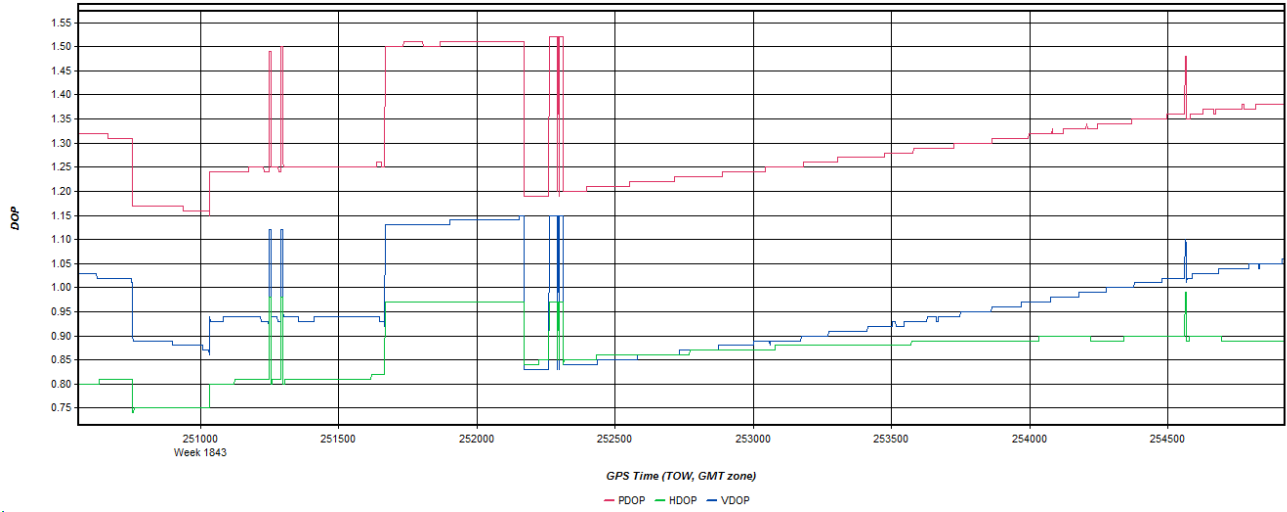


Combined Forward/Reverse Weighting

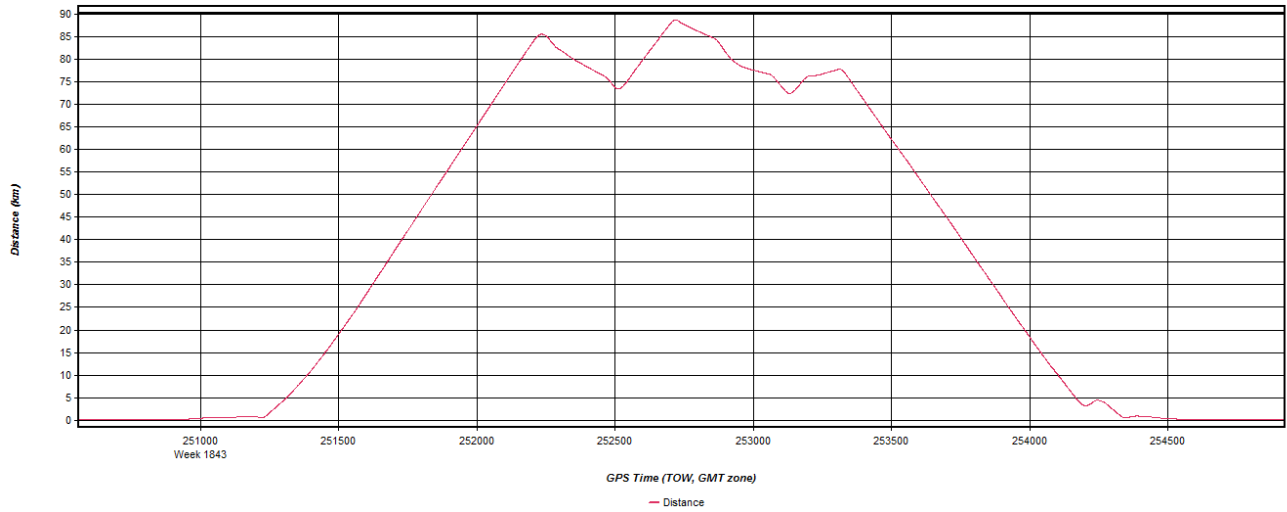




PDOP

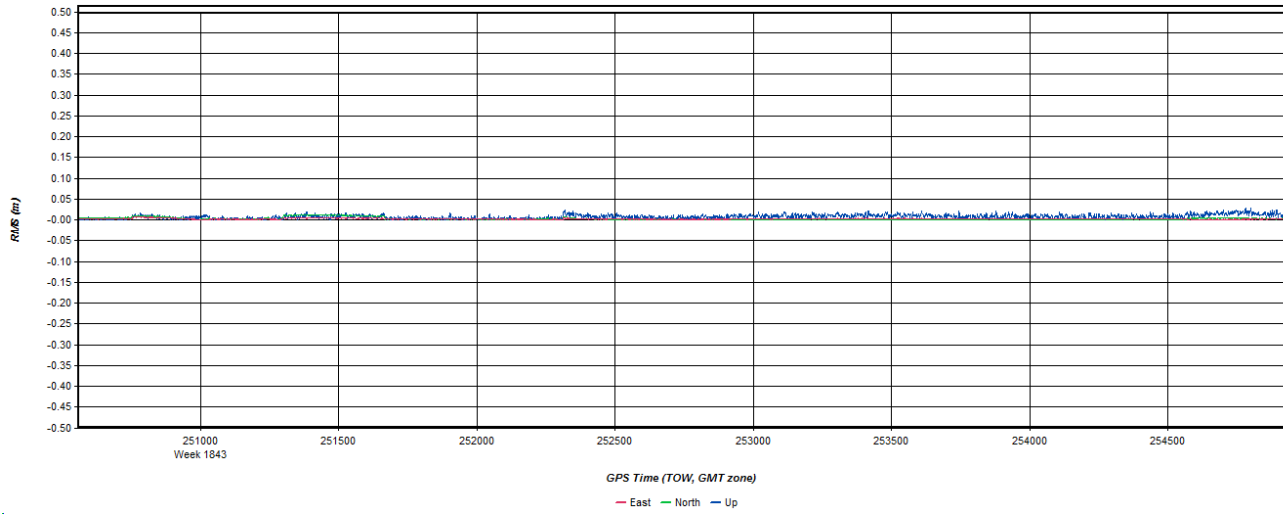


