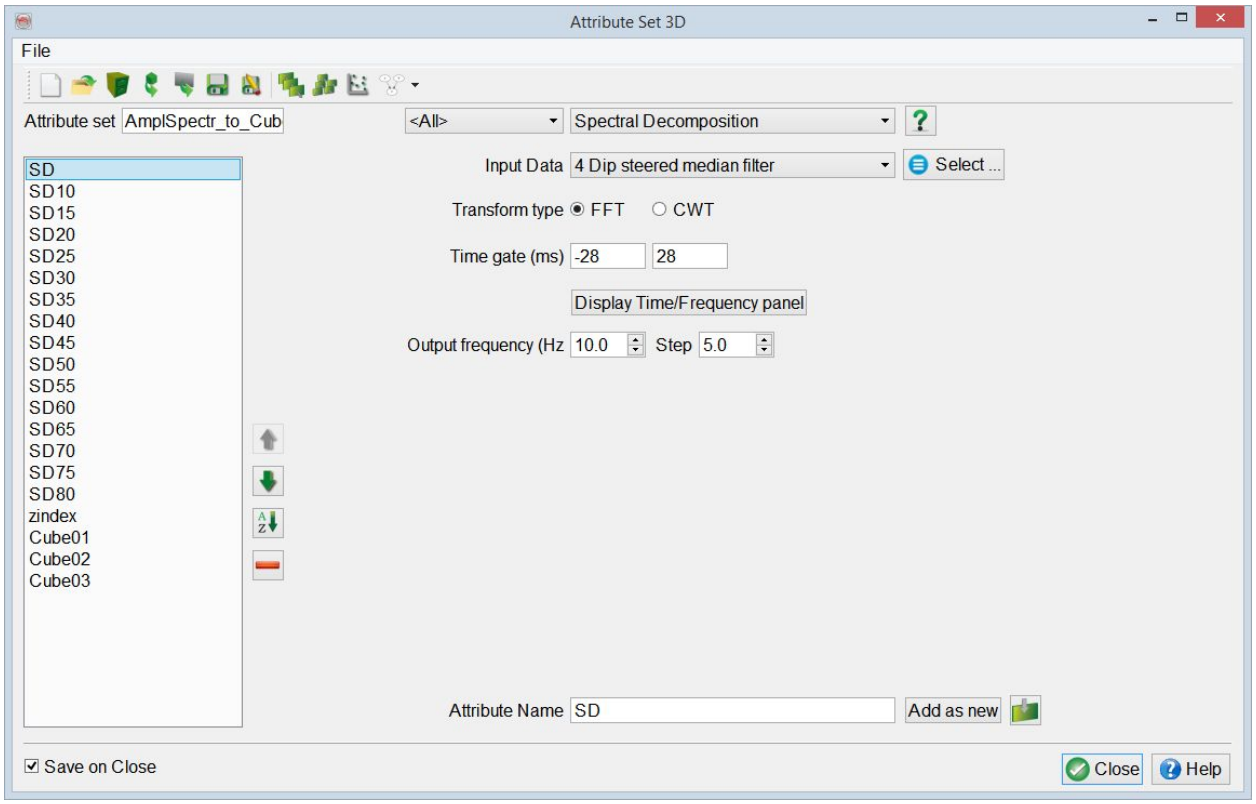
How to create a Zone-of-Interest Tuning Cube in OpendTect.

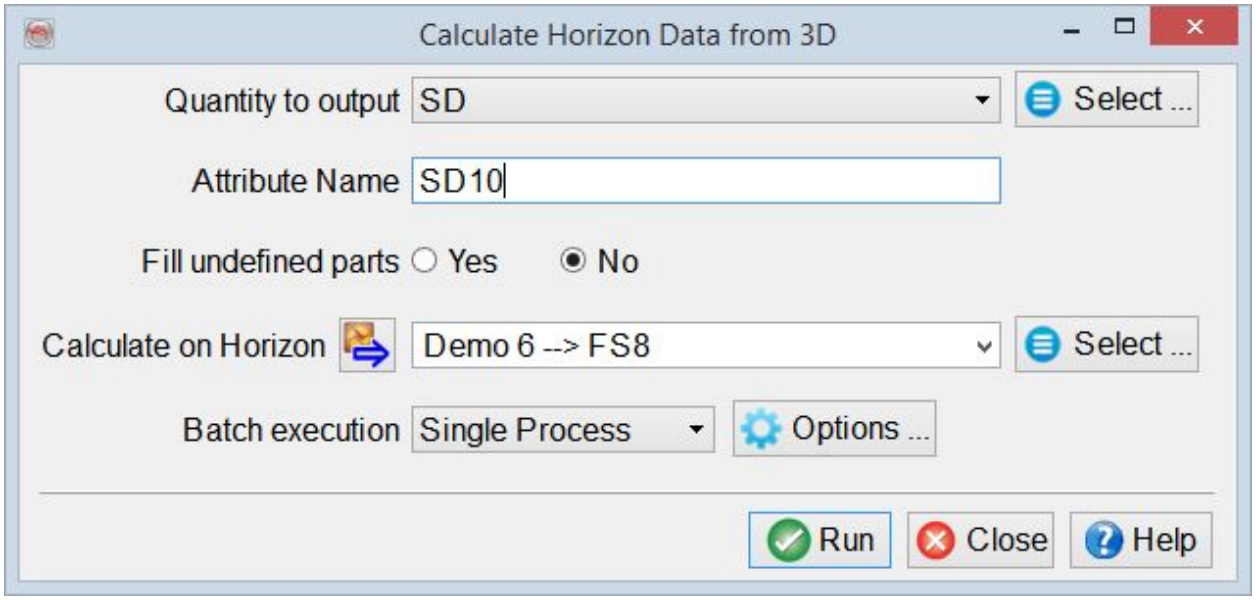
This is a workflow to create a zone-of-interest tuning cube (a cube which represents local amplitude spectrum calculated using spectral decomposition along seismic horizon) as described by Greg Partyka in 1999.

