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Testing survey resolution using Spectral Analysis

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One Layer; 50x50m, 100x100m and 500x500m grid spacing

Two Layers; 100x100m, 200x200m and 500x500m grid spacing

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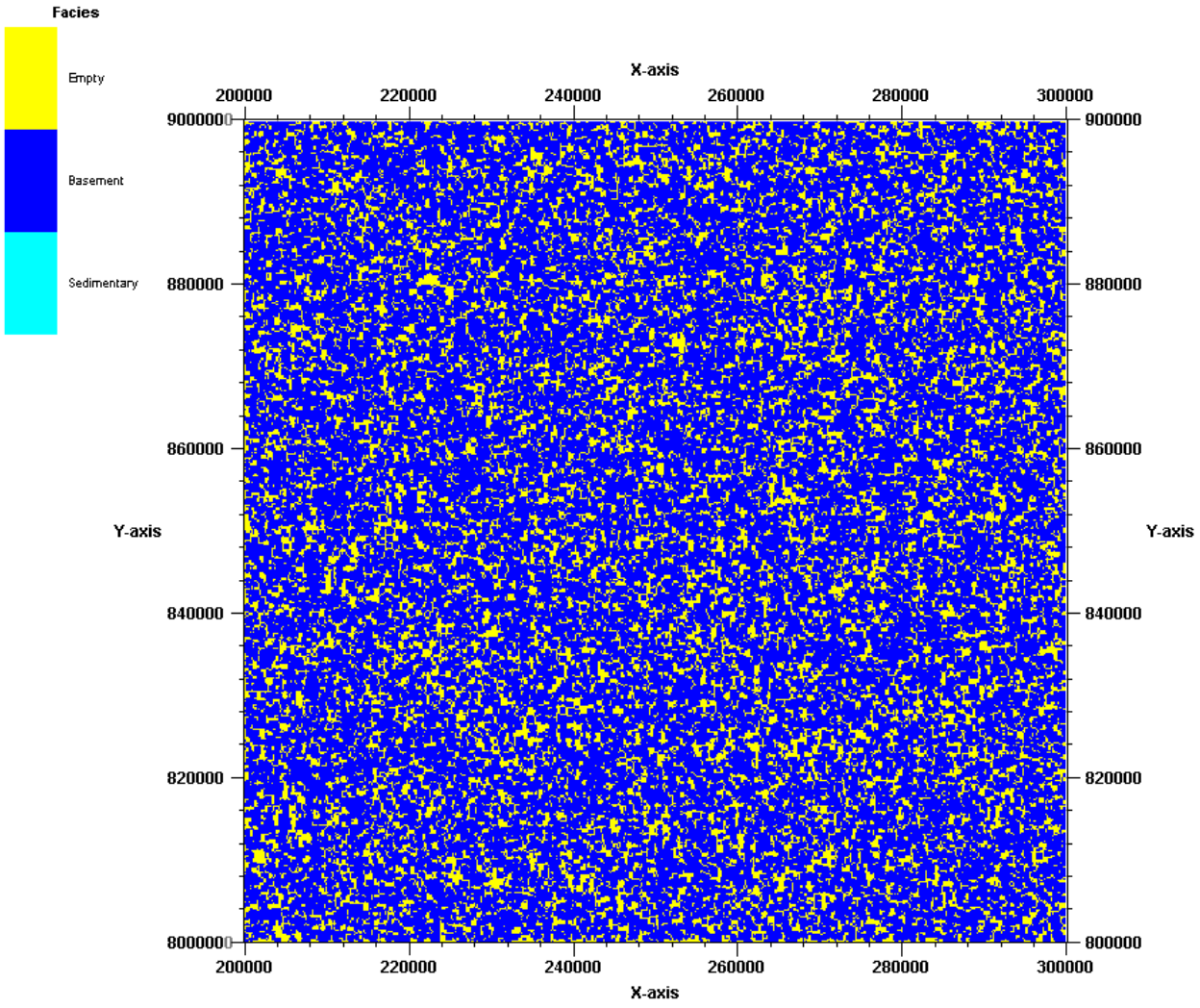
One layer model: Basement



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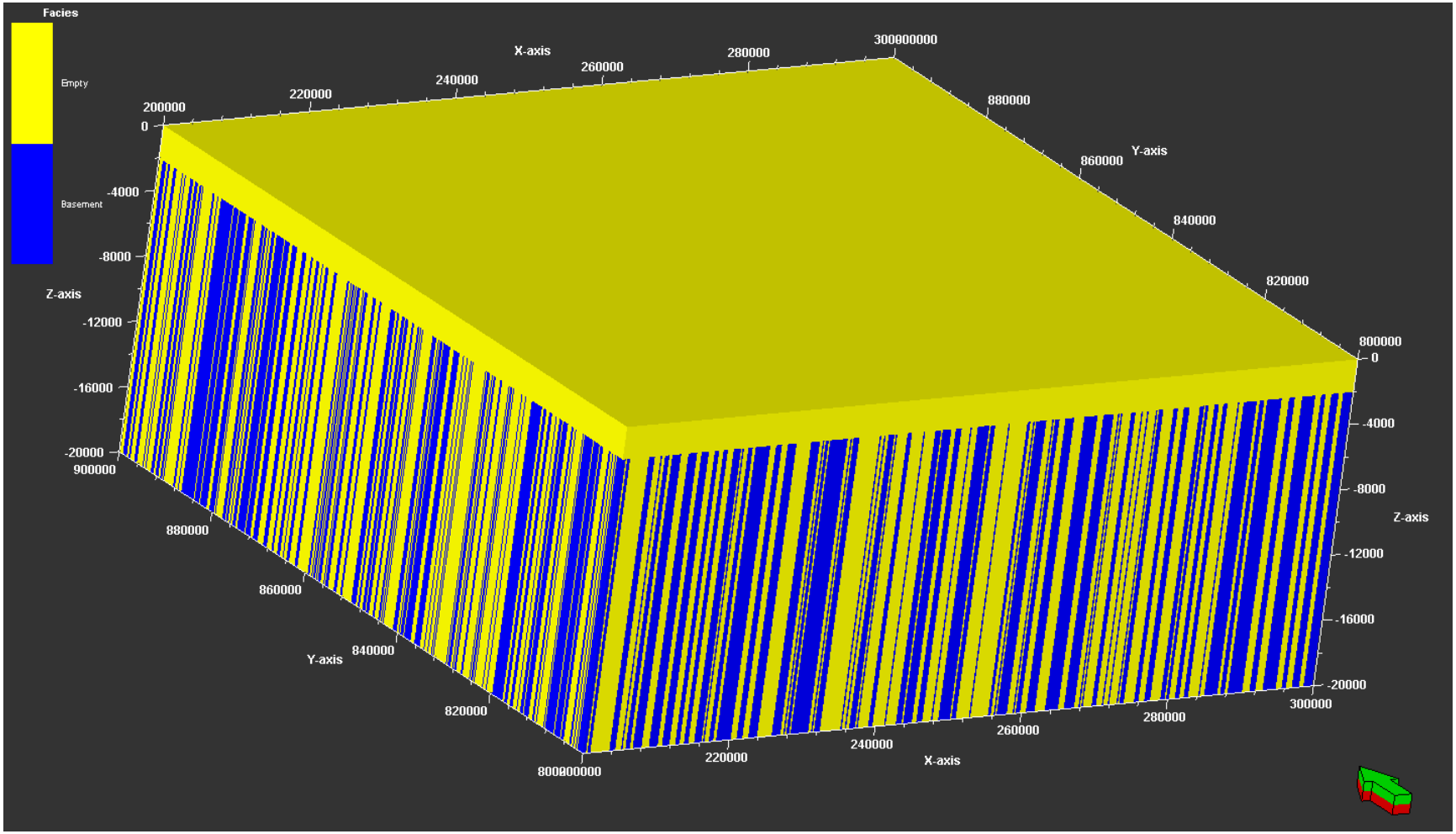
Profile view of one layer model



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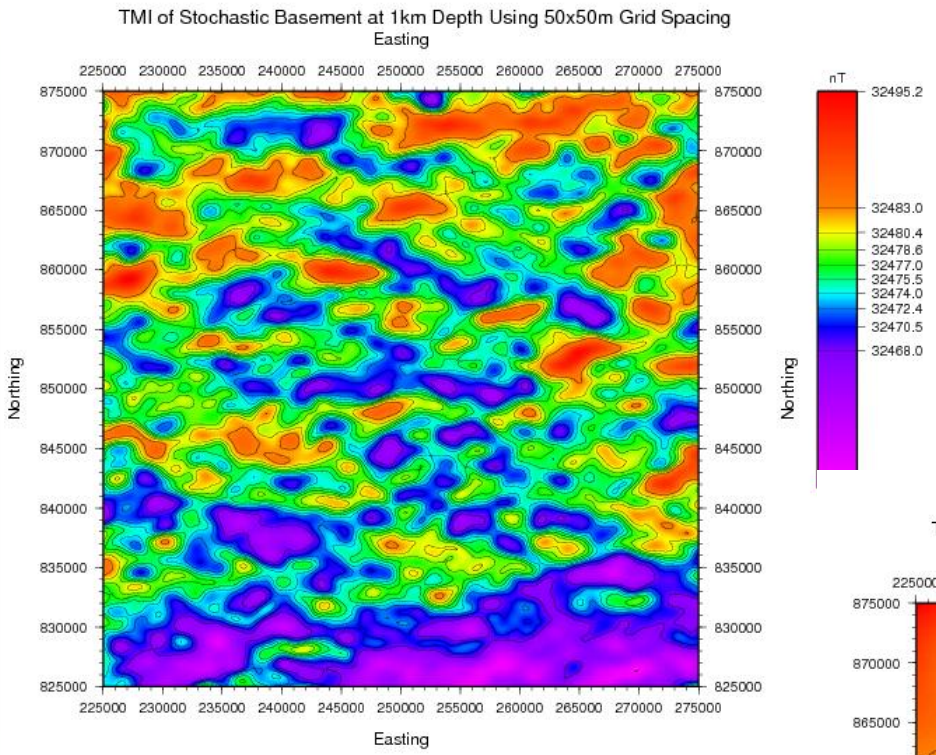
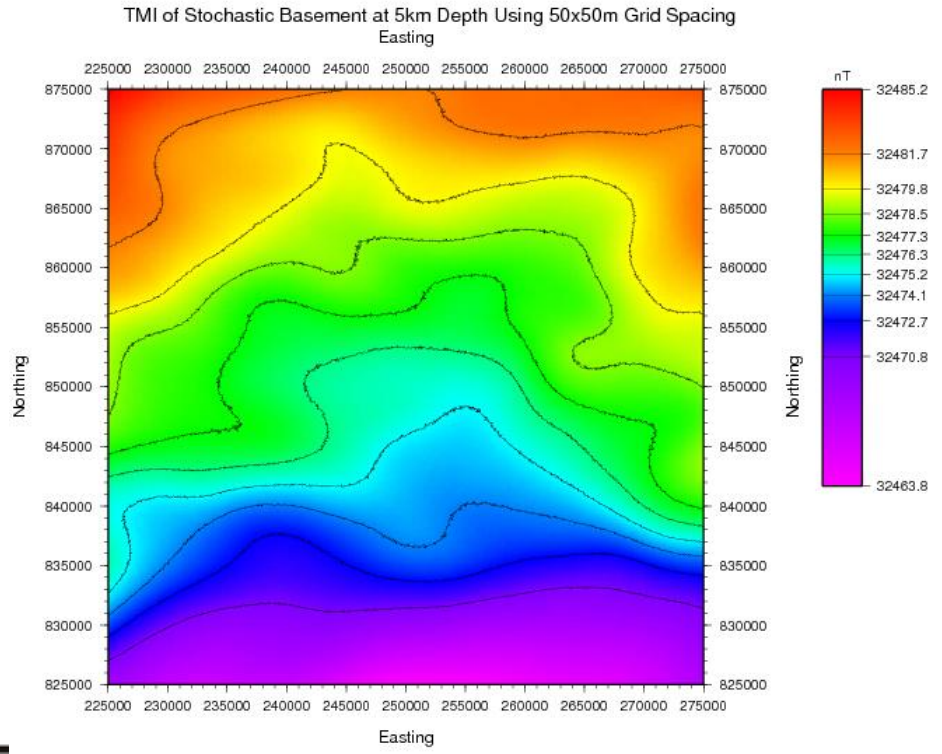
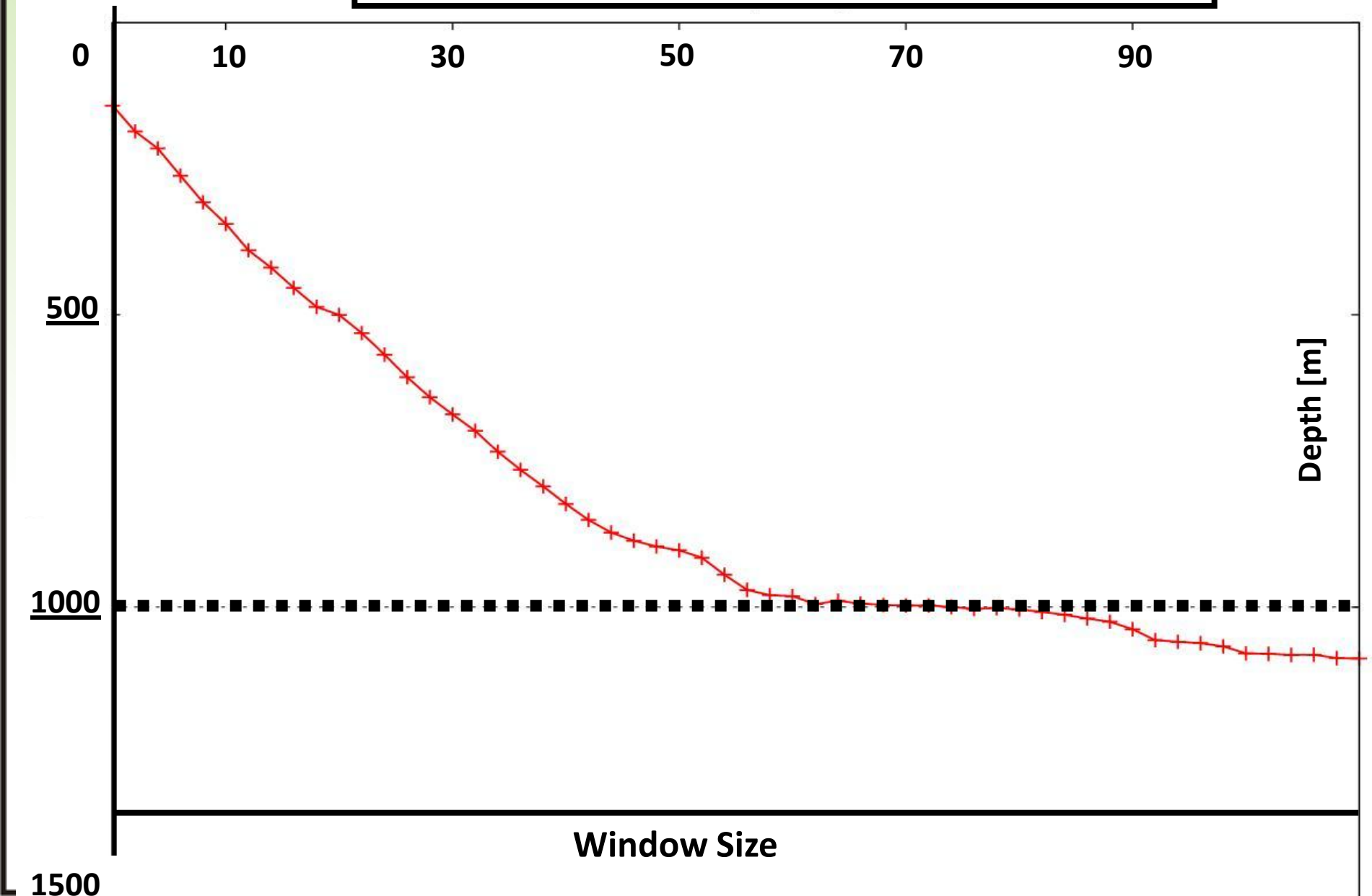
Simple one layer model: Basement at 1km and 5km



