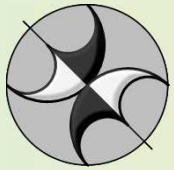
User-defined Wavelet for Modeling



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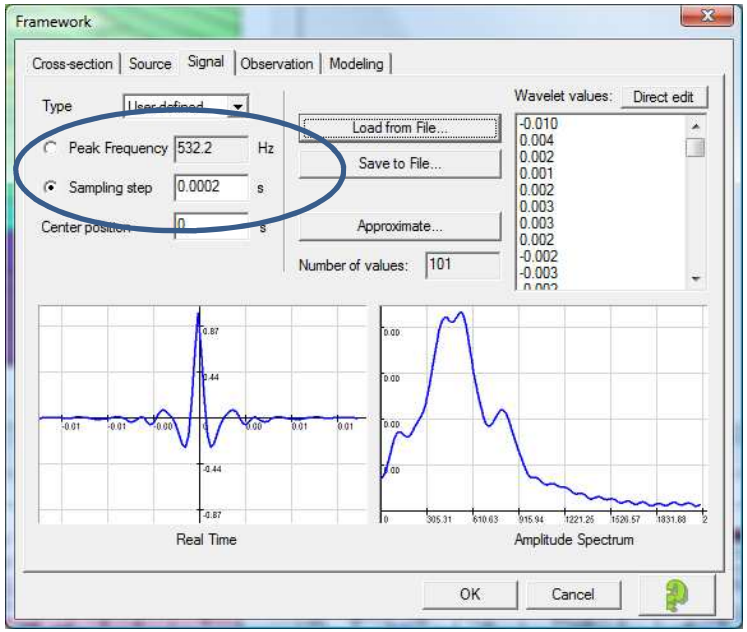
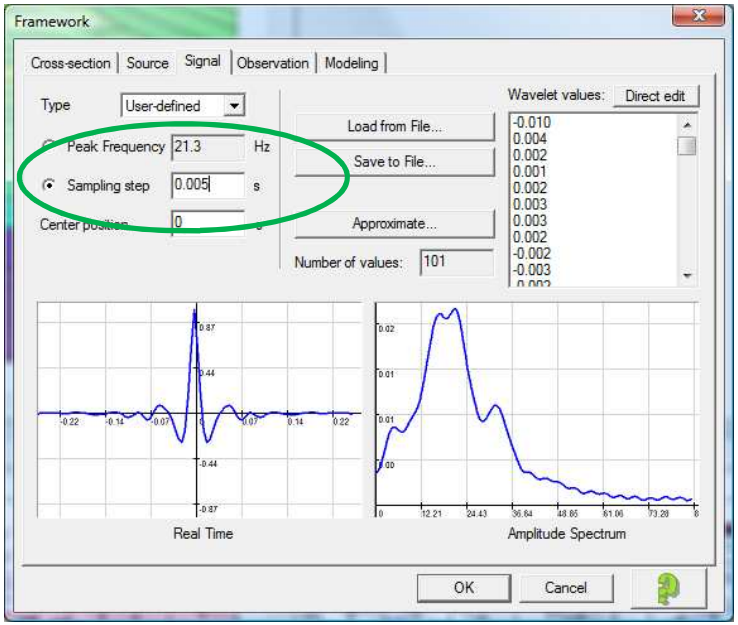
Adjusting User-defined Wavelet

