Damping Boundaries in Finite Difference Modeling Using Finite Integral Transforms

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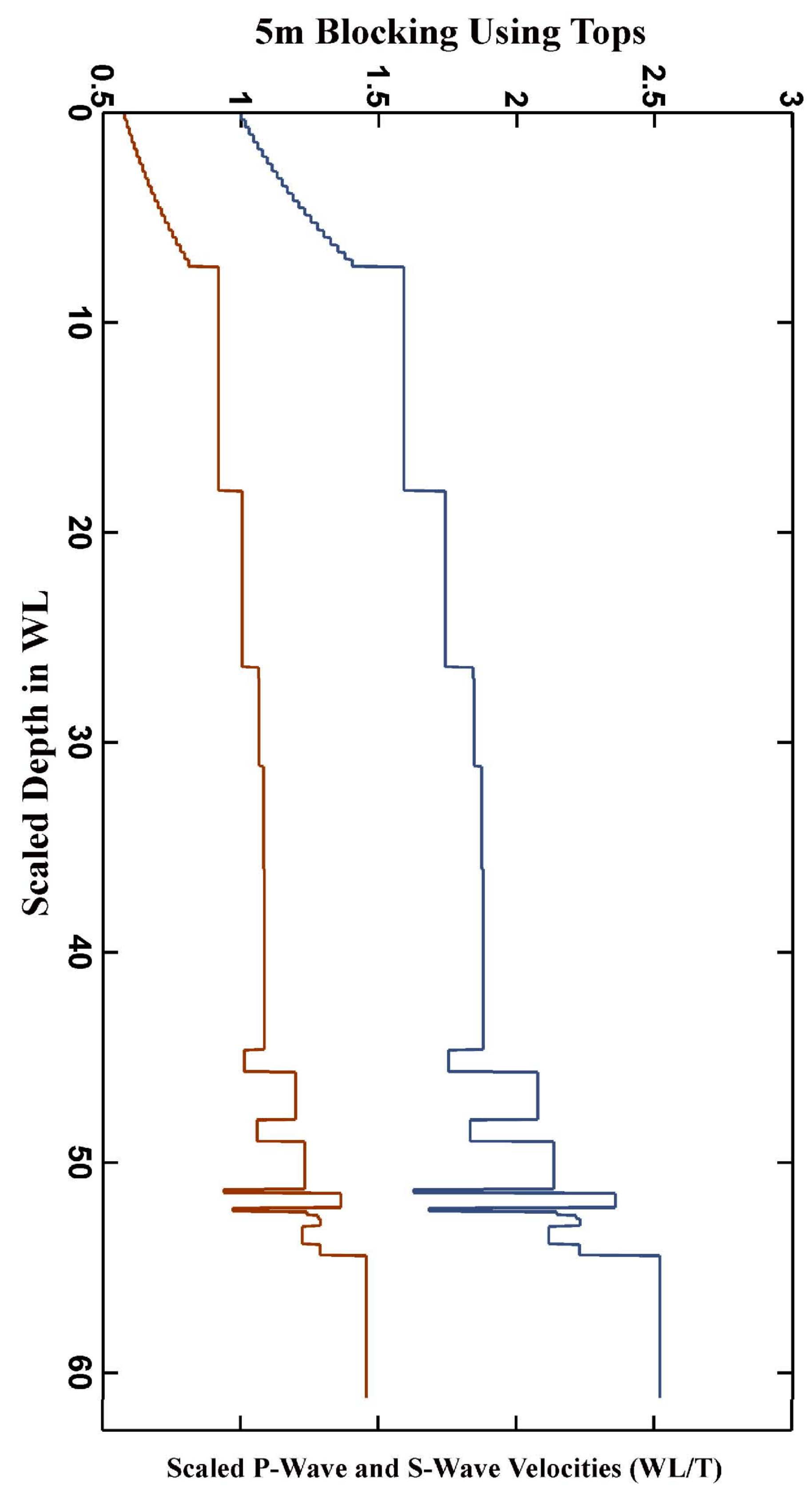
Finite Integral Transforms:

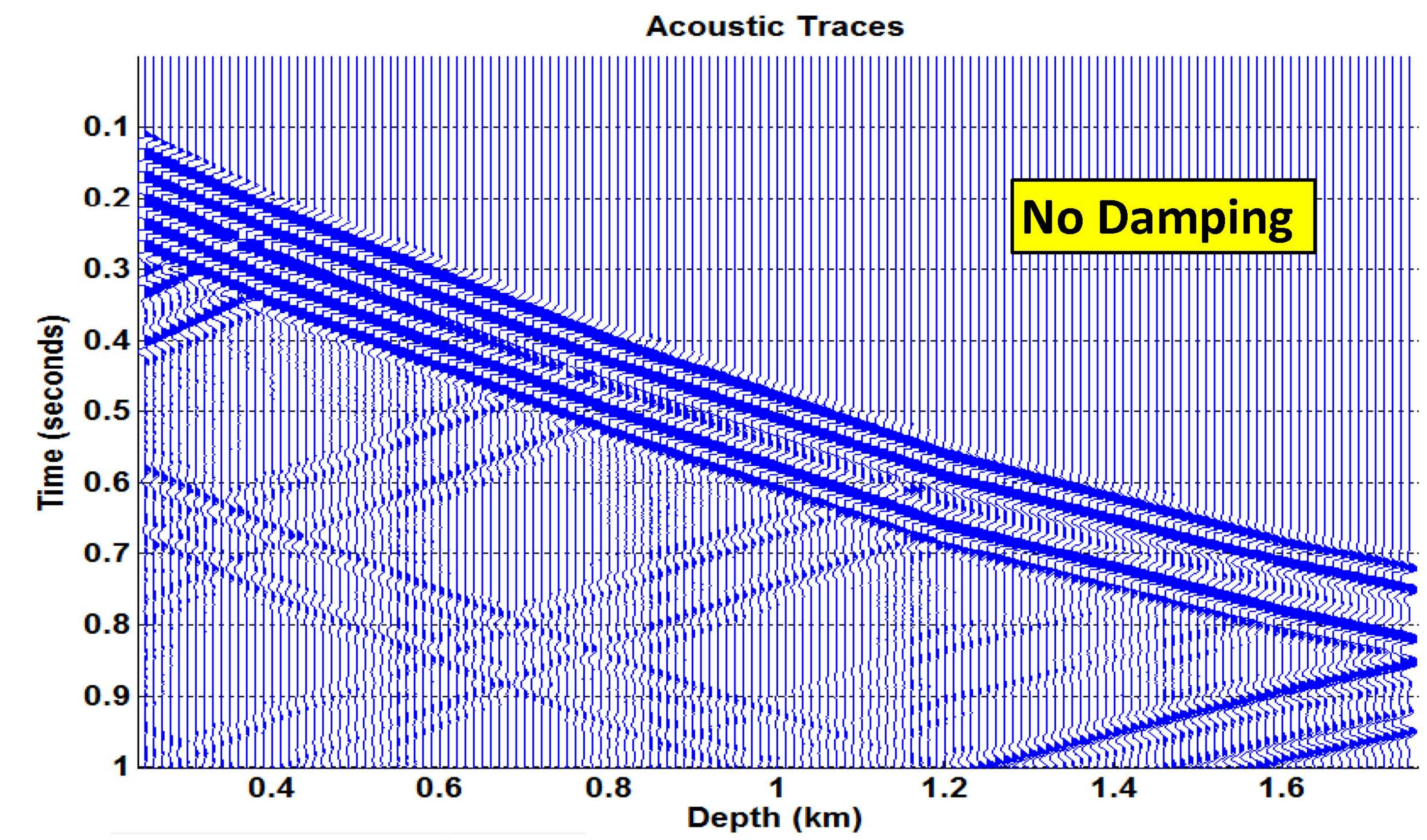
- In an effort to minimize computer resources used and while allowing for the introduction of true *3D* geometrical spreading into the solution, finite integral transforms are often employed. Usually the radial components are transformed away, leaving a finite difference (***FD***) problem in depth (*z*) and time (*t*).
- In the most general case this involves 3 coupled equation in the three unknown components of particle displacement.
- If radial symmetry is assumed, only a finite Hankel transform is required to be applied to produce a ***FD*** problem in (*z*,*t*). Proper choice of model parameters can produce a situation where no allowances need to be made for spurious reflected arrivals from artificially introduced vertical boundaries which can be eliminated. This leaves the bottom model boundary to contend with.