Distance from Base

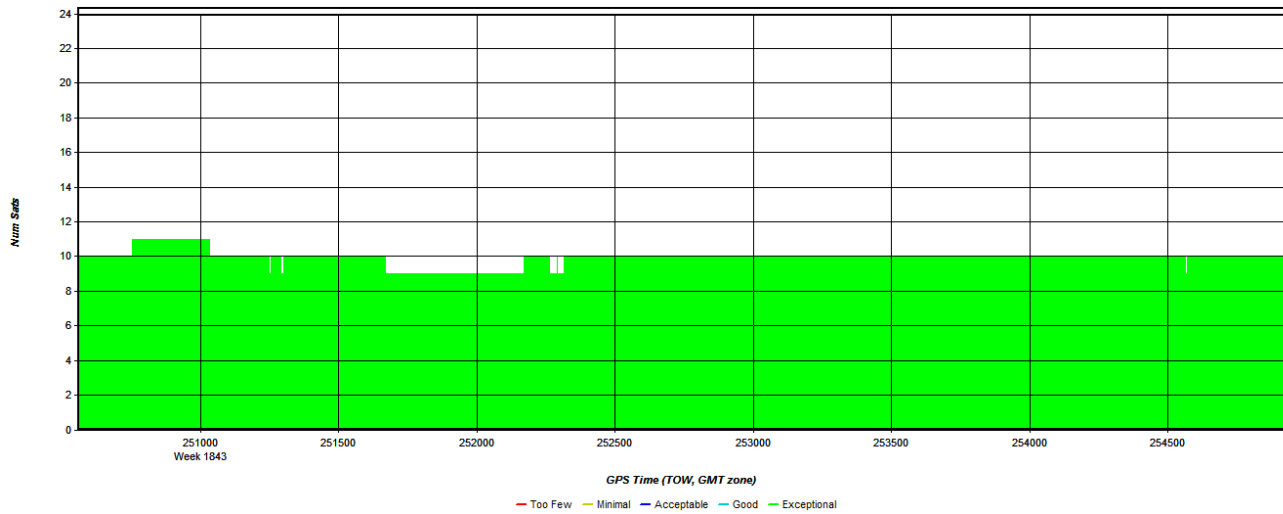




Combined RMS



SVs





Acquisition and Processing details ----- Collection 10 (May 18, 2015)

Log:

