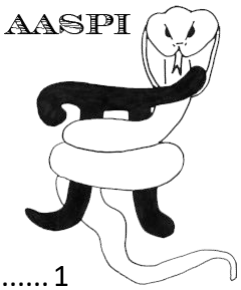
Computing the root mean square (RMS) amplitude – PROGRAM rms_amplitude

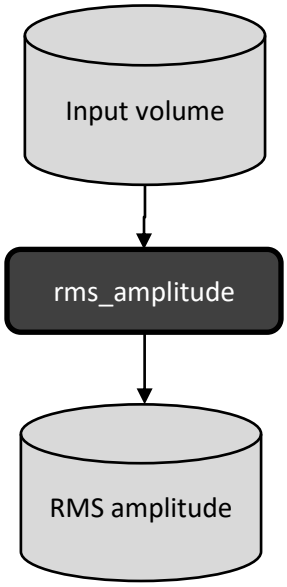


Overview

The root-mean-squared amplitude of the seismic data is one of the simplest and most used seismic attributes, particularly when trying to map the energy within a package about a noisy horizon.

Computation Flow Chart

Program **rms_amplitude** reads in an input seismic or attribute volume and computes the root-mean-square amplitude within a running time window:



Output file naming convention

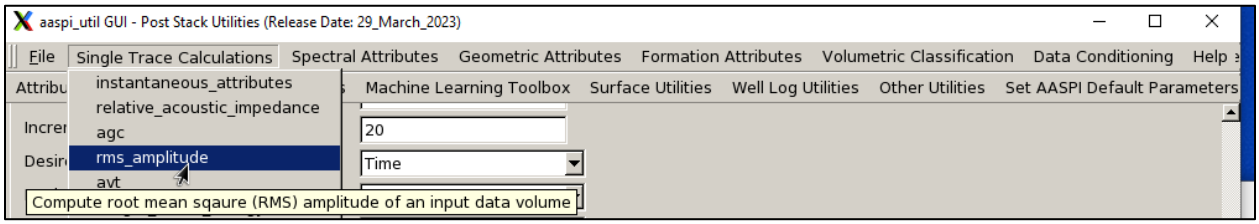
Program **rms_amplitude** will always generate the following output files:

Output file description	File name syntax
RMS amplitude of the data volume	rms_amplitude_*unique_project_name_suffix*.H
program log information	rms_amplitude_*unique_project_name_suffix*.log
program error/completion information	rms_amplitude_*unique_project_name_suffix*.err

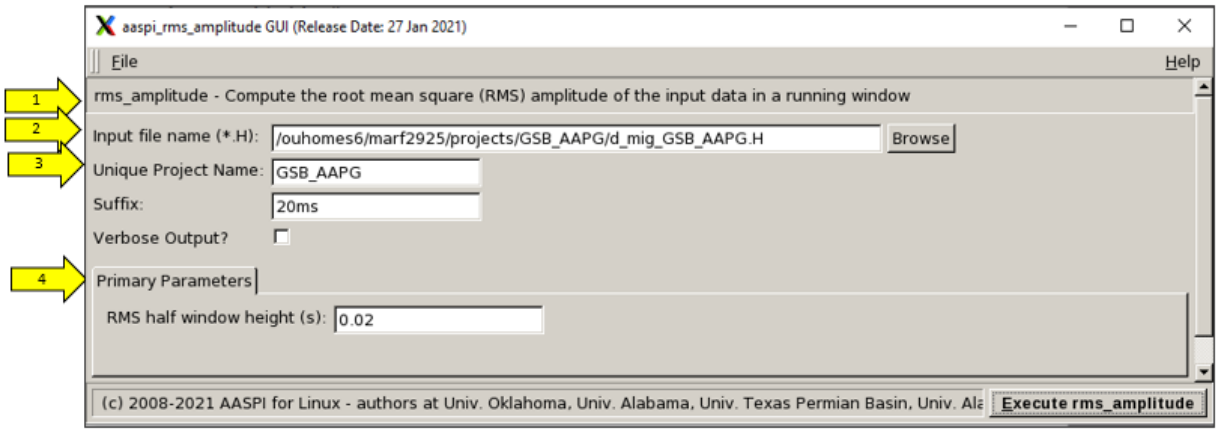
where the values in red are defined by the program GUI. The errors we anticipated will be written to the **.err* file and be displayed in a pop-up window upon program termination. These errors, much of the input information, a description of intermediate variables, and any software trace-back errors will be contained in the **.log* file.

