36th CA Subcommittee
6th of March 2025
Stavanger, Norway

Wellbore Positioning Technical Section

The Industry Steering Committee on
Wellbore Survey Accuracy (ISCWSA)

Collision Avoidance Subcommittee Update

CA Meeting #36 06-Mar-2025
11:30 pm –1:30 pm ~2hrs

Darren Aklestad - SLB
07 Mar 2025

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- Darren Aklestad

- 34 yrs Schlumberger/SLB

- Wellbore positioning, well planning, anti-collision, cartographic systems, survey corrections

- Aklestad@slb.com

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Attendees summary

- 44 Attendees (18 Online) (62 total)
  - 31 companies (14 Operators,41 Service Providers,7 Software vendors)
  - Online, probably higher

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Agenda

1. Quick Review of the previous activities

2. Jerry Codling HAL – PC Made Easy – Update presentation (details)

   - Adoption recommendation?

3. Pending Items – plan forward

4. New Business

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Previous activities review

1. Surface Margin – White Paper Recommendation

    1. Still needs formal publication

2. Reporting minimum-standards – columns / header items

    1. No additions – needs publication

3. Current activity of SC members – CA benchmarking

4. Focus on PC methods/usage/recommendations

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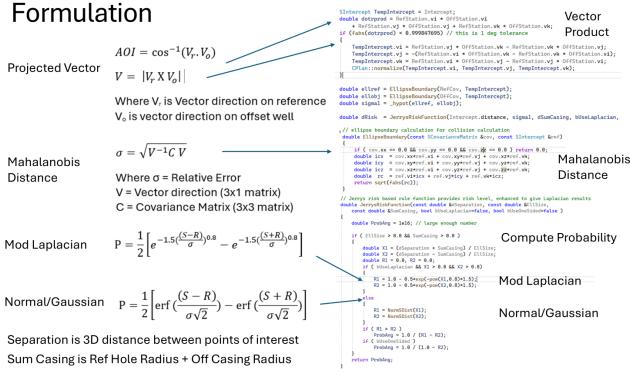# SPE-189654-MS Probability Of Wellbore Intercept Made Easy

- Full Presentation will be posted and made available

- Full formulation for others to implement in software

- Inputs are readily available now

- Software vendors will be continuing effort to validate against each other

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Formulation

Vector Product

Mahalanobis Distance

Compute Probability

Mod Laplacian

Normal/Gaussian

Projected Vector

$$AOI = \cos^{-1}(V_r . V_o)$$

$$V = |V_r \times V_o||$$

Where V_r is Vector direction on reference
V_o is vector direction on offset well

Mahalanobis Distance

$$\sigma = \sqrt{V^{-1}C\,V}$$

Where σ = Relative Error
V = Vector direction (3x1 matrix)
C = Covariance Matrix (3x3 matrix)

Mod Laplacian

$$P = \frac{1}{2}\left[e^{-1.5(\frac{(S-R)}{\sigma})^{0.8}} - e^{-1.5(\frac{(S+R)}{\sigma})^{0.8}} \right]$$

Normal/Gaussian

$$P = \frac{1}{2}\left[\text{erf}\,(\frac{(S-R)}{\sigma\sqrt{2}}) - \text{erf}\,(\frac{(S+R)}{\sigma\sqrt{2}}) \right]$$

Separation is 3D distance between points of interest
Sum Casing is Ref Hole Radius + Off Casing Radius

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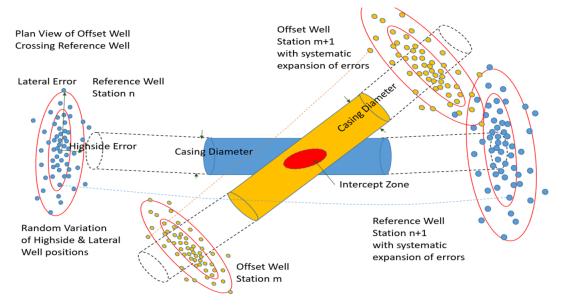
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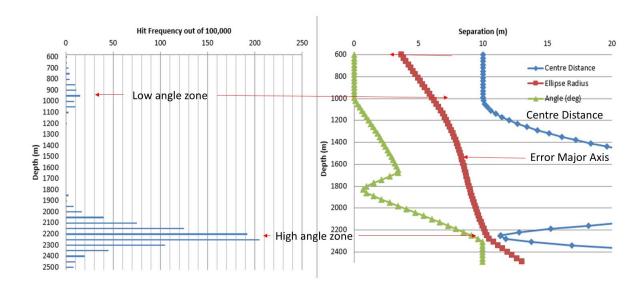# SPE-189654-MS Probability Of Wellbore Intercept Made Easy
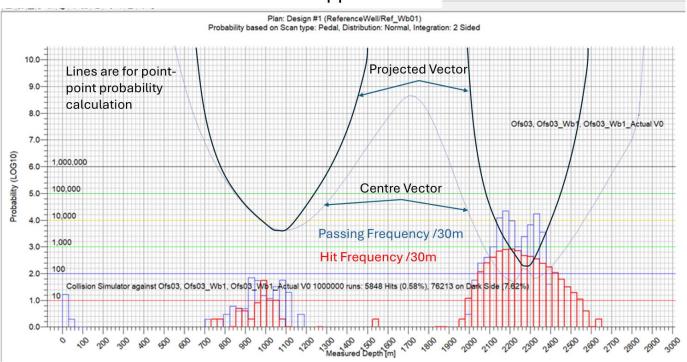
Illustration of Monte Carlo Simulator for Well Intercept

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Results of Monte-Carlo Simulator for Offset 03

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MC Simulation – Offset 03 - Native Application

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PC Discussion

- Lively debate concerning "what" PC is being computed
  - Shortcuts are inherent for convenience – shown do be adequate as a first step

- Focus is on getting a "common" tool available as a starting point
  - (just the beginning) a chance for everyone to learn more
  - Opportunity to change when shown to be inadequate
  - Has published limitations
  - Need to publish recommendations of when/how to be used

- Another tool in the toolbox for risk evaluation
  - Help make decisions on what to do next when SF has failed

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Continued Working

1. Benchmarks Update Rev5 & WPTS & Sidetrack

   - Work in progress – post results from all major software vendors
   - Include PC results – Projected Vector / Direct Vector?
   - Include rev4/5 w/wo inter-well geomag reference correlations
   - Update to give test trajectories as simplified paths un-interpolated
   - Add expanded "setup" details – specific error models

2. Post Surface Margin – White Paper Recommendation

3. Finalize CA Reporting minimum content standard

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New Initiatives

1. CA-Survey Database Management – Recommendations (Hans Dreisig – TotalEnergies)

   - Expansion with details of other components of competent CA system

2. Recommendations on Graphics systems for CA and combined covariance representation

3. * Coordination on analysis of operators "Exemption" process. Common elements?

   1. Possibly coordinated within the OWSG

4. * Update benchmarks to include "utility" error models

* Newly added

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Thank You – Questions? Corrections?

aklestad@slb.com