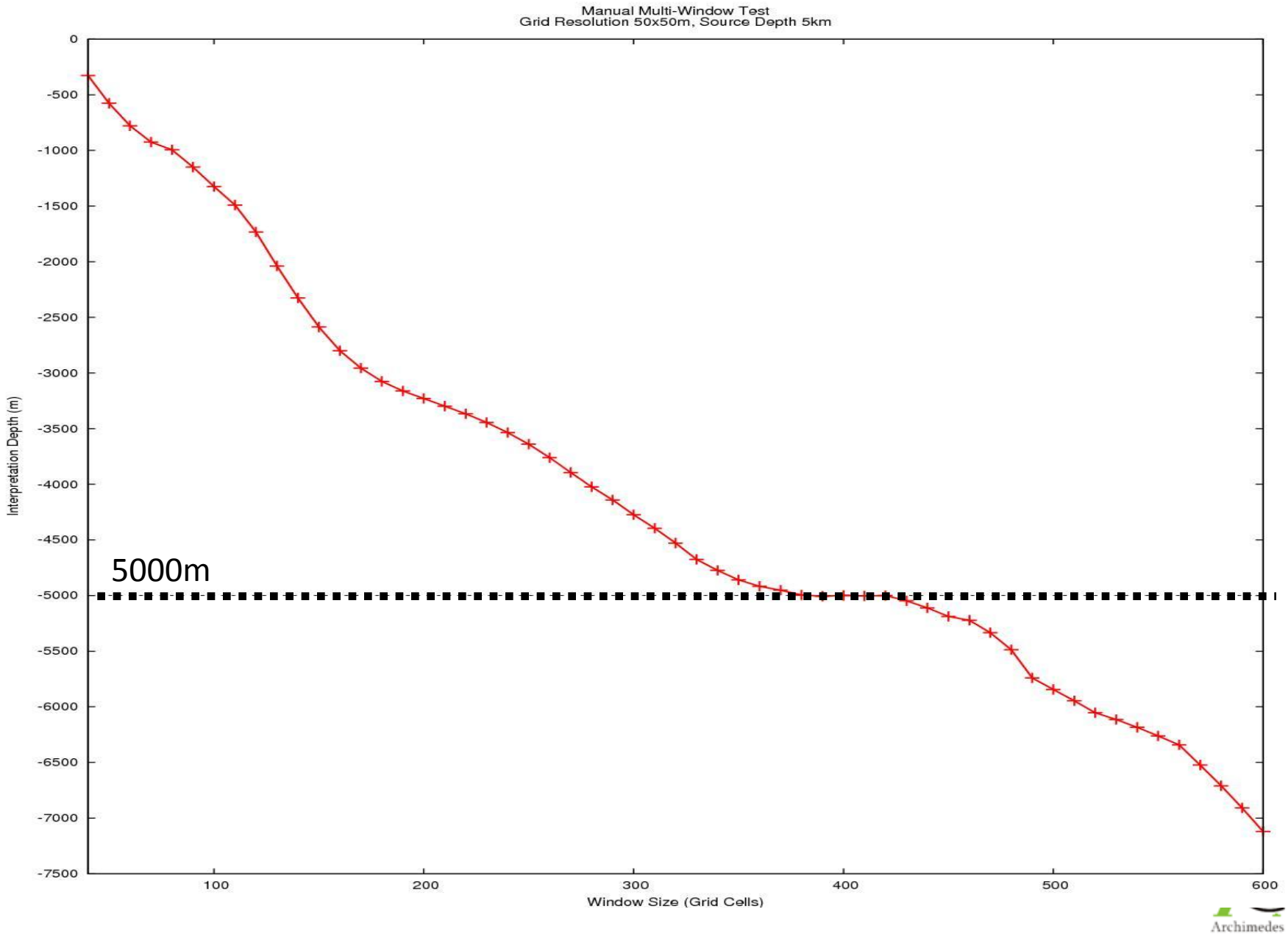


Manual Multi-Window Test

Grid Resolution 50x50m; Source Depth 1km



MWT plot for 50x50m grid, source depth 5km



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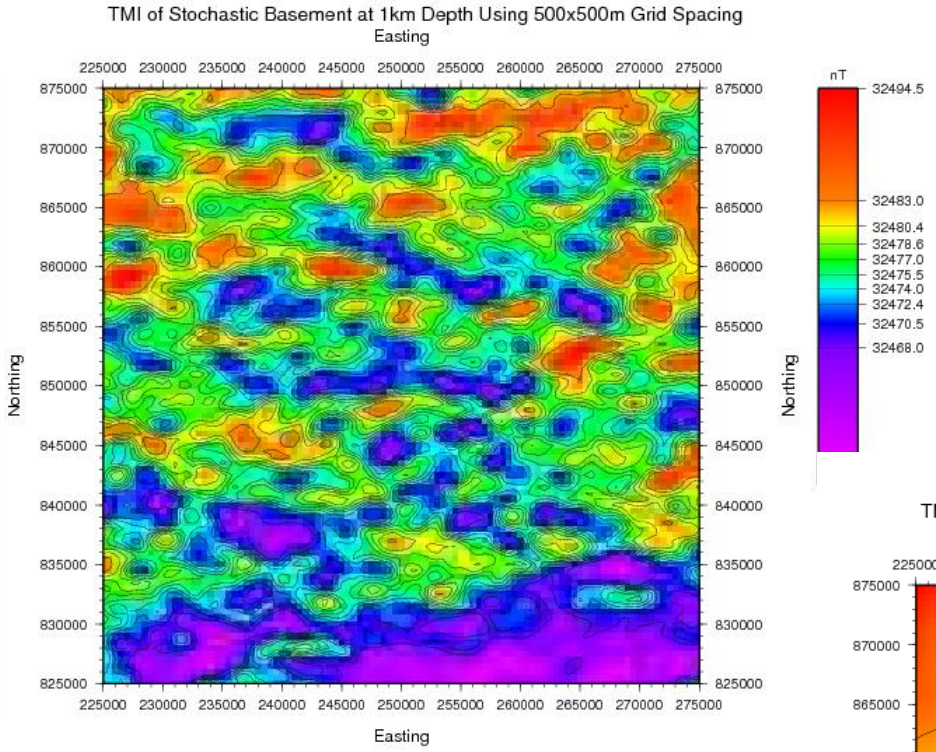
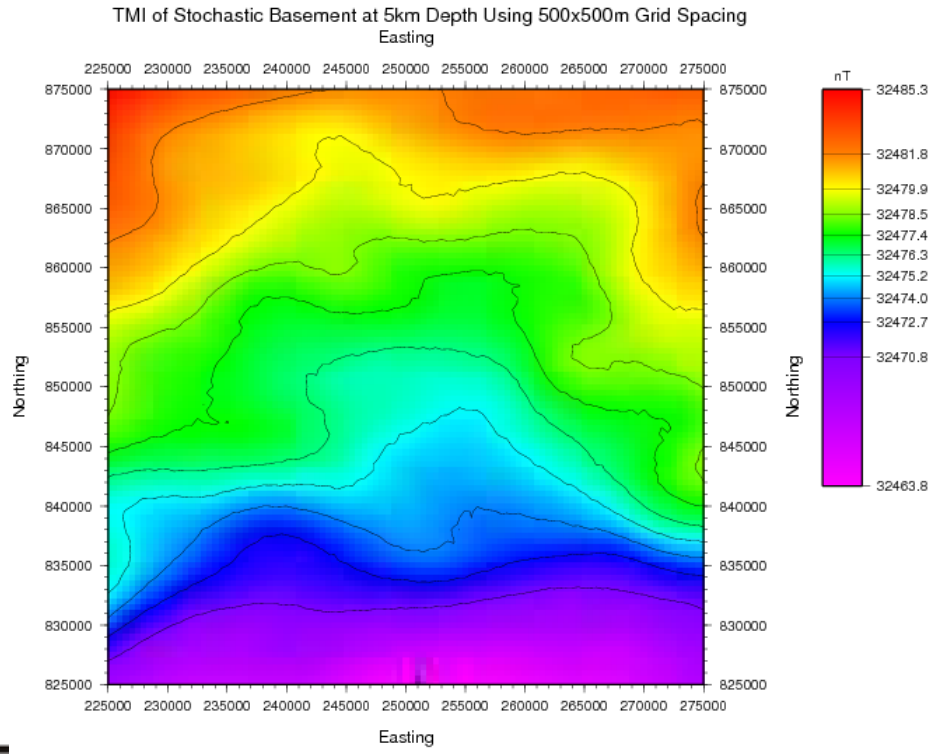
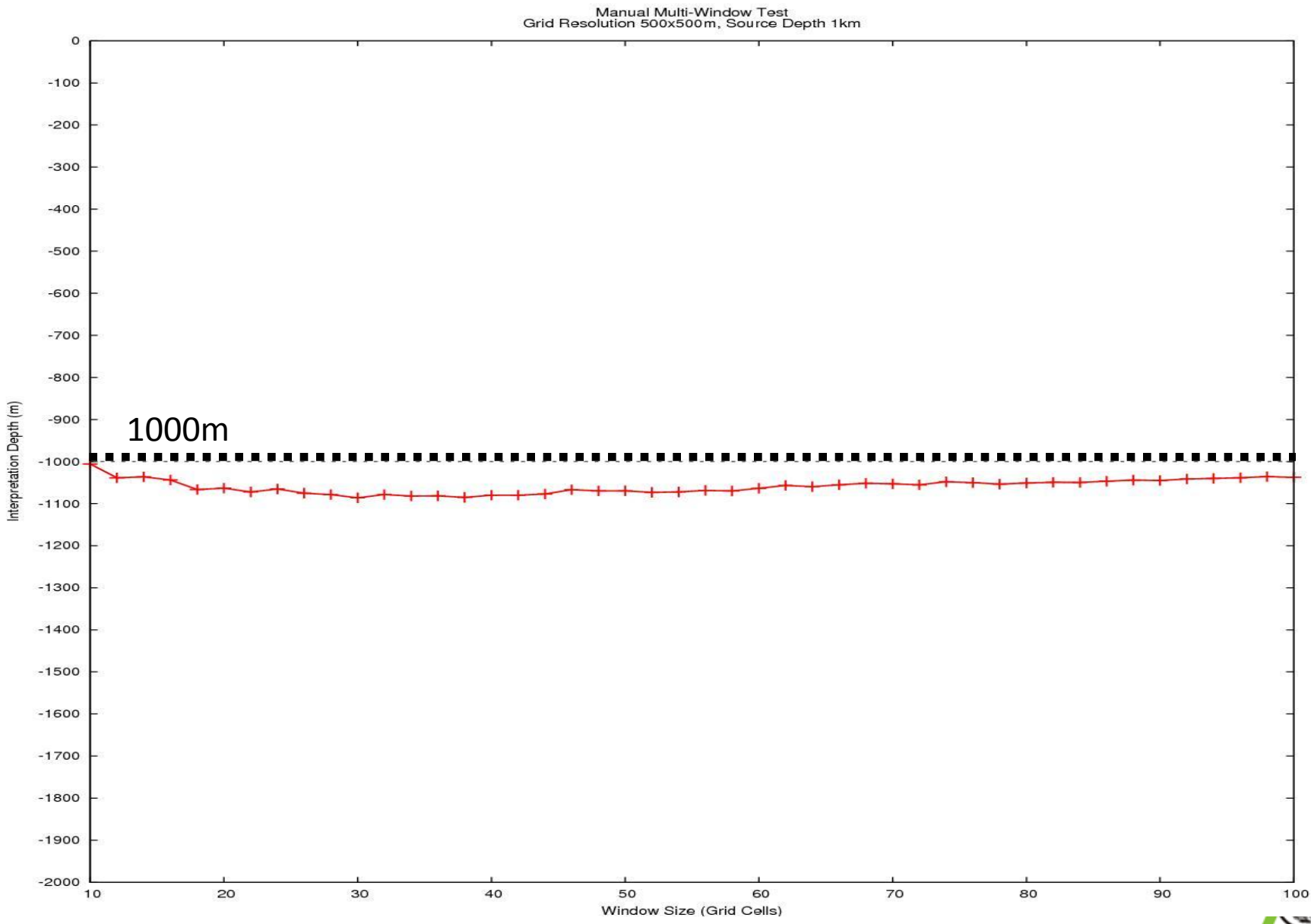
Simple one layer model: Basement at 1km and 5km





MWT plots for 500x500m grid, source depth 1km



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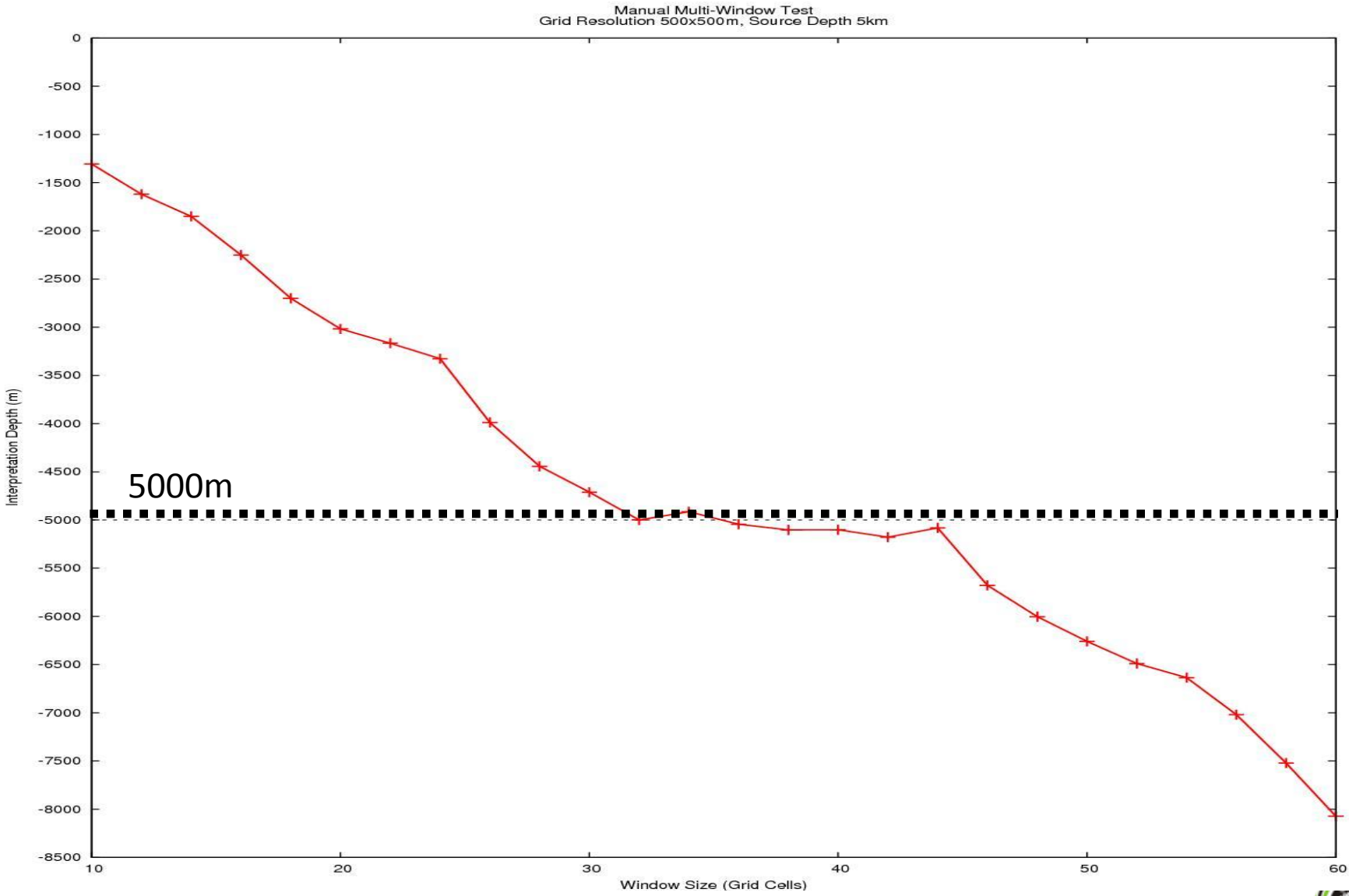
MWT plot for 500x500m grid, source depth 5km



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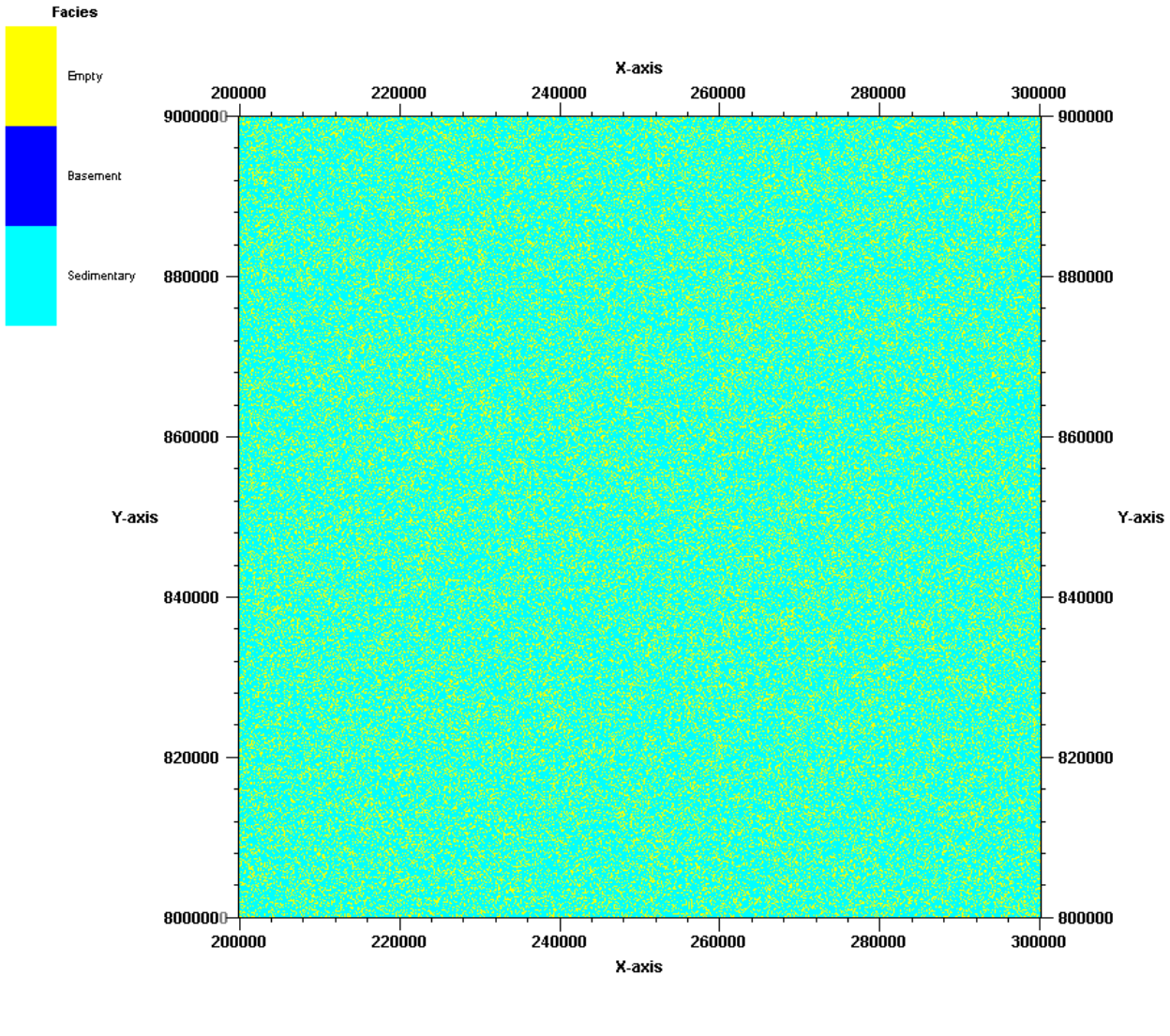
Two layer model: Sedimentary layer



