CALCULATING OFFSETS IN THE LOCAL MAGNETIC FIELD PARAMETERS

ISCWSA #32
Florence, Italy

HALLIBURTON

23rd September 2010

author Anne Holmes, presenter Ian Mitchell

Calculating Offsets in the Magnetic Field

Offsets in the local theoretical values of Btotal and dip angle can be calculated from downhole sensor data

- Requires changes in inclination and azimuth
- Uses all the survey data
- Can be applied even if survey data affected by drill string interference
- 2 examples presented showing good correlation between calculated offsets and observed offsets

Calculating Offsets in the Magnetic Field

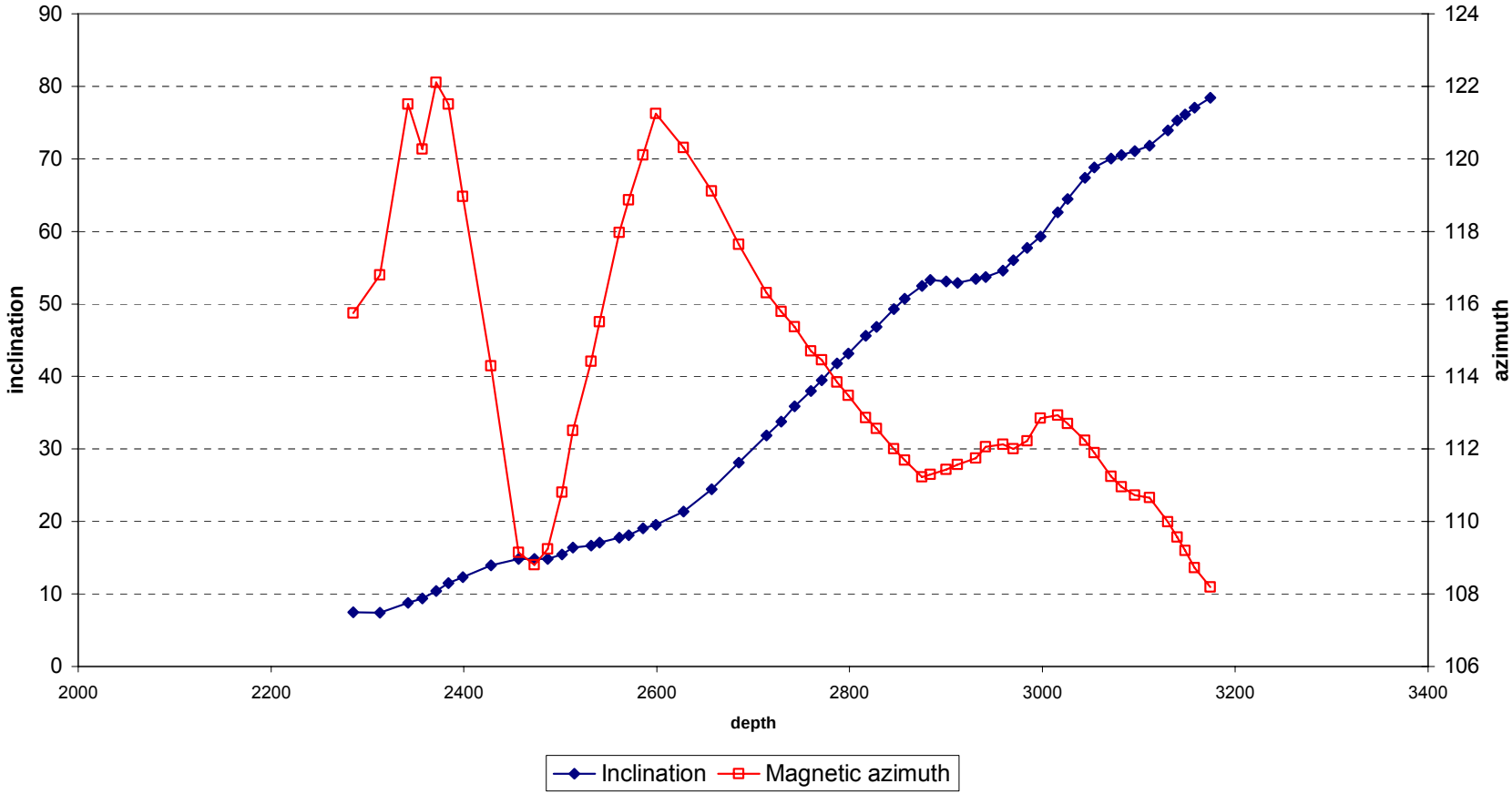
1. Reconstituted values of Btotal and dip can be calculated from the final azimuth
2. Difference between these values and the theoretical magnetic field values can be expressed as a function of attitude and location
3. Offsets in Btotal and dip can be determined by combining all data (e.g least squares) at varying inclination/azimuth angles

