# TEST PROFILE DIFFERENCES

This document gives some of the possible reasons for differences when comparing results from a software package with the ISCWSA / SPE-WPTS survey tool error model test profile results.

The reasons for differences have been split into three areas: implementation, input and output.

## *Implementation Differences*

These differences arise from ambiguities in the published papers and different interpretations of what has been written.

- True vs. Grid North for the covariance matrix calculations
- Calculations at a survey station (N) using different data. There are two common variations for the calculation at station N one method uses data from the station above and below [N-1 and N+1] while the other uses the two previous stations [N-2 and N-1]
- Missing terms in the software code. E.g. The Singular Vector terms in vertical holes.
- Wrong Weighting Functions
- Precision. The error model contains both very large and very small numbers and precision related errors can arise. E.g. dividing two numbers that should give zero actually gives a non-zero result.
- Implementing a different error model or non-standard calculations.

## *Input Differences*

These differences arise from different input parameters or assumptions about the input data for the model.

- Well Profile
  - True or Grid North. The MWD paper assumed the azimuth data was in True North while the Gyro paper assumed the same numeric values were Grid North.
  - Assumed coordinate systems and convergence
  - Different azimuths for the vertical (0° inclination) part of the well path.
  - Different number of survey stations and the inclusion of the extra survey stations at the inflection points for interpolated survey data.
  - Measured depths of survey stations. The gyro model needs to have survey stations (real or interpolated) at the mode change points.
  - Slightly different inclination and azimuth values for interpolated survey stations when the well profile is produced from a few planned points.

- Error Model
  - Missing terms from the error model
  - Extra terms in the error model
  - Wrong Units
  - Missing Singular Vector terms for vertical parts of well

- Other

- Gravity Value (e.g. Standard Gravity [9.80665 m/sec$^2$] or GRS80 which is latitude dependant.

### *Output Differences*

These differences are due to different output data, formats and reporting options. Diagnostic text files can be quite large (1 mB) and to help comparison a standardised format would be useful to allow the use of file comparison software to highlight the differences.

- Different data and formats reported
- Different precision
- Different units