VSP-based Q-estimation at Pike's Peak

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Outline

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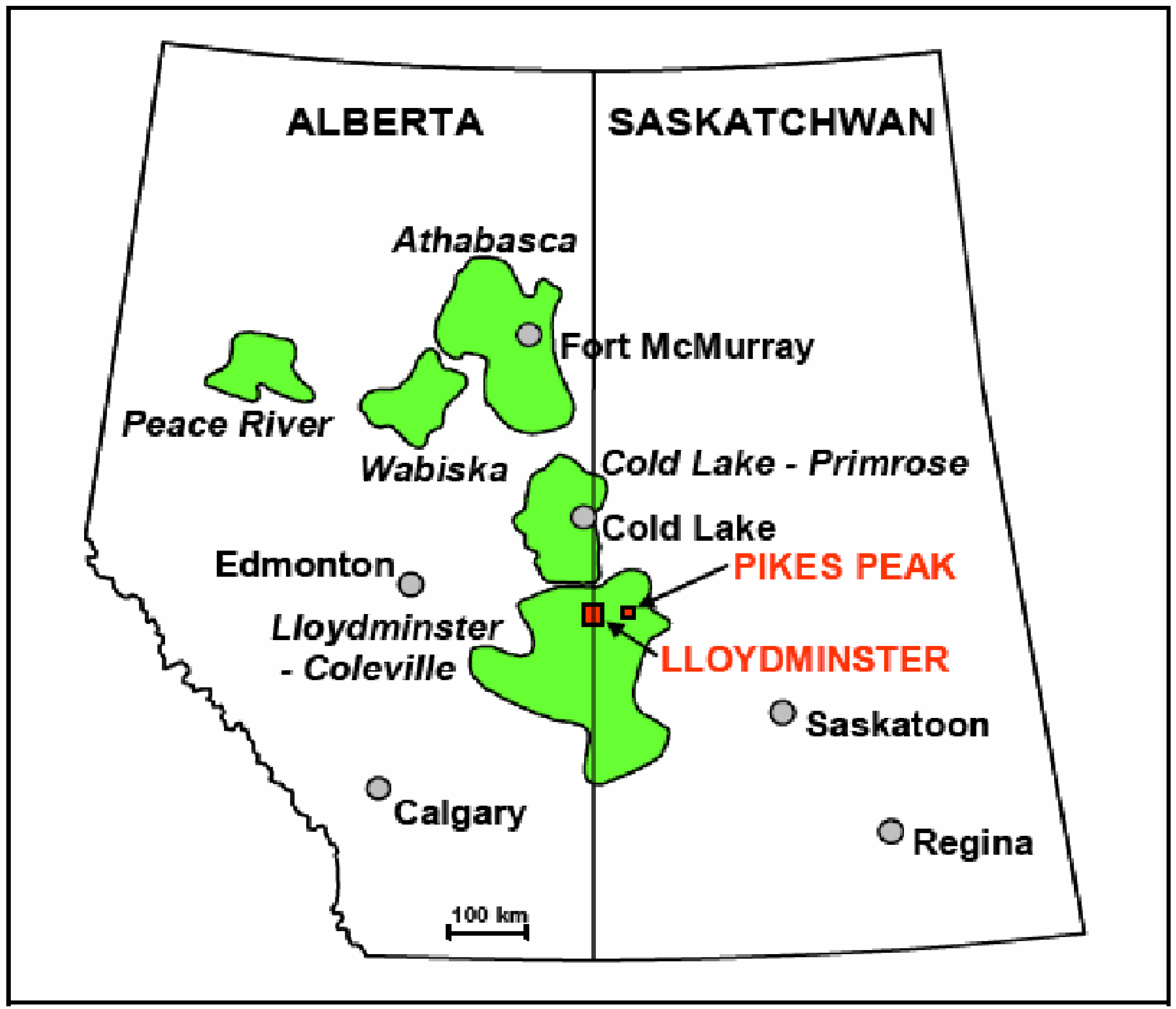
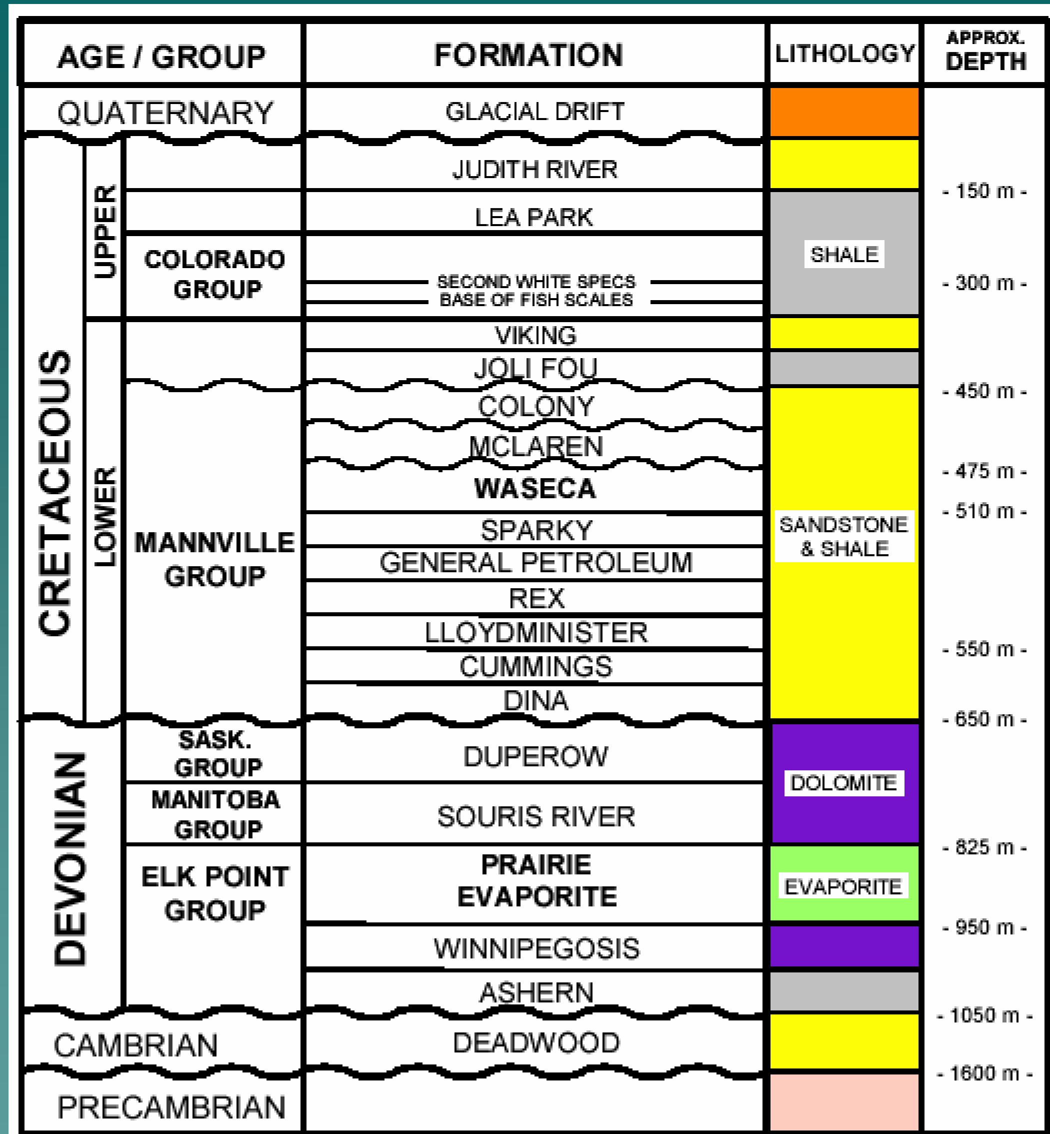
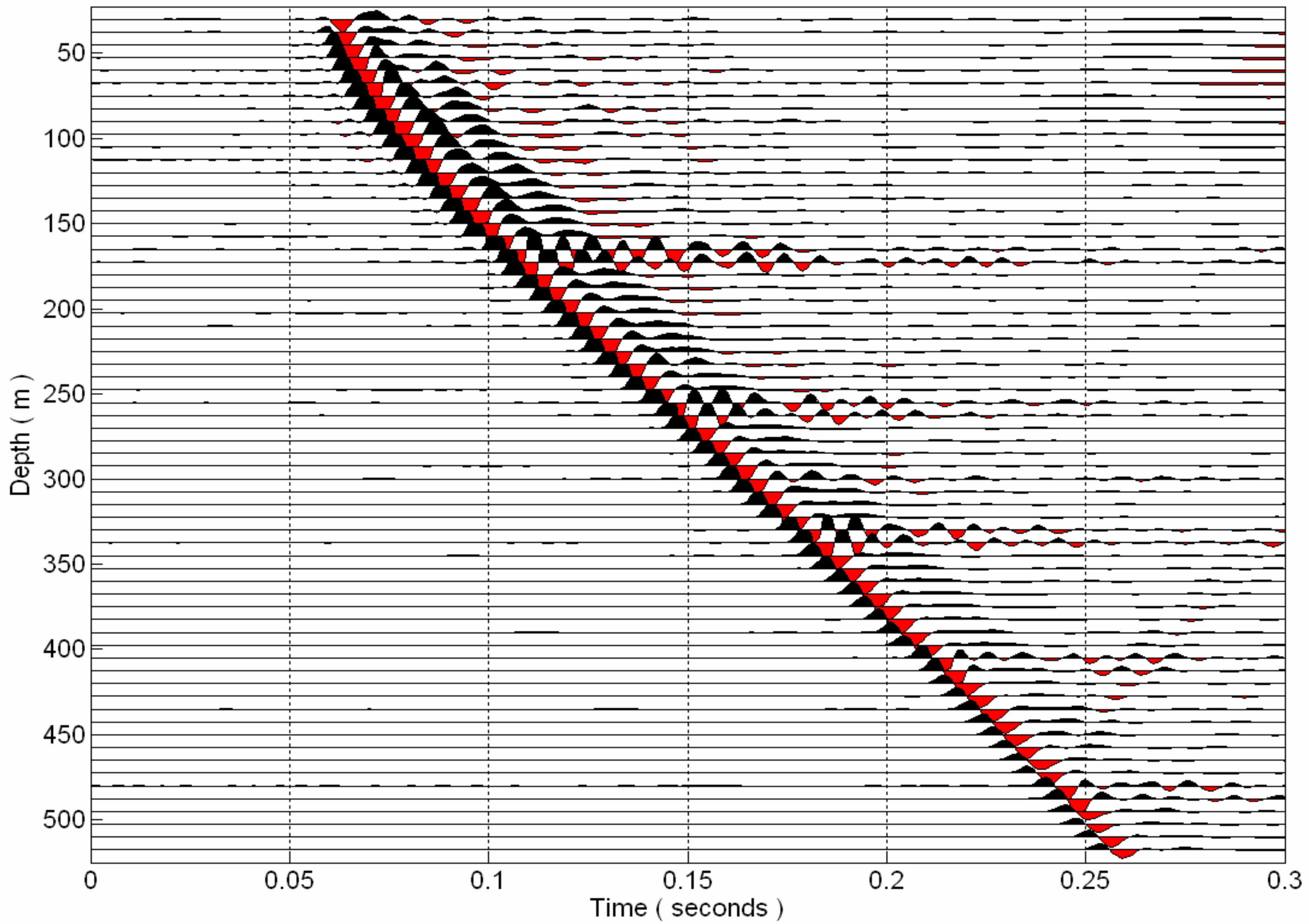
- Pike's Peak Location and Stratigraphy
- Z-stack and Q-estimation
- Downgoing P-wave and Q-estimation
- Taner and Treitel's Q-estimation Method
- Conclusions
- Acknowledgements