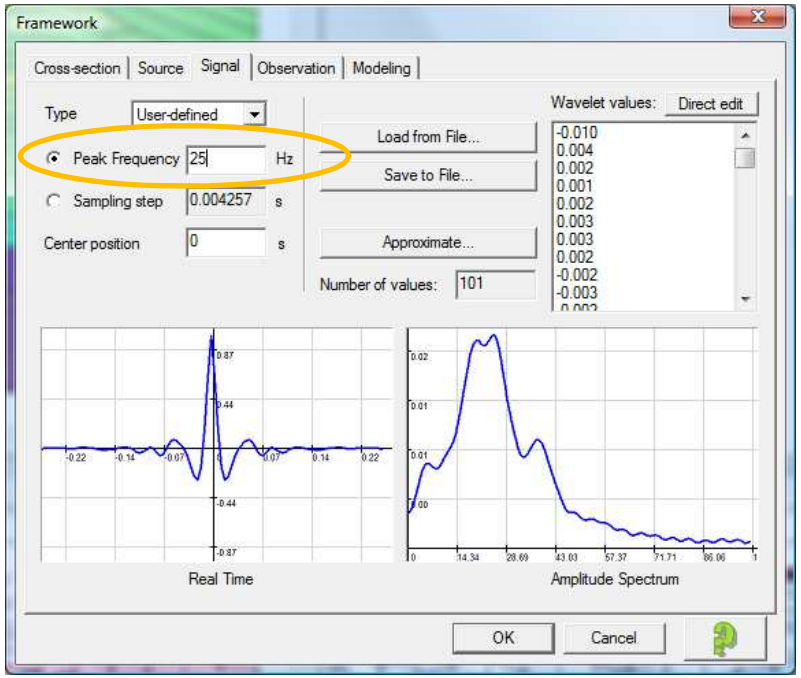


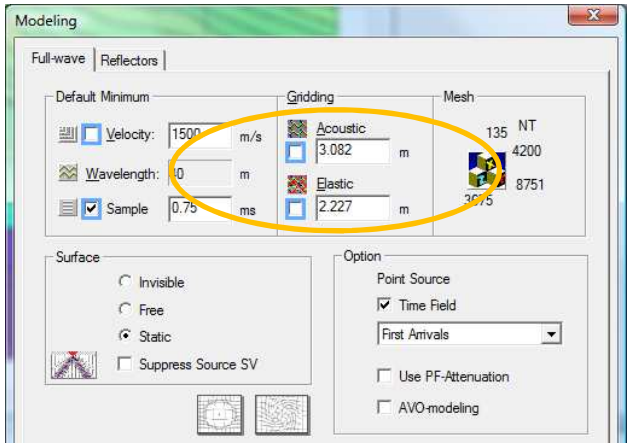
Default sampling step 0.0002 s –
Peak frequency 532 Hz –
Too high?