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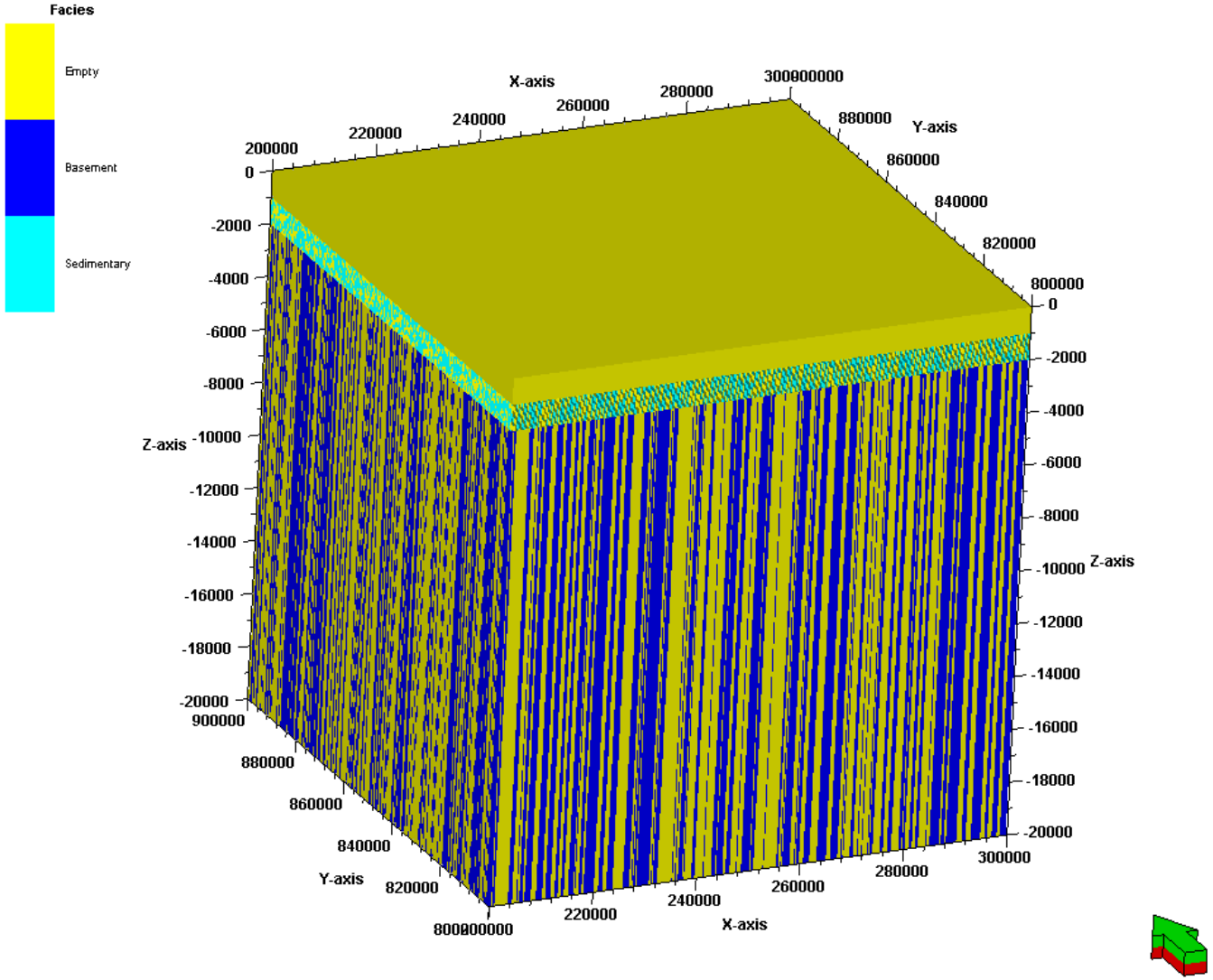
Profile view of 2 layer model



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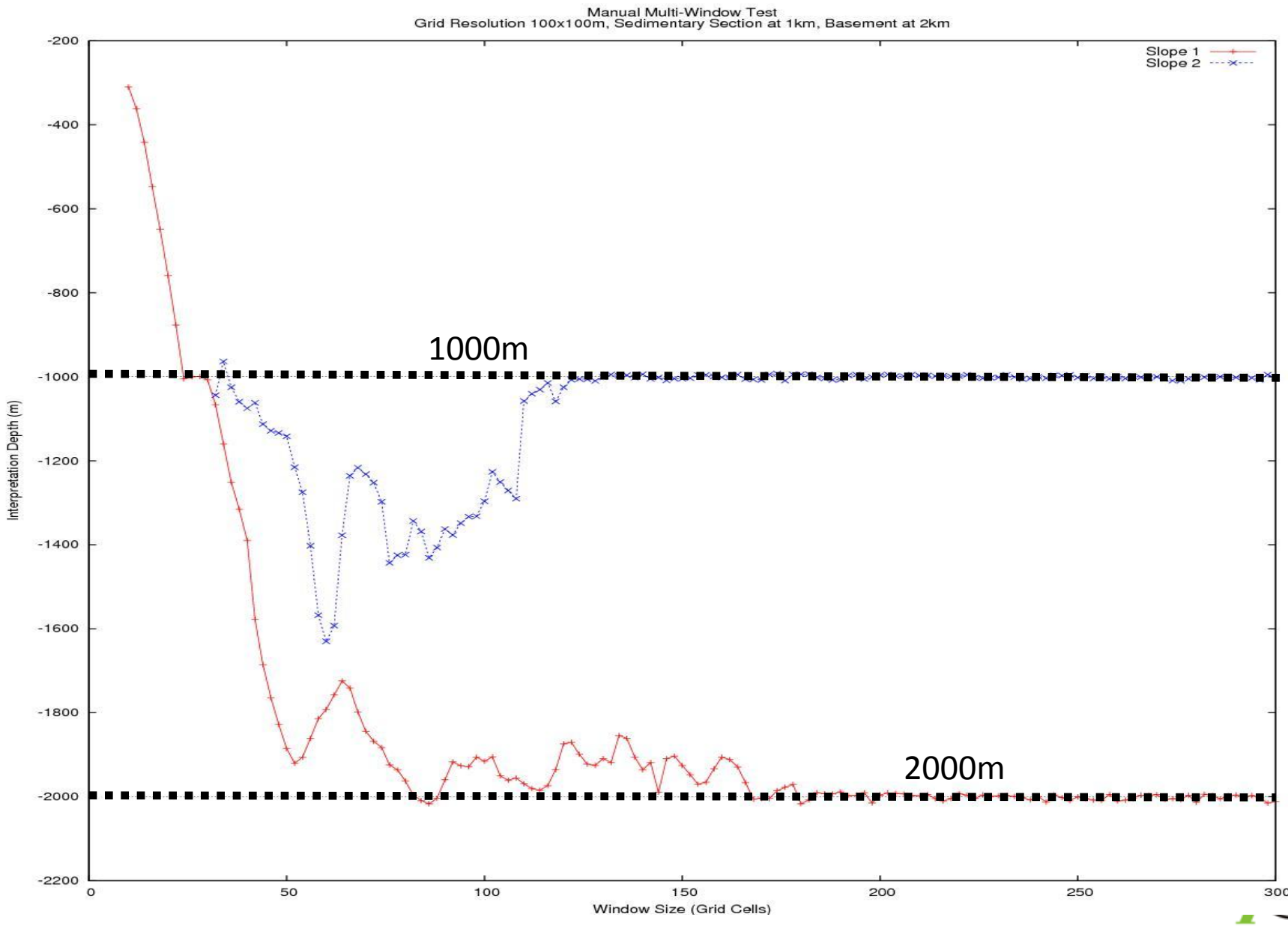
Two layer model: 100x100m grid, source depths 1 & 2km



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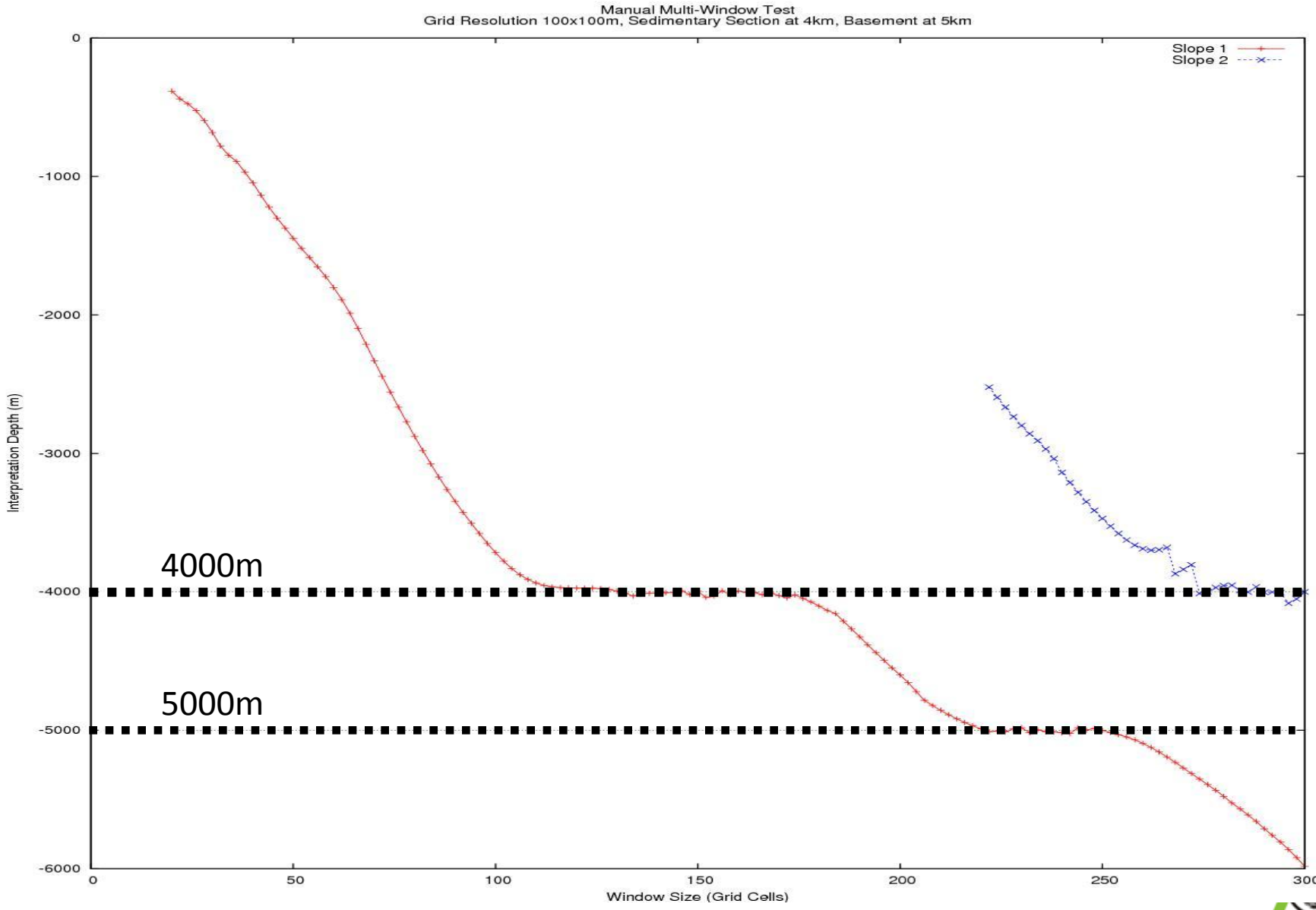
Two layer model: 100x100m grid, source depths 4 & 5km



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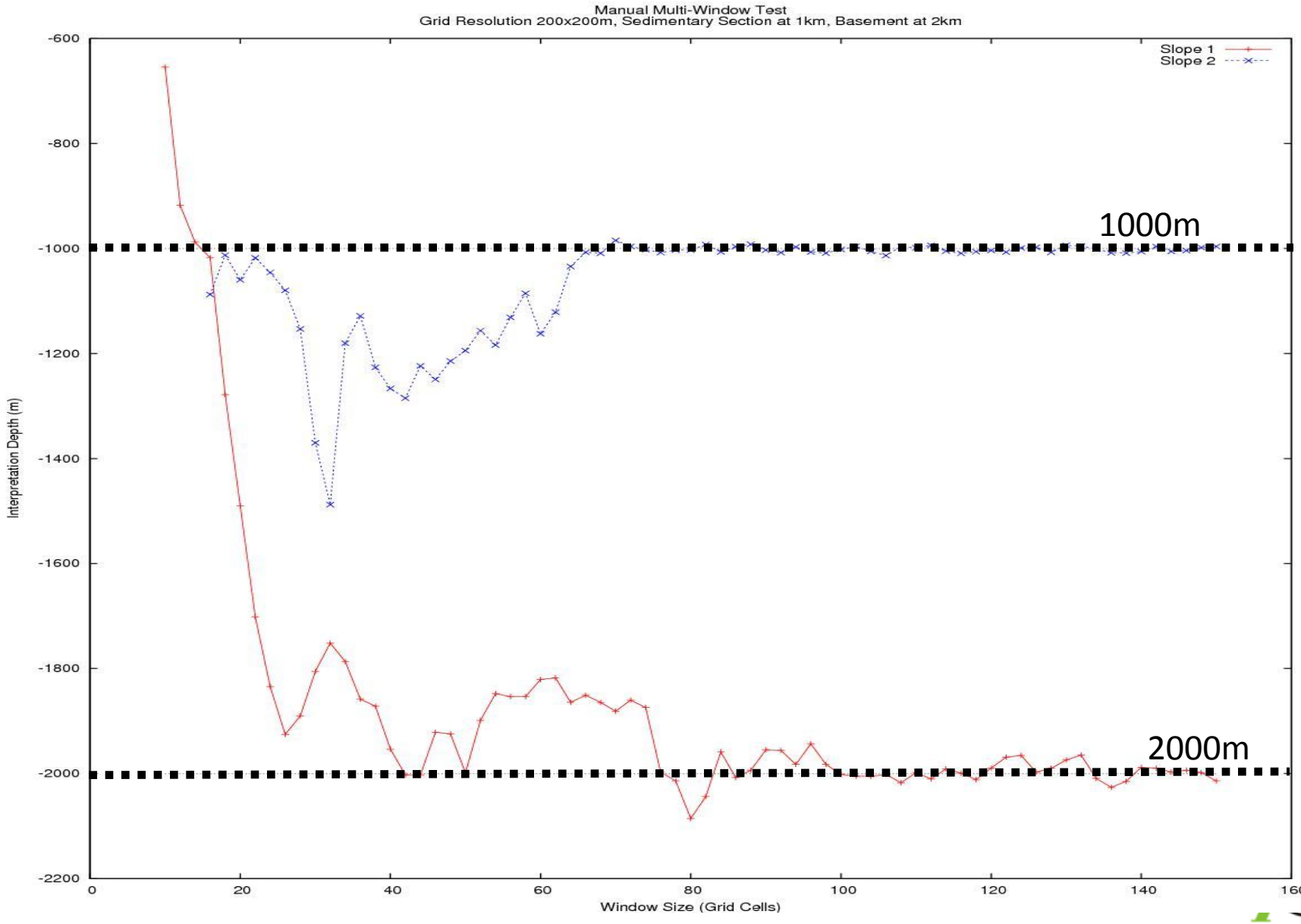
Two layer model: 200x200m grid, source depths 1 & 2km



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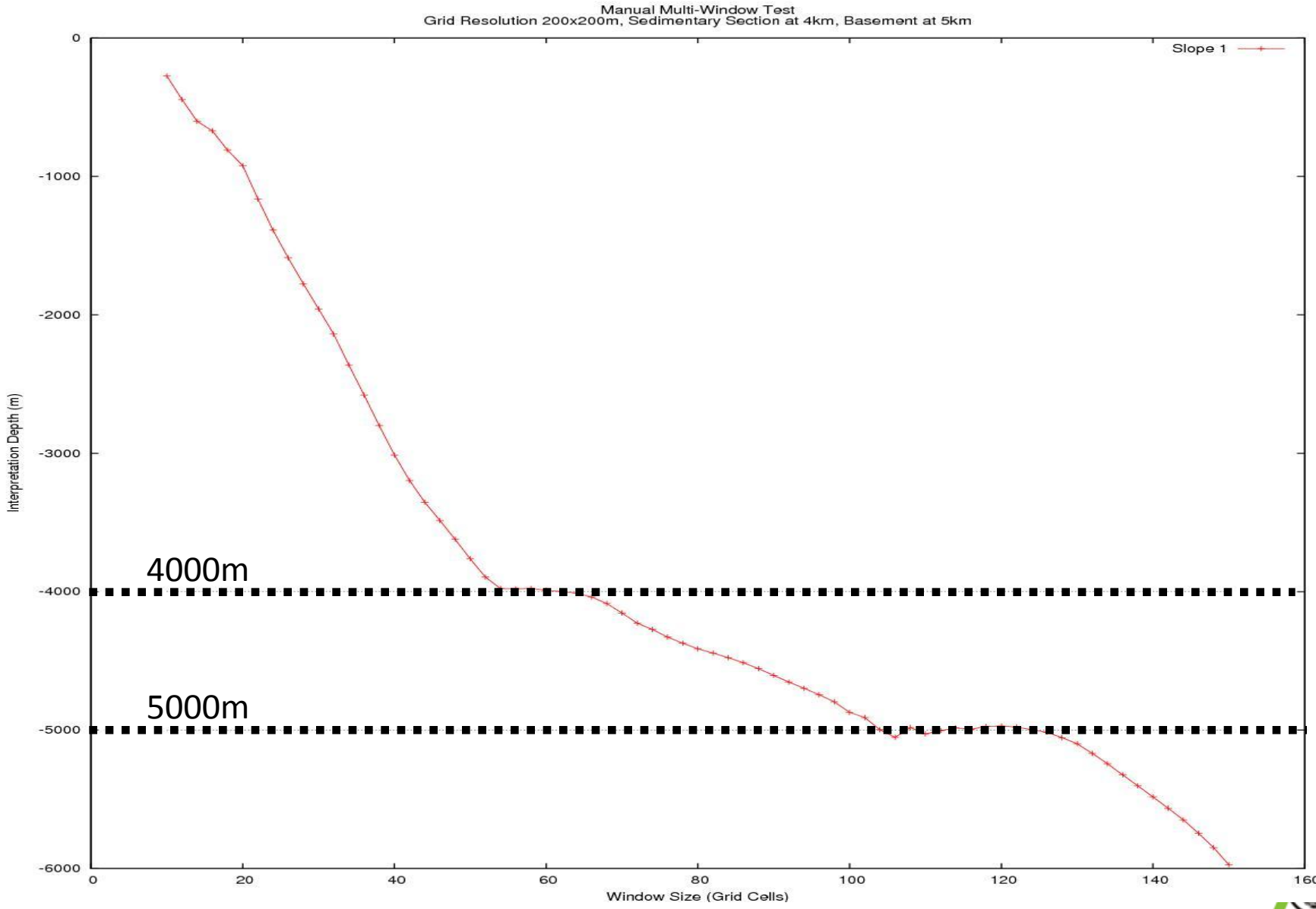
Two layer model: 200x200m grid, source depths 4 & 5km