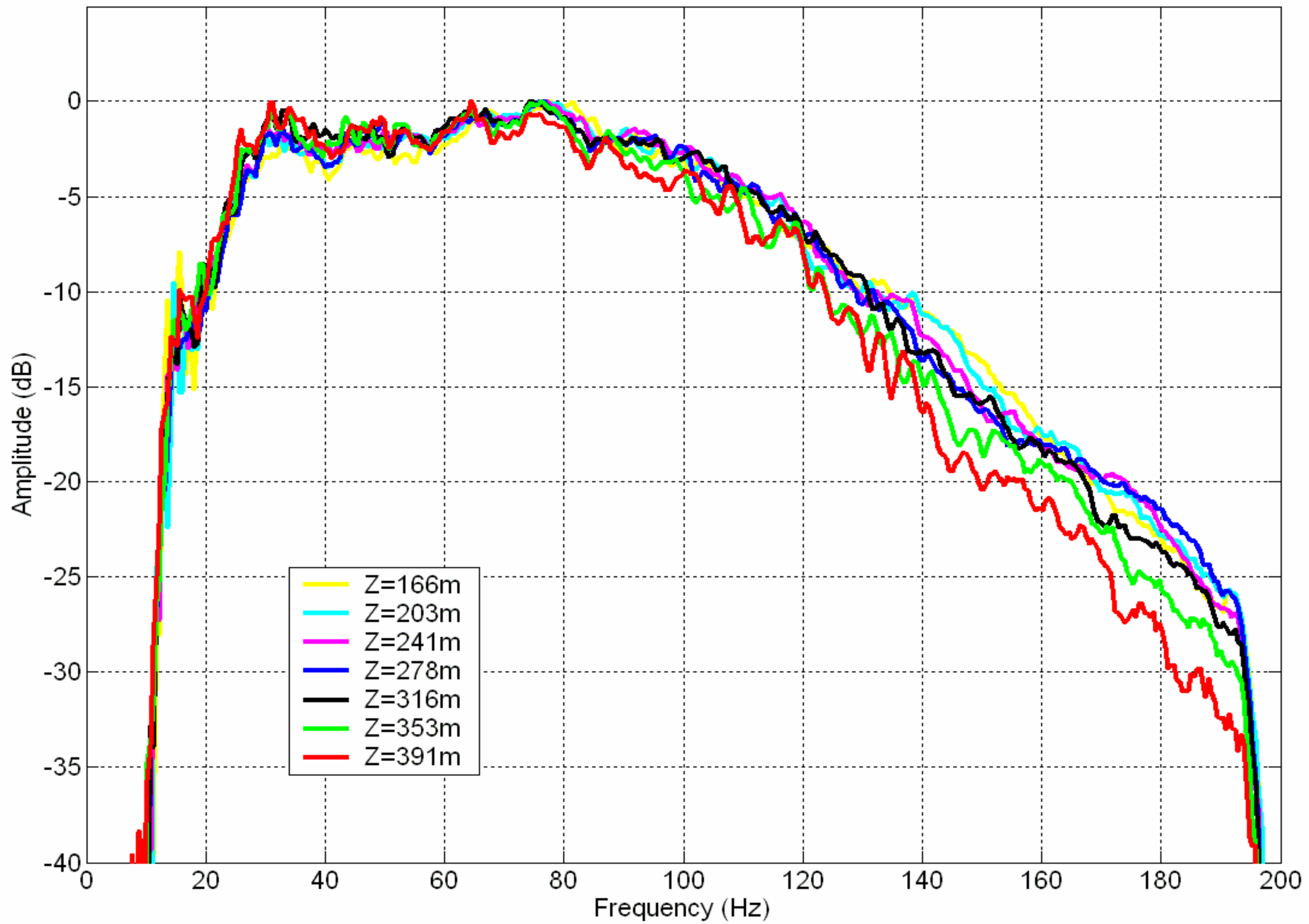
Pike’s Peak, Saskatchewan (Watson, 2004)



