

Assessment of the Validity of Assigning MSA-Variant Error Models to the ISCWSA Test Wells

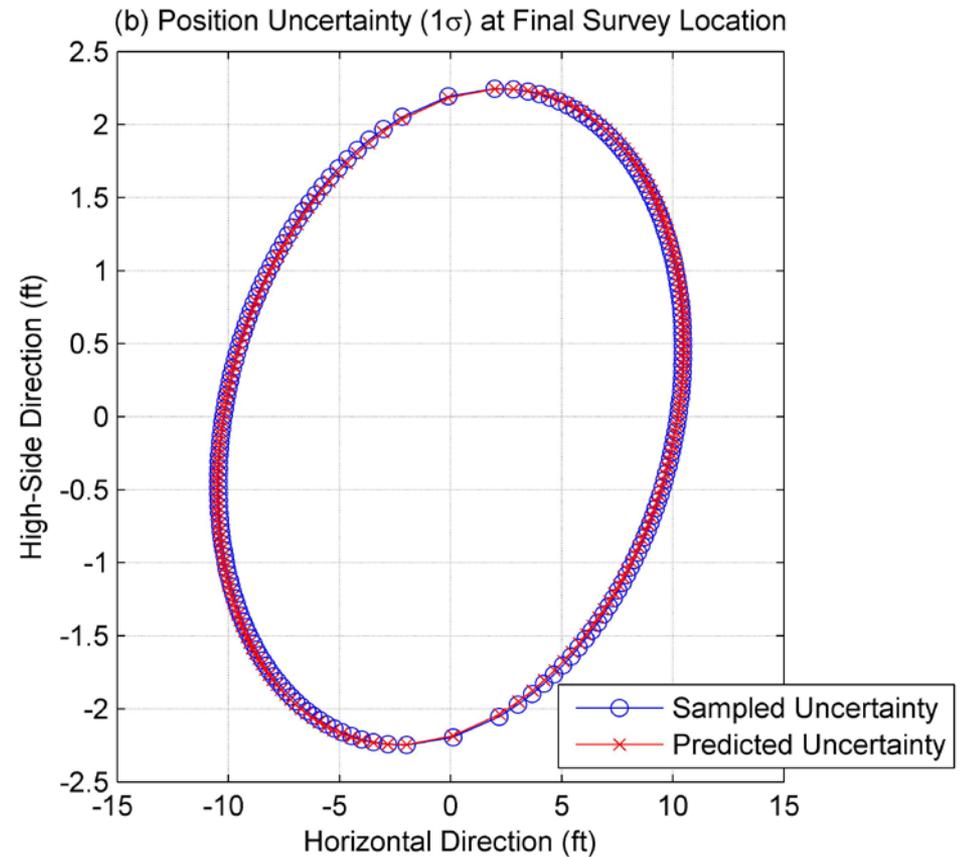
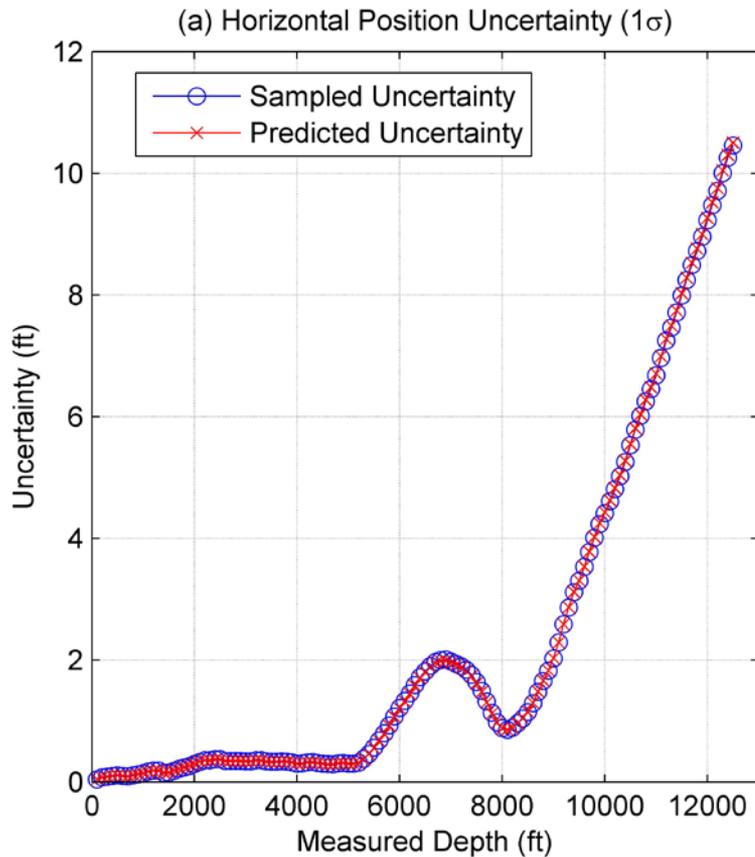
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This presentation is about MSA QC...