Calculating Offsets in the Magnetic Field

Validity of fit is checked by the Student t test at 95% significance

Accuracy of technique can be improved by correcting for cross axial biases and scale factor errors. This can be performed iteratively with calculating the offsets

Example 1: Well Profile



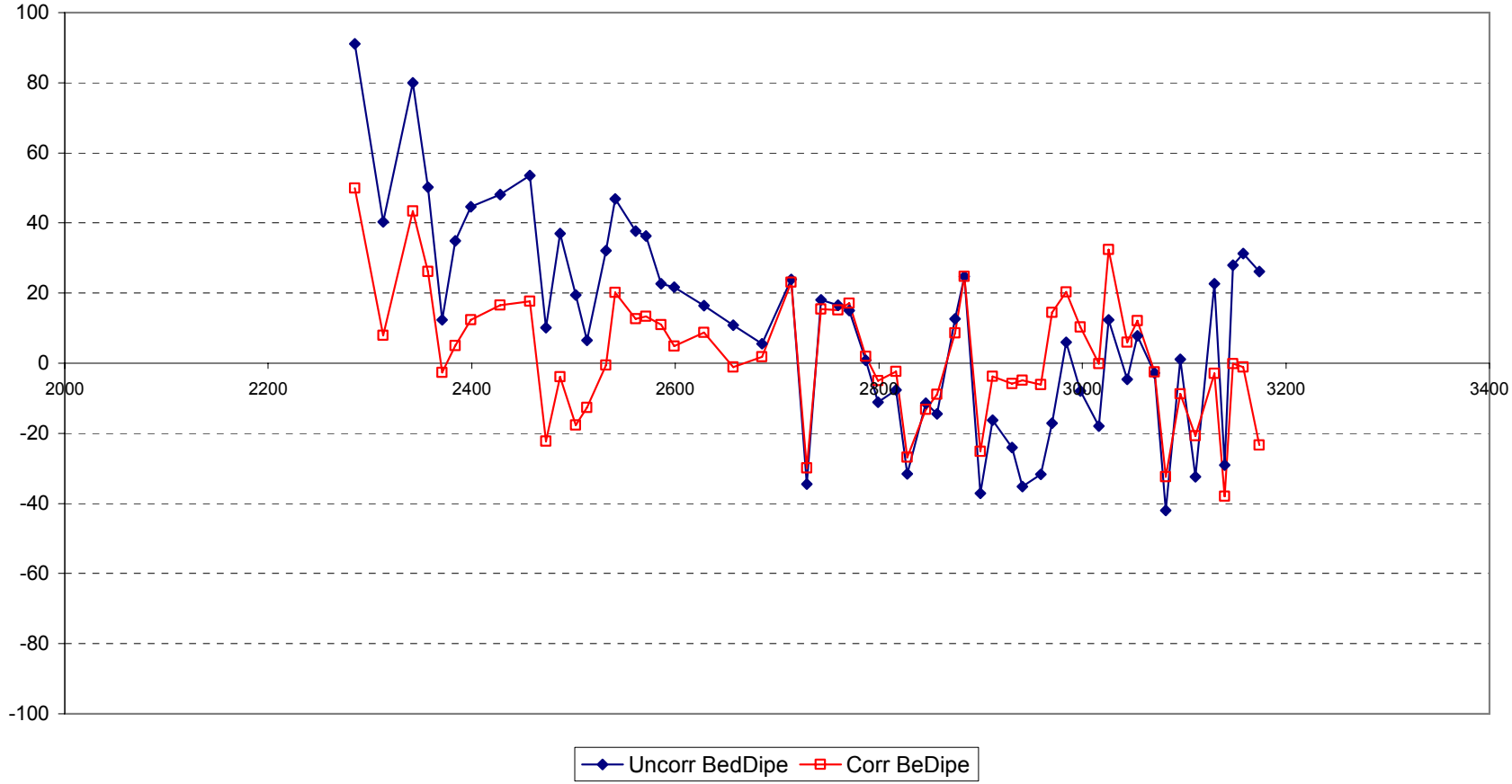
