Tiger User Manual

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Abstract

Tiger is a 3D finite-difference seismic modeling package capable of producing reflection/transmission surface seismic or VSP data over isotropic or anisotropic targets. The purpose of this work is to create manuals for packages with only internal, and sometimes incomplete, item by item help.

Input parameters

The following variables are kept as 3D arrays if present: Vp, Vs, density, and either Thomsen or Voigt parameters. Wavelets can be produced by the GUI, but may also be replaced with user-supplied versions. One wavelet is required for each shot, sorted into different files by component. A GUI allows control over many additional parameters and performs stability checks which prevent most crashes. It will also pick an operator of an appropriate size, depending on the type of the required calculations.

Input format

Data are supplied in seismic Unix format. Simple, horizontally layered models may be produced by the GUI. Header information is largely typed into the GUI, allowing for very minimal headers which makes using these data more difficult later.

Shot and receiver point locations are specified in ASCII files; a test run will produce examples.

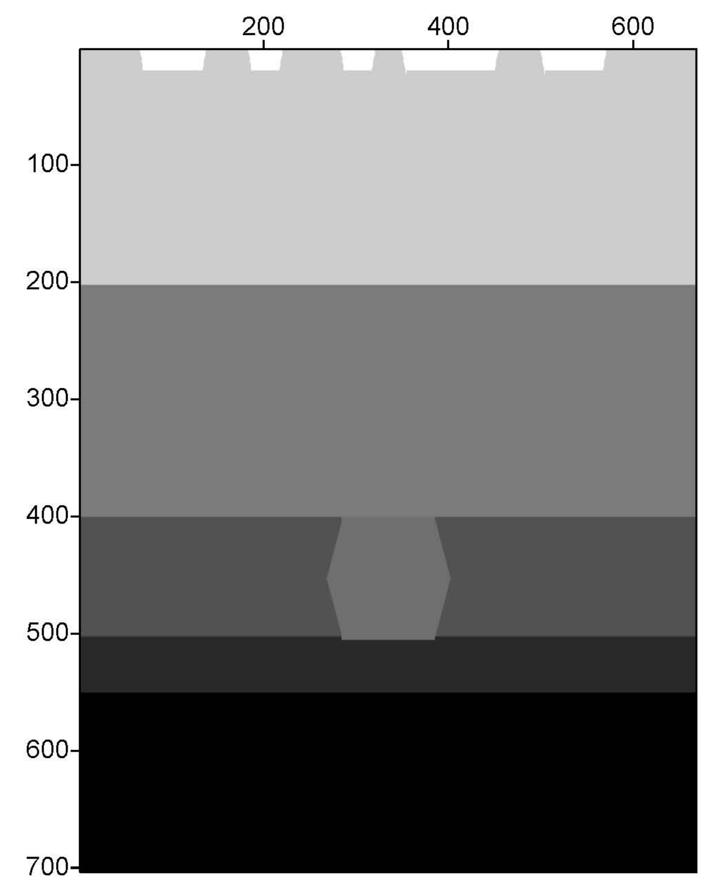
Runtime requirements

To run, a model will require a minimum size of the length of the operator plus two in all directions. These data are then further padded to allow for absorbing (ABS) or perfectly matched layer (PML) boundaries.

The GUI provides an estimate of the least amount of memory that is required, with an option to partition the model along any vertical or horizontal plane(s).

Model

The model used here was provided by Peter Manning. The intention is to compare Tiger results with results from Peter's code using the same wavelets. The model shows several low velocity pockets at the surface, and another buried in the third layer looking like a valley filled in with material from layer two. The low velocity pockets at the top have a velocity of 1400 m/s, the five layers have velocities of 2000, 3000, 3500, 4000, and 4500 m/s. The width of the model is 2 km, the depth is 700 m, and the grid spacing is 3 m.