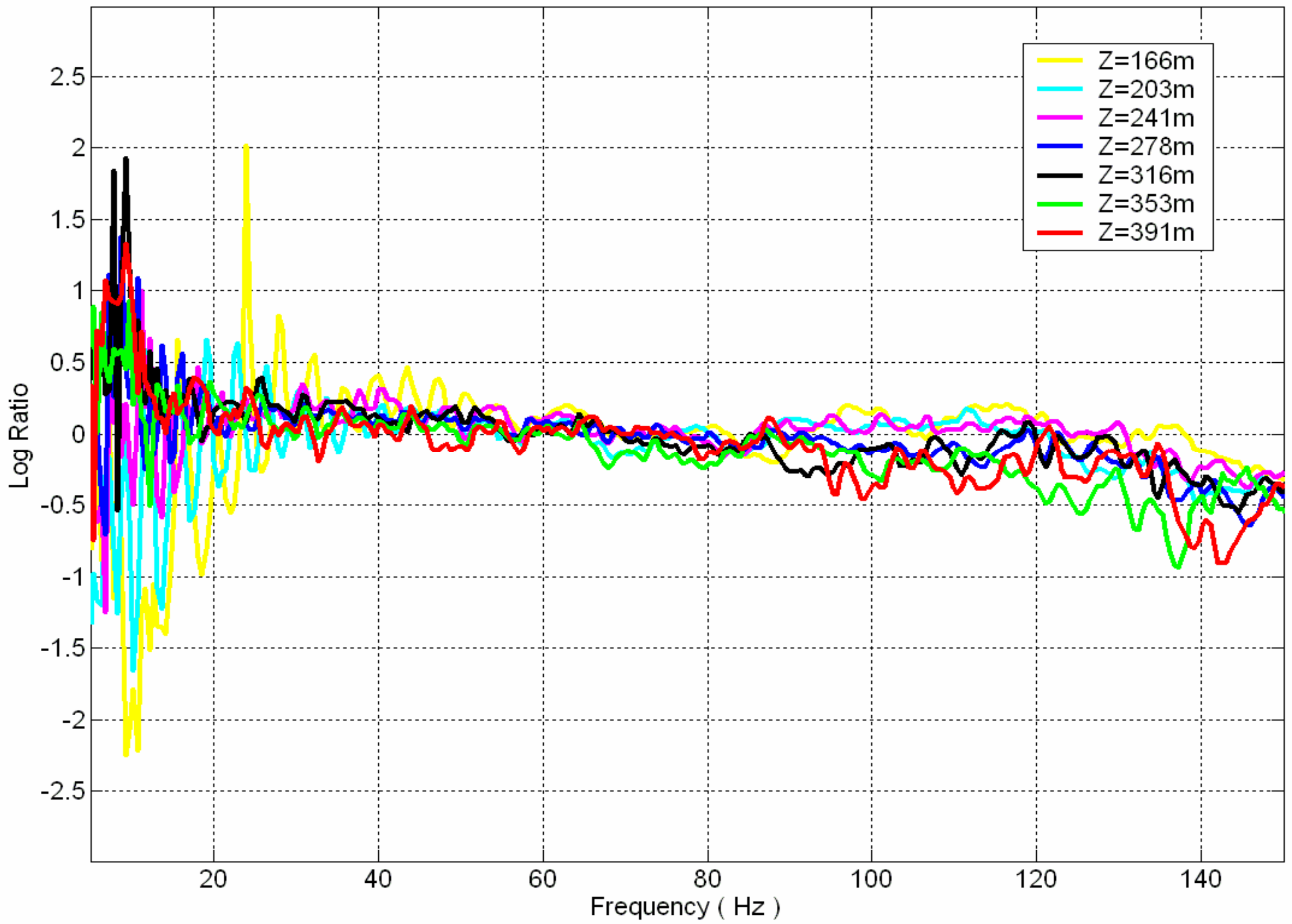
Pike’s Peak Area Stratigraphic Chart (Watson, 2003)



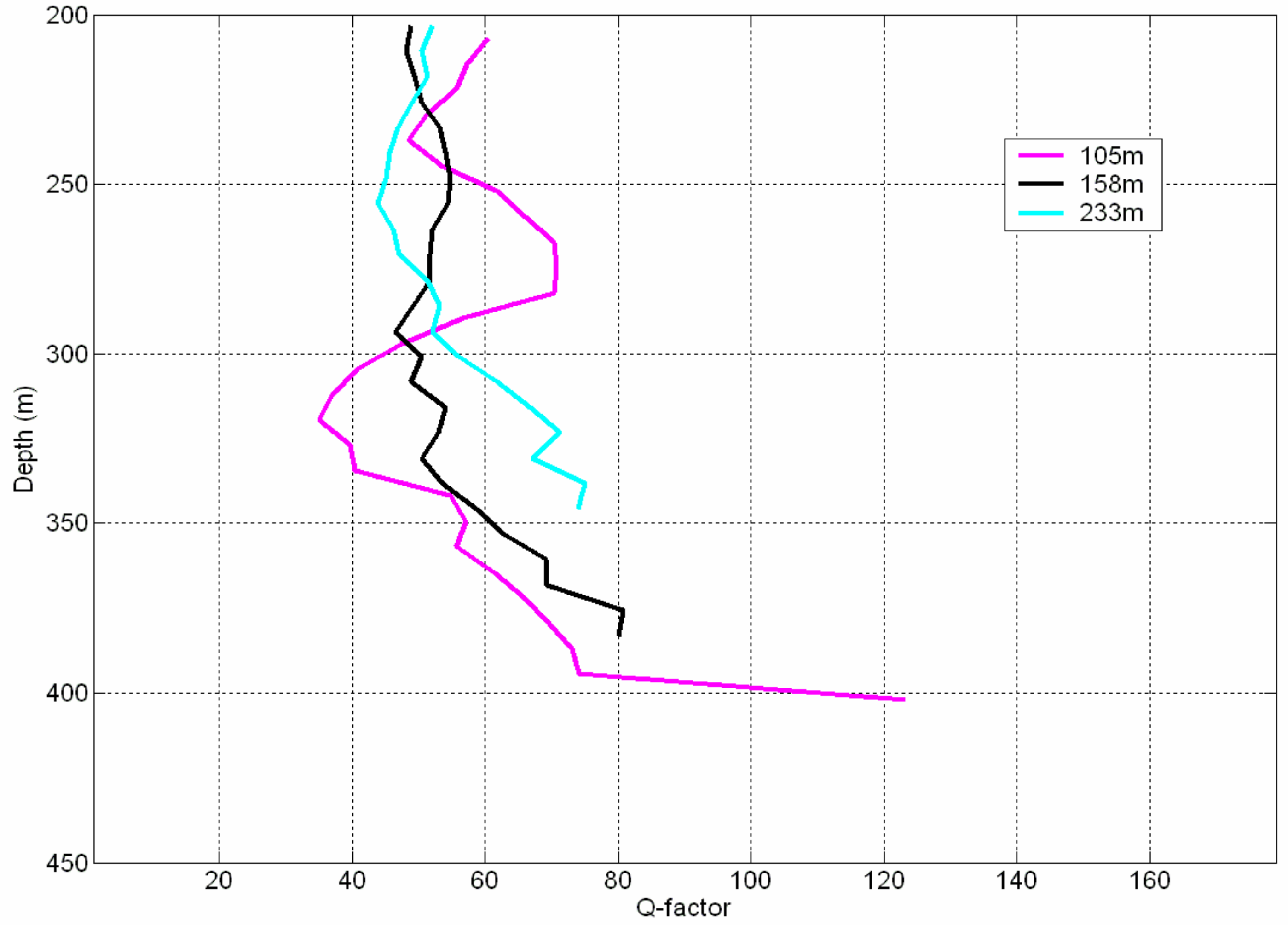
Pike's Peak 90m Offset VSP (true amplitude Z-stack)