HALLIBURTON

Calculated Offsets in the Local Magnetic Field

	Dip Angle (deg)	Btotal (nT)
Calculated	-0.243	-67
IFR measurements	-0.22	-76

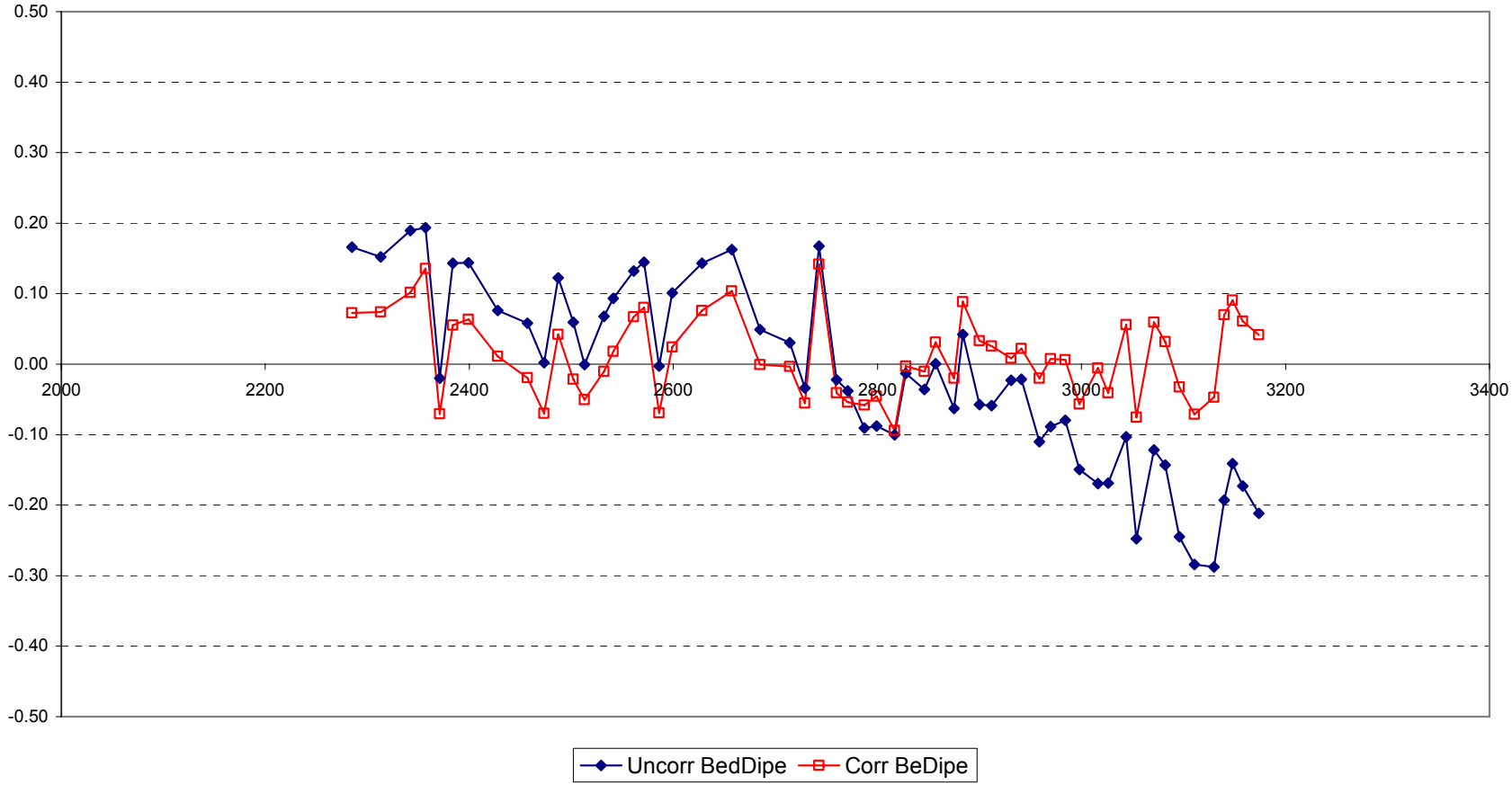
Note:
BGGM error for location: dip angle 0.11°, B-total 86 nT (1 σ)
IFR quoted error: dip angle 0.15°, B-total 100 nT (1 σ)

