



Error Model Sub- Committee Update

September 25th, 2025

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Sub-Committee Chair

Marc Willerth

- H&P (via MagVAR acquisition)
- 15+ years in varying facets of wellbore positioning product support, survey corrections, & error modeling
- Contact: Marc.Willerth@hpinc.com



Attendance – September 24, 2025

- 31 people in-person, additional 20 online attendees

Topics Covered

- Finalize Initial Rotating 6-axis Magnetic Survey Release
- Outline components of rotating 6-axis guidance document
- Discussion on OSDU Transfer Format



Review – Rotating Error Model

- Covers magnetic surveys taken while rotating
 - Still 6-axis surveys – same QC should be available
 - **Not** legacy axial sensor-only “continuous” surveys
 - Aims to cover specific errors that arise from rotation
- Initial proposed set of weighting functions in 2017
 - Additionally, magnitudes that approximate “MWD” surveys
- Work groups have since refined initial proposal
- “Release Candidate” error model shared in August



Pathway to Release

- Update All Tool Error codes to include “ROT_”
- Update descriptions to include “ROT” and link to error code
- Consolidate duplicated weighting functions
- Chad H. and Andreas R. to align on singularity value



Final Tweaks to Rotating Survey Error Model

Code	Term Description	Wt.Fn.	Wt.Fn. Source	Type	Magnitude	Units	Prop.	P1	P2	P3	Wt.Fn. Comment	Depth Formula	Inclination Formula	
1	DRFR	Depth: Depth Reference - Random	DREF	SPE 67616	Depth	0.35	m	R	0	0	0		1	0
2	DSFS	Depth: Depth Scale Factor - Systematic	DSF	SPE 67616	Depth	0.00056	-	S	1	0	0	MD	0	
3	DSTG	Depth: Depth Stretch - Global	DST	SPE 67616	Depth	0.00000025	1/m	G	1	1	1	MD * TVD	0	
4	AN1	MWD: XY-Shock and Vibe, Term 1	AN1	Superior QC	Sensor									
5	AN2	MWD: XY-Shock and Vibe, Term 2	AN2	Superior QC	Sensor									
6	ANZ	MWD: Z-Shock and Vibe	ANZ	Superior QC	Sensor									
7	ASXY-ROT	MWD: X&Y-Accelerometer Scale Factor	ASXY-TI1	Superior QC	Sensor								: / Sqrt(2)	
8	AXY-ATTEN	MWD: Accels XY-Attenuation From LP Filter	AXY-ATTEN	Superior QC	Sensor								:)	
9	ABZ	MWD: Z-Accelerometer Bias	ABZ	SPE 67616 Table 1	Sensor	0.004	m/s ²	S	1	0	0	0	-Sin(Inc) / Gfield	
10	ASZ	MWD: Z-Accelerometer Scale Factor	ASZ	SPE 67616 Table 1	Sensor	0.0005	-	S	1	0	0	0	-Sin(Inc) * Cos(Inc)	
11	MSXY-ROT	MWD: X&Y-Magnetometer Scale Factor	MSXY-TI1	Superior QC	Sensor	0.0016	-	S	1	0	0	0	0	
12	MXY-ATTEN	MWD: X&Y-Magnetometer Attenuation	MXY-ATTEN	Superior QC	Sensor	0.0015	-	S	1	0	0	0	0	
13	MBZ	MWD: Z-Magnetometer Bias	MBZ	SPE 67616 Table 1	Sensor	70	nT	S	1	0	0	0	0	
14	MSZ	MWD: Z-Magnetometer Scale Factor	MSZ	SPE 67616 Table 1	Sensor	0.0016	-	S	1	0	0	0	0	
15	AMXY-S	MWD: X&Y-Magnetometer Singularity	AMXY-PS	Superior QC	Sensor									
16	EDDY	MWD: Eddy Current	EDDY	Superior QC	Mgmtcs									
17	CA1	MWD: XY-Centripetal Accel, Term 1	CA1	Superior QC	Sensor	0.								
18	CA2	MWD: XY-Centripetal Accel, Term 2	CA2	Superior QC	Sensor	0.0038	m/s ²	R	0	0	0	0	-Cos(Inc) / Gfield	
19	DSC	MWD: Singularity	DSC	Superior QC	Sensor	0.096	deg	R	0	0	0	Singularity when vertical	0	1

Reuse existing weighting functions where possible

Descriptions will contain "MWD Rot:"

Update DSC singularity handling

Error codes to be denoted "ROT_"



To Do: Update Documentation

- Create 1-page Guidance Document
 - Define error model scope (is / is not) and assumptions
 - Provide guidance for operator/vendor discussion
- Update error model definition document
 - Incorporate weighting function work from Chad and Andreas
 - Summarize working group decisions
- Generate updated diagnostics / Perform sanity checks



OSDU Collaboration

Current Proposal

- Need a format to standardize on error model exchange
- Kyle Rickey is proposing a JSON standard
 - Would not change content of existing error models
- Set up ISCWSA github for tracking / version control



Draft JSON Schema

Define shared structure

- Common error names
- Weighting functions

Enable standardized transfer

Not for legacy models

```
1  {
2    "$schema"      : "https://json-schema.org/draft-07/schema",
3    "$id"         : "https://github.com/iscwsa/error-models/blob/main/schema/schema.json",
4    "type"        : "object",
5    "title"       : "Error Model Schema",
6    "description"  : "Provides validation of Error Models",
7    "markdownDescription" : "Provides validation of Error Models. See [iscwsa.net](https://www.iscwsa.net)",
8
9    "properties": {
10
11      "$schema": {
12        "description": "The schema to use for validation",
13        "type": "string"
14      },
15
16      "meta": {
17        "$ref": "meta.json"
18      },
19
20      "parameters": {
21        "$ref": "parameters.json"
22      },
23
24      "tags": {
25        "description": "A list of applicable tags",
26        "type": "array",
27        "items": {
28          "type": "string",
29          "minLength": 1
30        },
31        "minItems": 0,
32        "uniqueItems": true
33      },
34
35      "error_terms": {
36        "description": "Array of individual Error Terms",
37        "type": "array",
38        "items": {
39          "$ref": "error-term.json"
40        },
41        "minItems": 1,
42        "uniqueItems": true
43      }
44    },
45  }
```



Next Steps

Get Rotating Error Release finalized and published

- Working group on guidance document
- Engage with QA/QC sub-committee on operational considerations
- Consider similar documents for existing error models

Working group on OSDU

- Target delivery of Q1 2026

If you are interested in either group please reach out to me



Future Meeting Fodder

Guidance on Improved RIP tests

- Rev 5 special concerns (Misalignments)
- Rotating vs. Static Comparisons

Mixed Mode Surveying

Dynamic Error Model Construction

QC integration with error models



Thank You!

Questions / Discussion