Error Model	Global Tests		Case-by-Case Analysis
	Minimum Reqs. as Specified in SPE/IADC 125677	Minimum Reqs. Generated for MSA-Specific Error Models	Consider Covariance Analysis
ISCWSA MWD	✓	✗	✓
ISCWSA MWD + Enhanced Referencing	✓	✗	✓
Any Error Model + MSA	✗	✓	✓

Validation of Case-by-Case QC Method by Monte Carlo Analysis



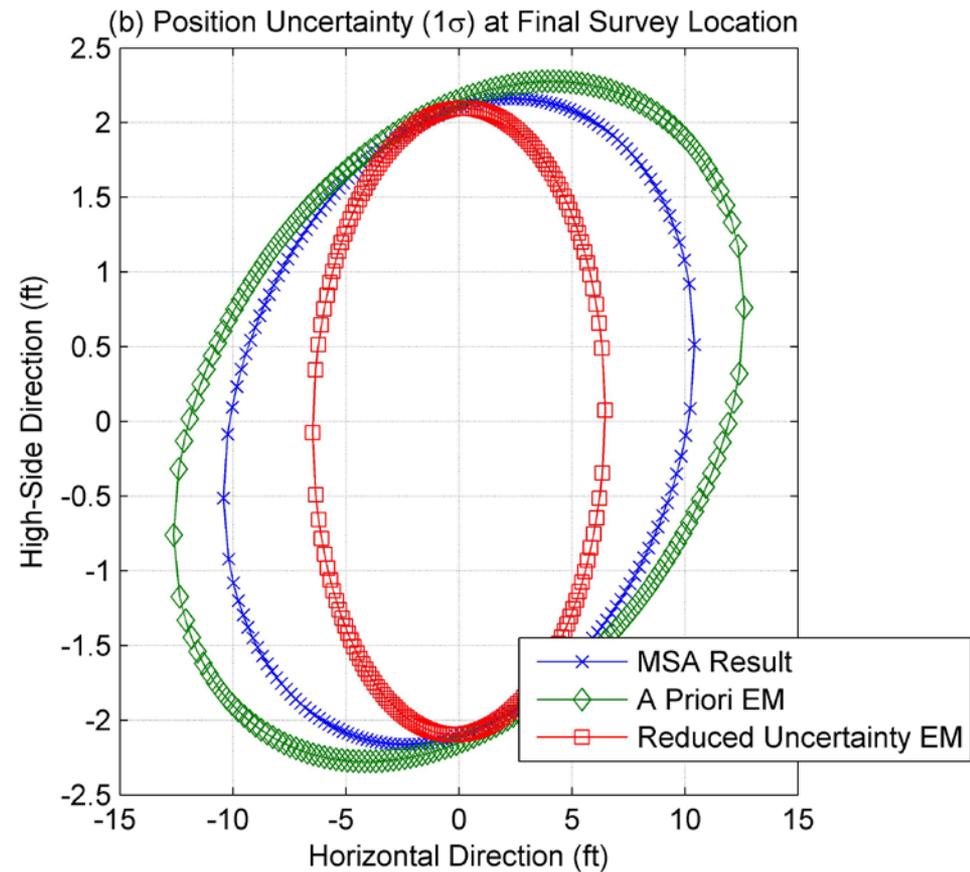
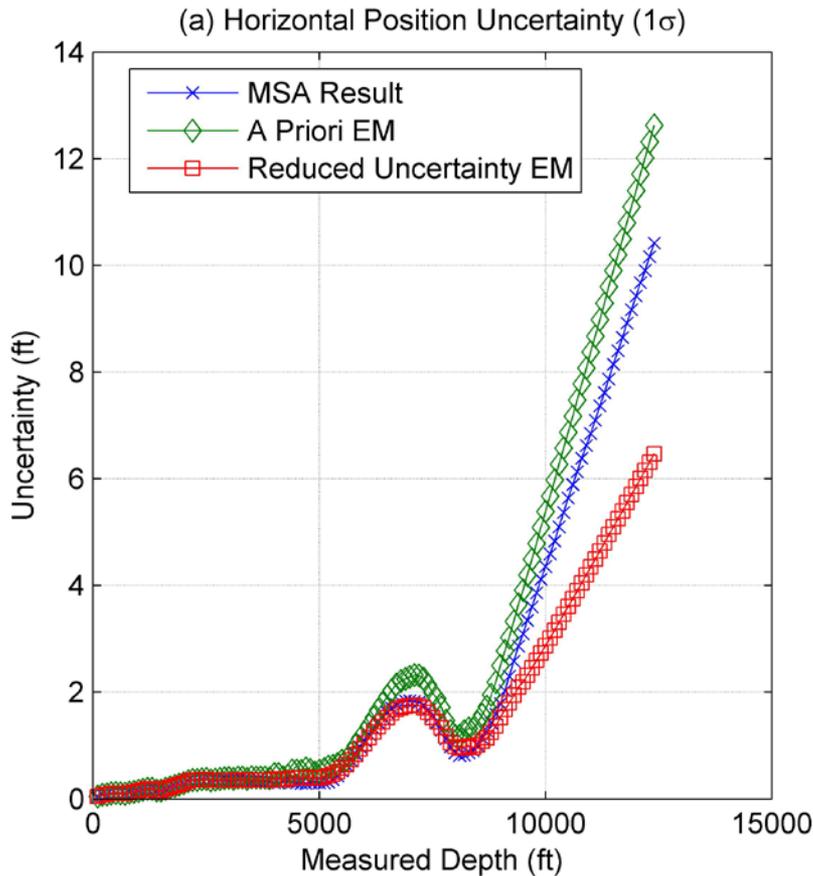
MSA-Specific Error Models