Example 1: Btotal difference



HALLIBURTON

Example 1: Dip difference

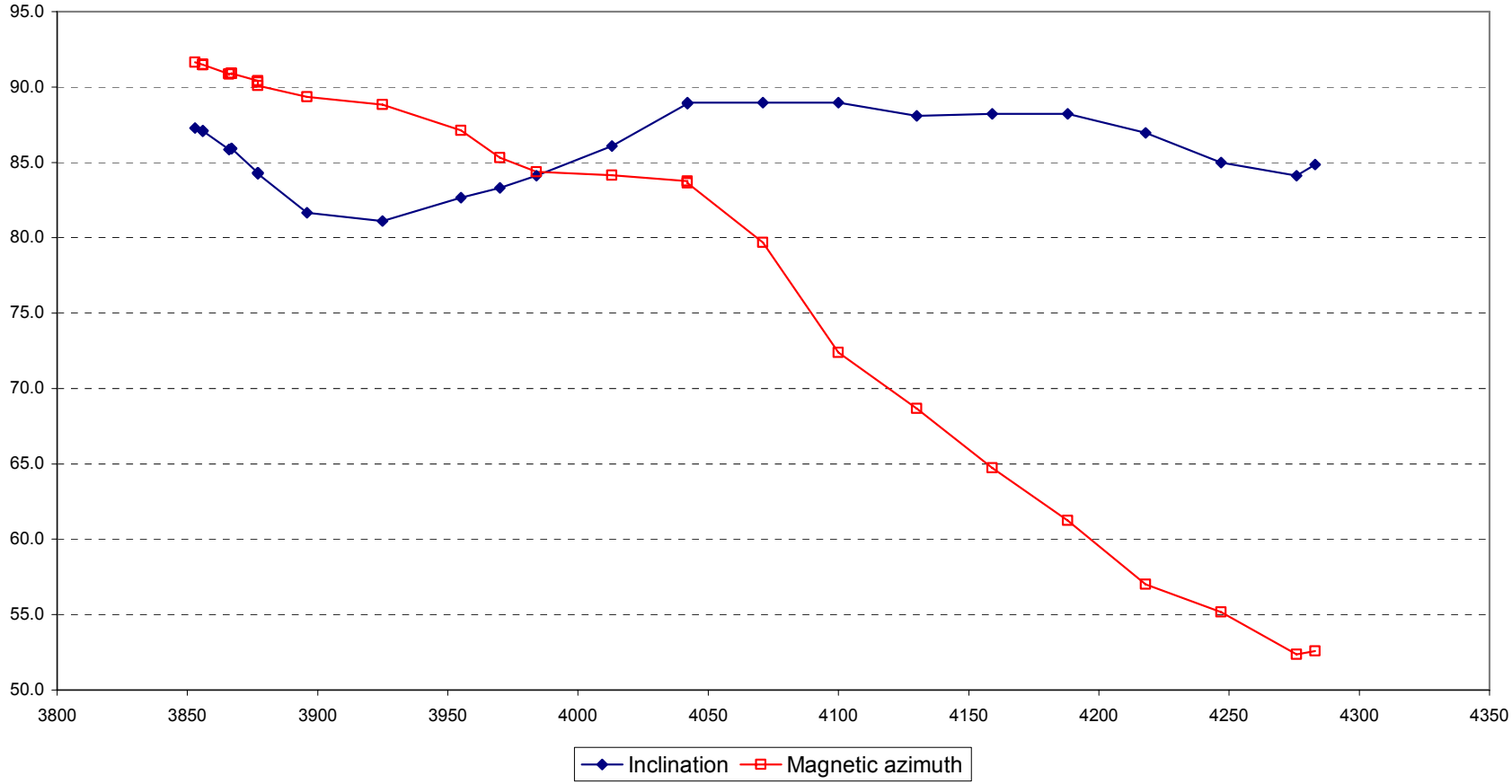


HALLIBURTON

Example 1: Resultant Azimuth Difference

HALLIBURTON