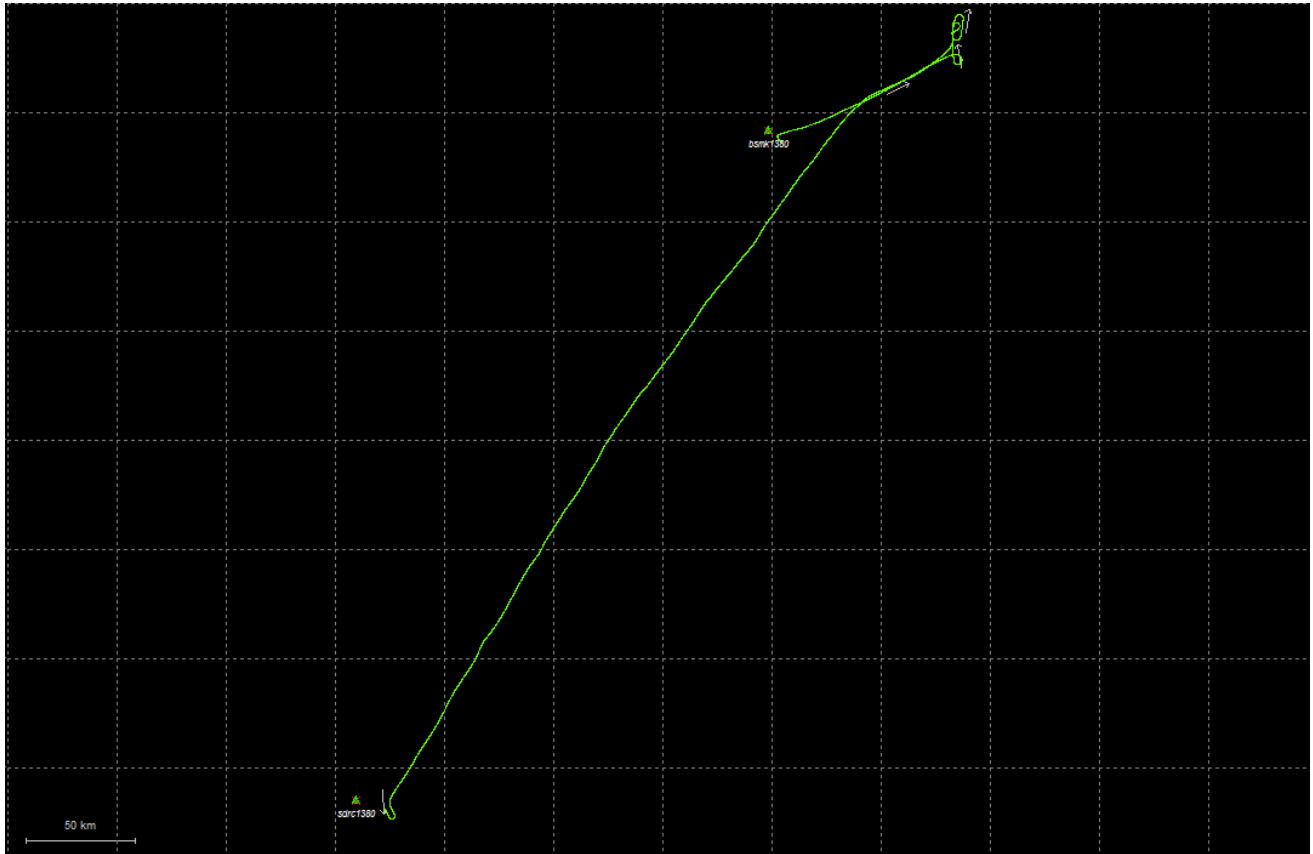


15.2	Lift Begin			Lift End			Flt Duration	Flt Hrs	Hobbs Hrs	Activity
	Airport	Chocks	Hobbs	Airport	Chocks	Hobbs				
1	KBIS		3057.2	KRAP		3059.0			1.8	
2										
3										

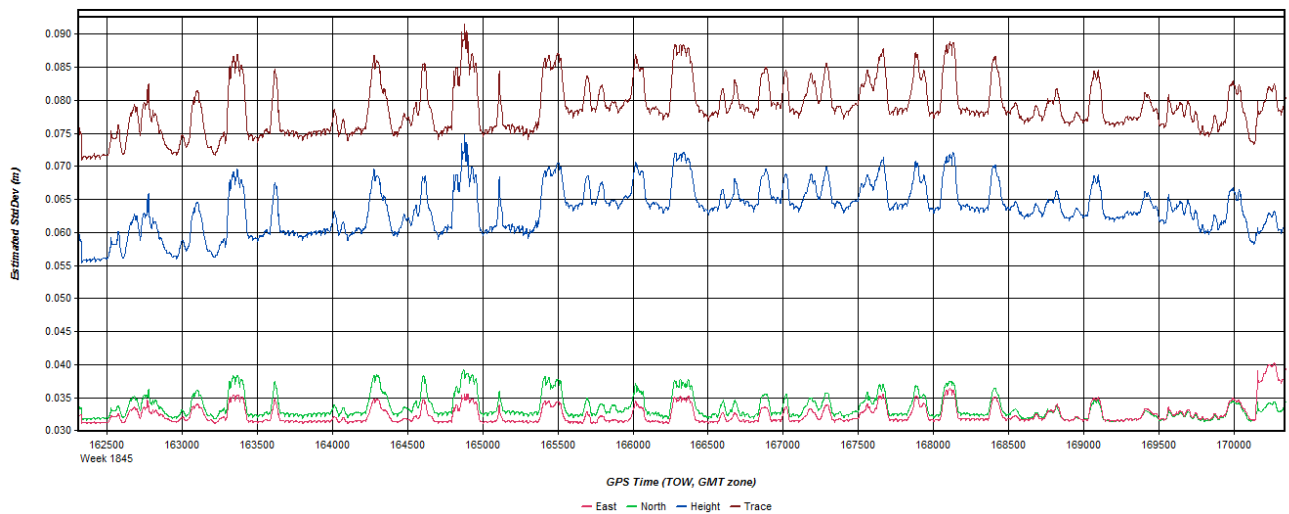
**Q680i
Flight Log**

FGL Job #		Project Name			Operator		Unit	IMU	Ground Temp °C			Mn Range'	Data Logger Drives			
Flight Date		GPS Day	Lift	System	Pilot		Sun°	Solar Times (UTC)		Flying Temp °C		Max Range'	Download Drive			
Mission ID (yyymmdd_Sen_Job_Lift)		Aircraft		Airport ID	FMS	UTC	AMT (ft)	Speed	FOV	Scan Rate (Hz)	MTA	km/WPT	Alt Setting	Humidity @ Alt	Shipping Track	
Base 1 ID	Location		Rec ID	Ant ID	ARP (m)	Start Time (UTC)		Stop Time (UTC)		GPS Filename		Operator		Data		
Area	Flight #		Wpt		Distance		UTC		Flt Dir	Altitude (GPS)	Speed (knots)	Scan Rate	Comments and Conditions		SVs	PDOF
	FGL	RCA	From	To	Begin	End	Start	End								
							21:05:00	21:12:00					Static observation @ KBIS			
kidder							21:39:00	21:41:00					360 turn before frst line			
	36	36			0	2	21:43:00	21:44:00	N	3,310	143	95.0	Moderate turbulence		19	1.3
	36	36			0	2	21:53:00	21:54:00	S	3,319	139	95.0	Moderate turbulence		19	1.25
							23:16:00	23:18:00					Static observation @ KRAP			