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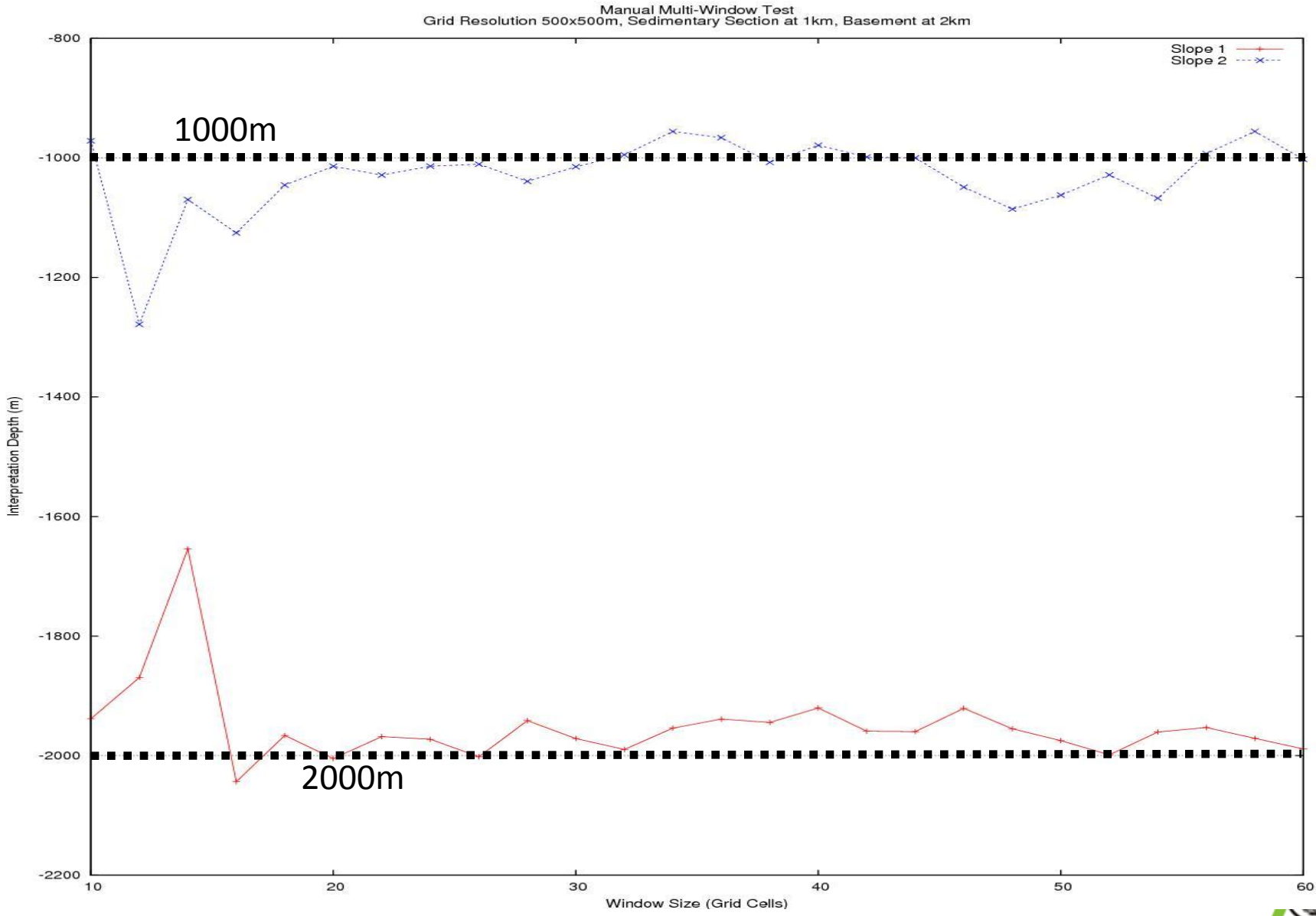
Two layer model: 500x500m grid, source depths 1 & 2km



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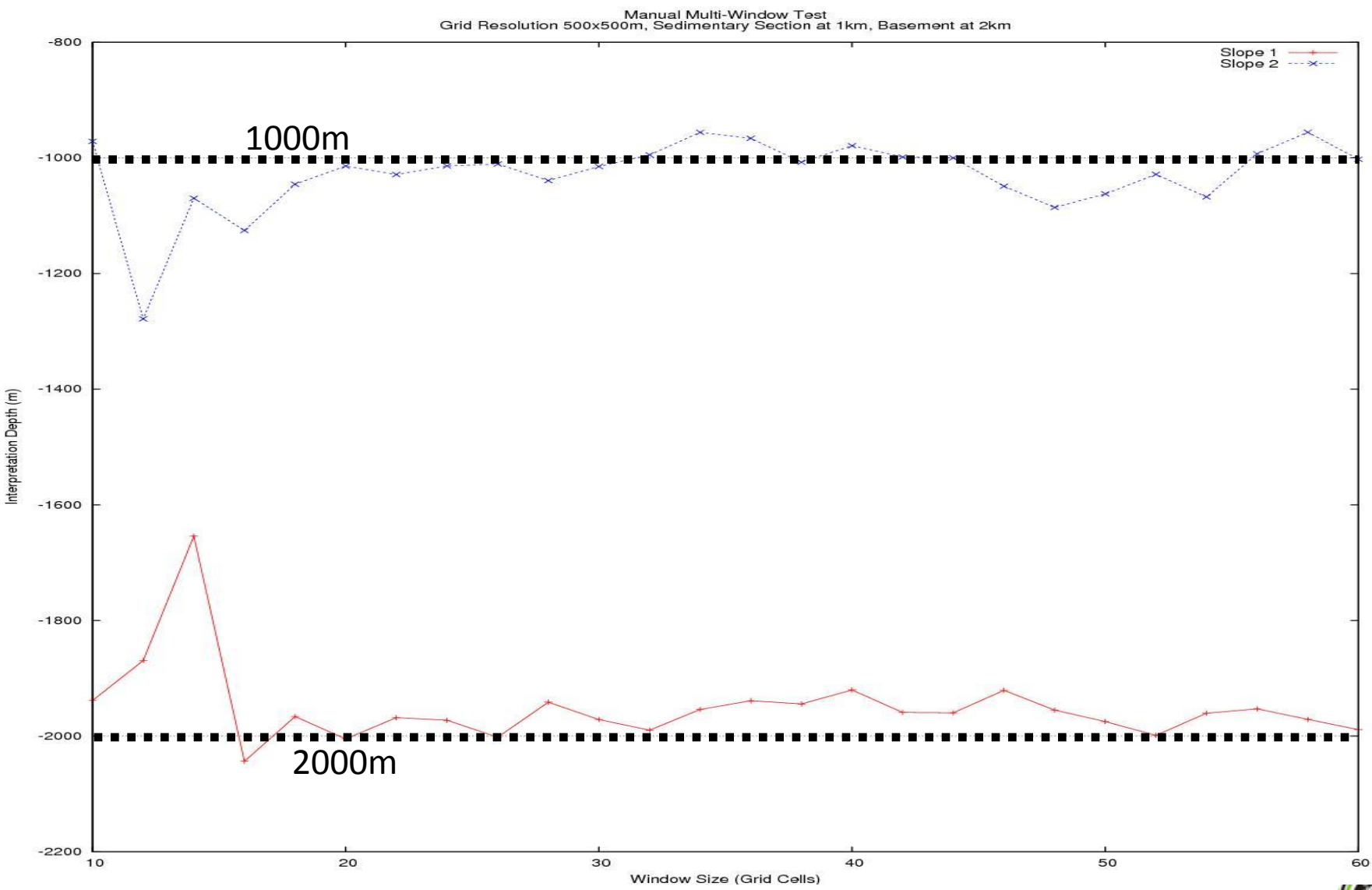
Two layer model: 500x500m grid, source depths 1 & 2km



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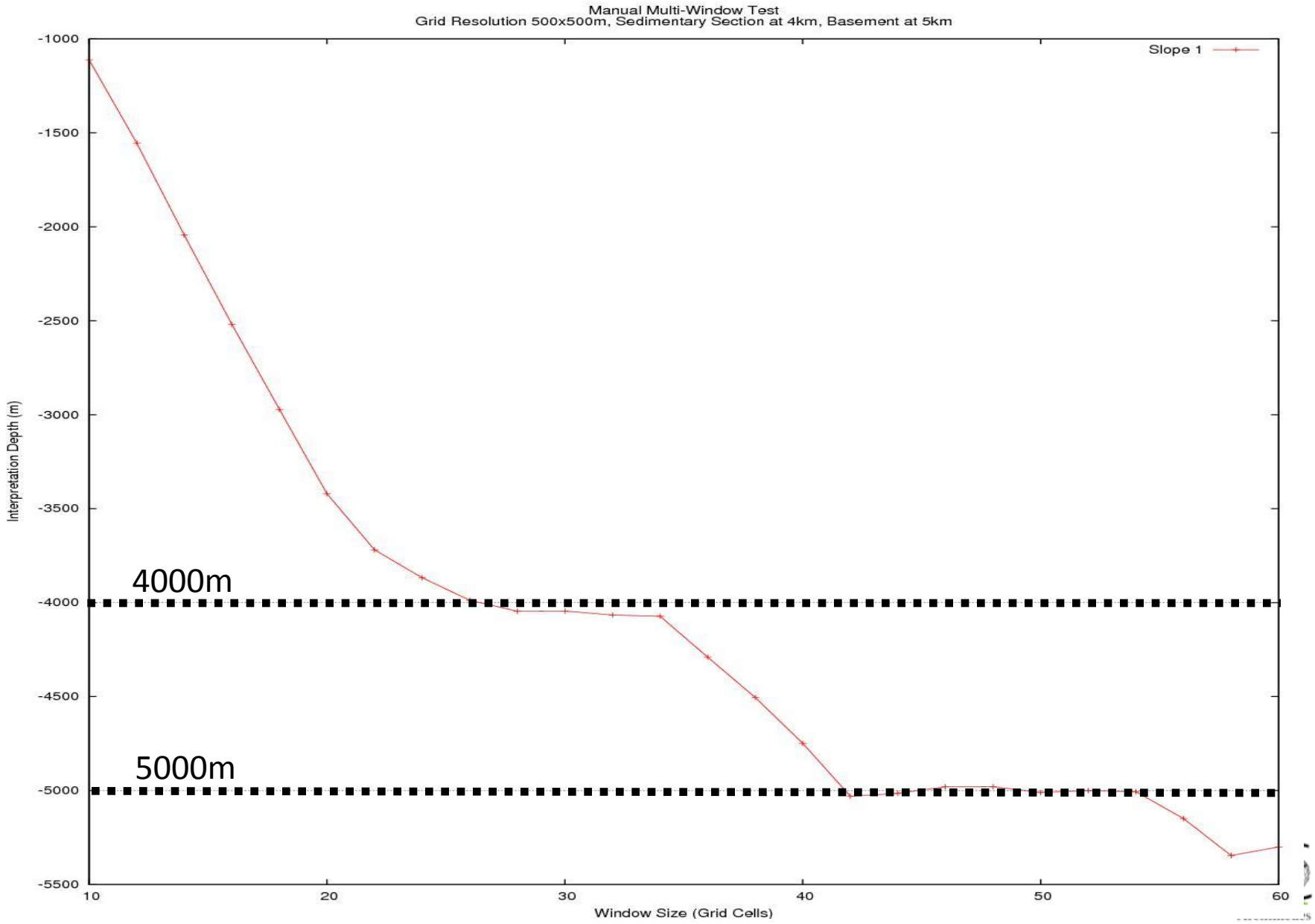
Two layer model: 500x500m grid, source depths 4 & 5km



Case study using survey acquired on behalf of USGS in Central San Luis Basin, Colorado, U.S.A.

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Central San Luis Basin survey (USGS)

Examples using the 200m line spacing dataset (40x40m grid)

Traverse lines removed to simulate;
400m line spacing (80x80m grid)
800m line spacing (160x160m grid)
2000m line spacing (400x400m grid)

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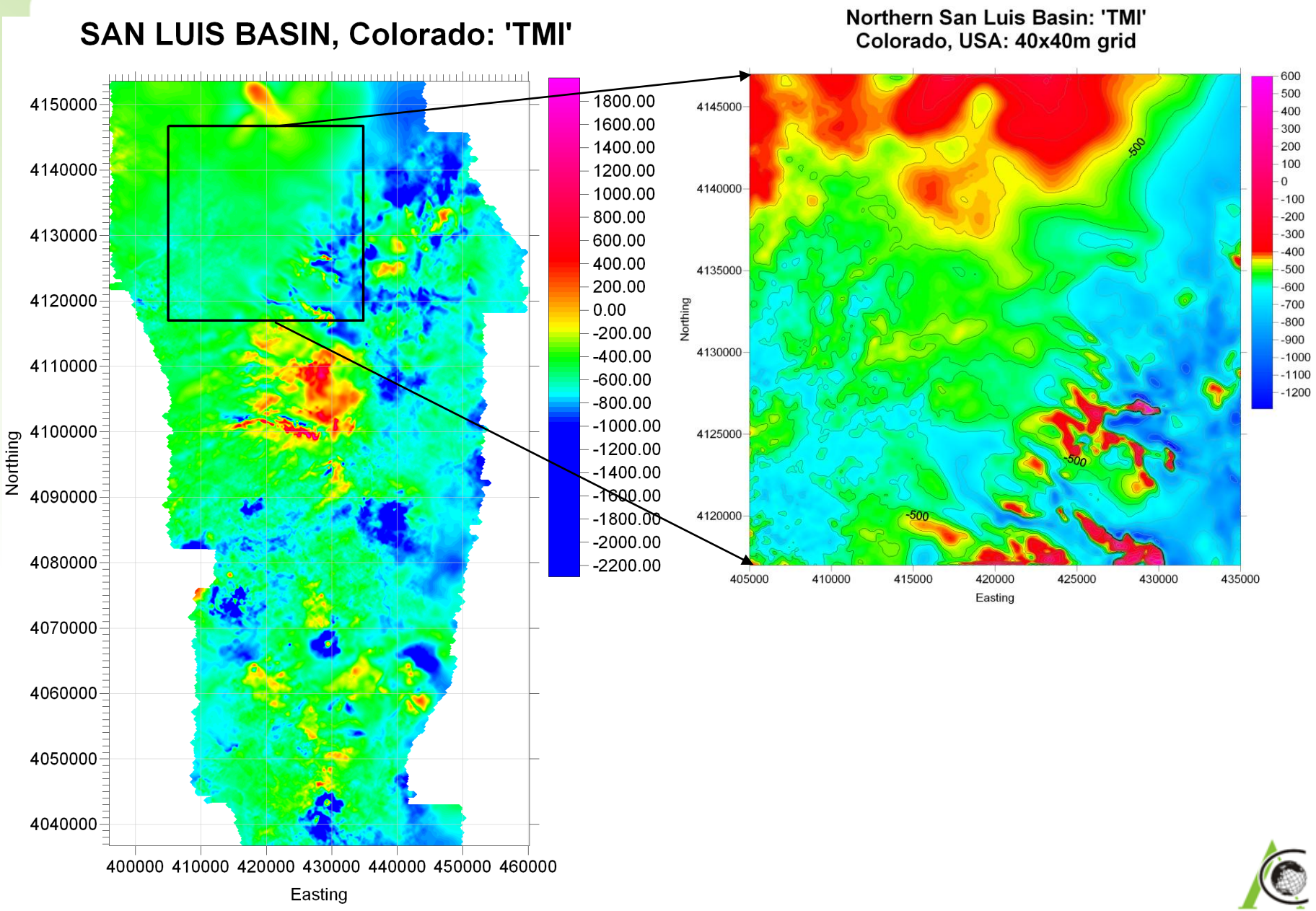
Location of test area