Step 1: Compute attribute grids on a horizon of interest.

1. Define *Spectral Decomposition* attribute:

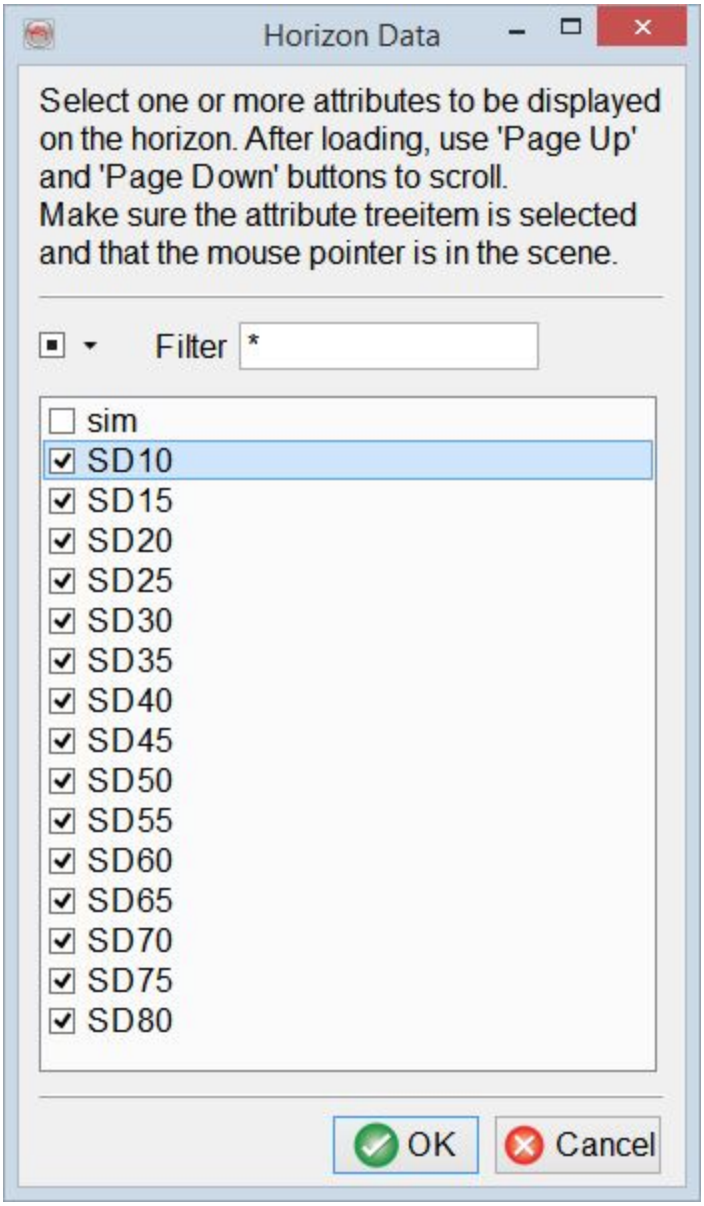


2. Go to *Processing* > *Create Horizon Output* > *Attributes* > *3D*.



3. Repeat these two steps to compute Spectral Decomposition grids on the horizon: for example, from 10 to 80 Hz with a step of 5.