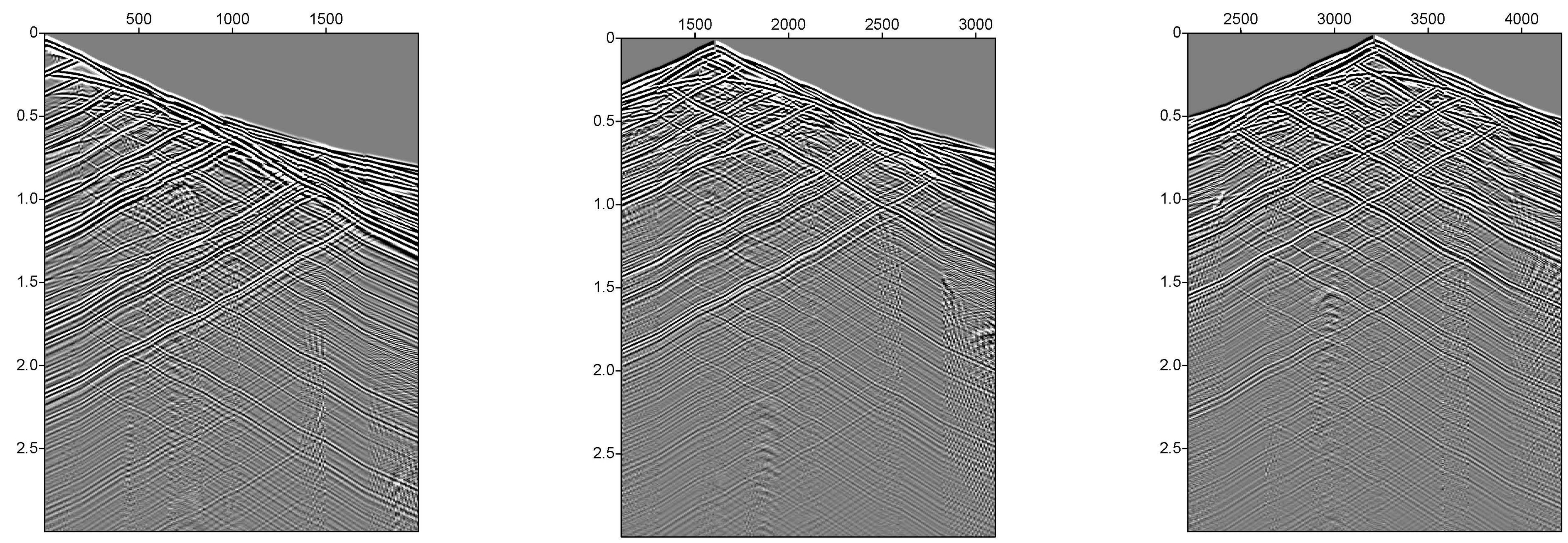
The P-velocity model

Results

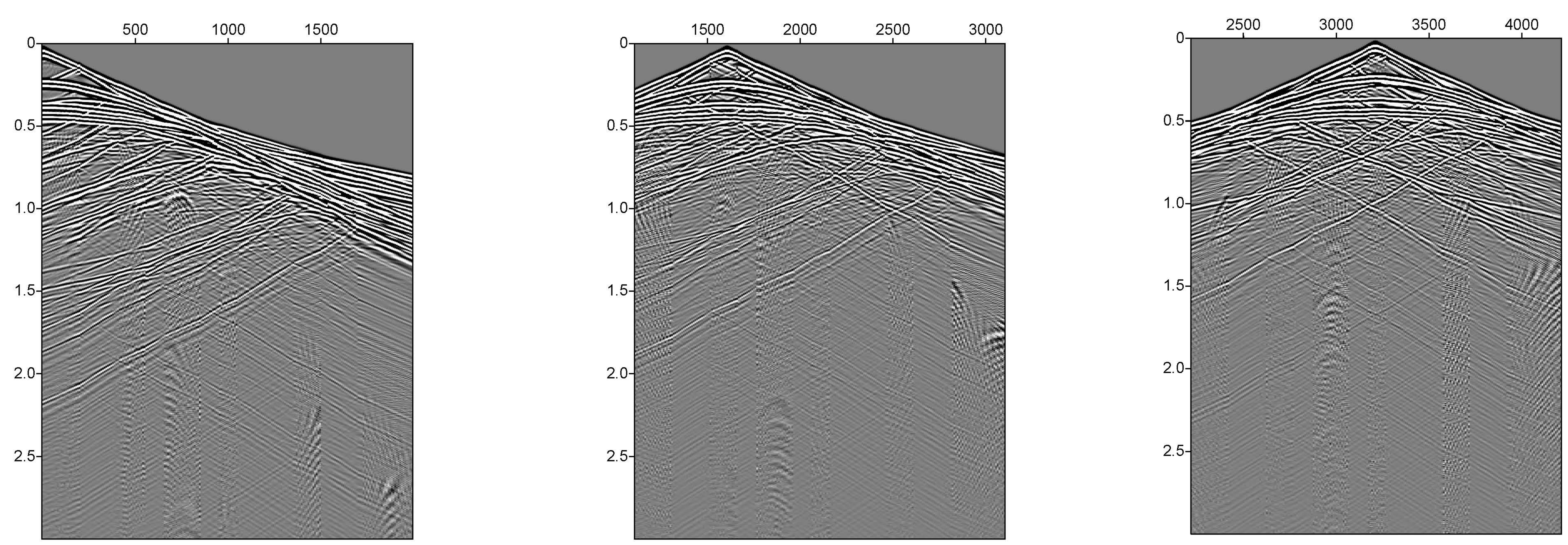
The plots below show x- and z-component records for three different shots. In all cases the presence of high-amplitude data at zero offset overwhelms the other traces, necessitating severe measures such as AGC or amplitude clipping. I used t-scaling with an exponent of one, followed by amplitude clipping in order to display the results.

The uneven first breaks are due to the low velocity pockets.

Reflections and reverberations caused by the vertical walls of the low velocity pockets cause severe overprinting of the reflections from lower horizons.



X-components for three shots at offset s of about 0, 500, and 1000 m. The model is 2000 m wide



Z-components for three shots at offset s of about 0, 500, and 1000 m. The model is 2000 m wide.