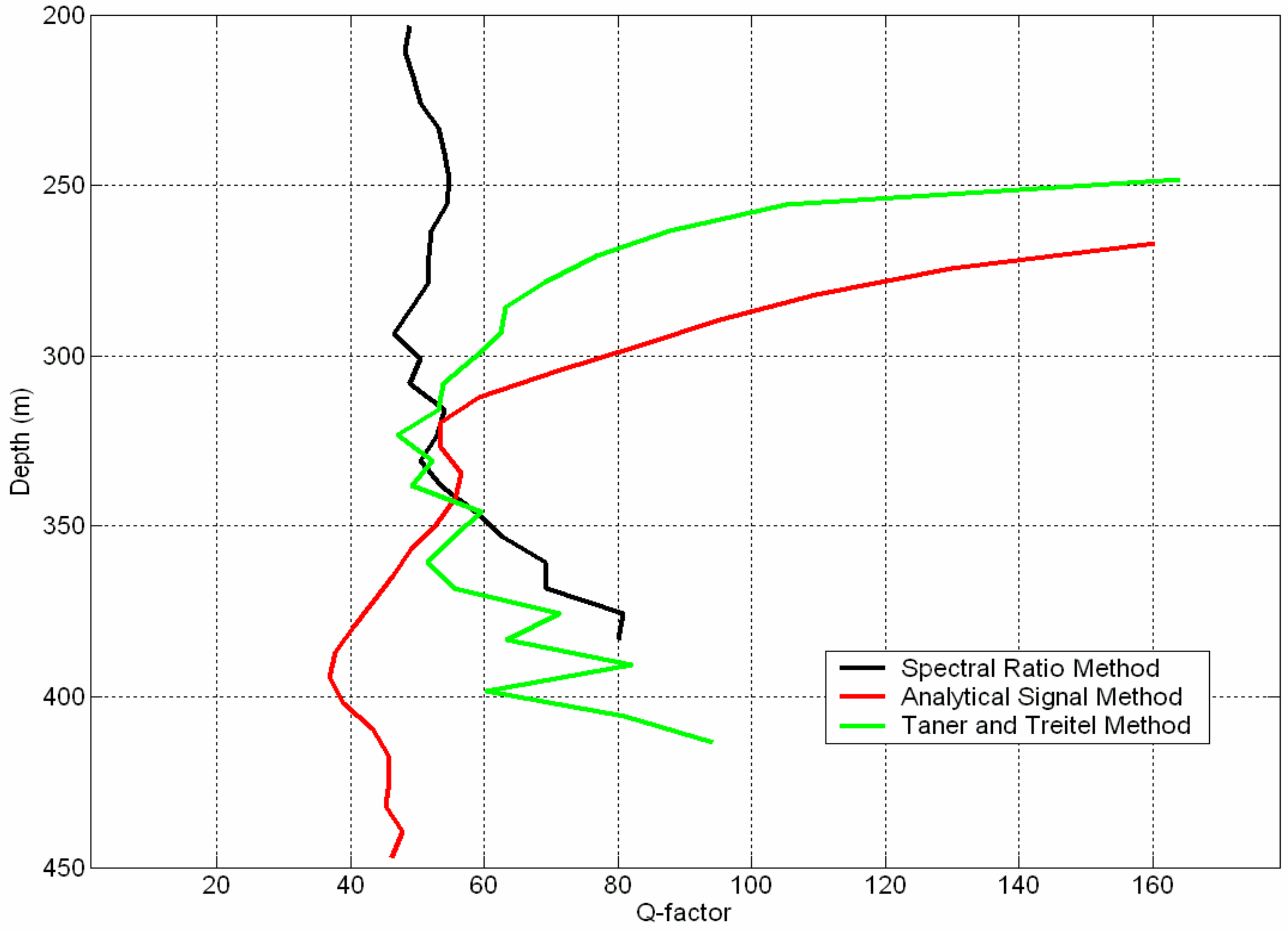
Z-stack Trace Spectra (8Hz to 200Hz Sweep)



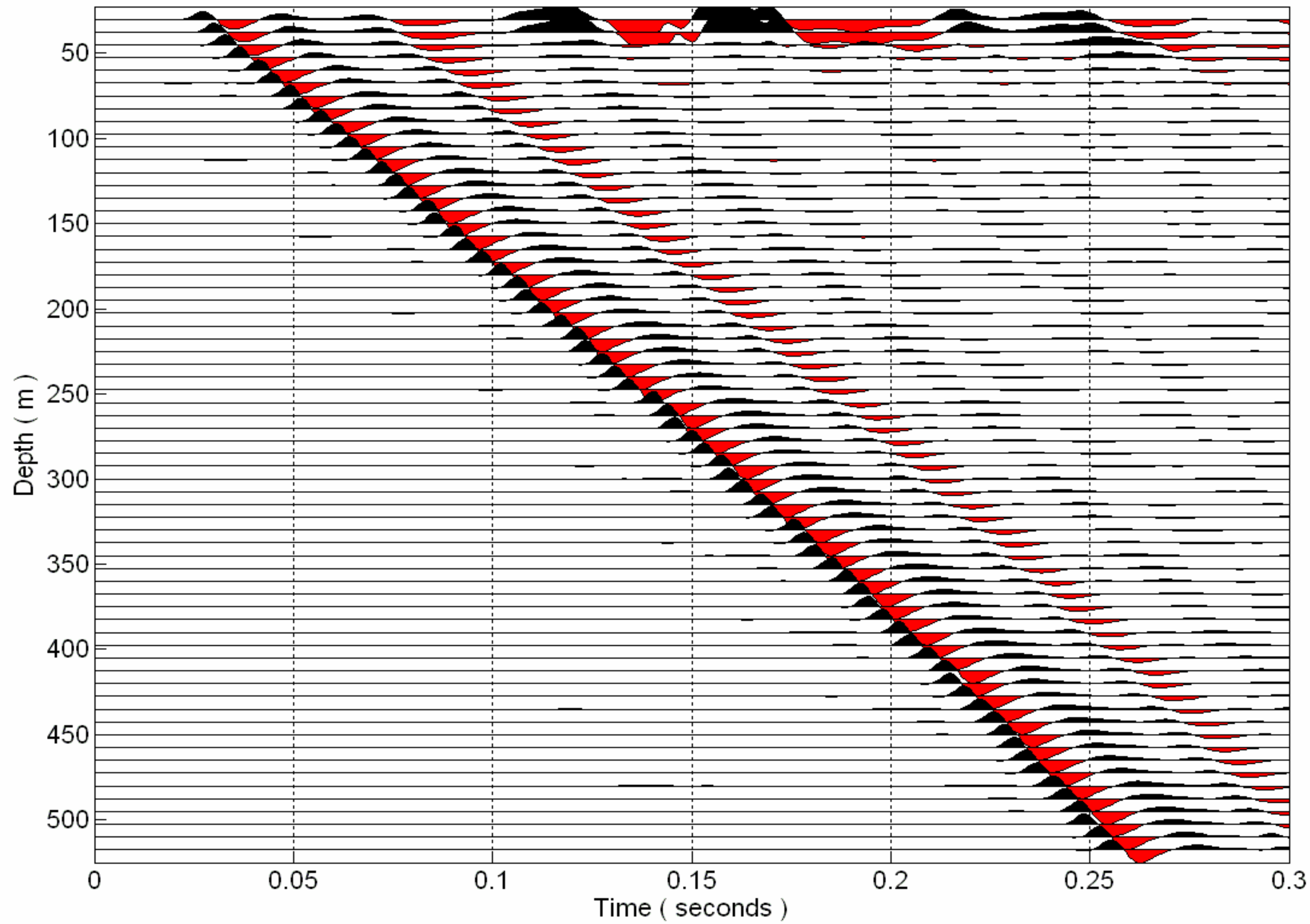
Log Spectral Ratio of Z-stack (90m Offset VSP)