Entered sampling step 0.005 s–
Peak frequency 21.3 Hz

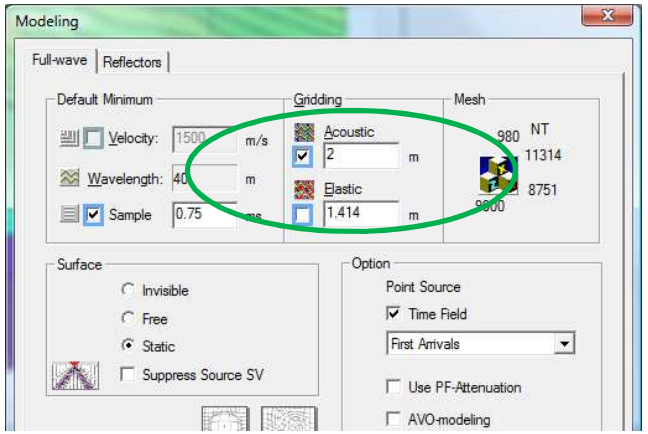
Adjusting user-defined wavelet



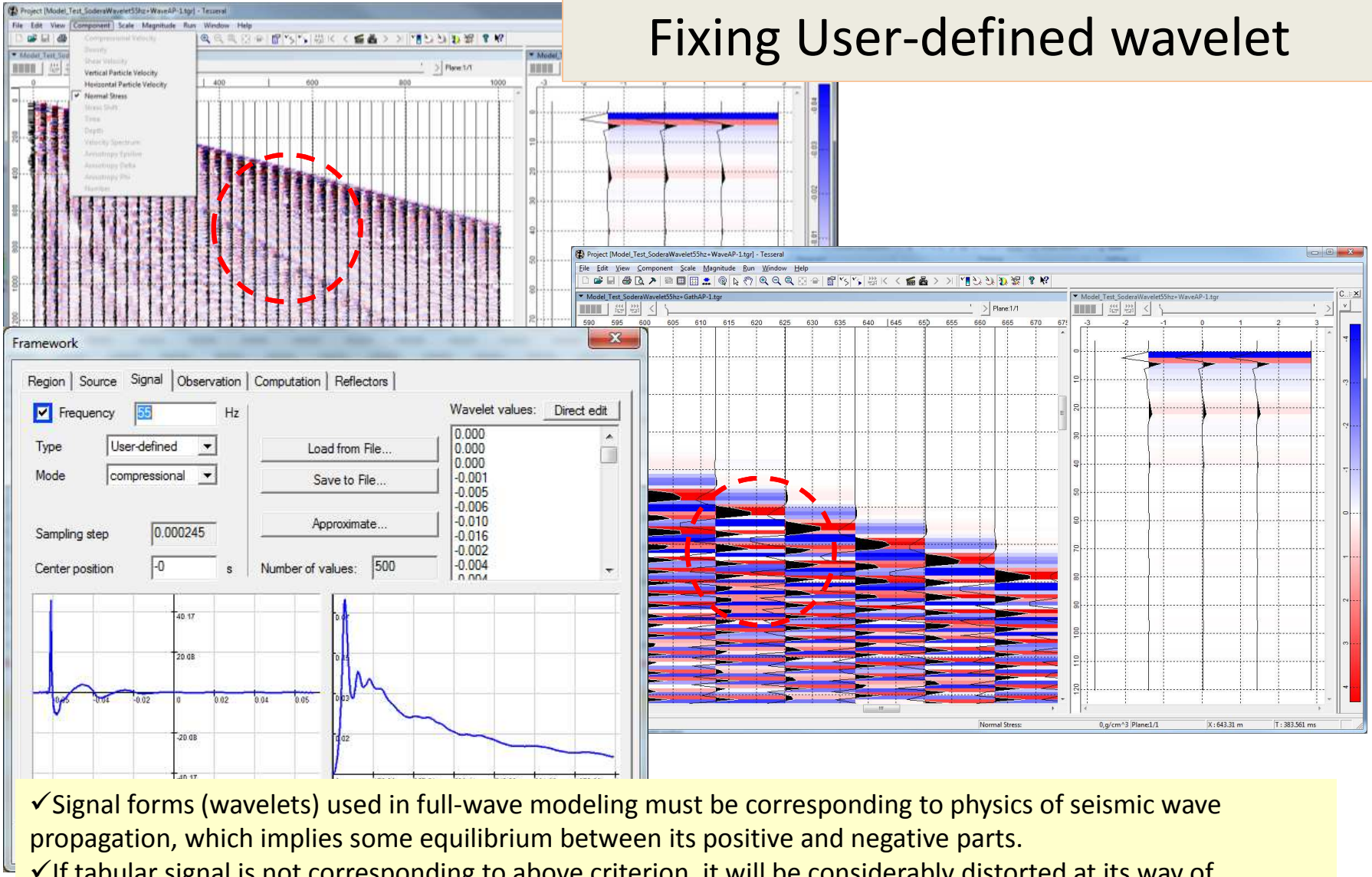


Because wavelet has complex shape it is advised to decrease default values of grid step by approximately 20-30% like in below picture example

