Depth Correction Residual Uncertainty

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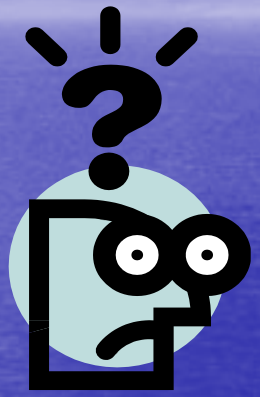
What are the causes of Depth Error

- Referencing
  - Tides
  - GPS Height
  - Slips Position
  - Datum Uncertainty
- Mechanical Stretch
- Thermal Stretch
- Differential Pressure



- Taping Errors
- Tally
- Jetting Lift
- Rounding
- Telescopic Components
- Pipe Deformation

The Stretch Error Term in ISCWSA

Error Source	Error Proportional to	Error Land Rig
Random reference	1	0.35 m
Systematic reference	1	0 m
Scale	D	2.4×10^{-4}
Stretch type	$D.D_v$	$2.2\times10^{-7}\ \mathrm{m}^{-1}$

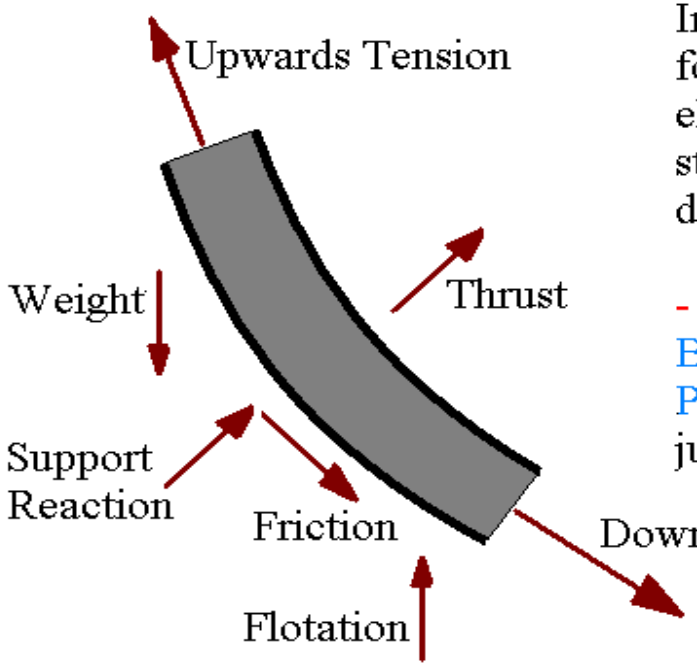
How does that affect my well?

- A 10,000ft TVD well with 15000ft MD will have a depth underestimate of

33 ft

Let's Pick two errors to Correct For

1. Mechanical Stretch



Integrate the effect of all forces acting on each finite element to determine the strain stretch at each survey depth and correct in the field