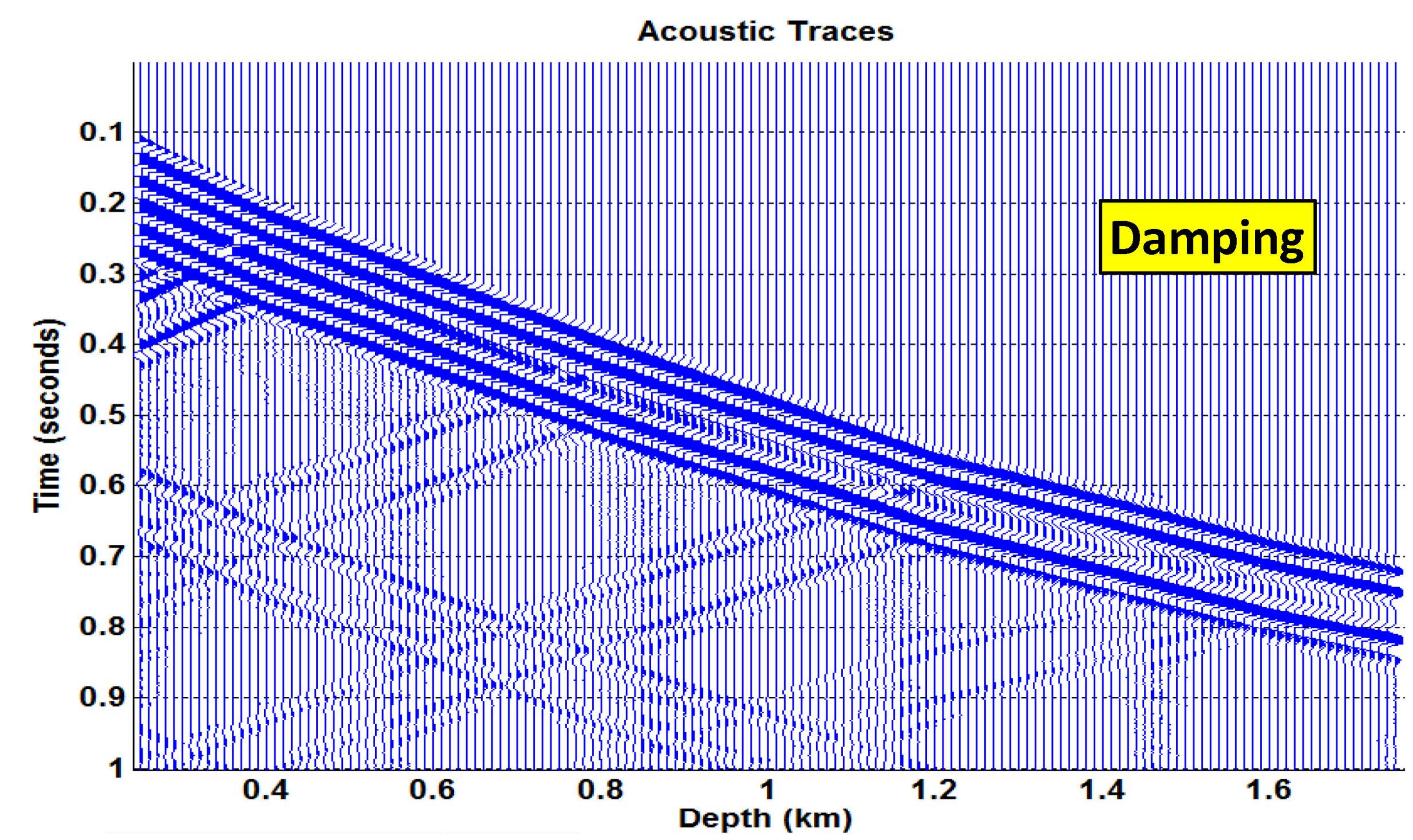
Absorbing Boundaries:

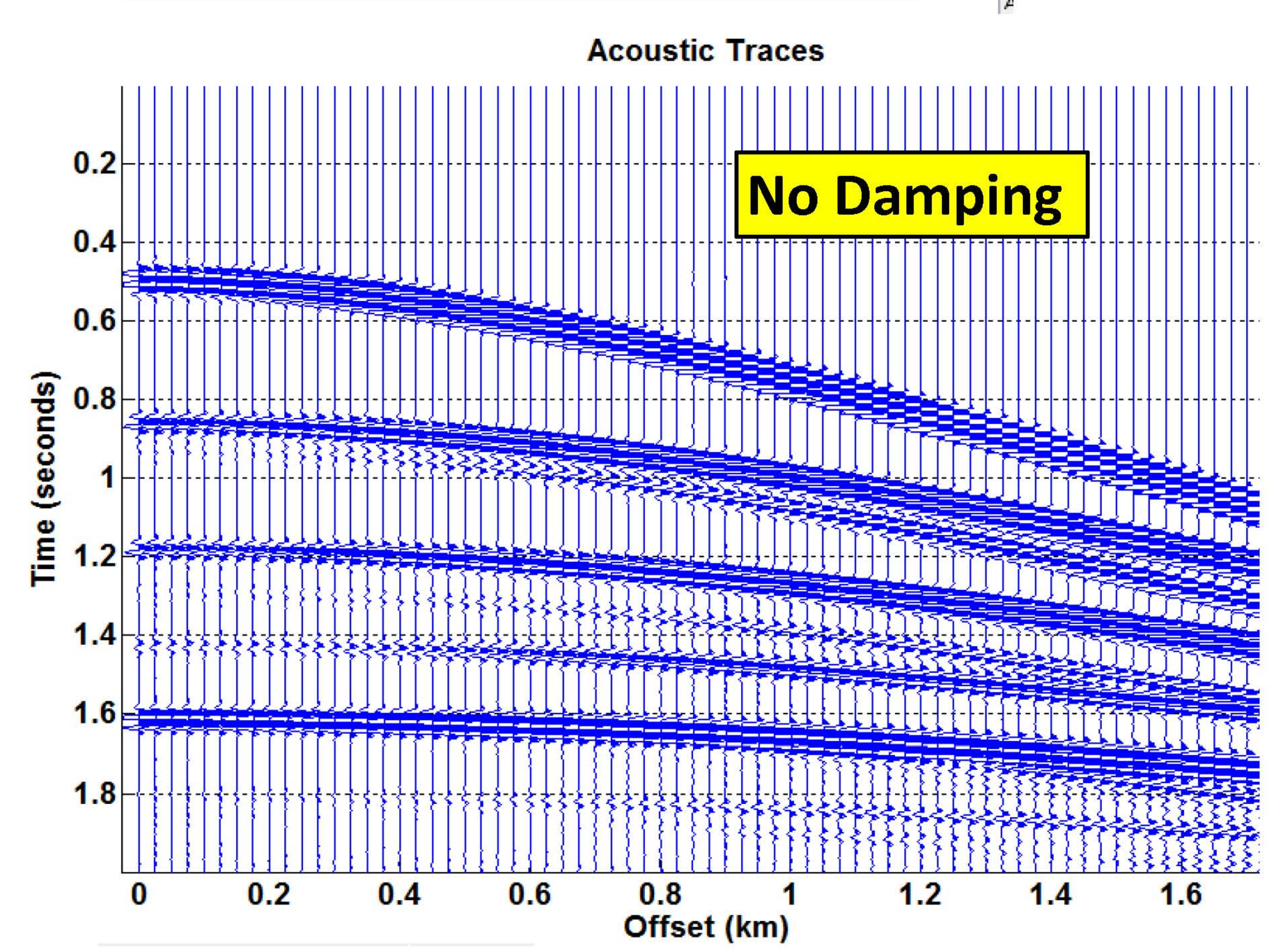
- Clayton and Engquist (1977), using paraxial approximations to the acoustic and elastic wave equations in two spatial dimensions and time (*x*,*z*,*t*), derived absorbing boundary conditions for these two problems. Using their work as a template, analogous boundary conditions may be derived for these two problem types in the cases where the radial spatial components have been transformed. In addition, with some effort, absorbing boundary conditions may be obtained for wave equations with dependence on three spatial dimensions, as well as for more complex problems, such as wave propagation in media types with transversely isotropic or orthorhombic symmetries.