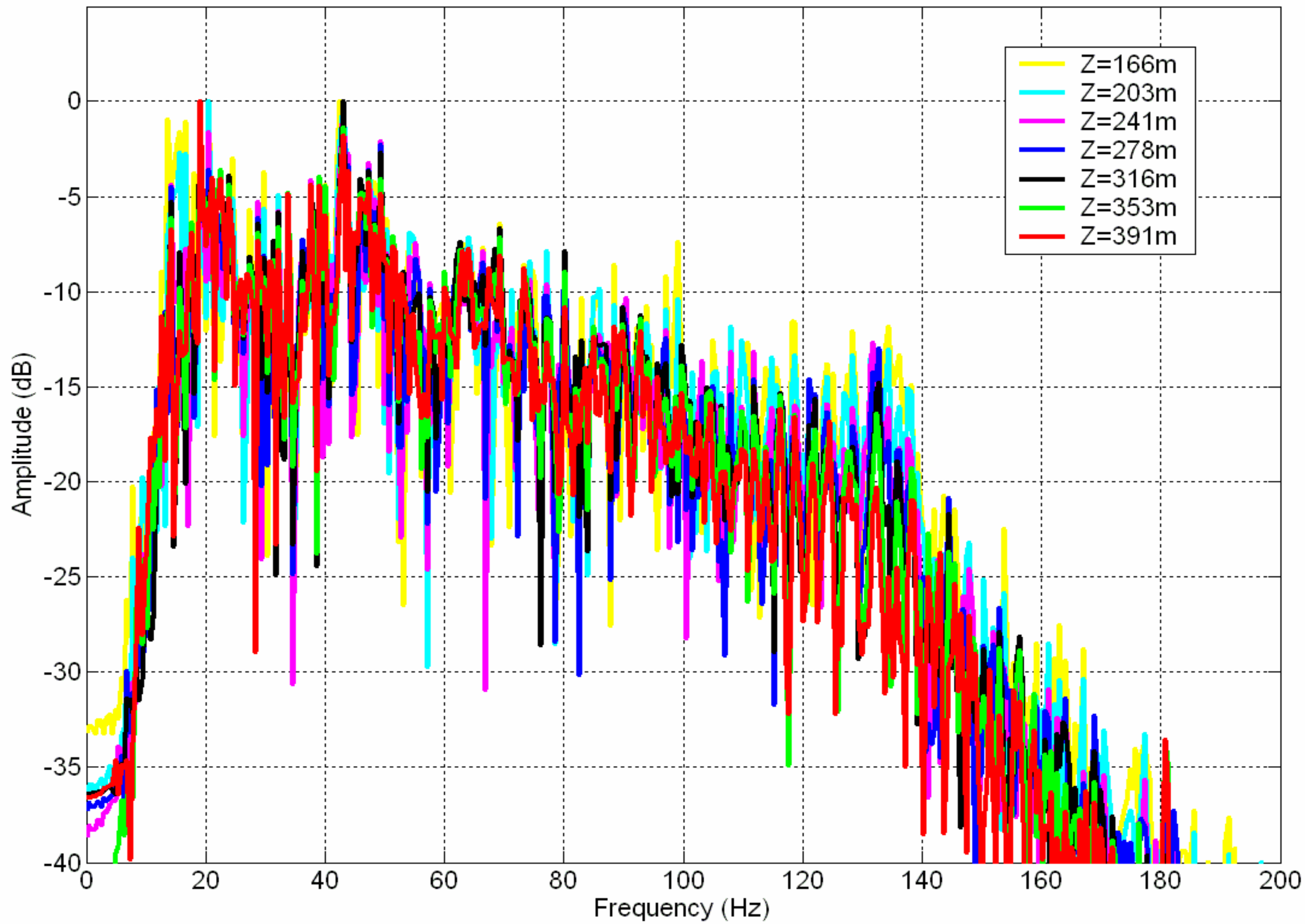
SRM-Q(z) as Function of Estimation Depth Interval



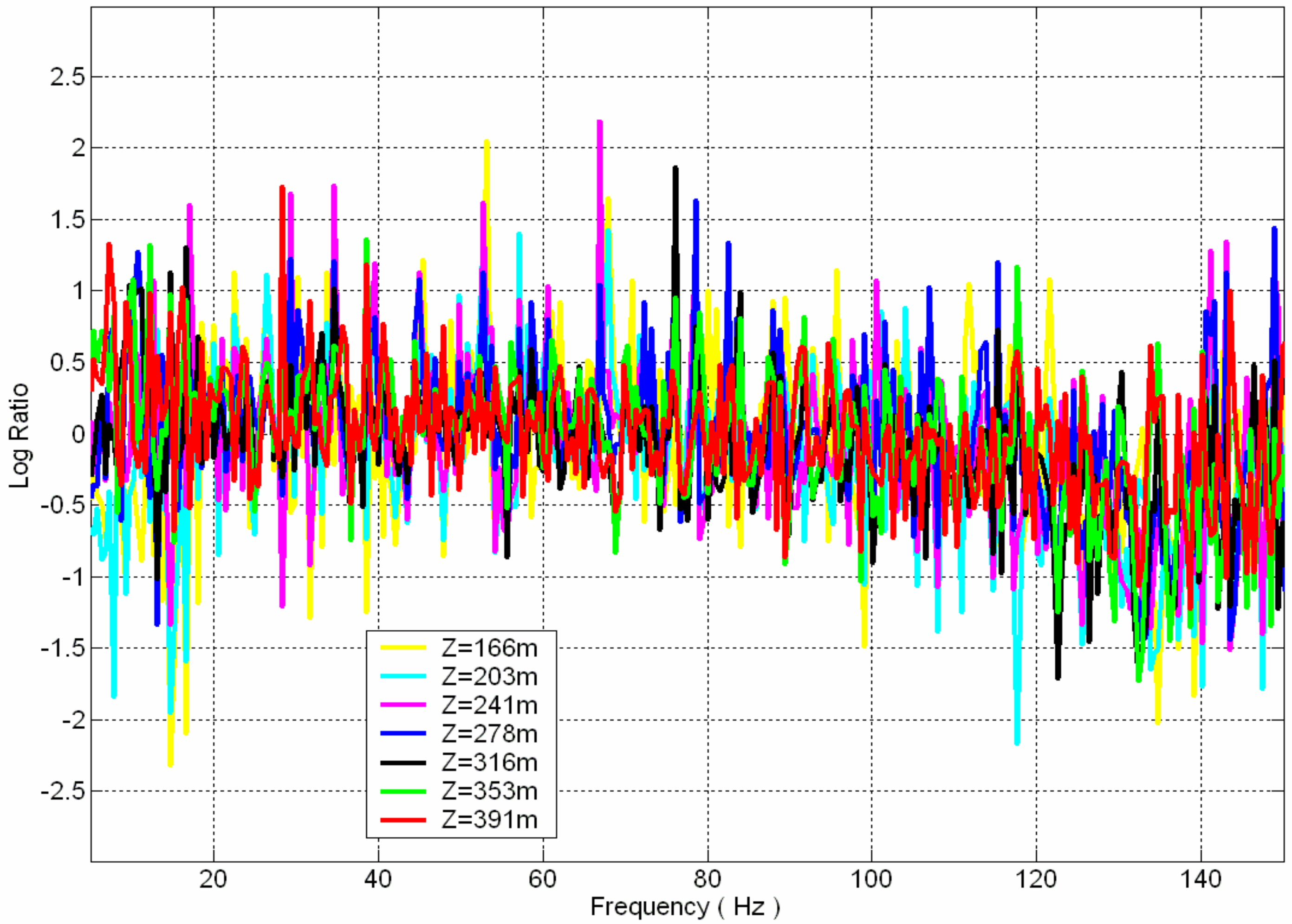
Q versus Depth for Z-stack (90m Offset VSP)