User can assign peak frequency value – Here it is 25 Hz



Fixing User-defined wavelet

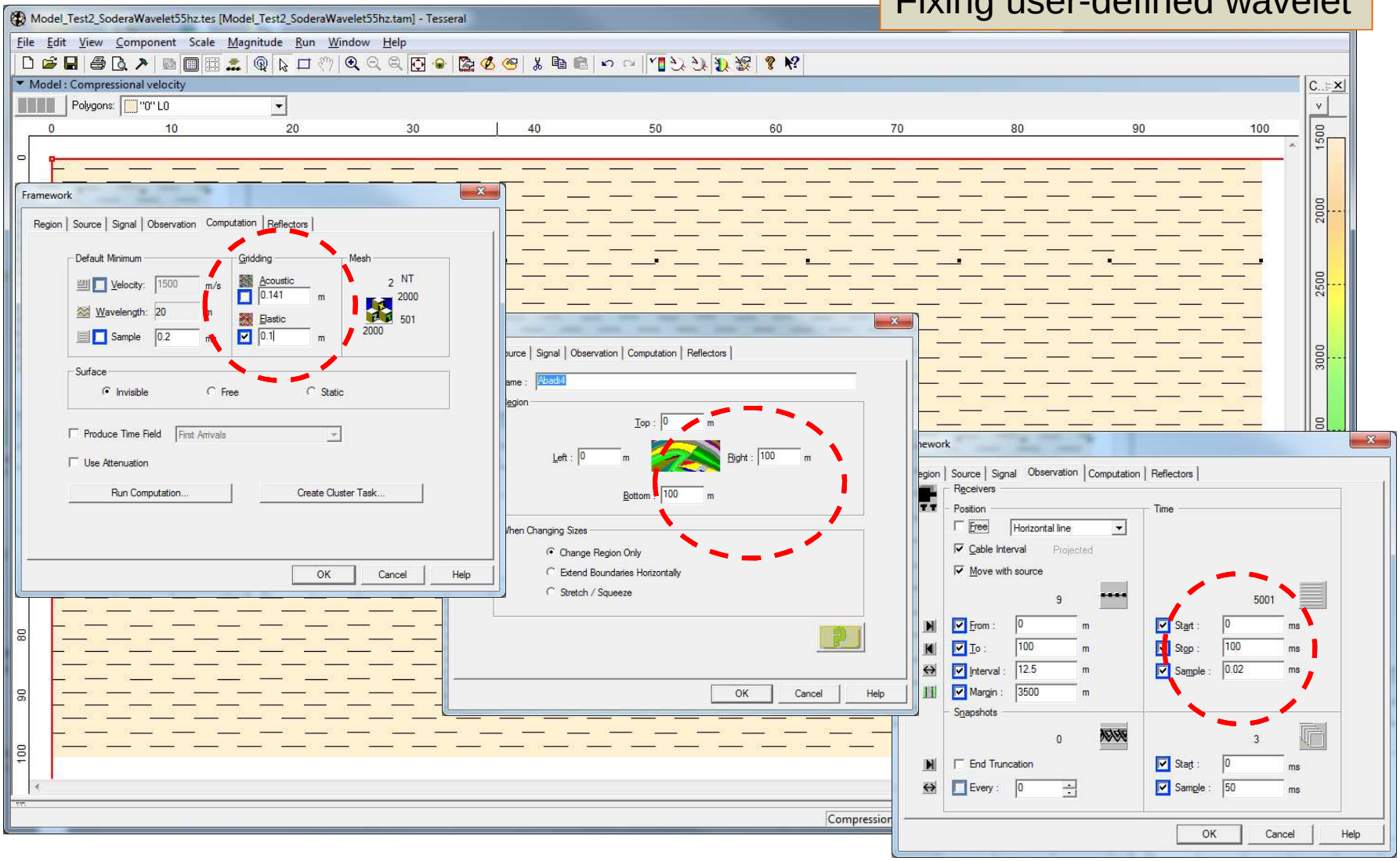


✓Signal forms (wavelets) used in full-wave modeling must be corresponding to physics of seismic wave propagation, which implies some equilibrium between its positive and negative parts.

✓If tabular signal is not corresponding to above criterion, it will be considerably distorted at its way of propagating through the medium. May be even worse is that such distortion will create high-frequency content, which at modeling (with finite grid cell size) with produce a lot of noise of signal aliasing on computational grid.

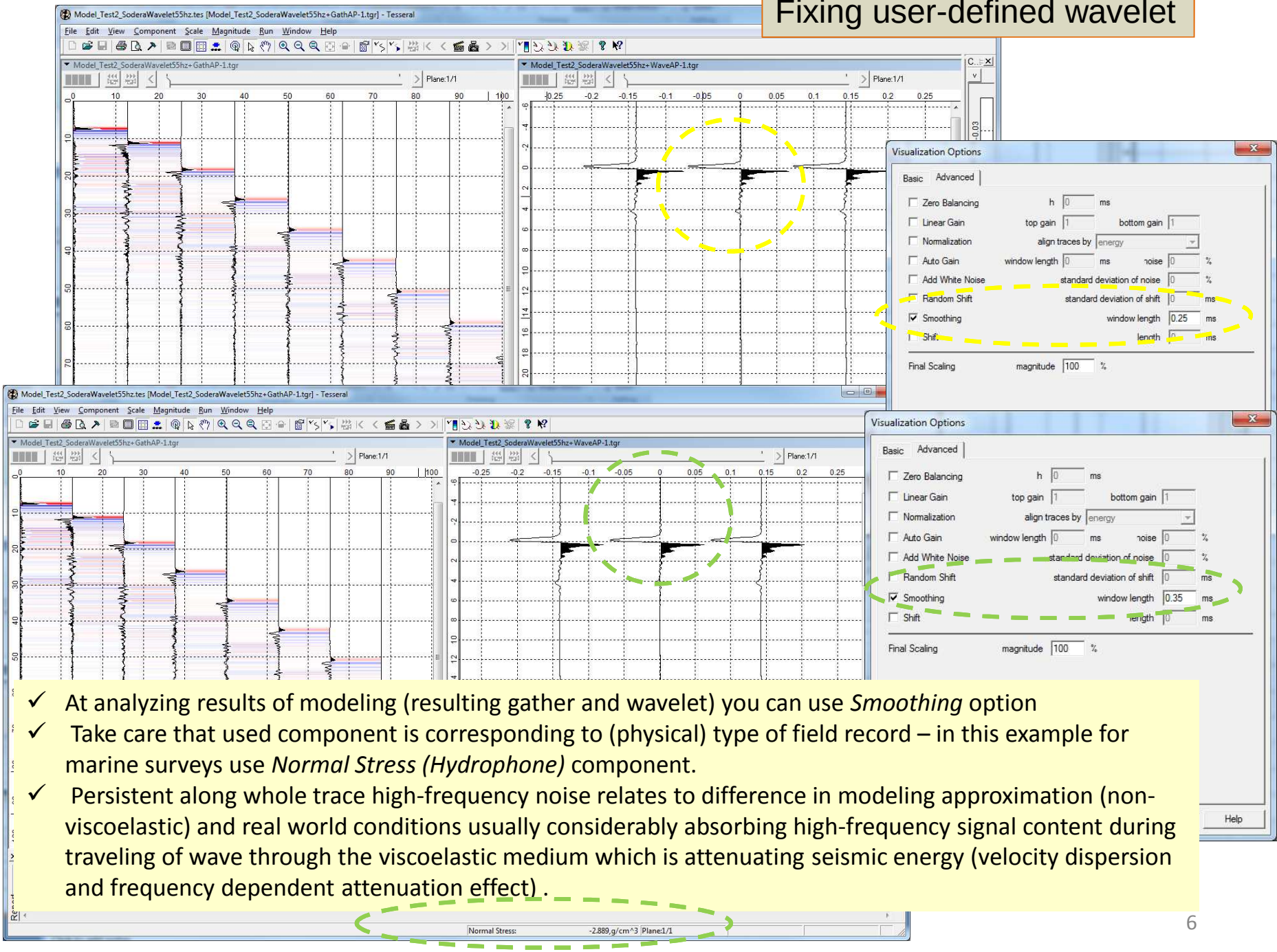
✓To avoid this issue there can be done adjustment of the tabular signal to make it more “physical”.