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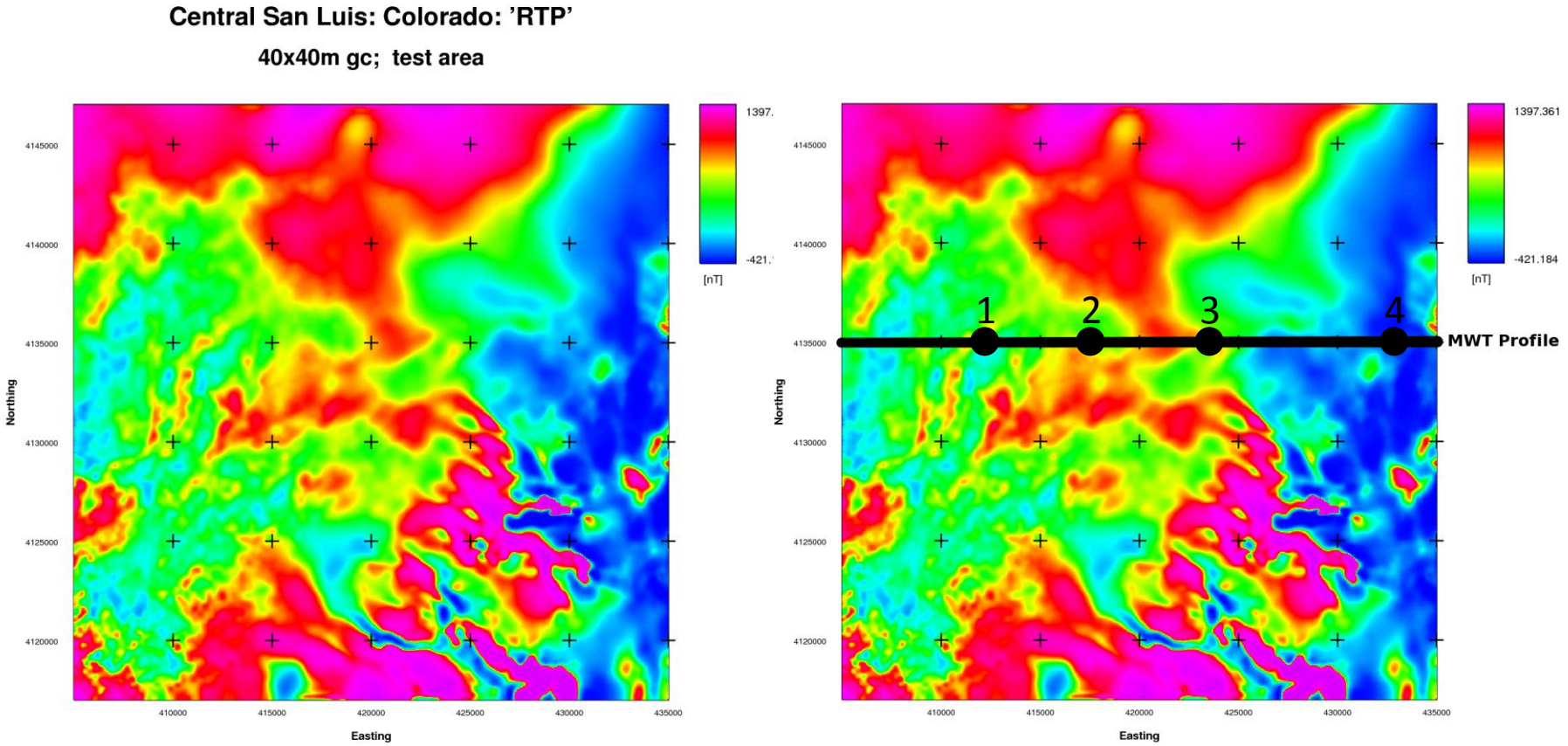
Location of MWT profile and manual stations



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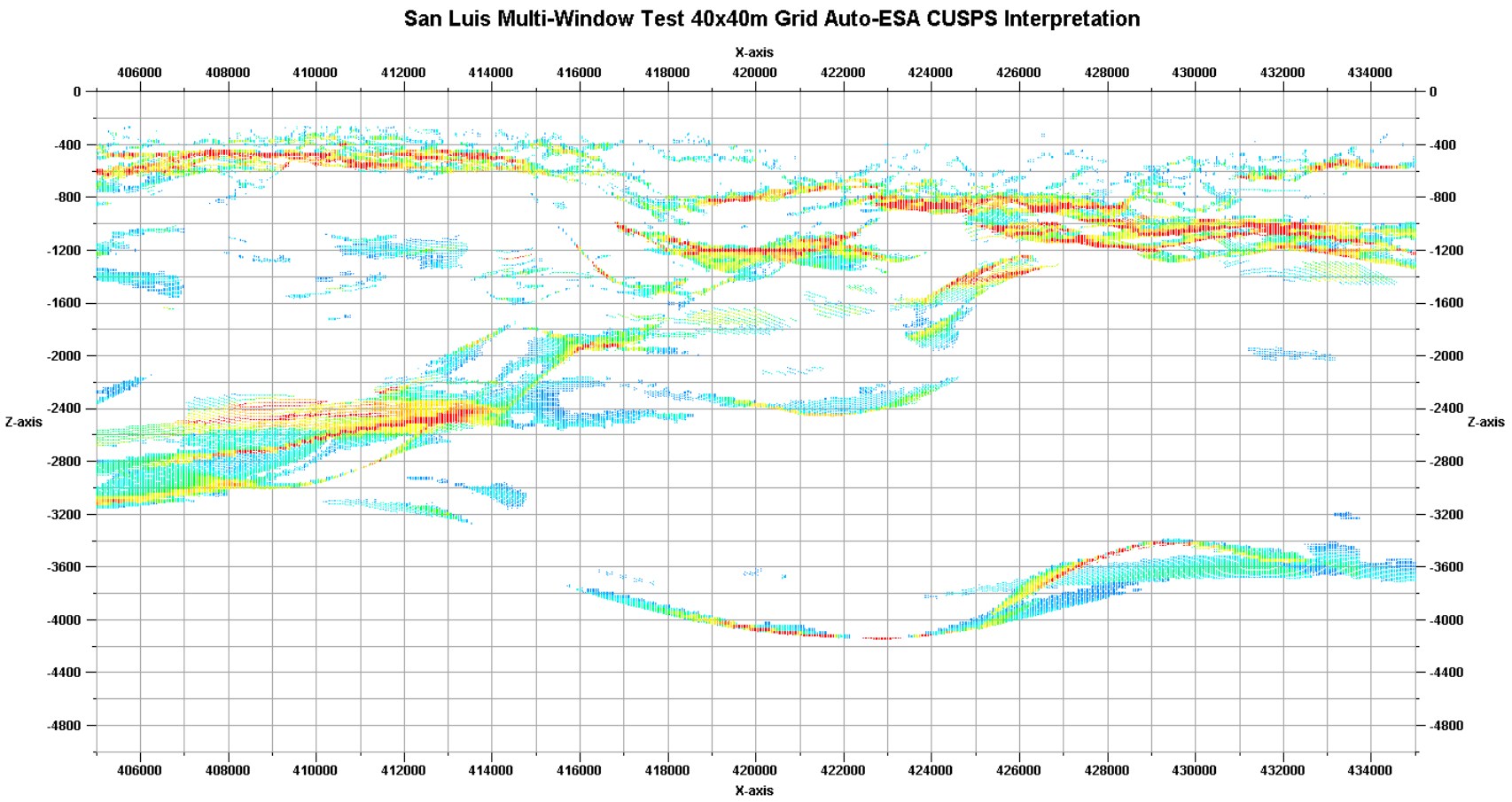
MWT: Auto-ESA (40x40m)



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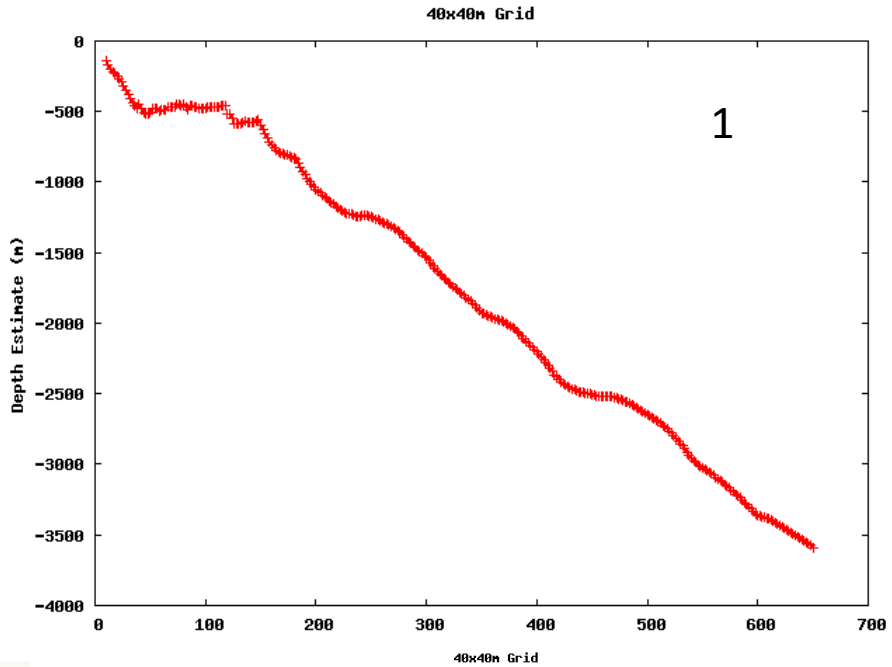
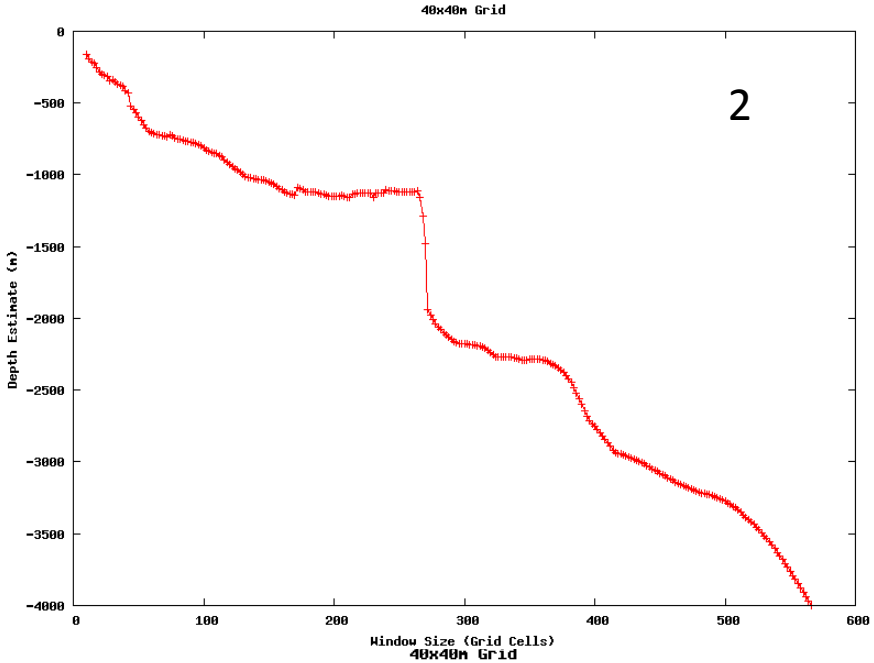
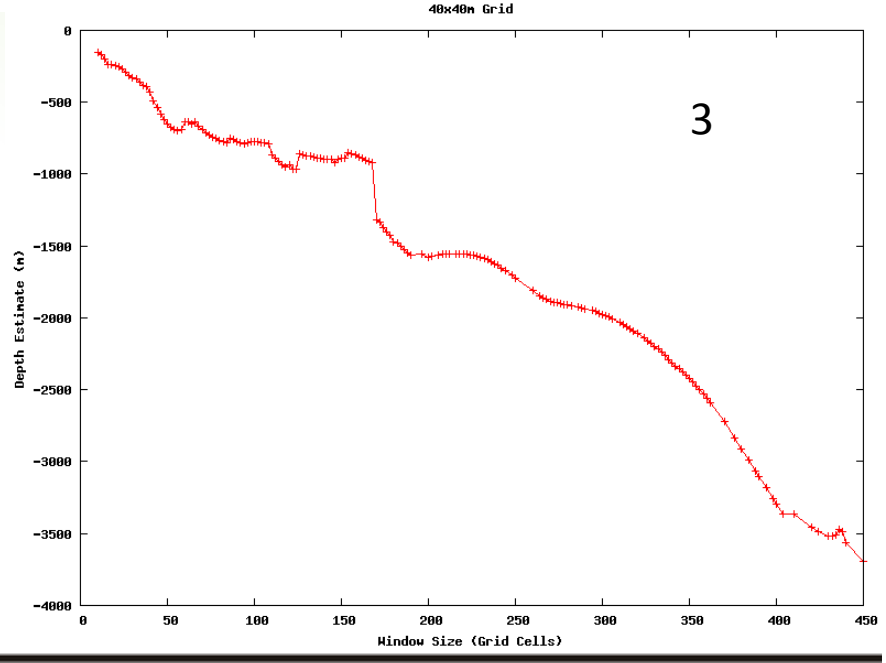
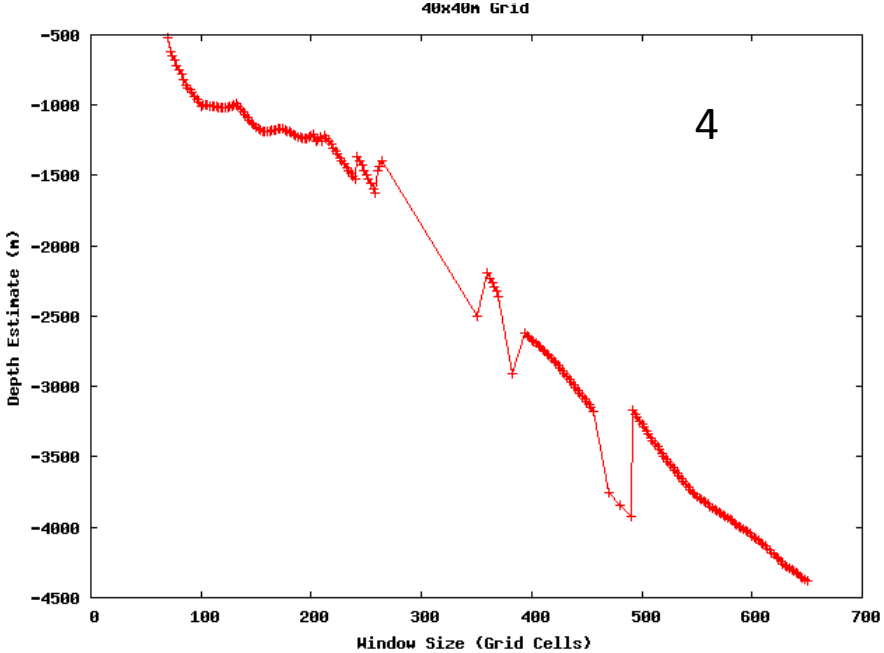
MWT: Depth vs. Window Size at 4 points along profile (40x40m)

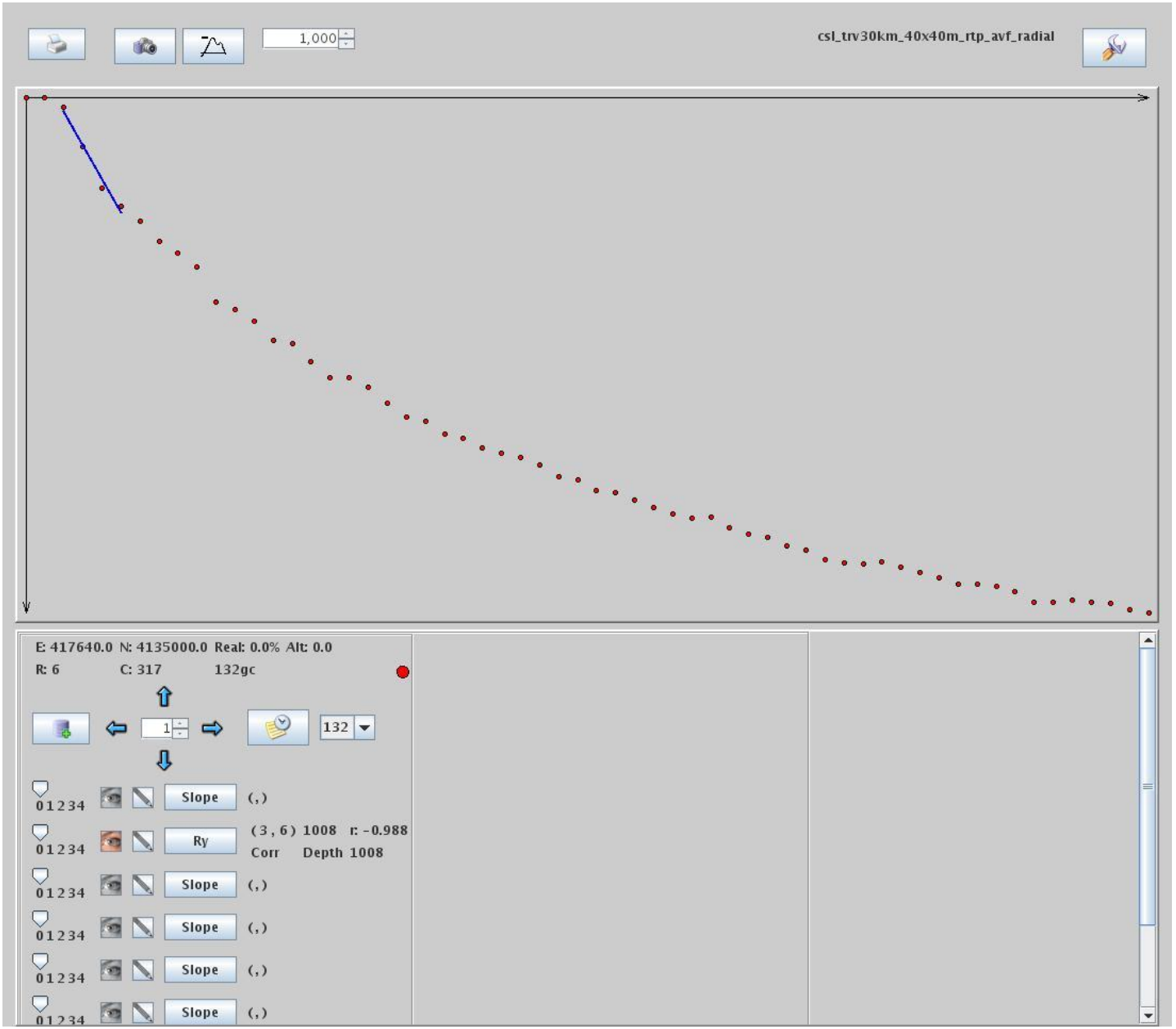








MWT: Example of spectrum at 417000mE (2)