Invoking the rms_amplitude GUI

Program **rms_amplitude** is launched from the *Single Trace Calculations* tab within in the main **aaspi_util** GUI:



The following GUI appears:



Begin by (1) entering the input data volume file name and (2) unique project name and (3) an appropriate suffix. Next, define the (4) half-height of the RMS amplitude window, $T=K\Delta T$, used in equation 1. For time domain data, the default value is 1 s. Finally, click the *Execute rms_amplitude* button to invoke the program.

Theory

The RMS amplitude is simply the standard deviation, $\sigma(t)$, of the data, $d(t)$, within a running analysis window. For a window that ranges from $-T=-K\Delta t$ to $+T=+K\Delta t$ about a sample j the RMS amplitude is

$$d_{\text{RMS}}(j\Delta t) \equiv \sigma(j\Delta t) = \left(\frac{1}{2K+1} \sum_{k=-K}^{+K} \left\{ d\left[(j+k)\Delta t\right] \right\}^2 \right)^{1/2}. \quad (1)$$

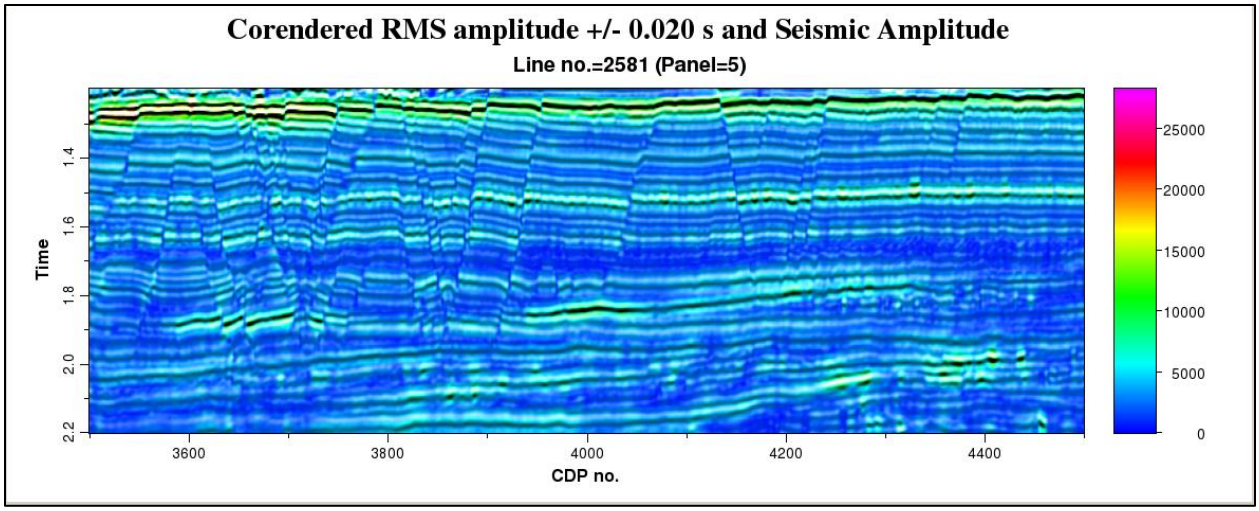
Because the window may be long, a more efficient implementation is to use an add/drop computation scheme, whereby

$$\sigma^2(j\Delta t) = \sigma^2\left[(j-1)\Delta t\right] + \left(\left\{ d\left[(j+K)\Delta t\right] \right\}^2 - \left\{ d\left[(j-K-1)\Delta t\right] \right\}^2 \right) \quad (2)$$

and where the variance $\sigma^2(t)$ is computed in double precision to avoid round-off errors.

Example

The first example shows a vertical slices through the RMS amplitude volume computed using a ±0.020 s (11 samples total) corendered with the seismic amplitude data for a Great South Basin, New Zealand:



Choosing a shorter analysis window of ±0.008 (5 samples total):