Fixing user-defined wavelet



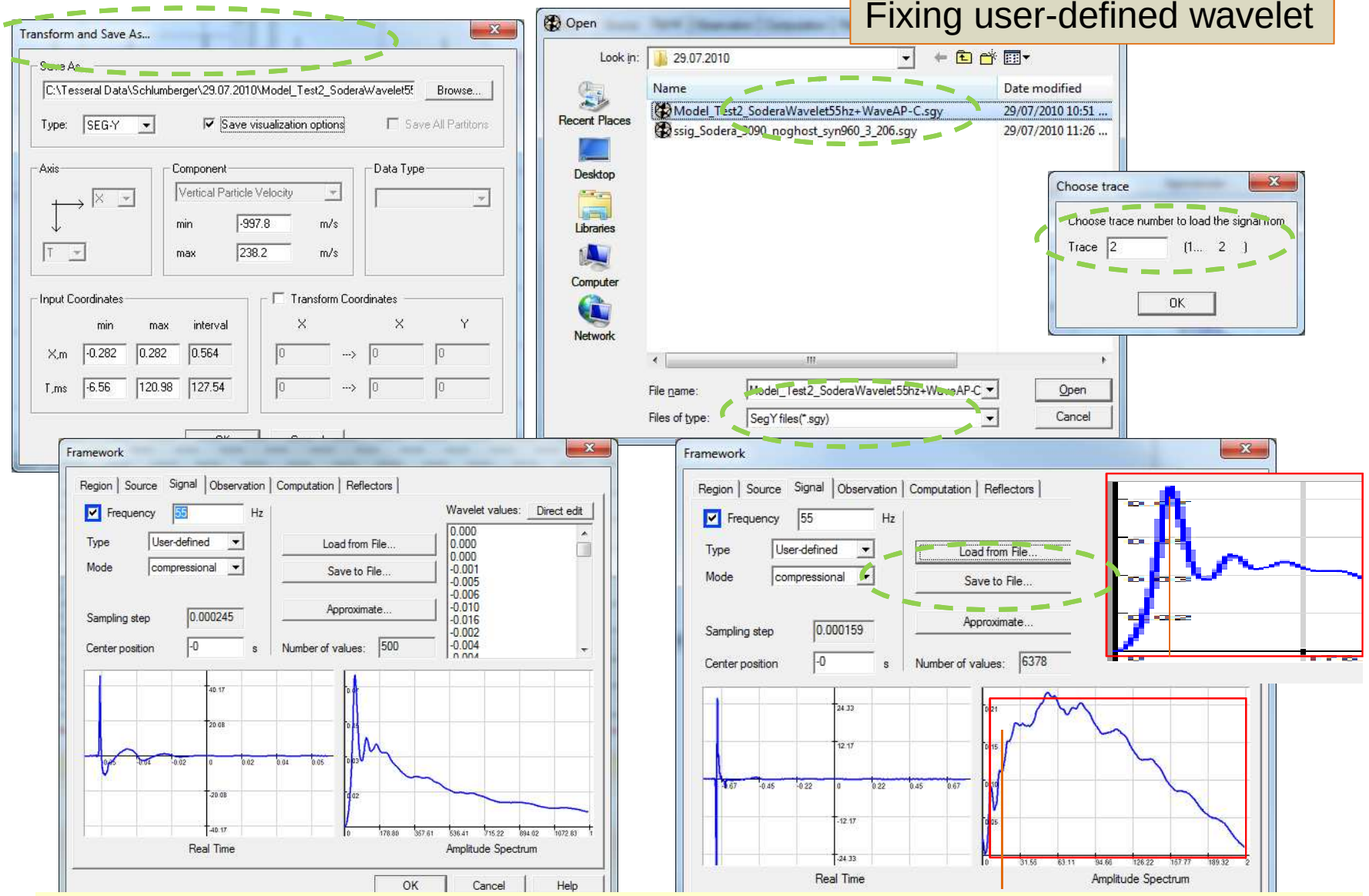
✓Reduce grid cell size a fraction of its default value to have resulting gather and wavelet (...-Wave.tgr) less distorted by grid aliasing;
✓Reduce model to small area around the source (about 1000 cells in each direction);
✓Reduce recording time and other relating observation parameters.