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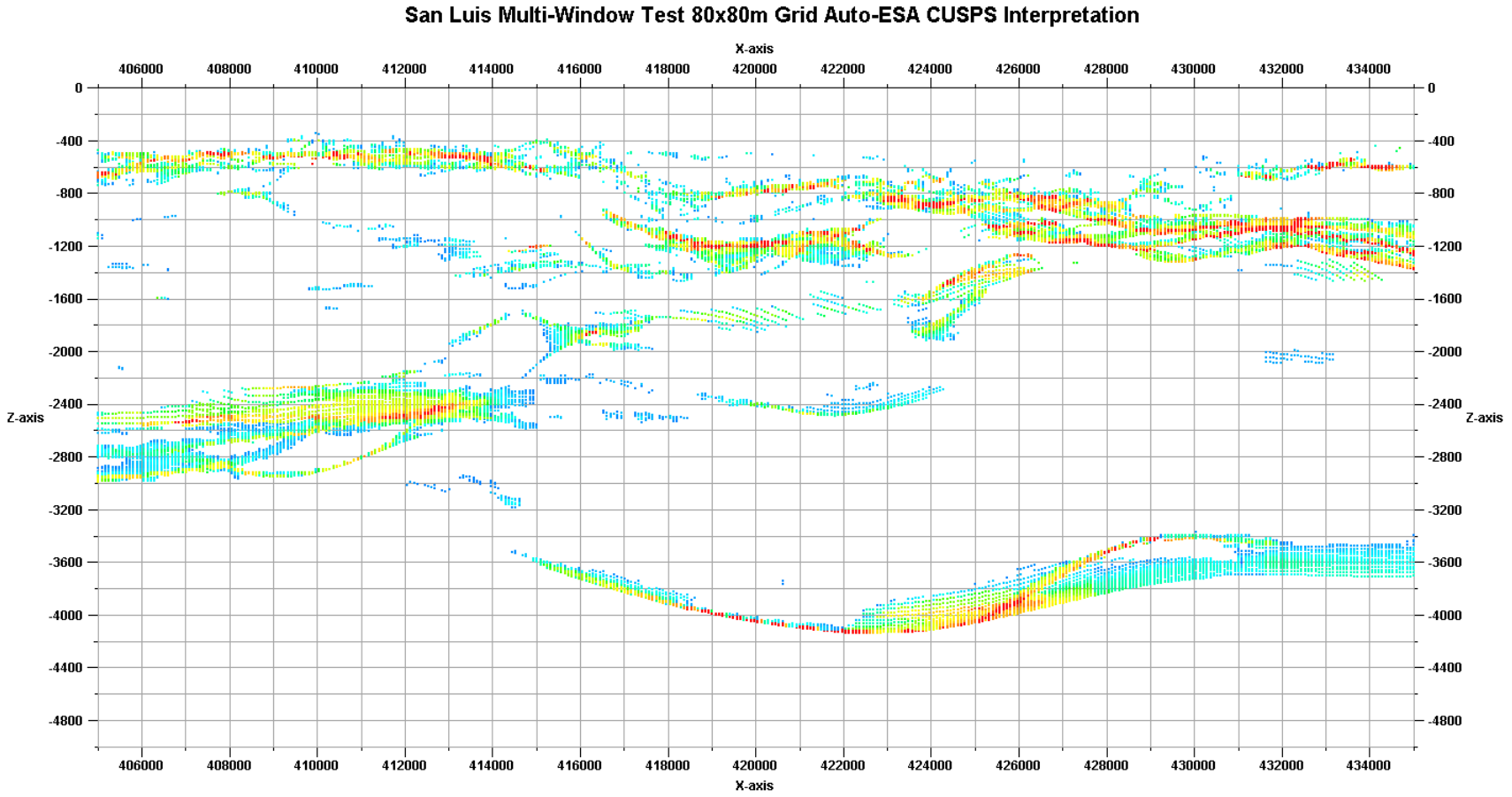
MWT: Auto-ESA (80x80m)



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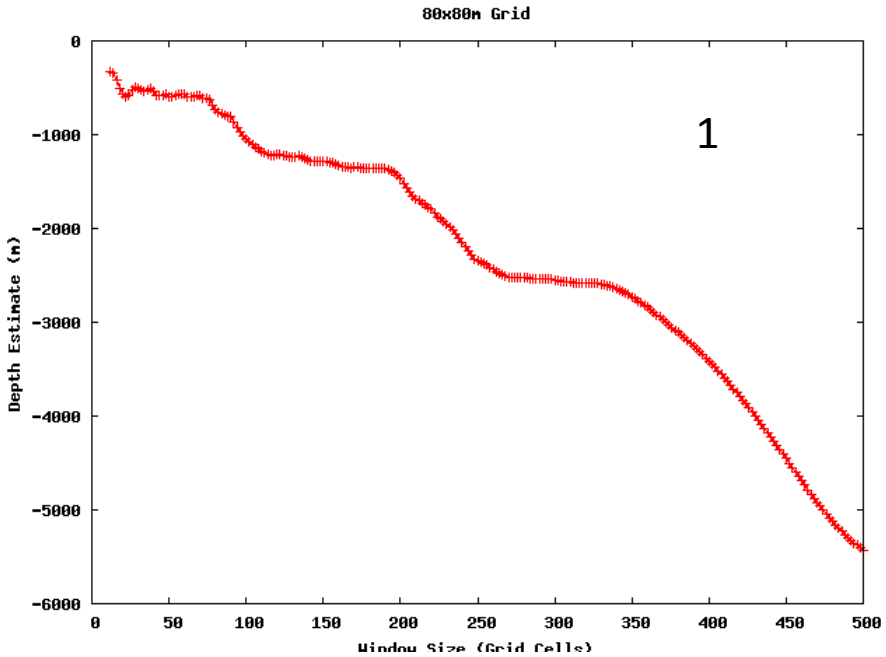
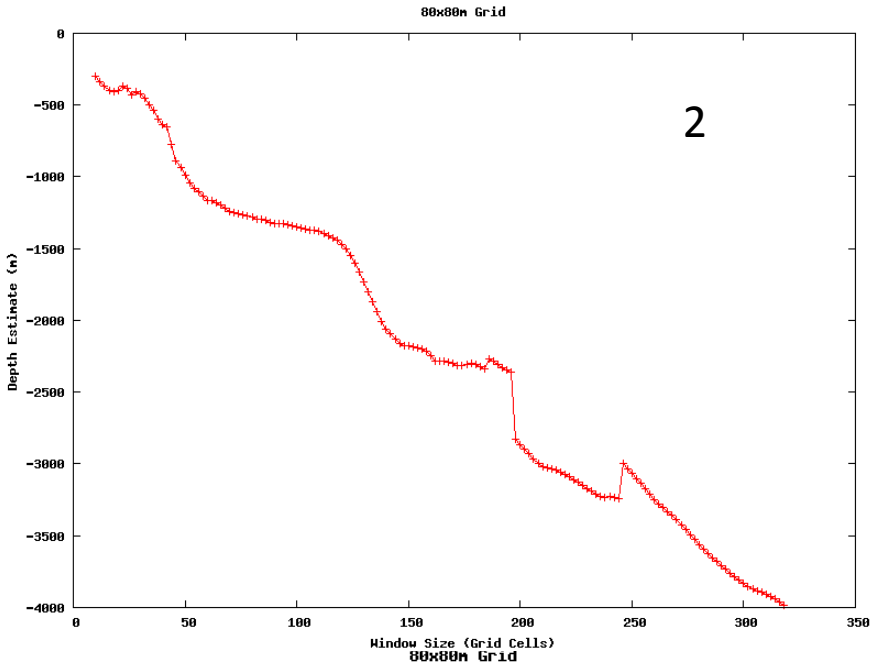
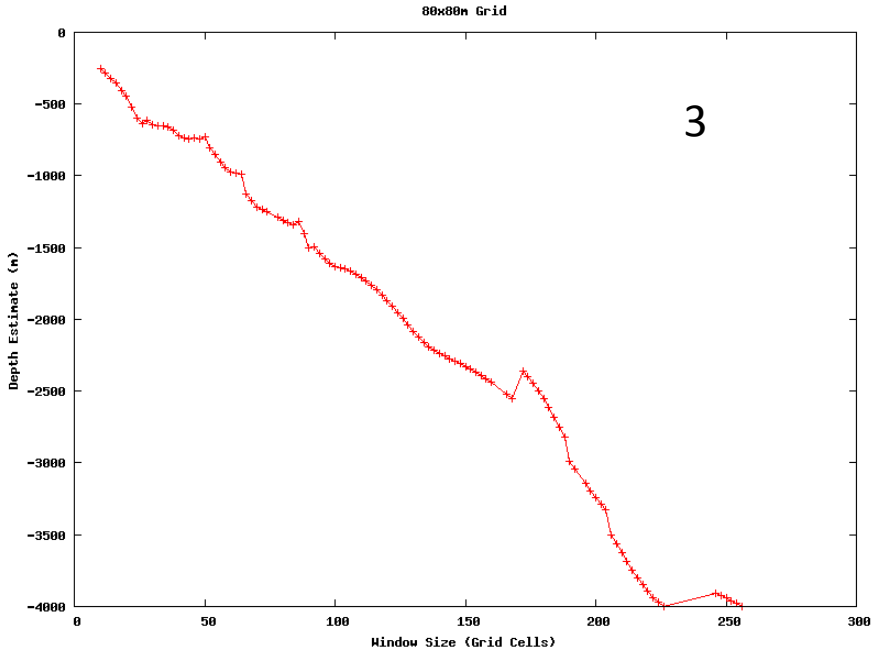
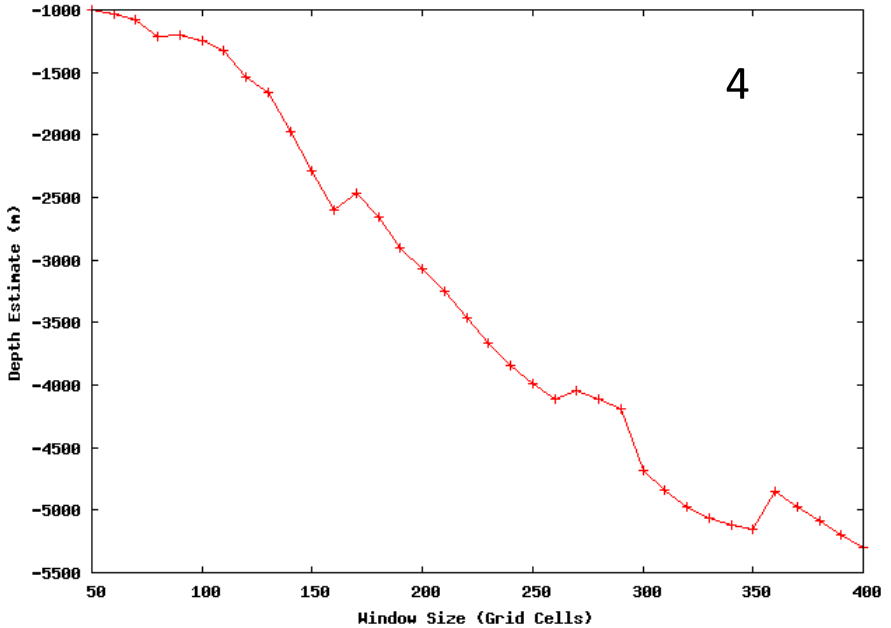
MWT: Depth vs. Window Size at 4 points along profile (80x80m)

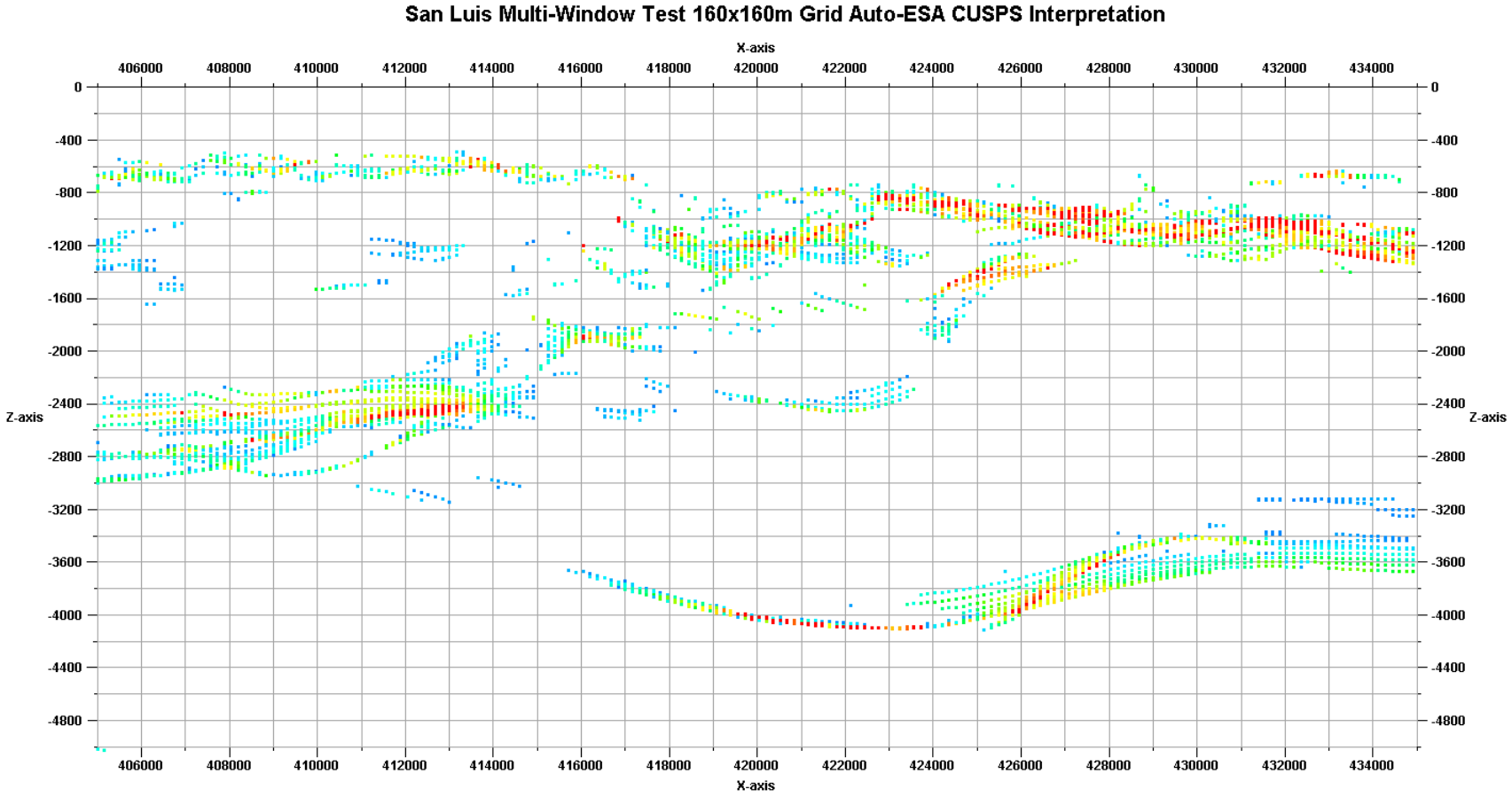








MWT: Auto-ESA (160x160m)