- requires

BHA weight Mud Weight

Pipe Weight Coeff Friction

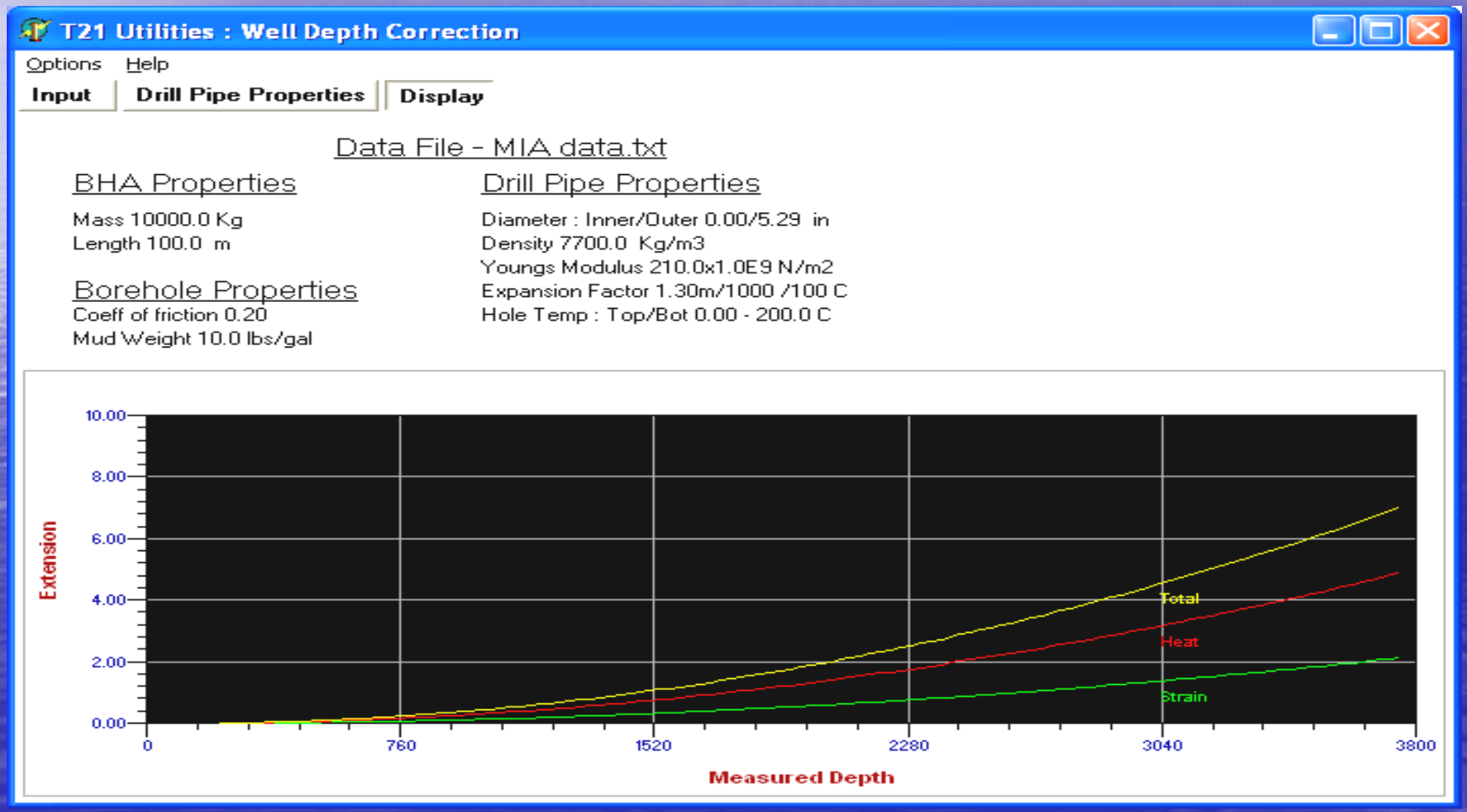