Fixing user-defined wavelet



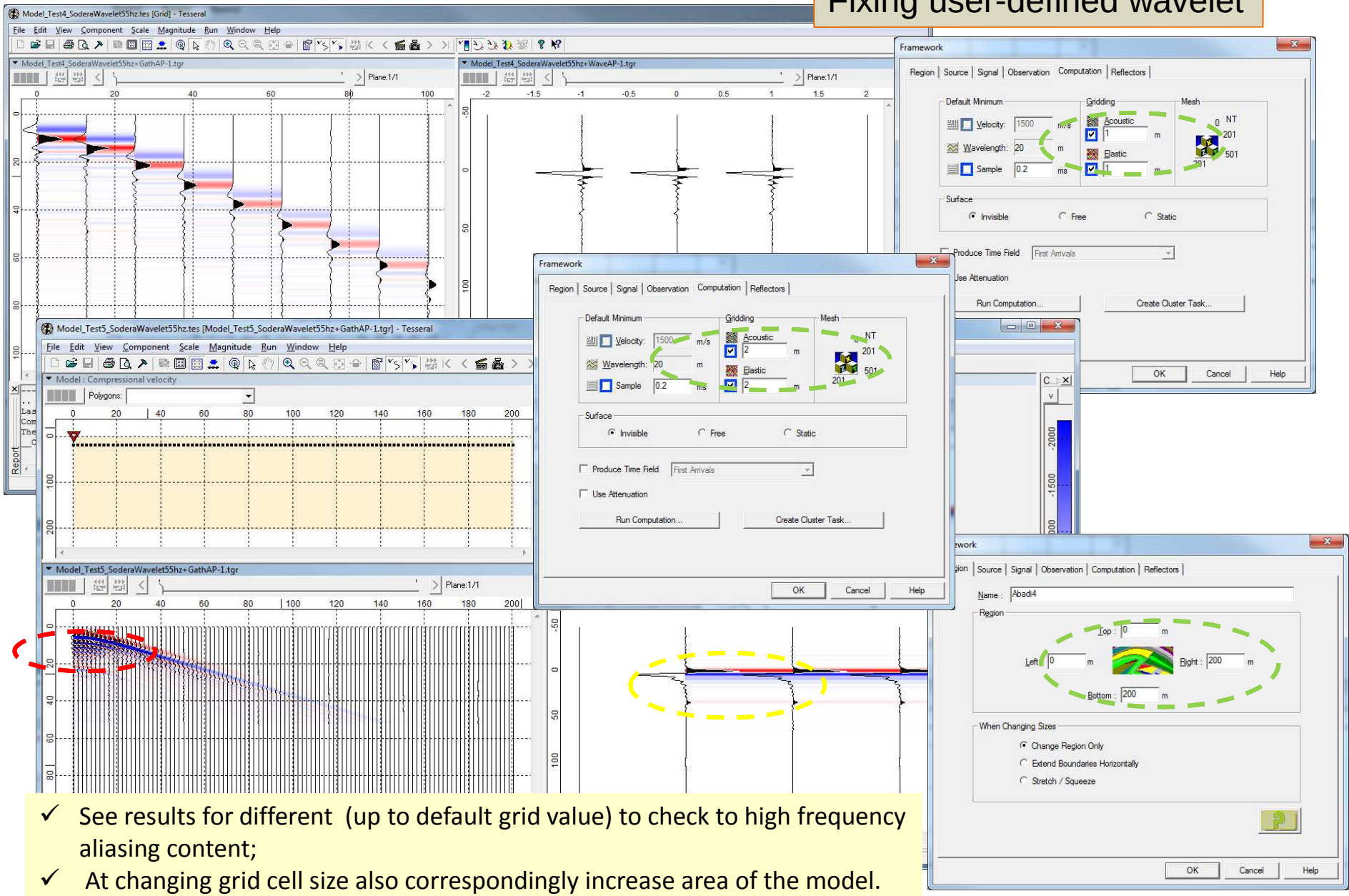
- ✓ At analyzing results of modeling (resulting gather and wavelet) you can use *Smoothing* option
- ✓ Take care that used component is corresponding to (physical) type of field record – in this example for marine surveys use *Normal Stress (Hydrophone)* component.
- ✓ Persistent along whole trace high-frequency noise relates to difference in modeling approximation (non-viscoelastic) and real world conditions usually considerably absorbing high-frequency signal content during traveling of wave through the viscoelastic medium which is attenuating seismic energy (velocity dispersion and frequency dependent attenuation effect) .