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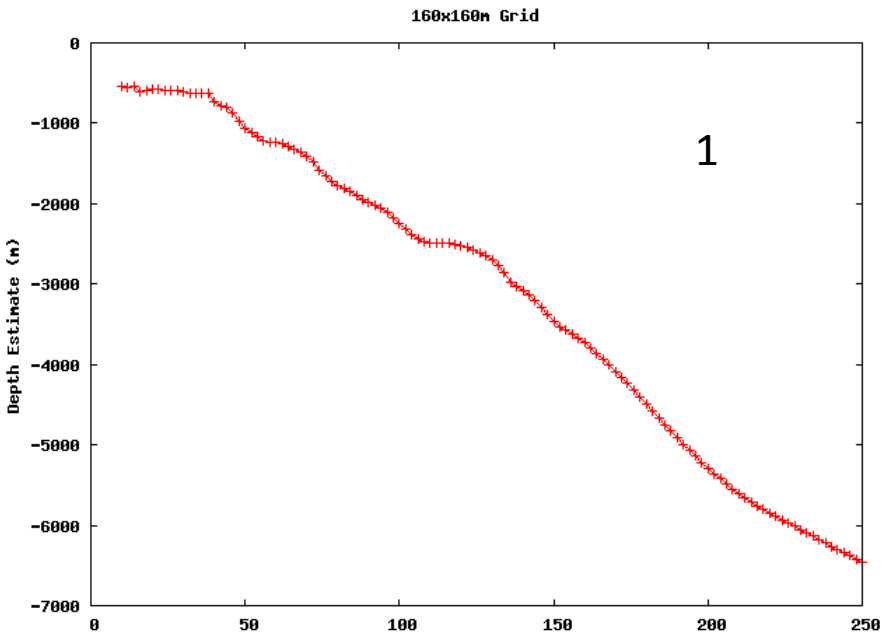
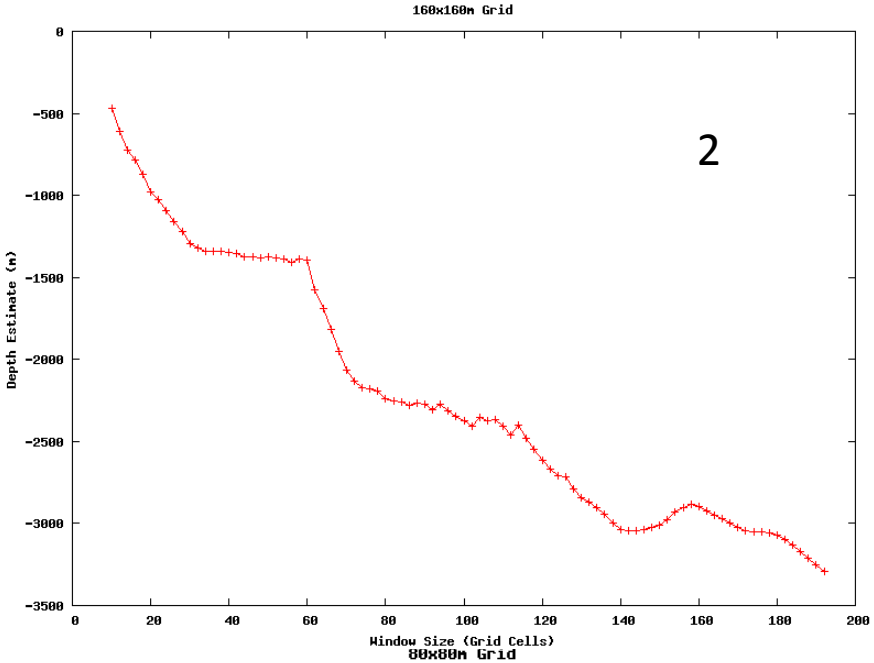
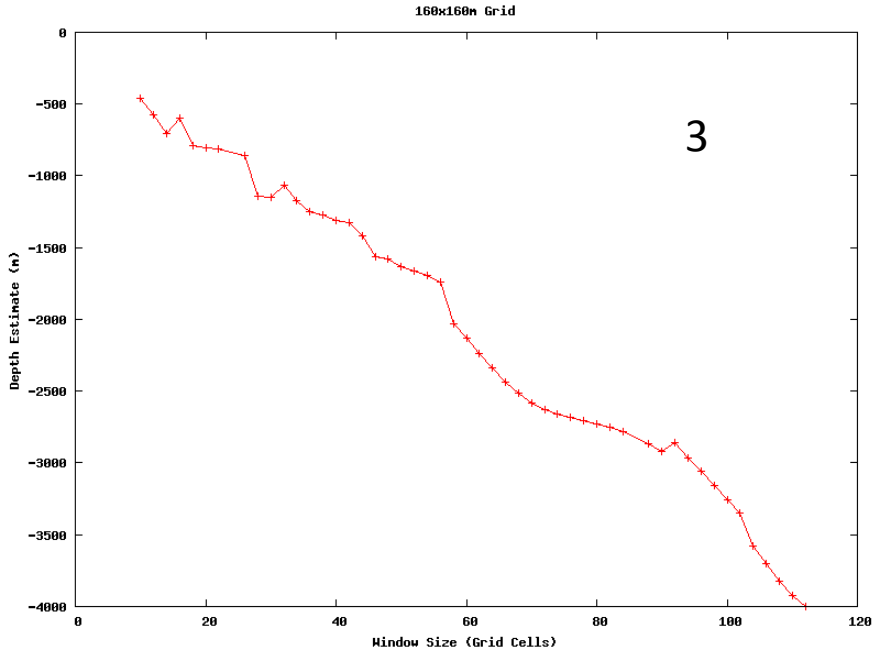
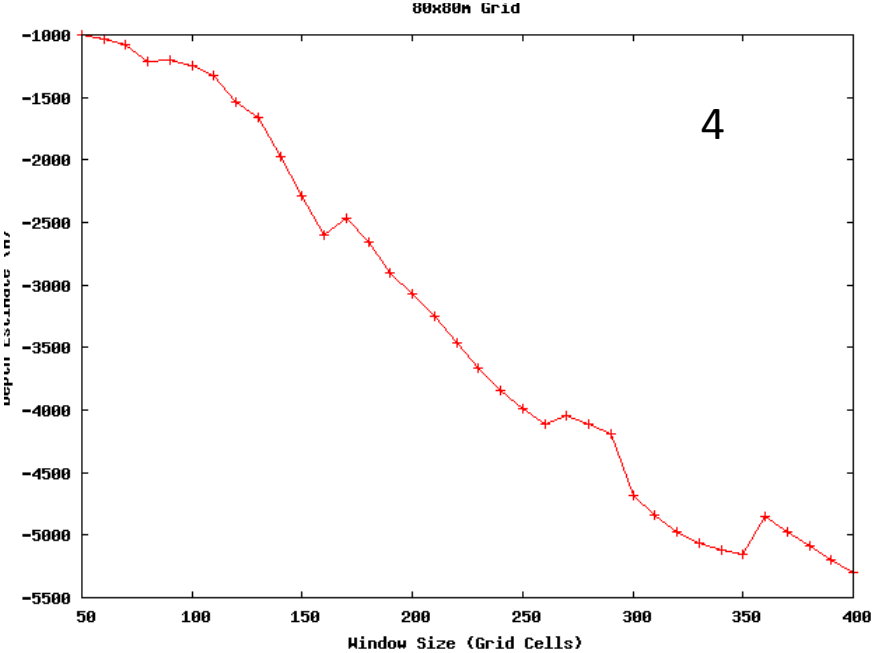
MWT: Depth vs. Window Size at 4 points along profile (160x160m)

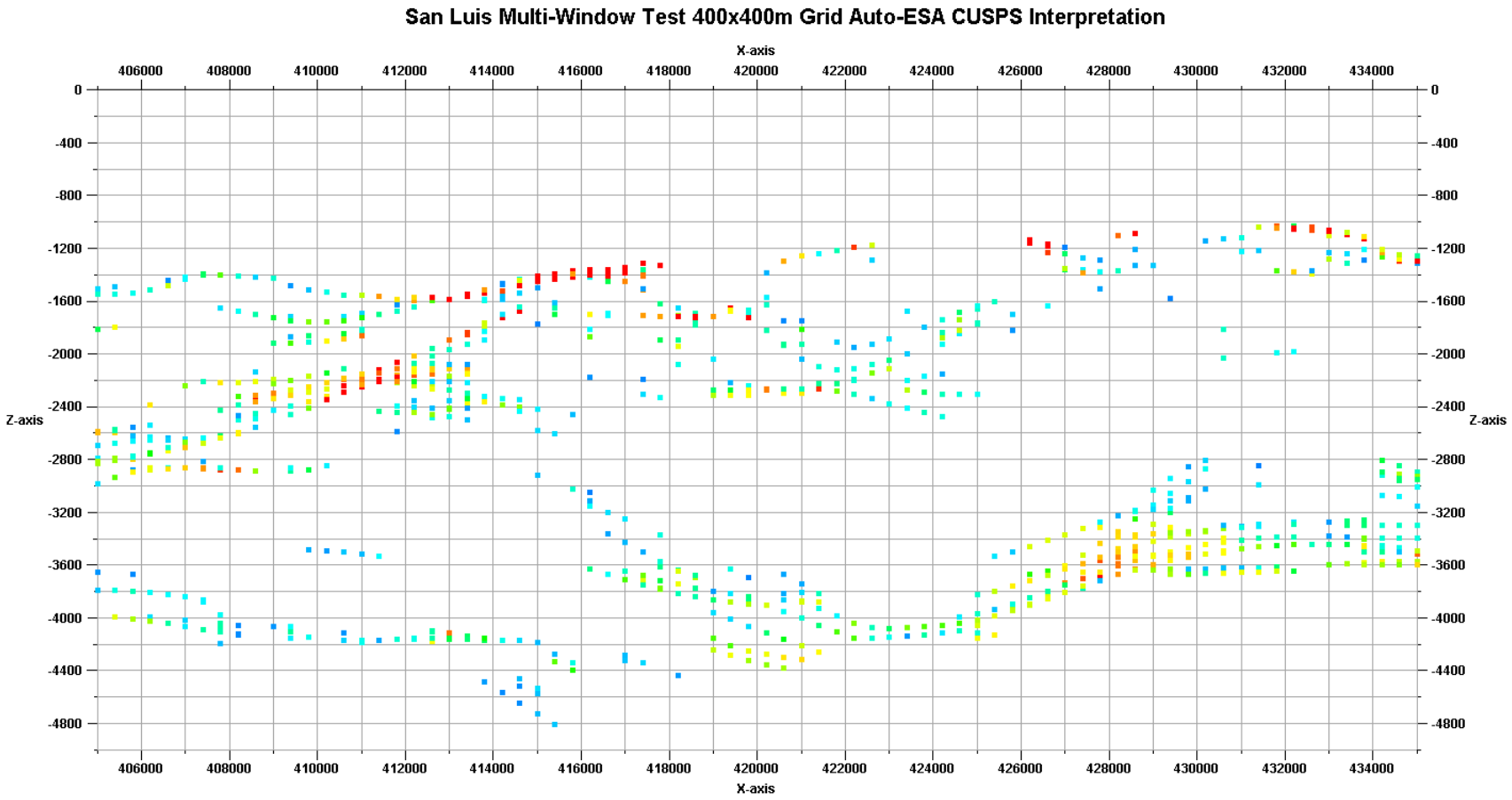








MWT: Auto-ESA (400x400m)



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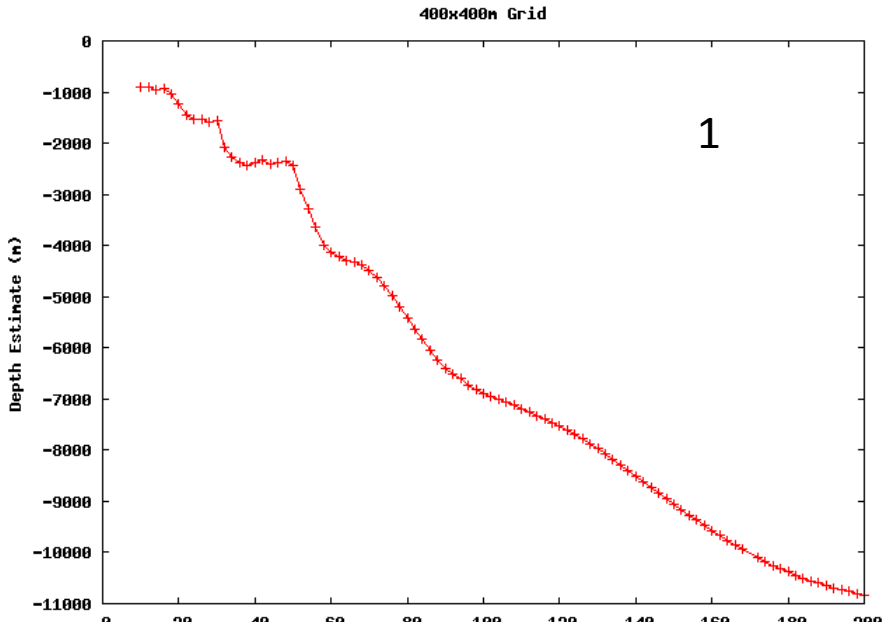
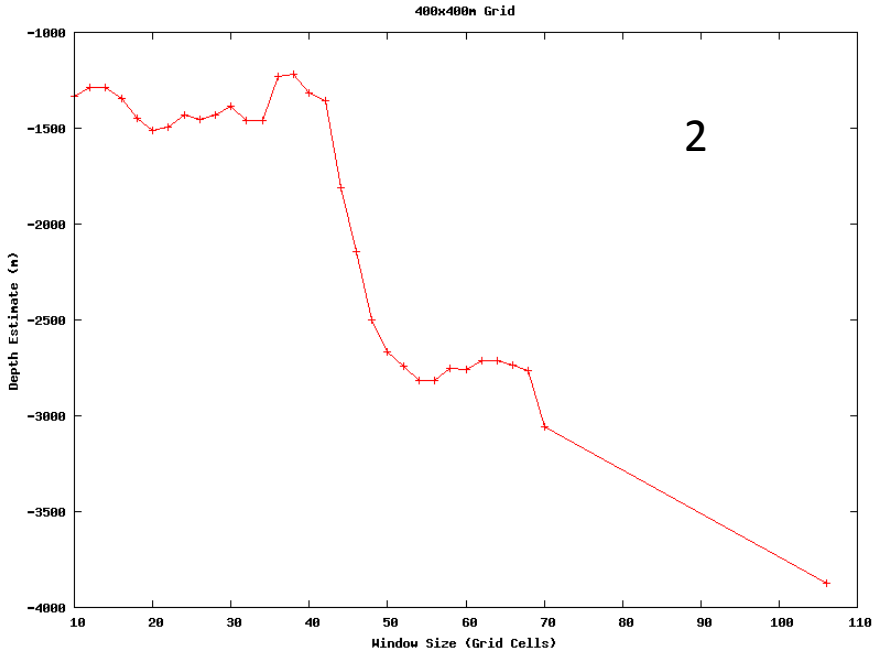
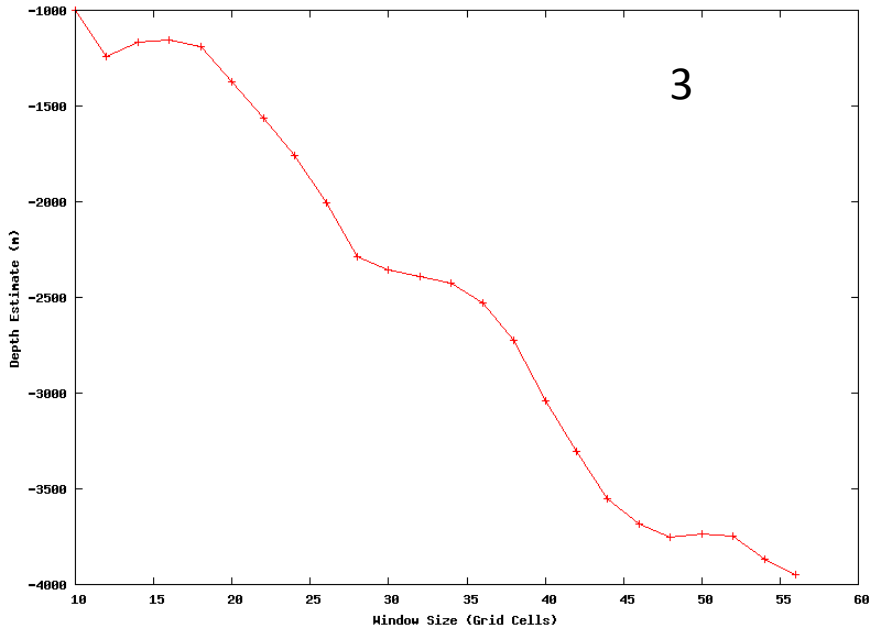
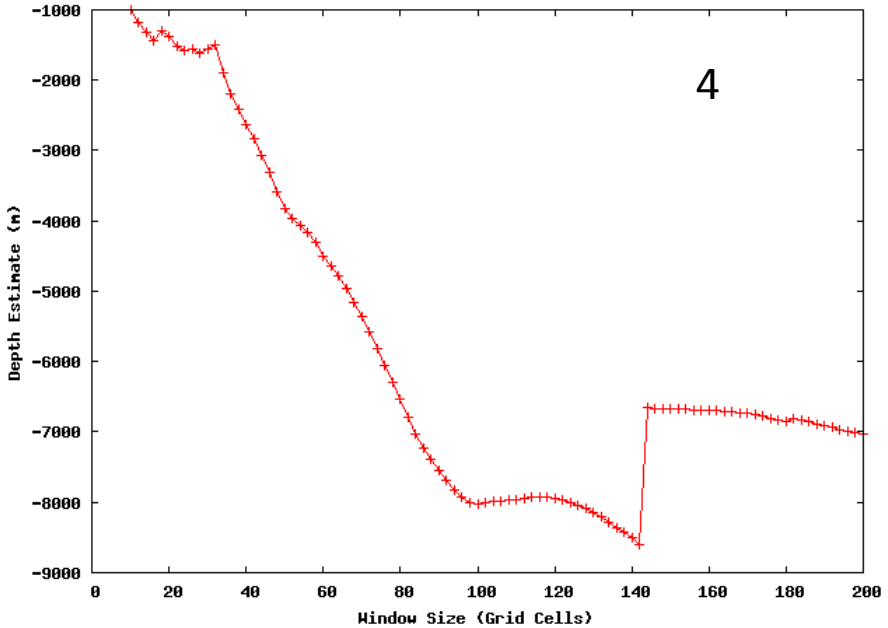
MWT: Depth vs. Window Size at 4 points along profile (400x400m)