- What is considered here is the simplest of the transformed cases, that of an acoustic wave in a *2.5D* medium which displays radial symmetry. A blocked sonic log, where the block boundaries are defined by the picked tops, has been used as the depth model that will be investigated.

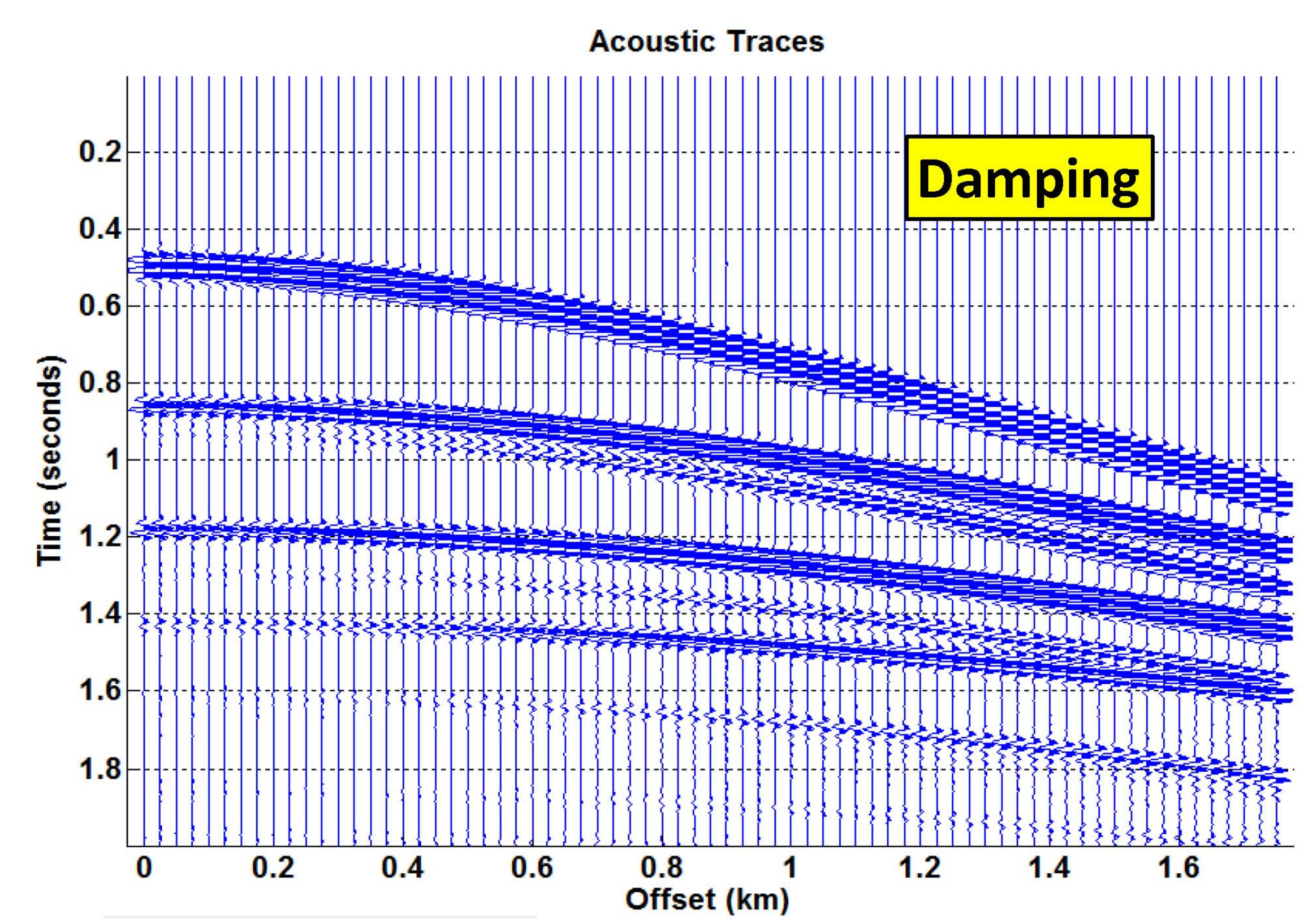


Wavelengths & Periods
1WL = 0.0333km
1T = 0.0028s









Acknowledgements: The author would like to his express his thanks for support from the CREWES Sponsors and NSERC (CRDPJ 379744-08).