Example 2: Well Profile

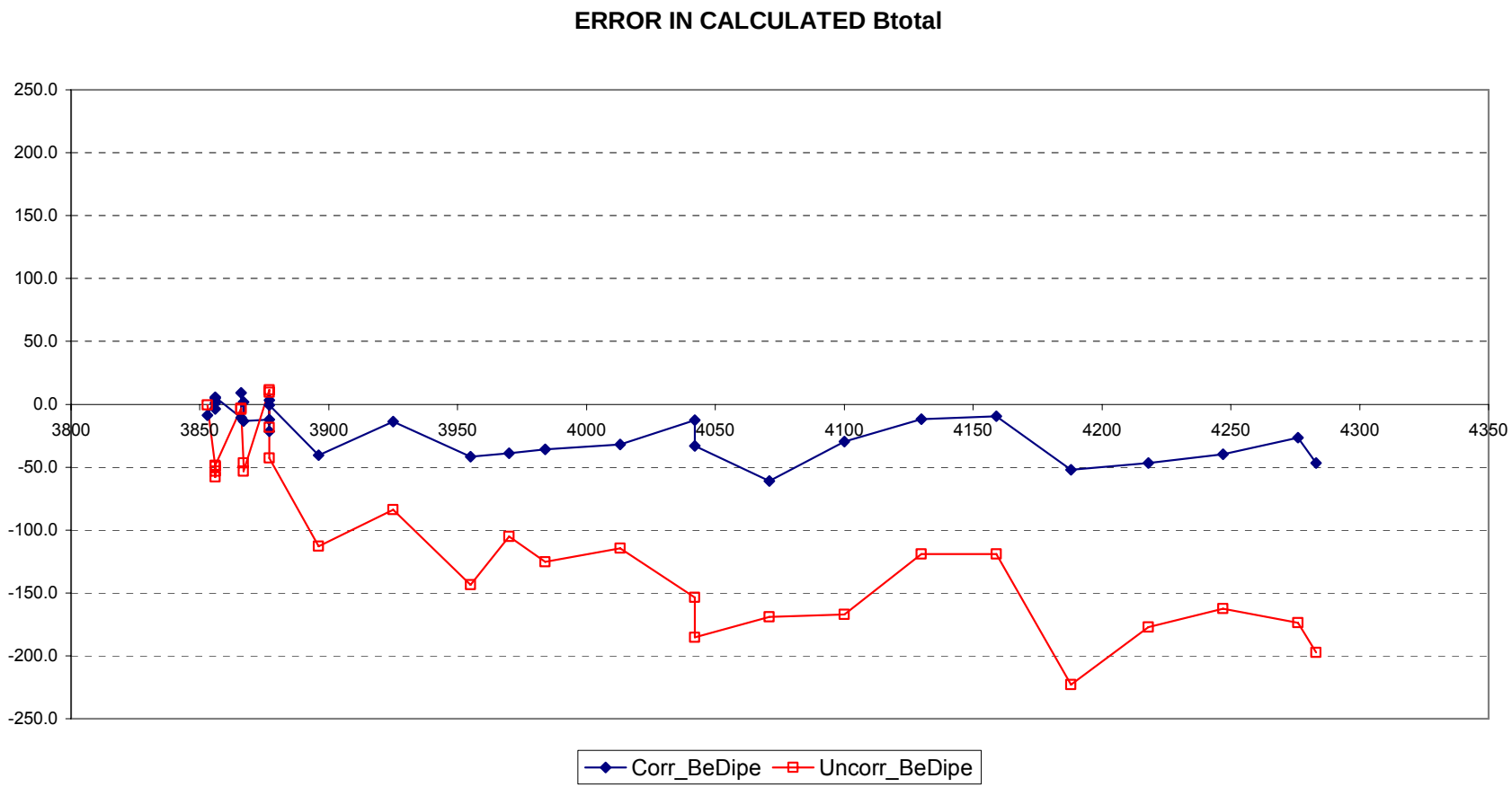


Calculating Offsets in the Local Magnetic Field

	Dip Angle (deg)	Btotal (nT)
Calculated	-0.212	-122