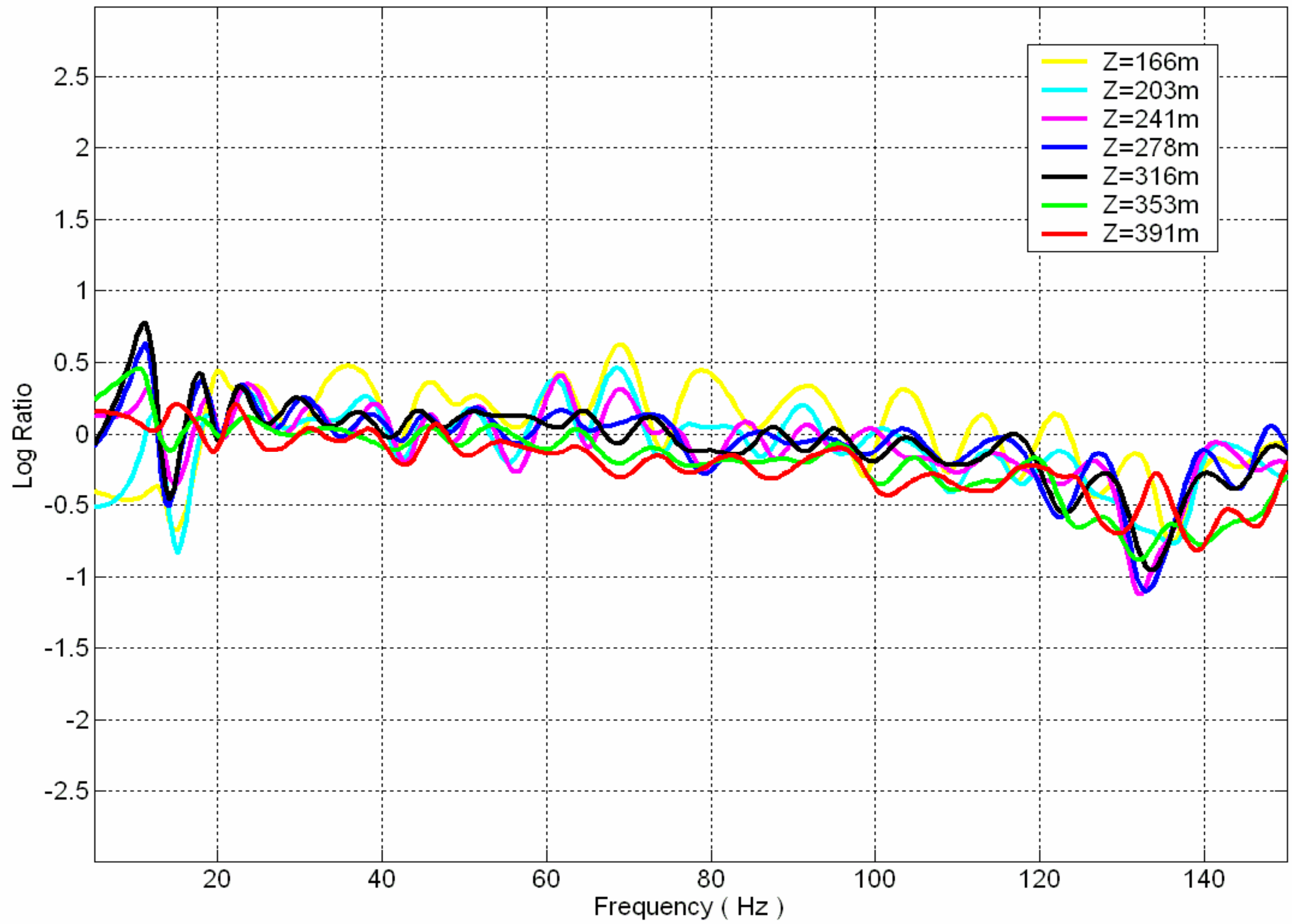
Pike’s Peak VSP (Isolated Downgoing P-wave)