Fixing user-defined wavelet



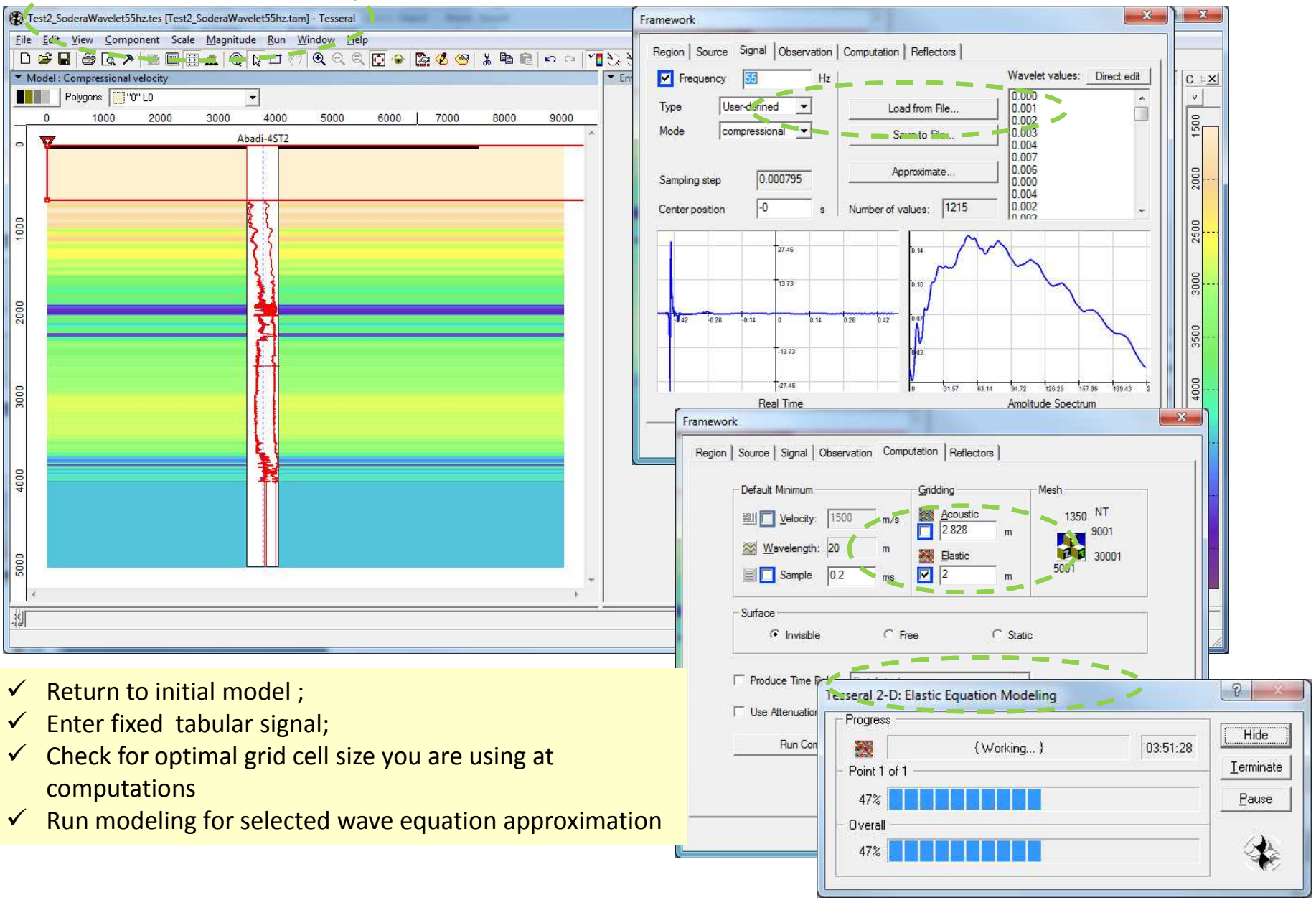
- ✓ Save resulting wavelet with applied visualization options in SEGY format using corresponding dialog and options and *Normal stress* component for *Omnidirectional* source type;
- ✓ In Signal dialog import this file and select 2-nd trace;
- ✓ Please, notice changed signal form and apmlitude spectrum for the fixed wavelet ;
- ✓ Save this signal in tabulat .txt form for further usage.