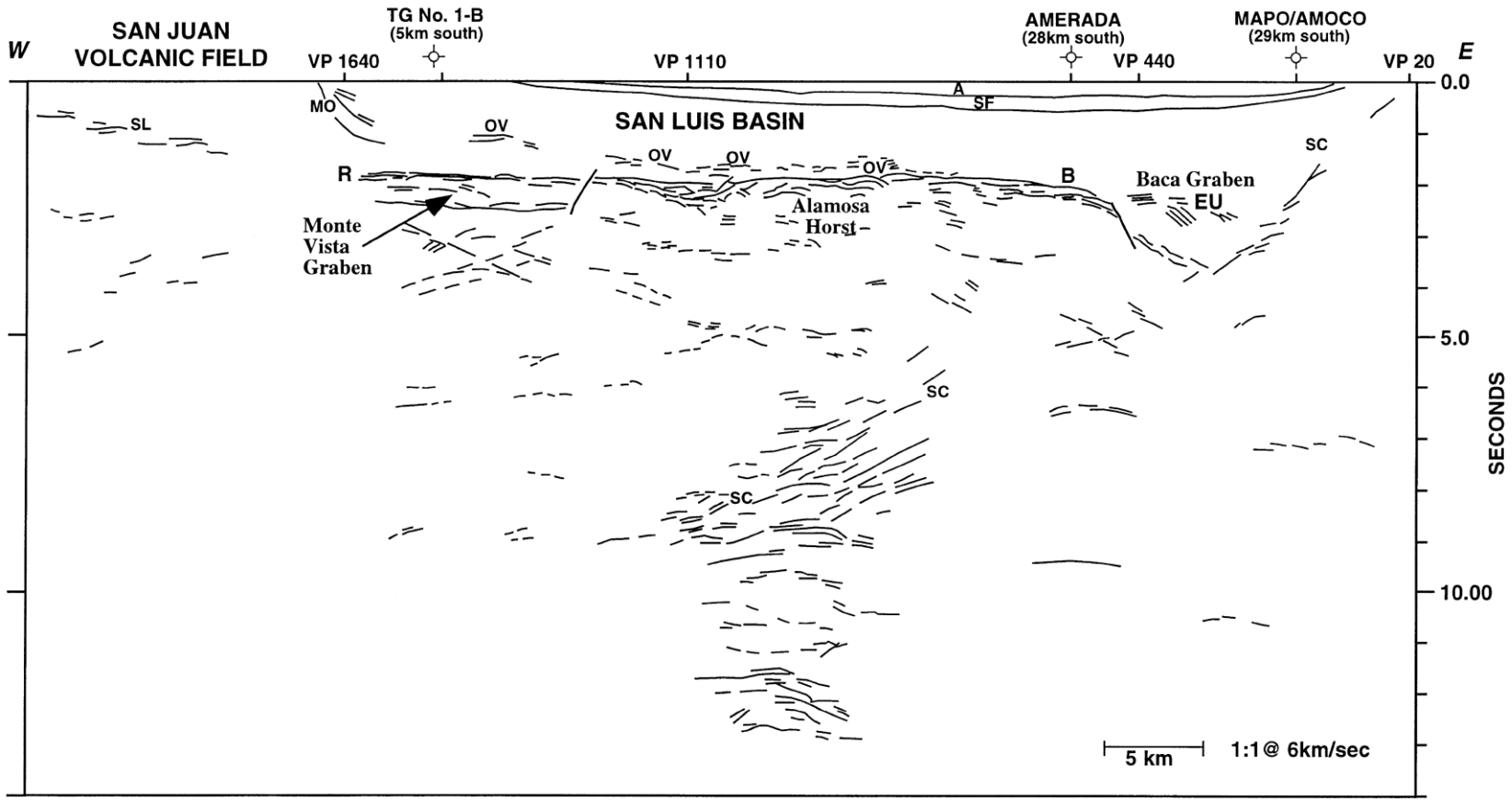








Cross-section derived from Seismic data



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Examples of manual MWT at well locations in Middle East

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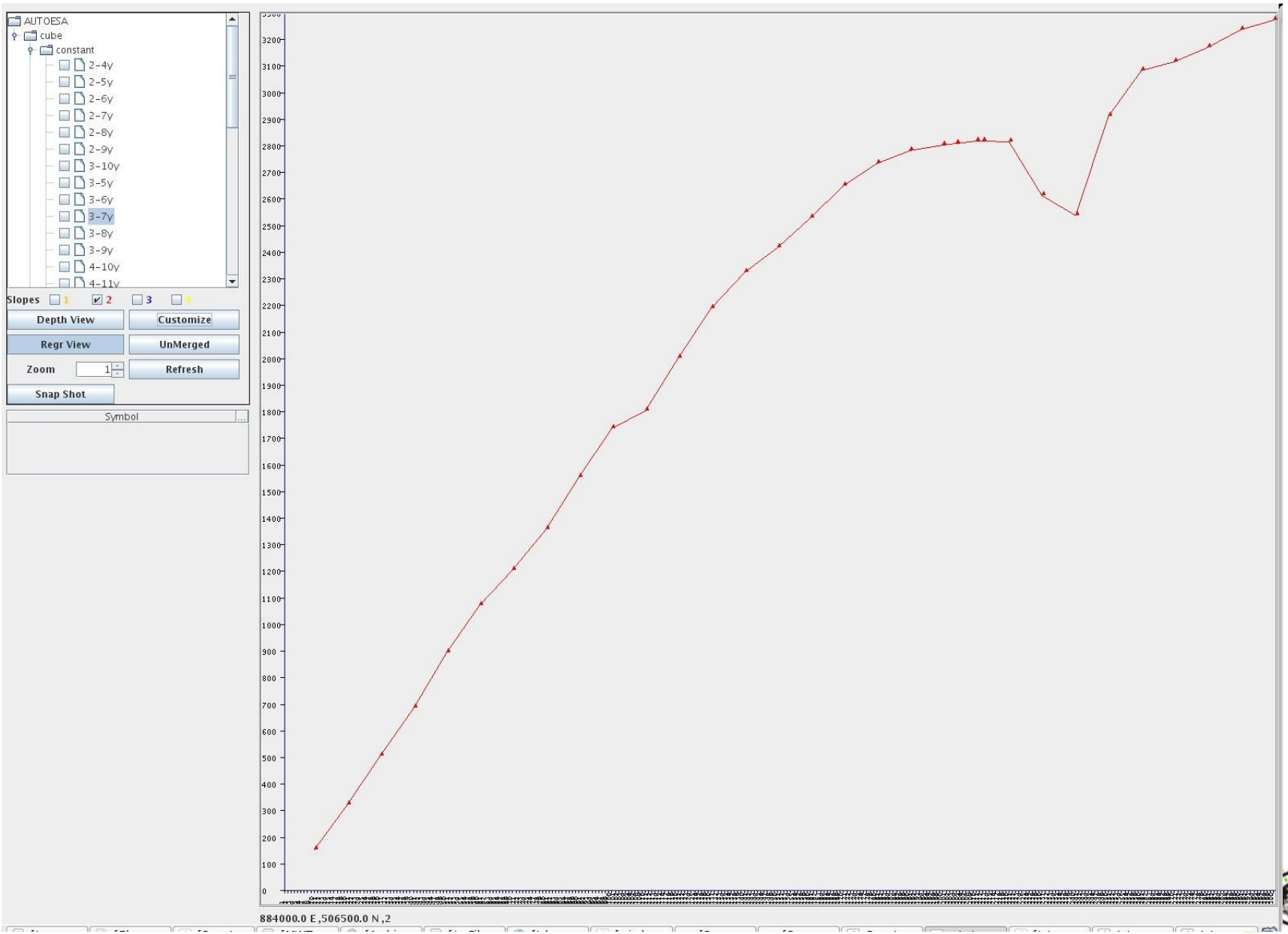
MWT example at well location 1



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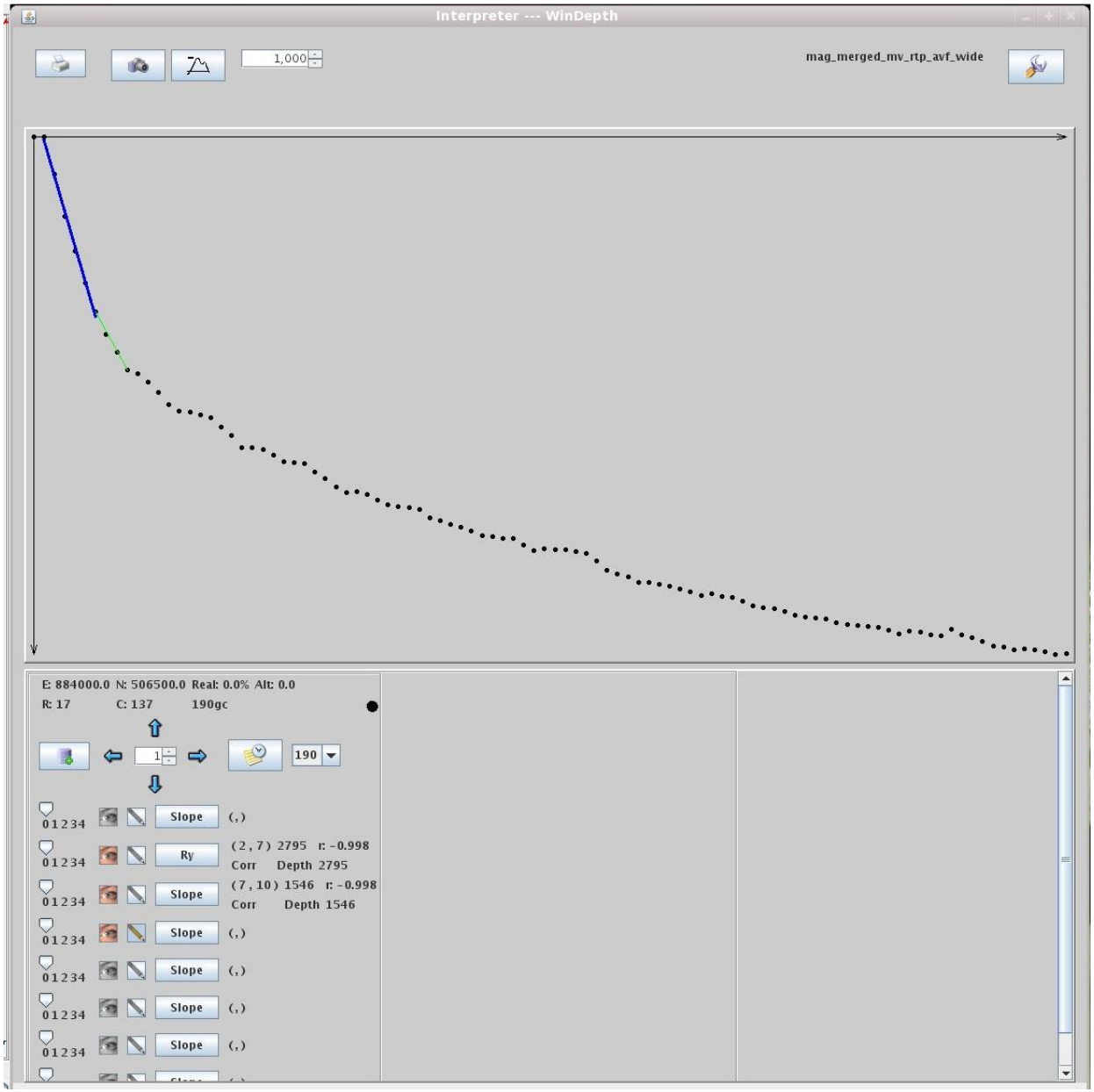
Spectrum example at well location 1



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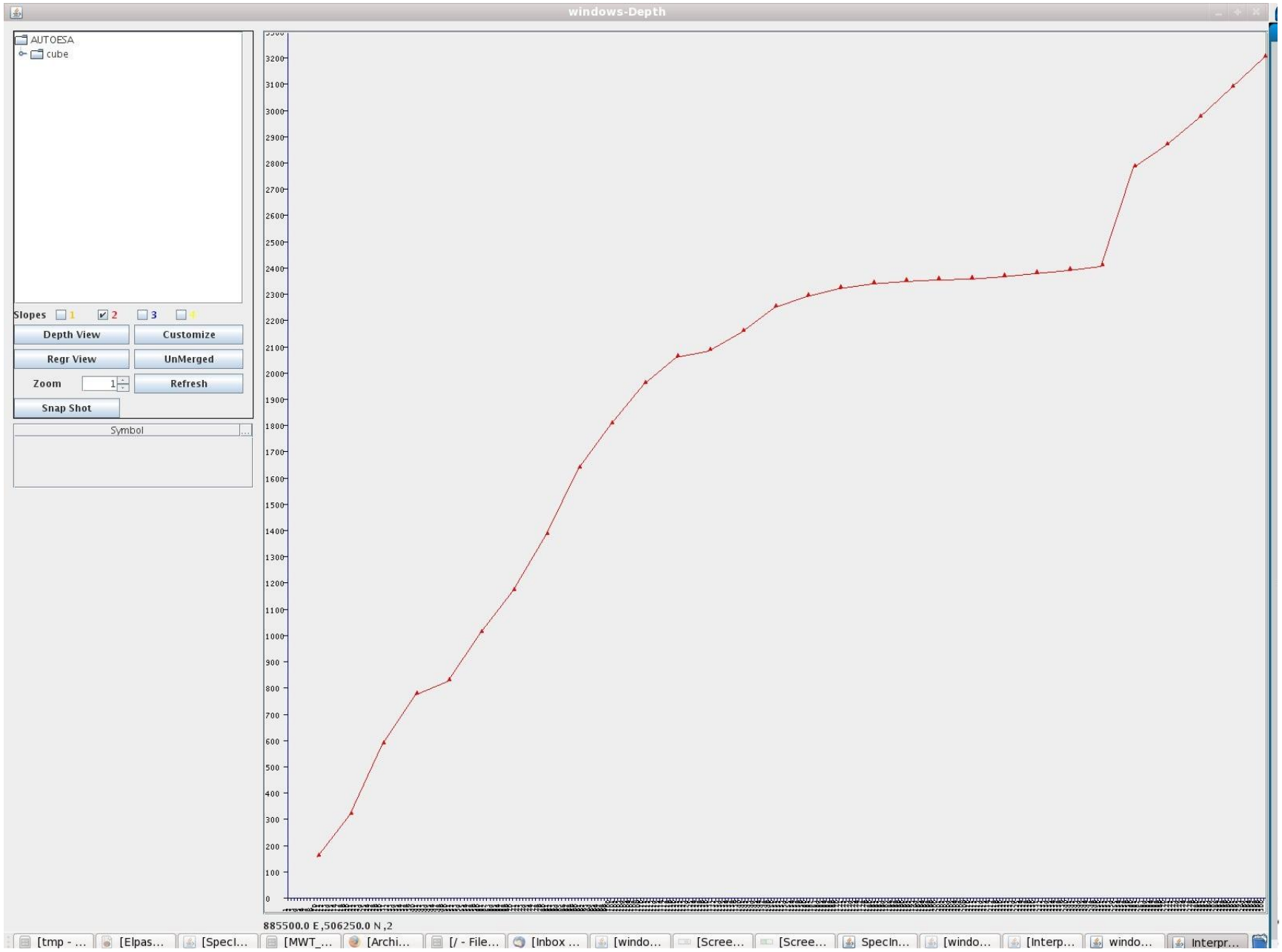
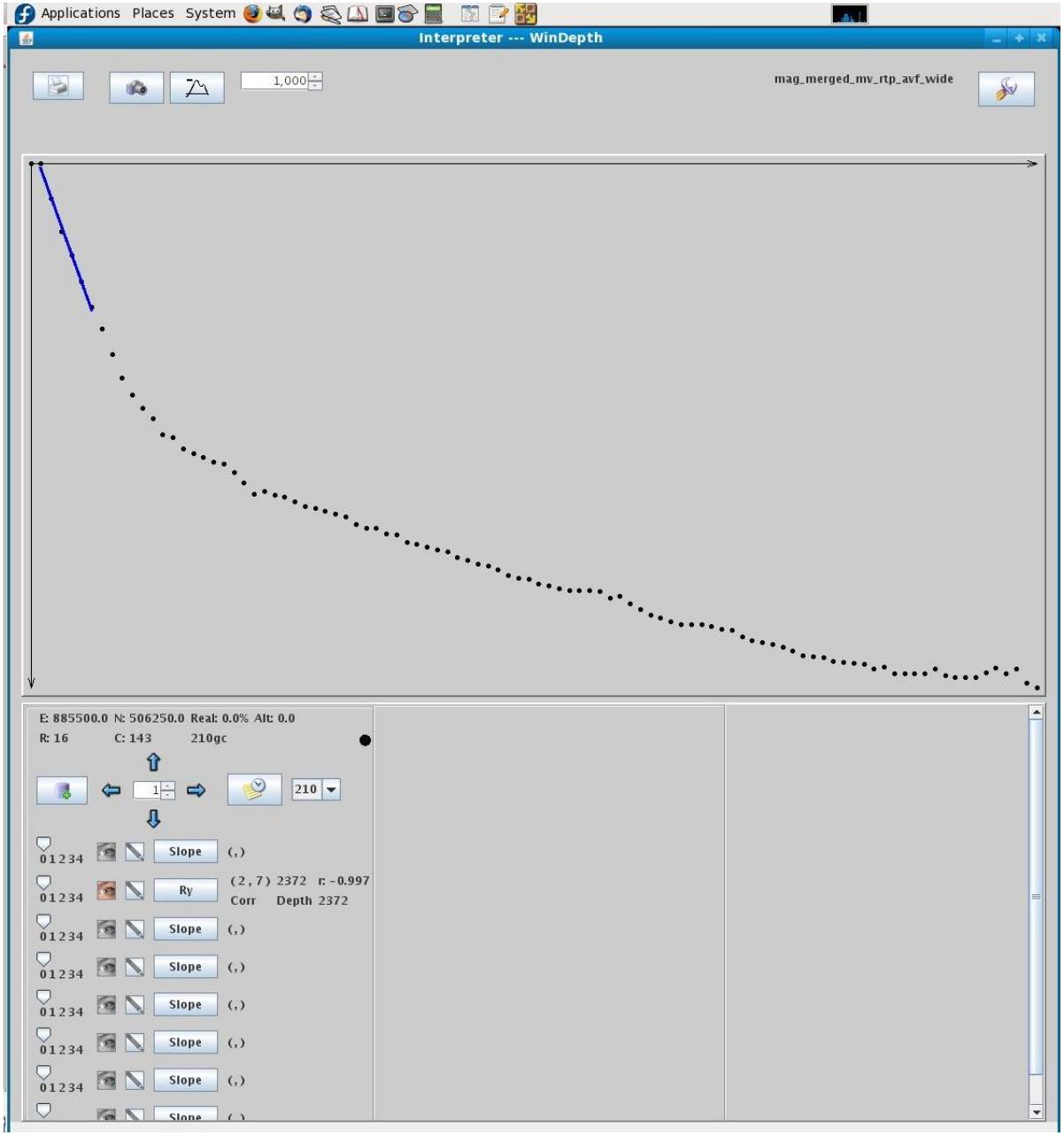
MWT example at well location 2



Spectrum example at well location 2



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Conclusions

The resolution of the survey data has significant impact on ability to accurately define depths using spectral analysis

High resolution surveys with line spacings of 200 and 400m are needed to image subtle intersedimentary horizons

Widely spaced surveys of 1600 and 2000m are unlikely to resolve shallow features

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References

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Kivior, I., Boyd, D., Shi, Z. and McClay, K., R., 1993, Exploration Geophysics, 24, 603-608.

Spector, A. and Grant, F., 1970, Geophysics, 35, 293-302.

Yates, S., Kivior, I., Damte, S., Markham, S., L. and Vaughan, F., 2008, in press.

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Acknowledgements

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