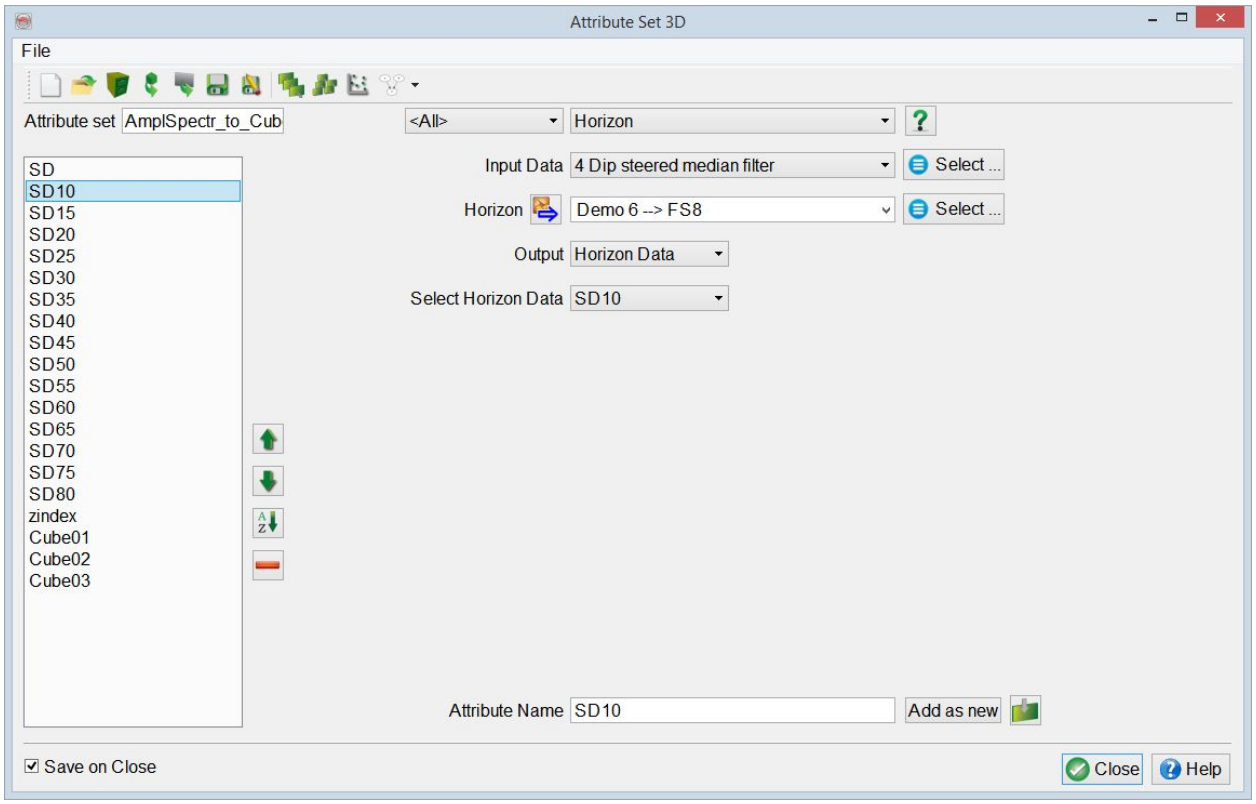
4. To QC all components:
    - Add the horizon to the 3D scene
    - Right-click on it > *Add* > *HorizonData*
    - Choose all components