just as for torque and drag

2. Temperature Effects

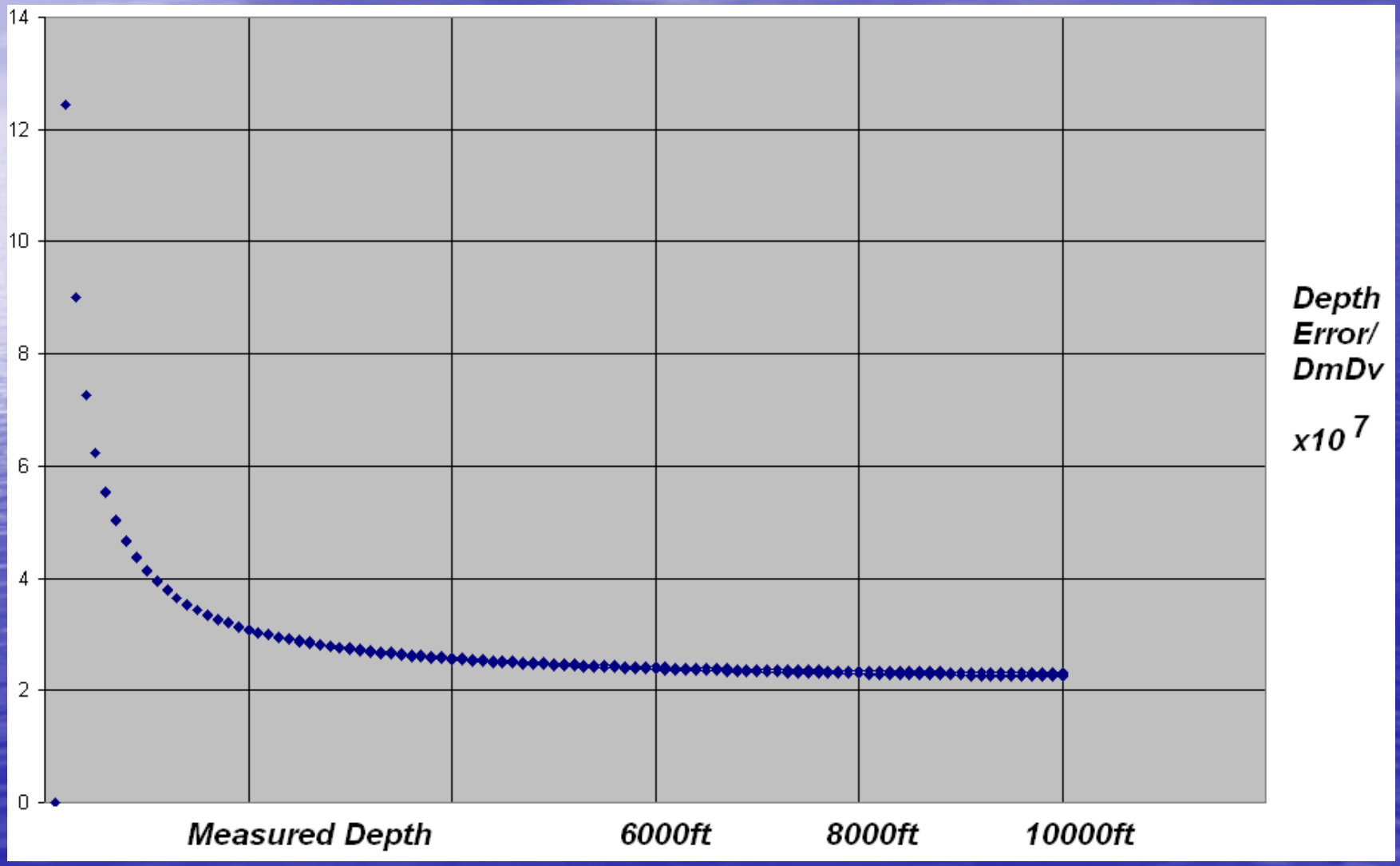
- Steel will stretch by