Trajectory and GPS Plots:

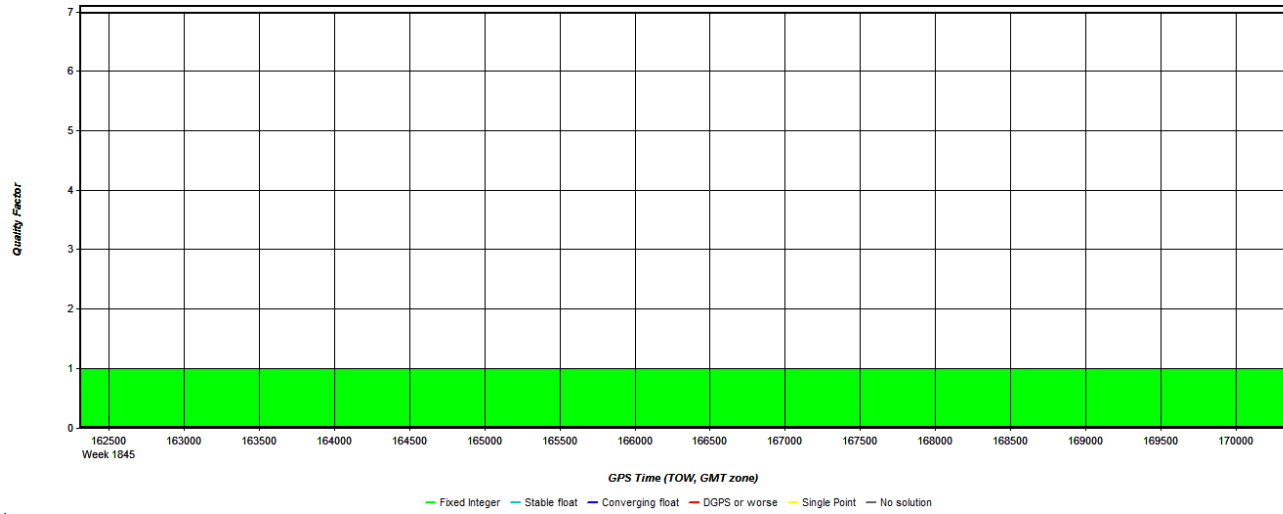


Estimated Accuracy

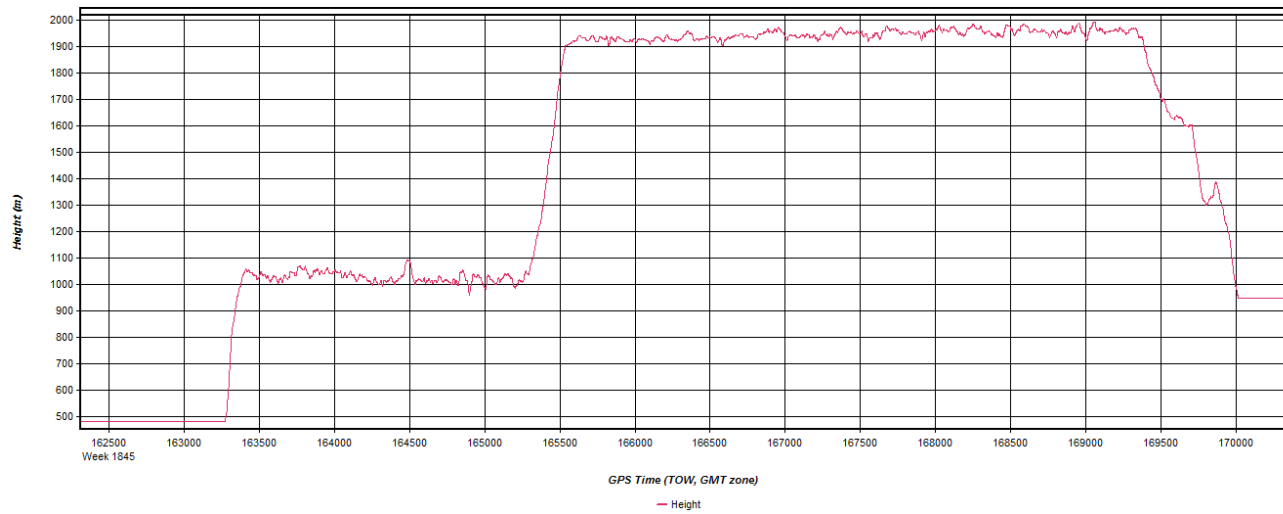