IFR measurements	-0.18	-108

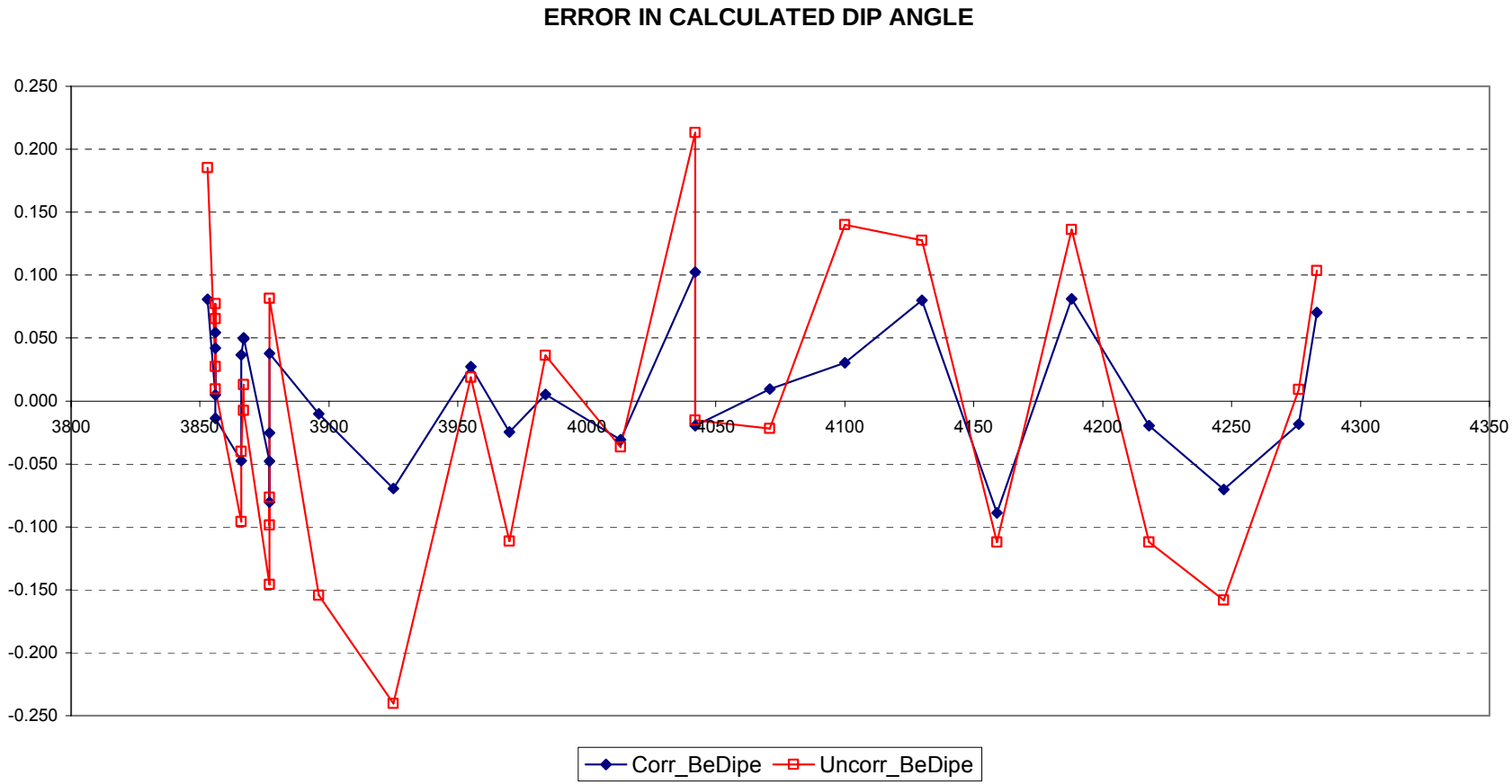
Note:
BGGM error for location: dip angle 0.11°, B-total 86 nT (1 σ)
IFR quoted error: dip angle 0.15°, B-total 100 nT (1 σ)