1.3m / 1000 / 100 degs C

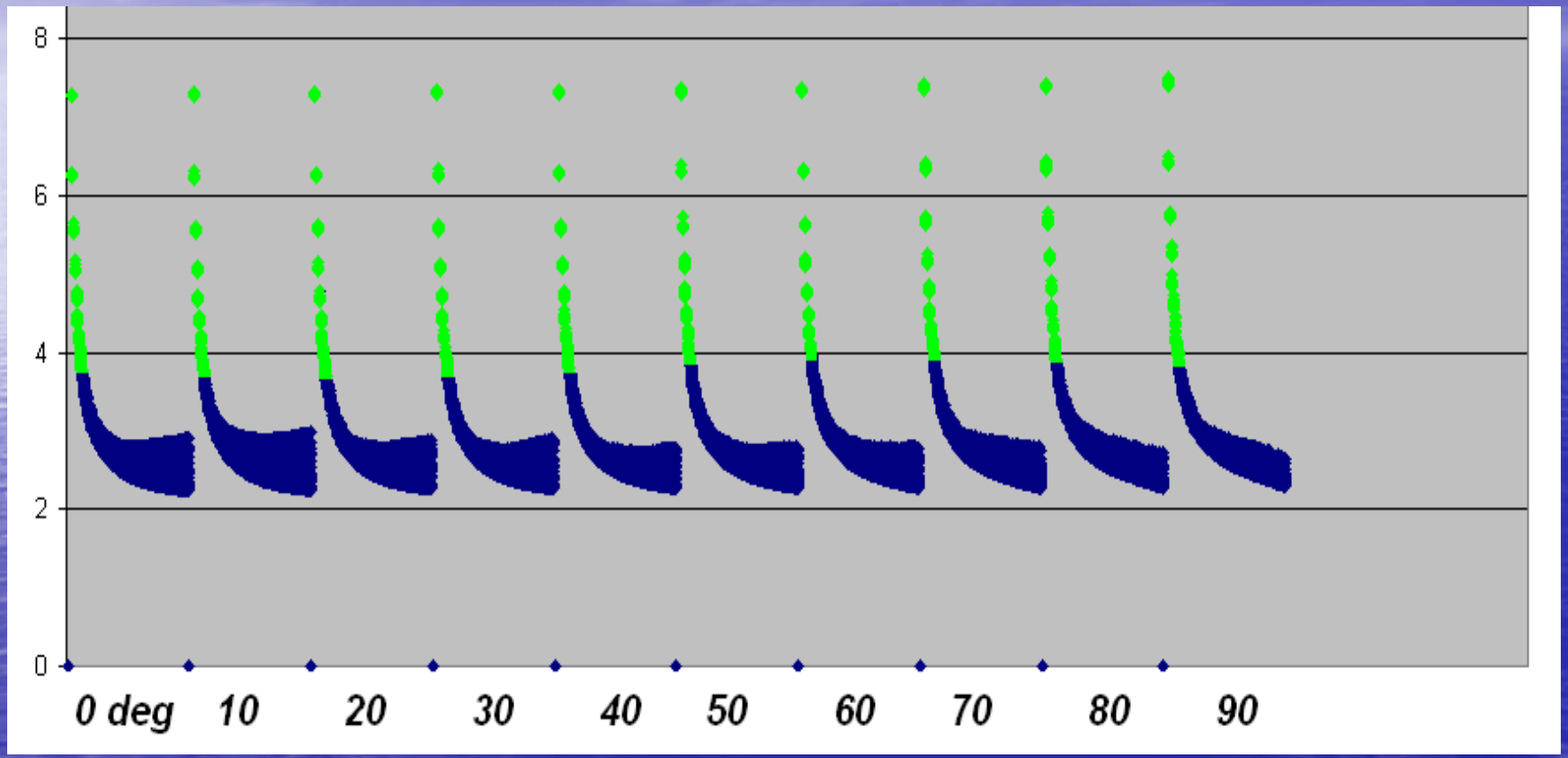
Depth Correction Software



Depth Err / (Meas D x TVD)