Quality Factor

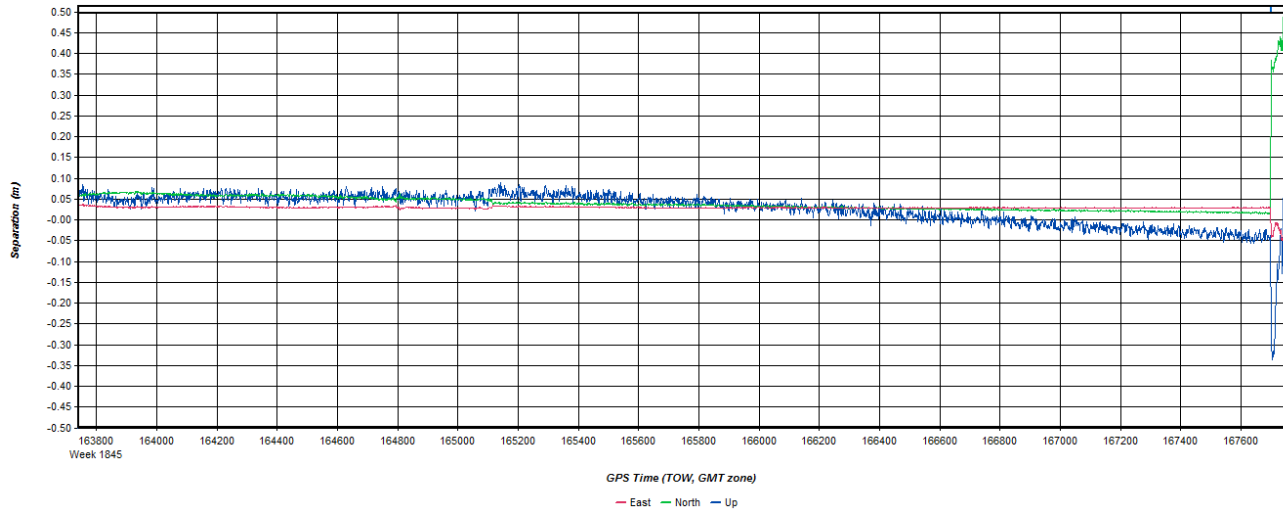


Height

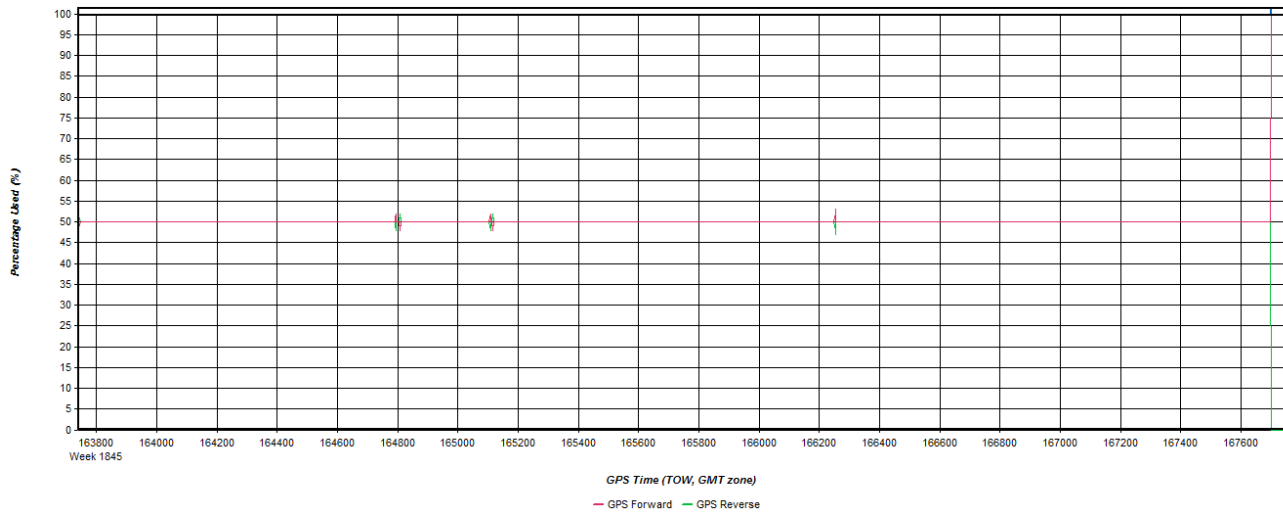