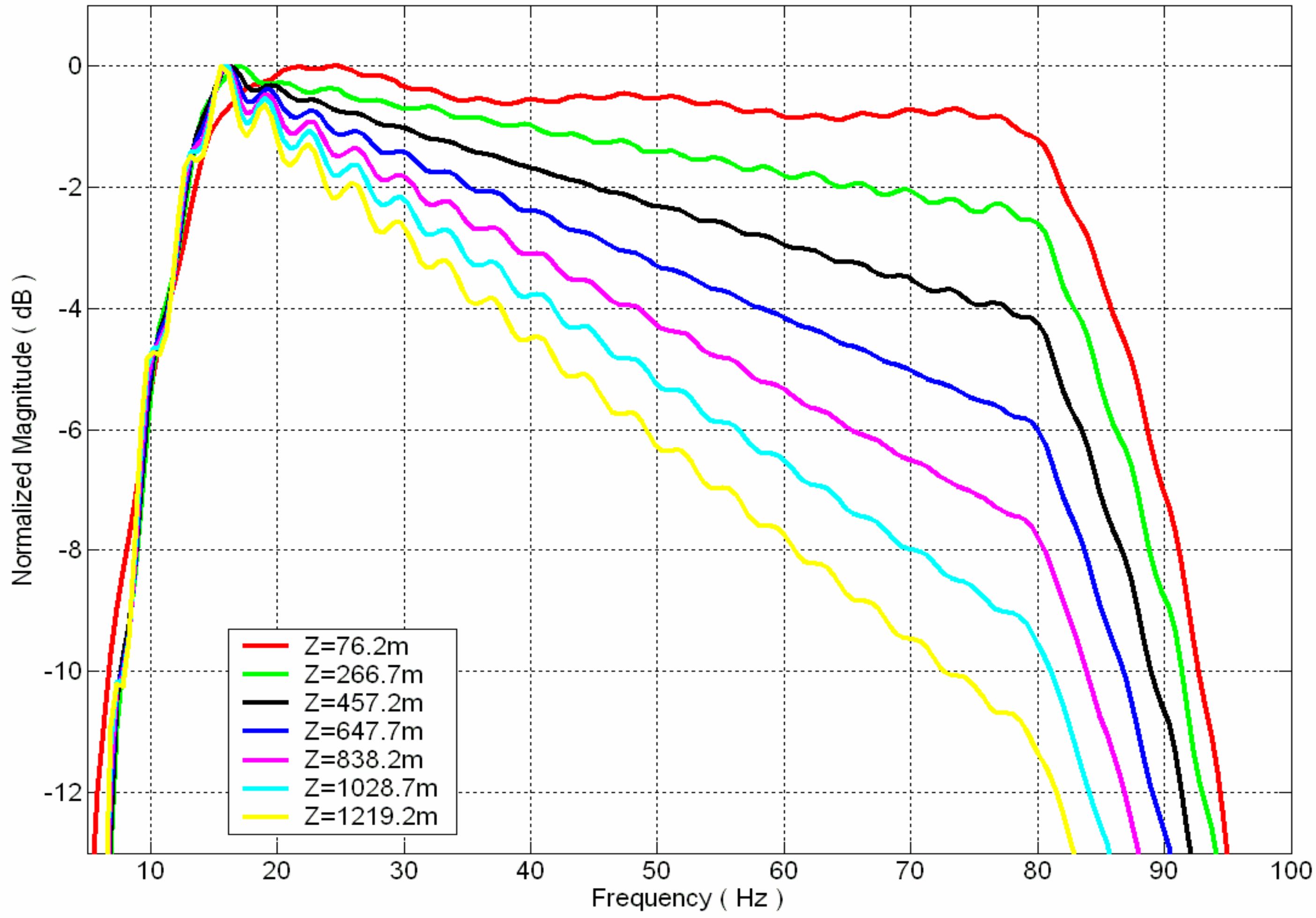
Trace Spectra of Isolated Downgoing P-wave



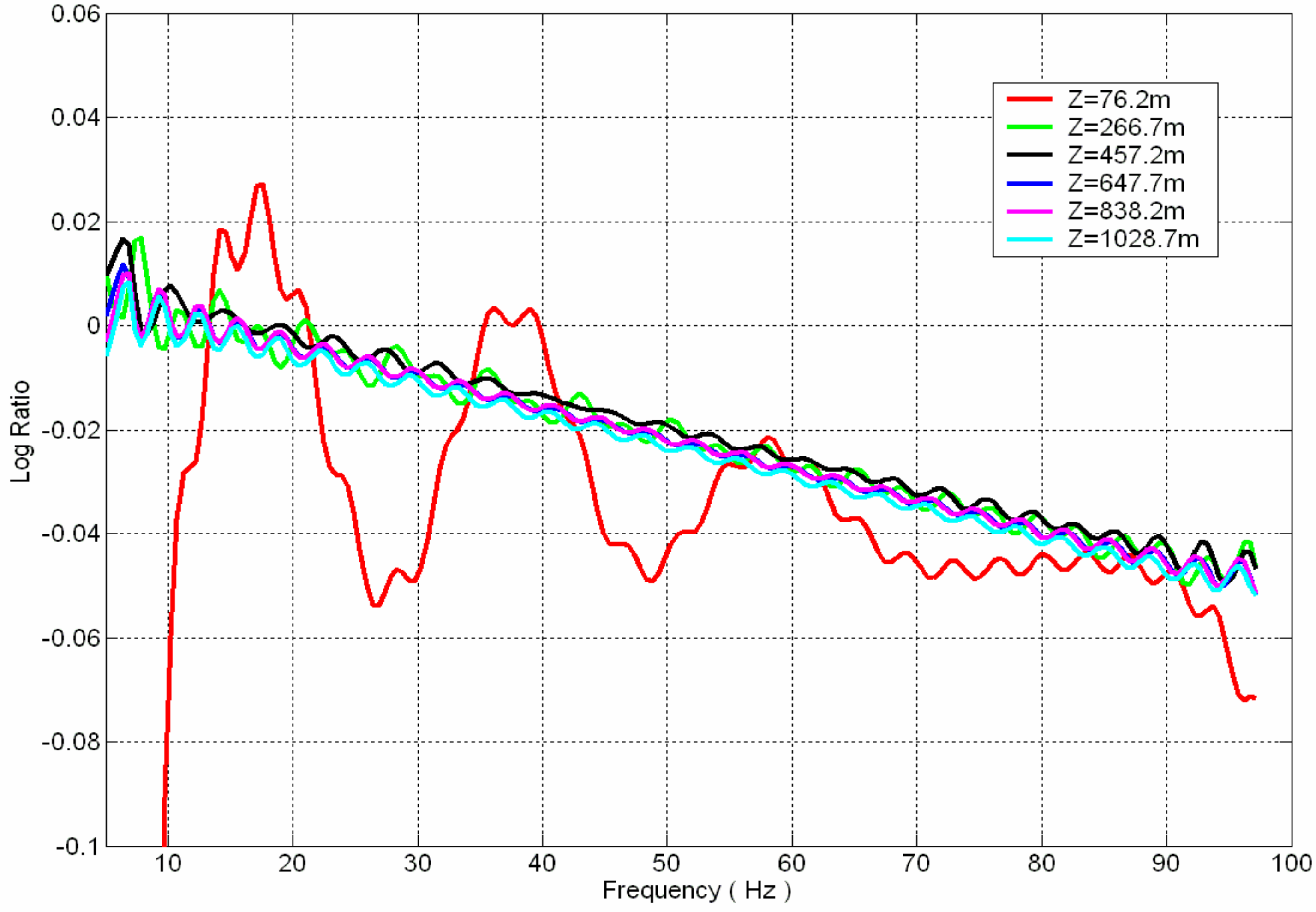
Log Spectral Ratio of Isolated Downgoing P-wave



Log Spectral Ratio of Minimum Phase Wavelet (T+T)



Magnitude Spectra of Minimum Phase Wavelets (Taner and Treitel Method applied to Model)



Log Spectral Ratios from Minimum Phase Wavelets (Taner and Treitel Method applied to Model)