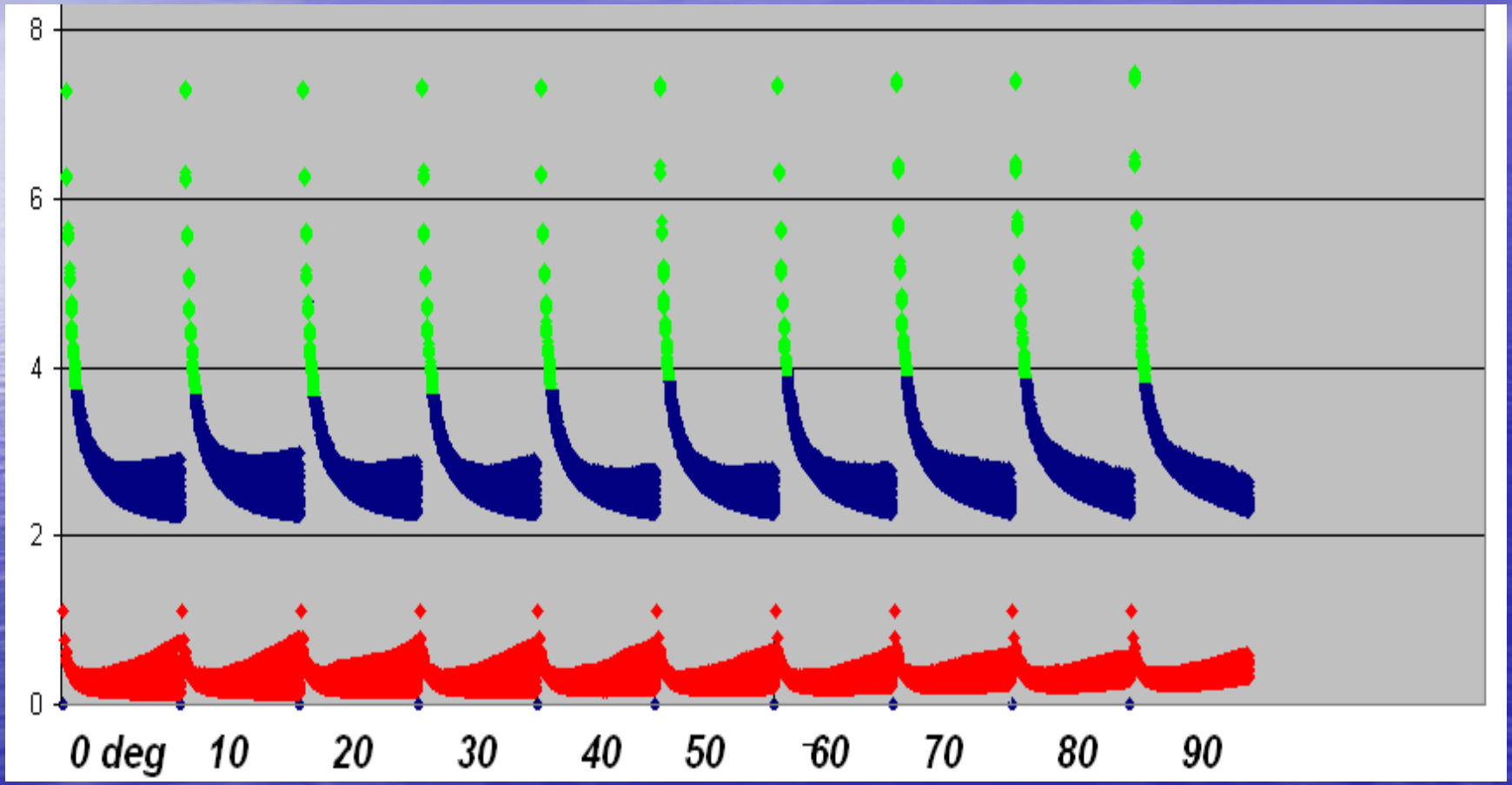
How does it vary in other wells?



If I Correct for Heat & Strain What am I left with ?

- Assumptions
  - Coeff of friction estimate only good to 0.1
  - Temperature Measurement good to 20%
  - BHA Weight good to 10%
  - Mud Weight good to 10%
  - Taping error small and random

Residual Uncertainty Derr/DDv



Conclusions

- The current error model approximation is good over a wide range of geometries.
- The largest effects are Strain and Heat
- A Depth Correction Algorithm will remove approximately 70% of depth error

BUT .....

Be Careful !

- More science is needed to reduce Depth Error further and PROVE the assumptions
- Be VERY careful about Depth Error Correlation.
  - If all wells drilled with similar geometry and similar BHAs the relative errors may be small
  - Wirelines shorten when you heat them and drillpipe lengthens so a wireline logging pick in a drillpipe survey may be a long way out.