Combined Forward/Reverse Separation

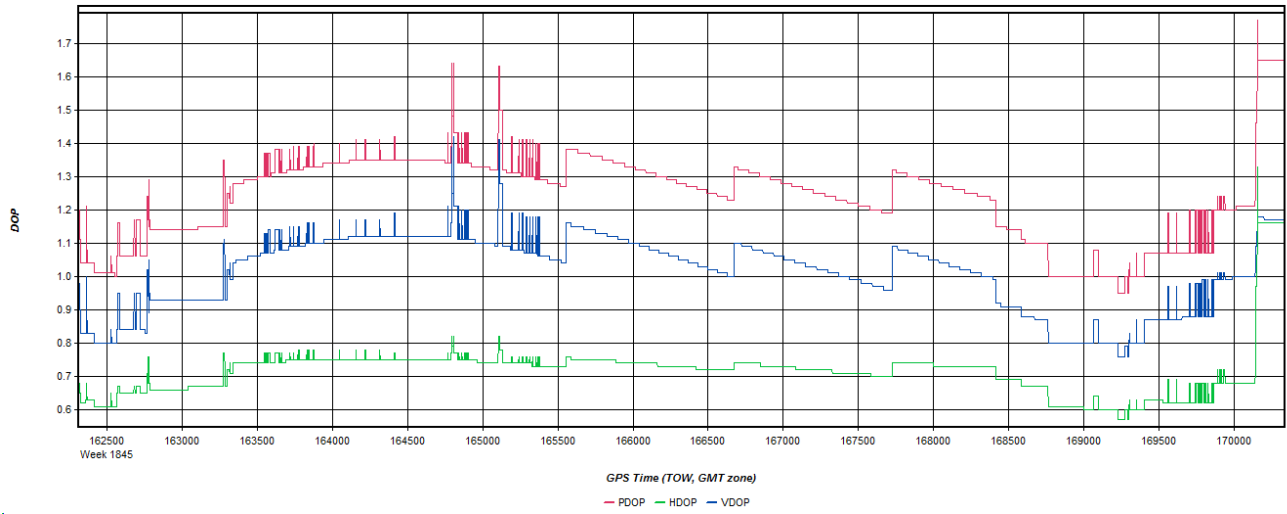


Combined Forward/Reverse Weighting