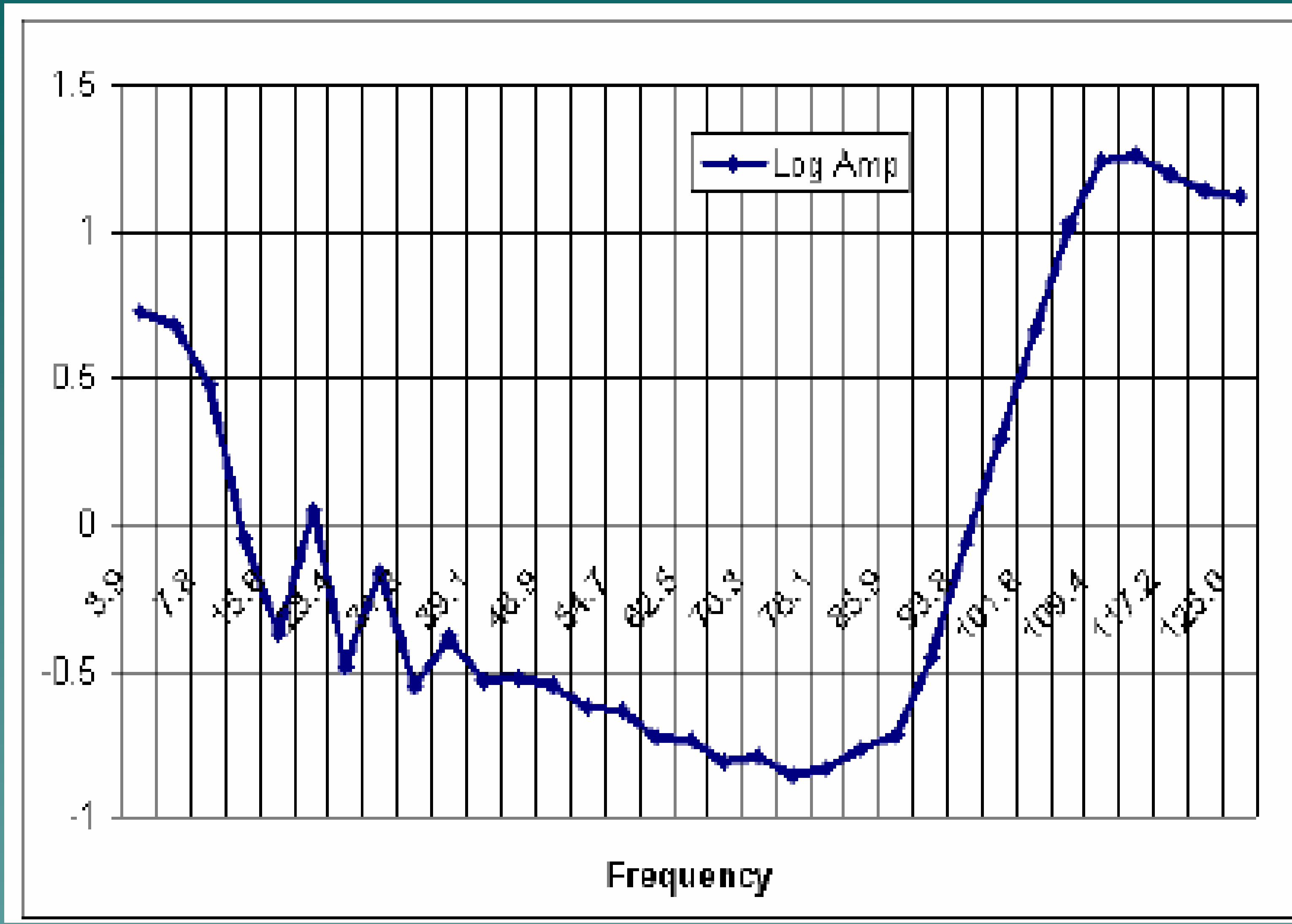
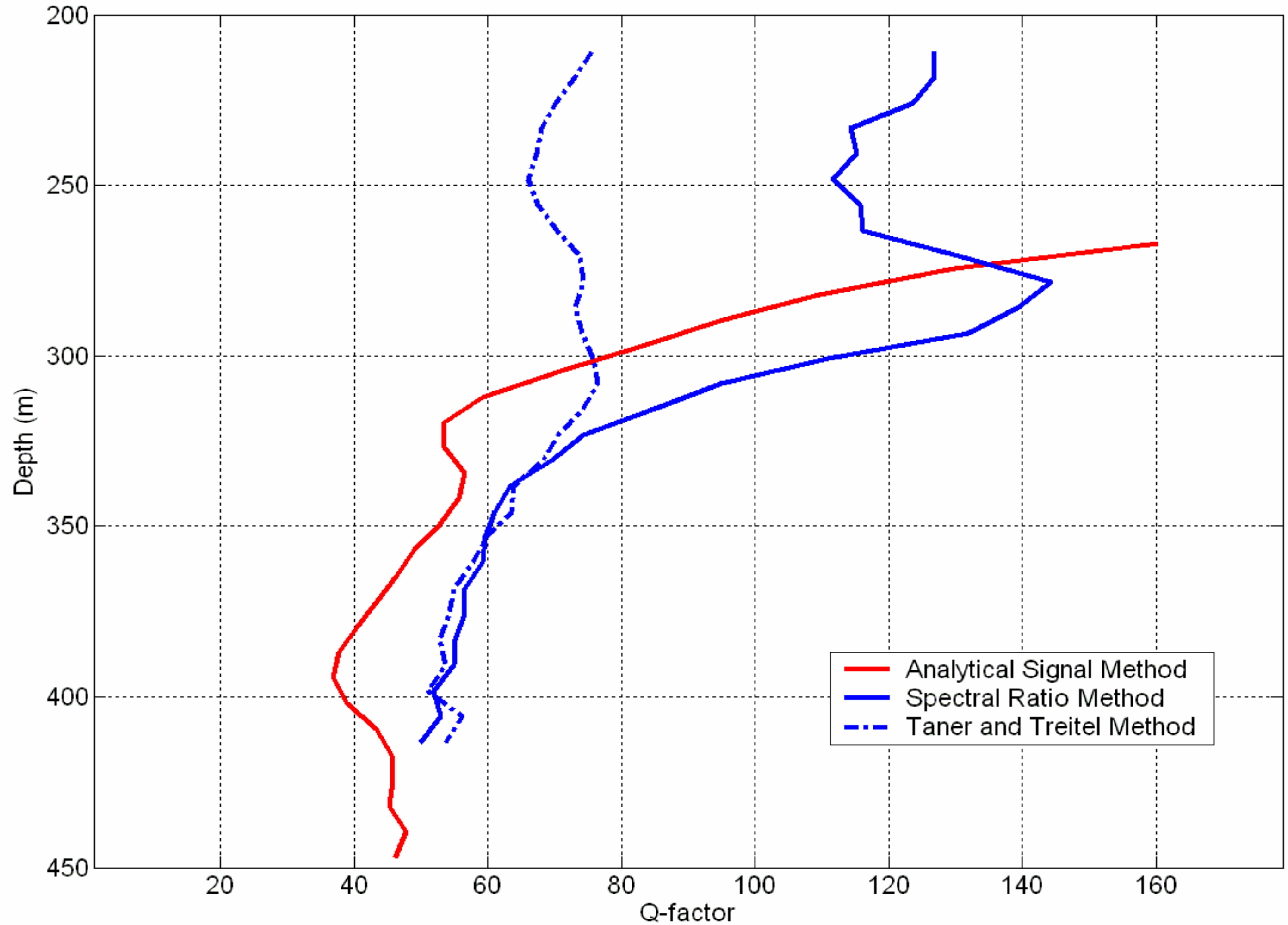


Figure 5 of Taner and Treitel, 2003 (Spectral Ratio)



Q(z) computed with ASM, SRM and Taner + Treitel

Station #	Depth Range (from KB)	V-int (m/s)	Q
35 ~ 45	282 m ~ 357 m	2300	45.2
45 ~ 55	357 m ~ 432 m	2350	48.2
55 ~ 65	432 m ~ 507 m	2500	74.0

Table 1. Q factors for well 15-06.

Pike's Peak Q-estimates by Richard Xu et al. (2001)

Conclusions

- Q versus depth trends, estimated by spectral ratios and analytic signals, are again similar.
- Consistent with previous observations (Ross Lake) is the increase of Q(z) values toward shallower depths which is thought to be caused by near-field effects.
- From the comparisons done it is unclear whether or not the Taner and Treitel technique improves the spectral ratio approach.

Acknowledgements

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