ISCWSA / SPE Wellbore Positioning Technical Section

Error Model Maintenance Work Group

Minutes of the Meeting at ISCWSA#40, Amsterdam, 29th October 2014

Membership
Membership of the error model committee stands at 52. This may have to be reduced in future to ensure a workable number.
Action: Deferred to a future meeting.

Error Model Documentation
There was general agreement that a single comprehensive document was needed to bring together the latest revisions of the MWD and gyro models. This could be based on existing source material i.e. SPE papers, eBook, OWSG spread-sheets etc.

Suggestions were made that more detail on implementation was needed and also on how to handle singularities in the equations. Validation limits should be defined for comparison with test data.

The anti-collision committee is also considering validation of error models.

It was agreed that the spread-sheets that Steve Grindrod has produced for the OWSG models are a useful way of describing the models and that these should be used for defining the ISCWSA models.

Action: Work group was set up, consisting of Andy McGregor, Steve Grindrod, Jerry Codling, Adrian Ledroz, Darren Aklestad and Kevin McClard.

ISCWSA MWD Model & OWSG MWD Models
The ISCWSA MWD model is currently at Rev3.

The OWSG MWD models are based on ISCWSA MWD Rev3, but include changes to the form of the drill string magnetisation terms and to the term values for the hole misalignments.

Action: The error model chapter of the ebook incorrectly refers to the lookup tables for BGGM accuracy as rev4. This is to be corrected.

Drill String Magnetisation

The OWSG models have made use of a different method of modelling drill string magnetisation replacing the existing AMIC and AMID terms with AMIL. The core of the difference reflects how non-mag spacing is handled (see for example Harry Wilson's presentation at ISCWSA#39 in New Orleans).

There was a wide ranging discussion on the merits of this, after which by vote the committee decided to also adopt the AMIL form.

Action: The term value for AMIL is to be decided with a view to matching the current drill string interference term at mid-latitudes.

The older AMIC and AMID will be retained for historic surveys.

Misalignment Terms

The size of the OWSG term values for hole misalignment (0.1 deg as opposed to 0.06 deg in the ISCWSA models) was discussed, but no conclusion reached. Harry Wilson commented that there had been significant changes to the contribution due to hole misalignment since Rev0.

Action: Deferred to a future meeting.

Alternative Method for Handling Misalignment

Jon Bang gave a presentation on a new means of handling misalignment (see presentation in main meeting). Instead of modelling misalignment in the md, inc, az level misalignment is included later directly into the NEV covariance matrix.

This is mathematically elegant and reduces the complexity of the misalignment calculation and avoids singularities. However it also means that misalignment is now handled in the same way as the other error sources. It is also not suitable for use with the recent Inclination Only model which uses differing values for the XYM1/XYM2 and XYM3/XYM4 terms.

It is possible that this method can be extended to other terms with singularities.

Accuracy of Geomagnetic Reference Terms

There were some differing views on the committee's recommendation in reference to the lookup tables for modelling BGGM accuracy.

Action: To be reviewed at a future meeting.

There was a request to include accuracy modelling of the HDGM and IGRF into the ISCWSA model.

Random Contributions to Geomagnetic Reference Terms

Stefan Maus gave a presentation on random contributions to the geomagnetic field (see proceedings of main meeting).

This recommended changes to the random terms currently used in many IFR1 and IFR2 models (such as the OWSG models). However these are not currently under the remit of the ISCWSA error model committee.

For completeness Stefan also recommended that random terms be added to the MWD models, although the cumulative effect on ellipse dimensions are small, these terms will modified derived QC limits.

Action: To be included in future model revision.

CNI and CNA Weighting Functions

It was proposed that the inclination and azimuth error cone terms (CNI and CNA) be incorporated into the ISCWSA documentation since these are used in some error models.

However it was noted that these terms can be modelled using the existing misalignment terms.

Inclination Only Models

The handling of TVD in the inclination only model was discussed. This currently has the MD and TVD values the same.

Action: Harry Wilson and Andy Brooks to investigate options.

Course Length

The current model assumes that users will follow good survey practice including a survey interval no greater than 100ft.

There have been a number of requests to model the effects of survey frequency or to penalise long survey intervals.

Baker Hughes currently have a term in some of their models which has this effect.

Action: Proposal for modelling course length to be considered at a future meeting.