Example 2: Btotal difference



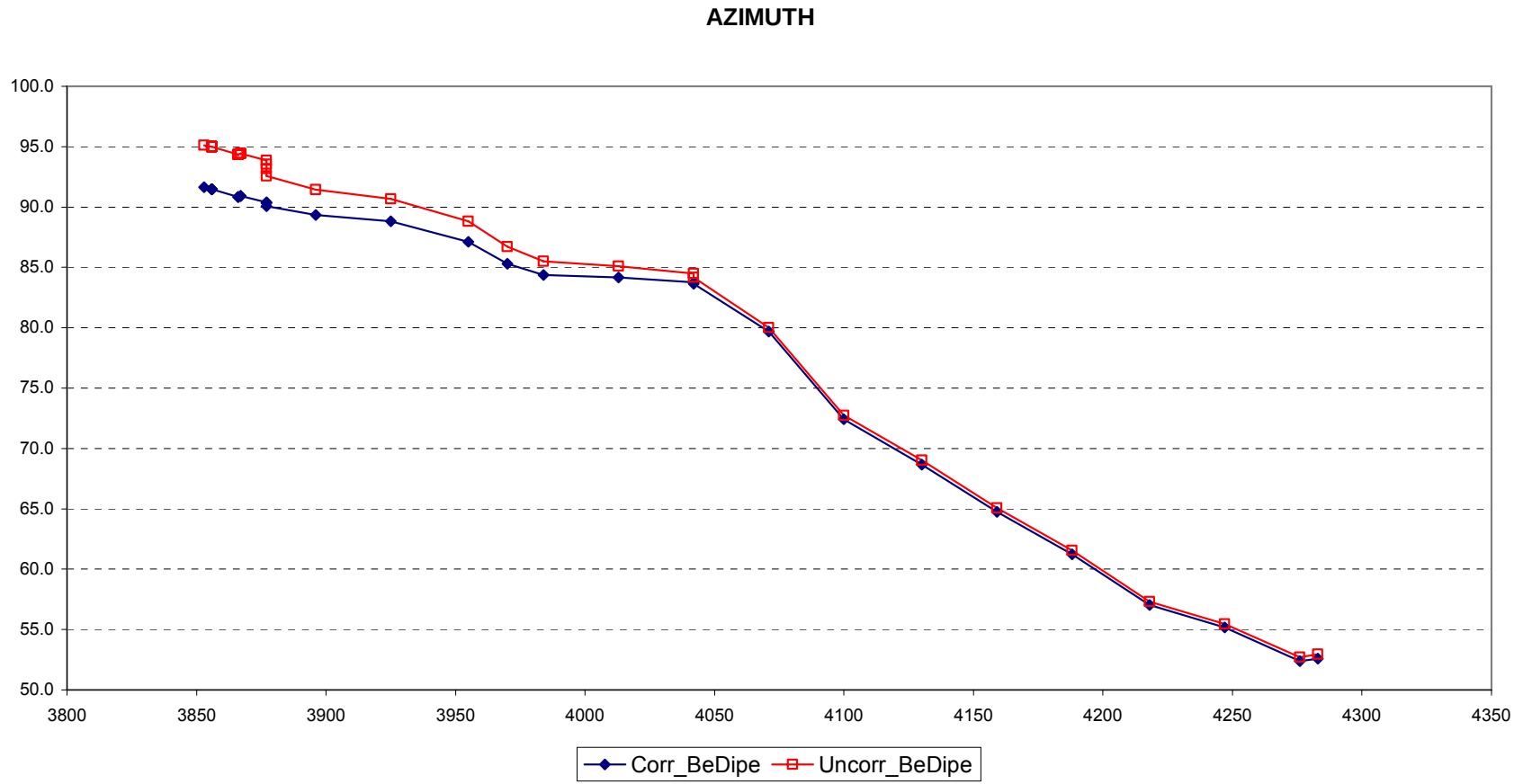
HALLIBURTON

Example 2: Dip difference



HALLIBURTON

Example 2: Resultant Azimuth Difference



HALLIBURTON

SUMMARY

Inaccuracies in the theoretical values of Btotal and Dip can be determined provided that there is sufficient turn and/or build

Technique has been verified both theoretically and by comparison with IFR measurements

Method can be used to correct survey data or advise of potential inaccuracies in local magnetic field parameters

Method can be used to corroborate IFR values

Gyro survey comparison would be needed for quantification of declination offset