Code	Term Description	ISCWSA MWD	OWSG MWD+IFR1+MSA	ISCWSA MWD+MSA	Units
MBX	MWD: X-Magnetometer Bias	70	35	35	nT
MBY	MWD: Y-Magnetometer Bias	70	35	35	nT
MBZ	MWD: Z-Magnetometer Bias	70	35	35	nT
MSX	MWD: X-Magnetometer Scale Factor	0.0016	0.0008	0.0016	-
MSY	MWD: Y-Magnetometer Scale Factor	0.0016	0.0008	0.0016	-
MSZ	MWD: Z-Magnetometer Scale Factor	0.0016	0.0008	0.0016	-
AMIL	MWD: Axial Interference - $\sin I \cdot \sin A$	150	100	75	nT

Note: The error models do not exist in exactly this format. The modifications are:

1. Toolface independence has been removed
2. AMIL is used instead of AMIC and AMID in the ISCWSA models
3. There is no official ISCWSA MSA error model. The one presented here is for illustration purposes.

Comparison of Error Model Uncertainty with Post-Fit MSA Uncertainty: ISCWSA Test Well #2



Max. Uncertainty Overshoot from MSA

Correction: ISCWSA Test Well #2

								Agreement Tolerance:	10%
ISCWSA MWD*	Standard Magnetic Referencing				IFR1 (Crustal Map)				
	Accept Ref.	Dip	B_ref	Dip, B_ref	Accept Ref.	Dip	B_ref	Dip, B_ref	
b_z	0%	0%	3%	0%	0%	0%	0%	0%	
b_xy	0%	0%	0%	0%	0%	0%	0%	0%	
b_xy, b_z	0%	0%	2%	0%	0%	0%	0%	0%	
b_xy, b_z, s_xy	0%	0%	21%	0%	0%	0%	0%	0%	
ISCWSA MWD* + MSA	Standard Magnetic Referencing				IFR1 (Crustal Map)				
	Accept Ref.	Dip	B_ref	Dip, B_ref	Accept Ref.	Dip	B_ref	Dip, B_ref	
b_z	62%	60%	100%	38%	39%	39%	39%	39%	
b_xy	94%	93%	92%	92%	95%	94%	93%	93%	
b_xy, b_z	60%	58%	99%	1%	1%	1%	4%	1%	
b_xy, b_z, s_xy	60%	9%	137%	1%	1%	1%	18%	1%	
		= Adheres to Minimum Requirements (SPE/IADC 125677)							

* AMIL term of magnitude 150 nT was used in place of AMIC and AMID

Max. Uncertainty Overshoot from MSA

Correction: ISCWSA Test Well #1 Below 5400 m

	Agreement Tolerance:							10%
ISCWSA MWD*	Standard Magnetic Referencing				IFR1 (Crustal Map)			
	Accept Ref.	Dip	B_ref	Dip, B_ref	Accept Ref.	Dip	B_ref	Dip, B_ref
b_z	589%	1960%	626%	69%	247%	1001%	264%	69%
b_xy	0%	0%	0%	0%	0%	0%	0%	0%
b_xy, b_z	622%	2289%	658%	1282%	263%	1173%	279%	1282%
b_xy, s_xy	0%	0%	654%	21842%	0%	0%	277%	21842%
ISCWSA MWD* + MSA	Standard Magnetic Referencing				IFR1 (Crustal Map)			
	Accept Ref.	Dip	B_ref	Dip, B_ref	Accept Ref.	Dip	B_ref	Dip, B_ref
b_z	1248%	3929%	1321%	230%	579%	2053%	612%	230%
b_xy	95%	95%	95%	95%	95%	95%	95%	95%
b_xy, b_z	1313%	4575%	1384%	2605%	610%	2391%	642%	2605%
b_xy, s_xy	96%	96%	1376%	42845%	96%	96%	638%	42845%
		= Adheres to Minimum Requirements (SPE/IADC 125677)						

* AMIL term of magnitude 150 nT was used in place of AMIC and AMID

Max. Uncertainty Overshoot from MSA

Correction: ISCWSA Test Well #2 Below 7201 ft

								Agreement Tolerance:	10%
ISCWSA MWD*	Standard Magnetic Referencing				IFR1 (Crustal Map)				
	Accept Ref.	Dip	B_ref	Dip, B_ref	Accept Ref.	Dip	B_ref	Dip, B_ref	
b_z	9%	118%	13%	4%	0%	18%	0%	4%	
b_xy	0%	0%	0%	0%	0%	0%	0%	0%	
b_xy, b_z	10%	118%	13%	0%	0%	10%	0%	0%	
b_xy, s_xy	0%	7%	42%	0%	0%	1%	0%	0%	
b_xy, b_z, s_xy	11%	0%	19%	0%	0%	0%	0%	0%	
ISCWSA MWD* + MSA	Standard Magnetic Referencing				IFR1 (Crustal Map)				
	Accept Ref.	Dip	B_ref	Dip, B_ref	Accept Ref.	Dip	B_ref	Dip, B_ref	
b_z	115%	328%	124%	68%	46%	124%	47%	68%	
b_xy	94%	94%	94%	94%	94%	94%	94%	94%	
b_xy, b_z	116%	330%	123%	0%	9%	117%	13%	0%	
b_xy, s_xy	95%	97%	134%	88%	95%	97%	62%	88%	
b_xy, b_z, s_xy	118%	0%	135%	0%	10%	0%	18%	0%	
= Adheres to Minimum Requirements (SPE/IADC 125677)									

* AMIL term of magnitude 150 nT was used in place of AMIC and AMID

Questions?