Q tools: Summary of CREWES software for Q modelling and analysis

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Contents of Qtools

These are a collection of tools intended to illustrate and explore the constant Q model of attenuation.

Functions:

EINAR ... creates the constant Q impulse response (wavelet) based on Kjartansson's 1979 paper

QMATRIX ... creates a matrix which can be applied to a reflectivity or to a stationary trace to install minimum phase time-frequency decay. This is the transmission effect of Q. Options exist to model drift delay relative to Nyquist or, more realistically, relative to sonic logging frequencies.

INVQ ... design an inverse Q matrix. This is done by finding a pseudo inverse to the forward problem (qmatrix). The pseudo inverse is used to allow thresholding of the singular values.

FAKEQ ... given velocity and density logs, invent a Q log based on empirical rules.

TDRIFT ... calculate the drift time. This is the traveltime difference at seismic frequencies minus that at logging frequencies.

DRIFT_CORR ... given a seismogram computed with logging velocities, apply the drift delay to simulate having done the computation with check-shot corrected velocities.

QESTIMATOR ... estimate Q by various methods.

QZ2QINT ... given a finely layered Q model as a function of z, compute the effective interval Q over a large interval. This is the expected result of a Q measurement.

VSPMODELQ ... compute a 1D VSP given a Q model and velocity and density logs. Based on Ganley 1981.

Demonstration scripts

DEMO_Q_WAVELETS ... show the basic nature of Q wavelets using einar.

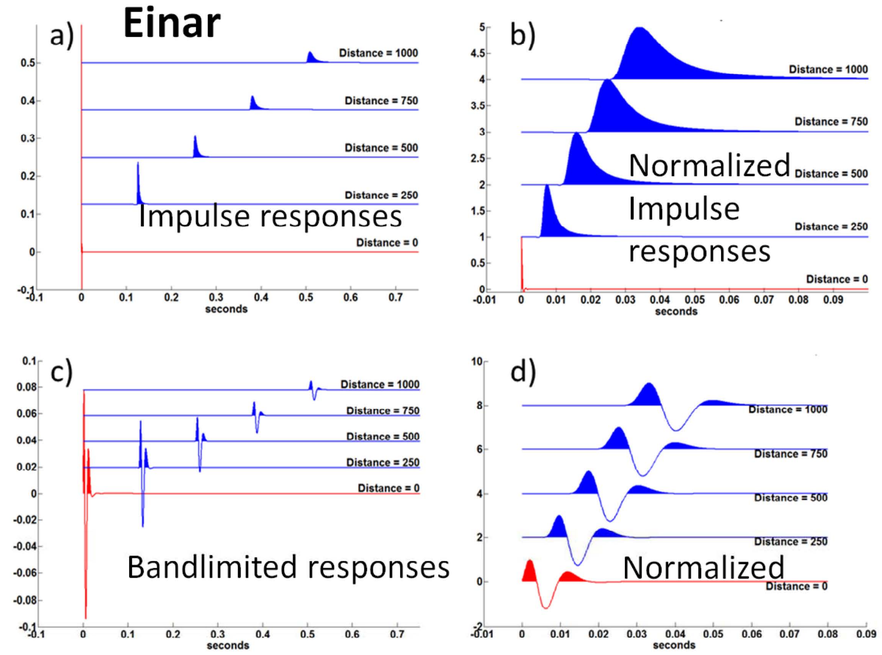
DEMO_CONVMTX_QMTX ... illustrate the creation of stationary and nonstationary synthetic seismograms using Toeplitz convolution matrices and nonstationary Q matrices.

DEMO_INVQ ... shows the use of the invq command to render a nonstationary seismogram stationary.

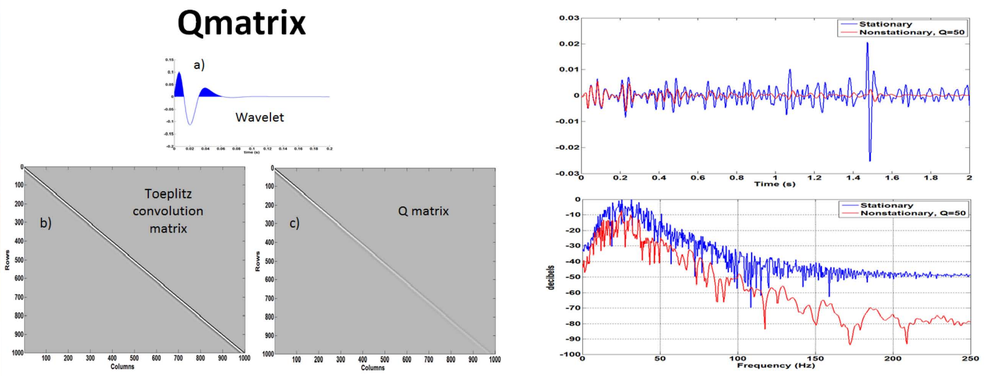
TEST_QESTIMATOR ... demo the use of qestimator.