Fixing user-defined wavelet



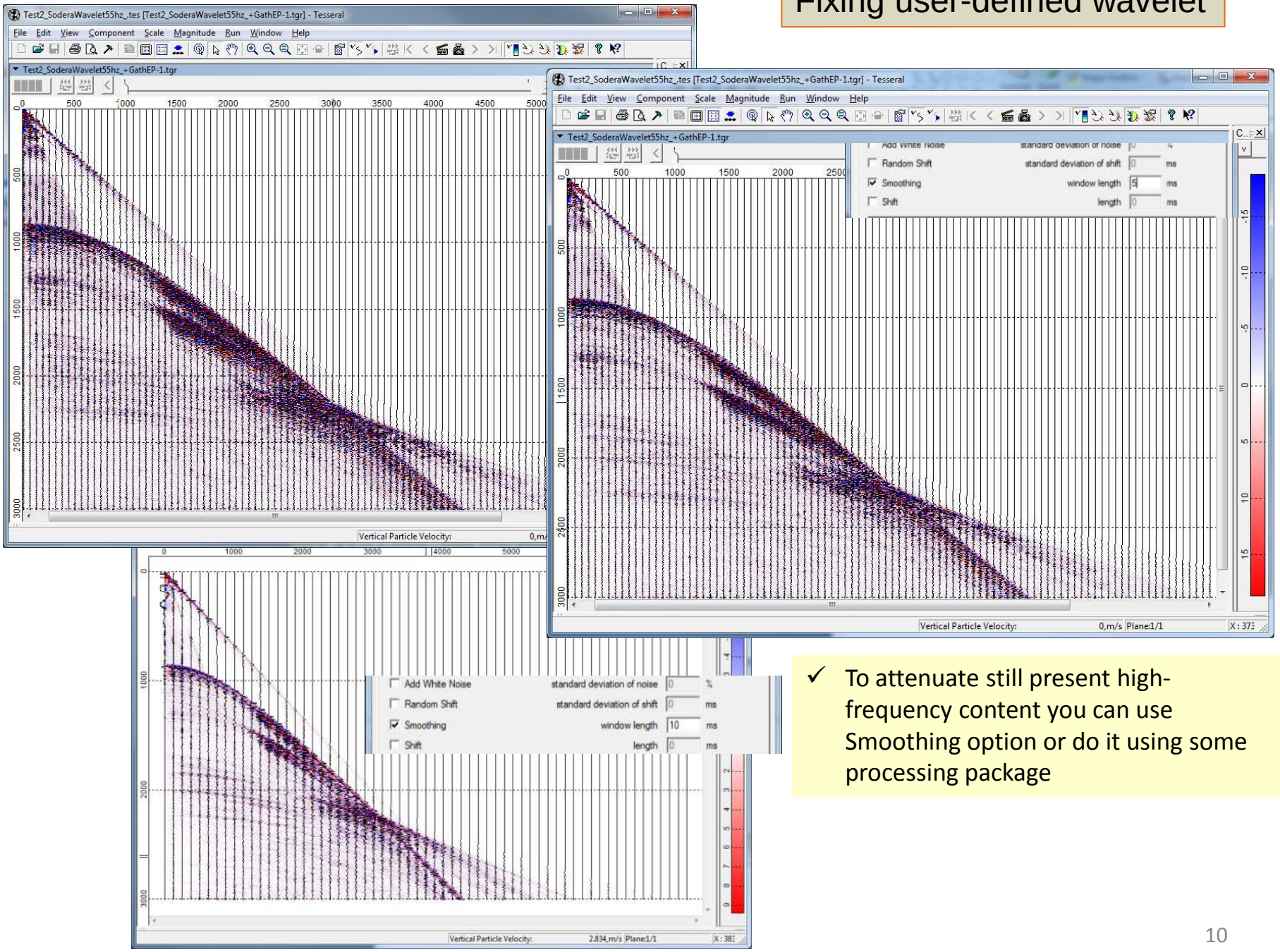
- ✓ See results for different (up to default grid value) to check to high frequency aliasing content;
- ✓ At changing grid cell size also correspondingly increase area of the model.

Fixing user-defined wavelet



- ✓ Return to initial model ;
- ✓ Enter fixed tabular signal;
- ✓ Check for optimal grid cell size you are using at computations
- ✓ Run modeling for selected wave equation approximation

Fixing user-defined wavelet



- ✓ To attenuate still present high-frequency content you can use Smoothing option or do it using some processing package