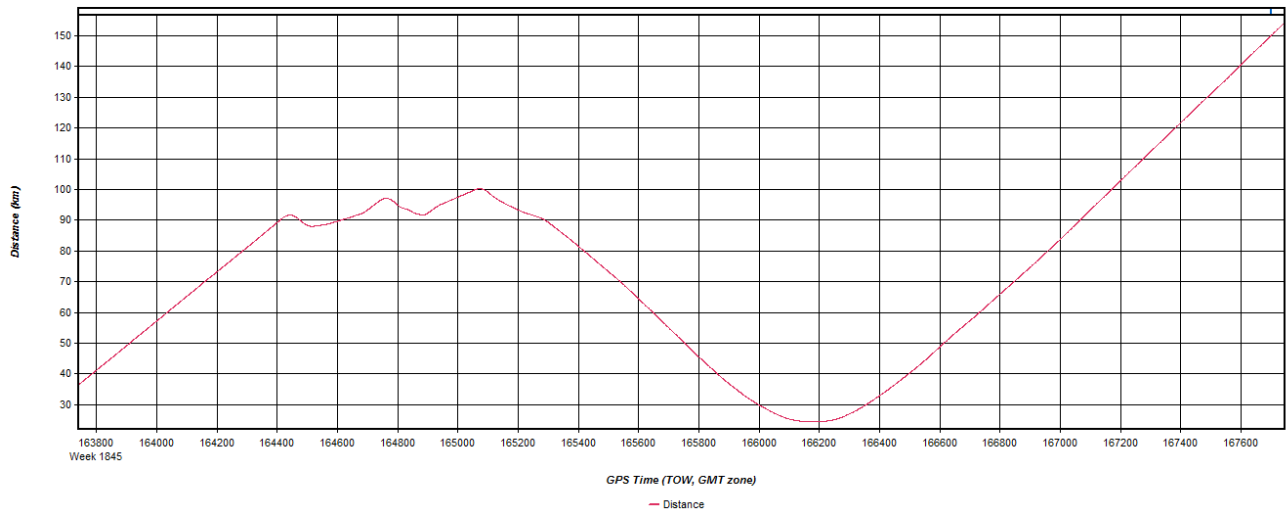




PDOP

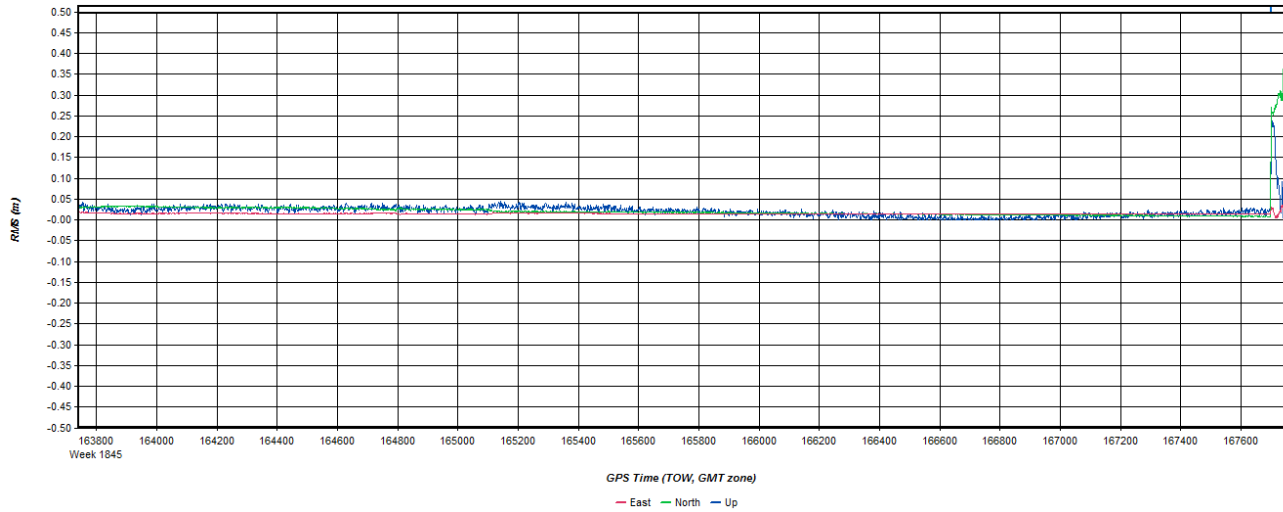


Distance from Base





Combined RMS



SVs