TEST_VSPMODELQ ... demo the creation of VSP synthetics using vspmodelq.

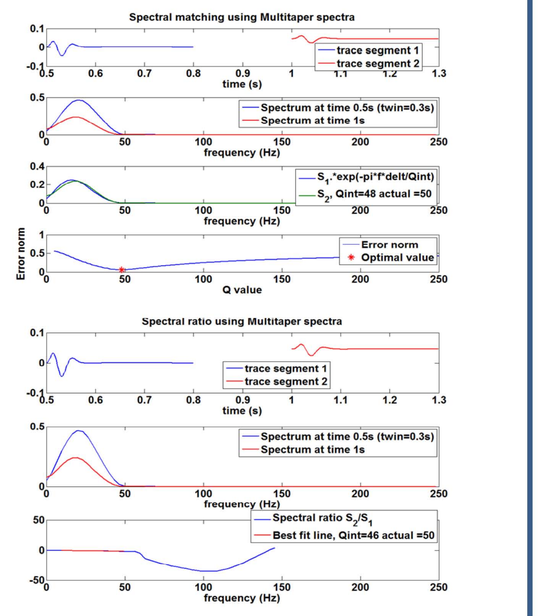
Einar



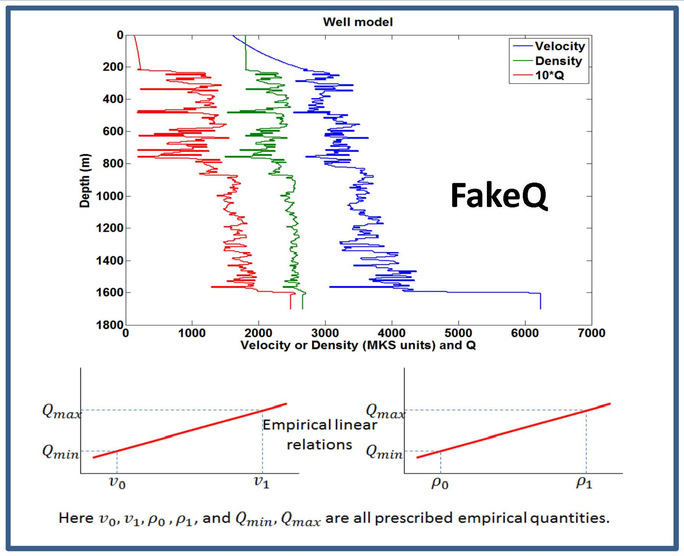
Qmatrix



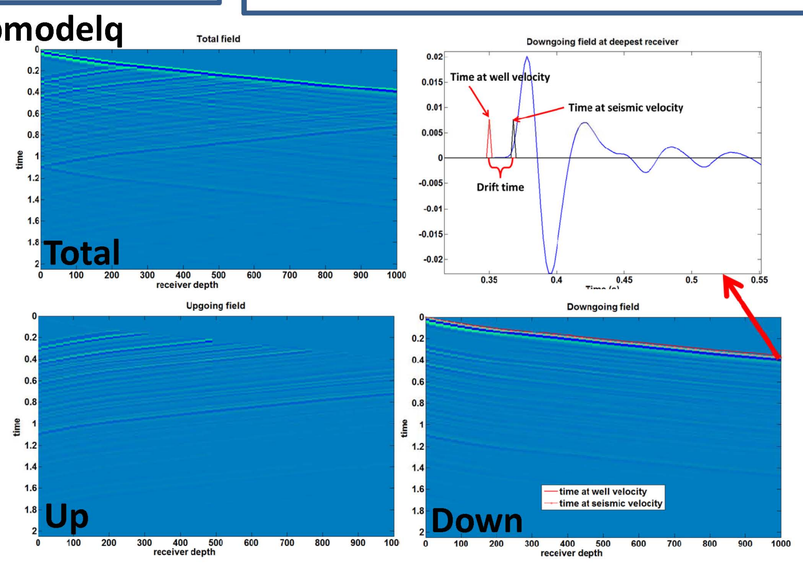
Qestimator



FakeQ



Vspmodelq



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