    - Use *PageUp*/*PageDown* to scroll through the grids

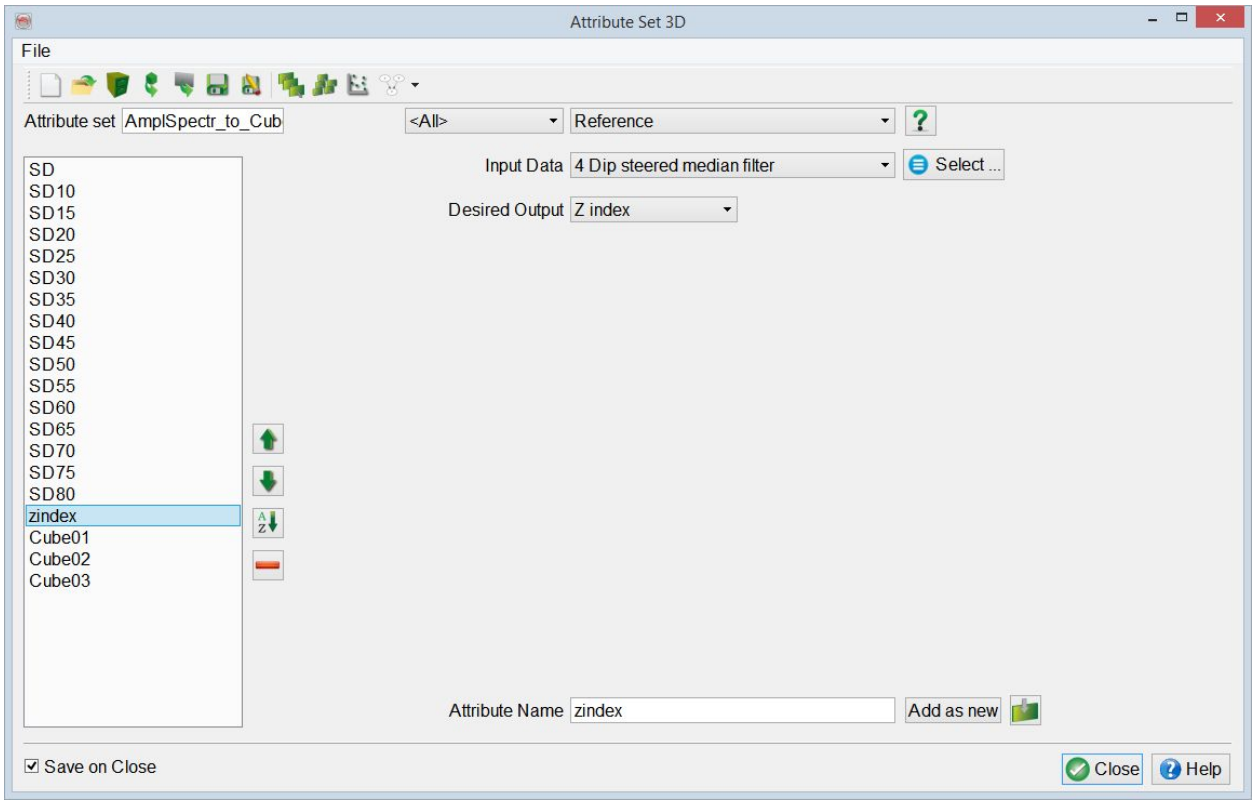
Step 2: Create a zone-of-interest tuning cube from horizon attribute grids.

1. For each horizon grid define *Horizon* attribute as such:



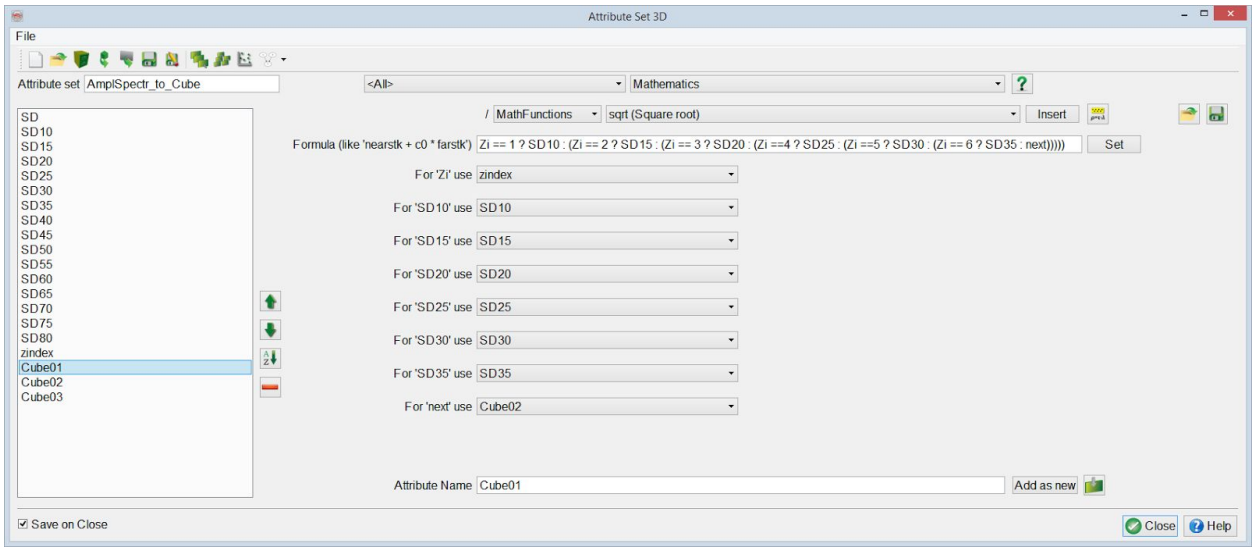
The attribute propagates attribute grid value along the whole trace. The seismic cube is provided for the geometry reference.
In this example attributes *SD10*, *SD15*, ..., *SD80* are defined based on the horizon data of *Demo 6 --> FS8* horizon (Note that the attributes are named the same way as the horizon data: don't be confused, those are not the same objects).

2. Define *Reference* attribute which at each sample is equal to *Z index* (sample number): 1,2,3,...

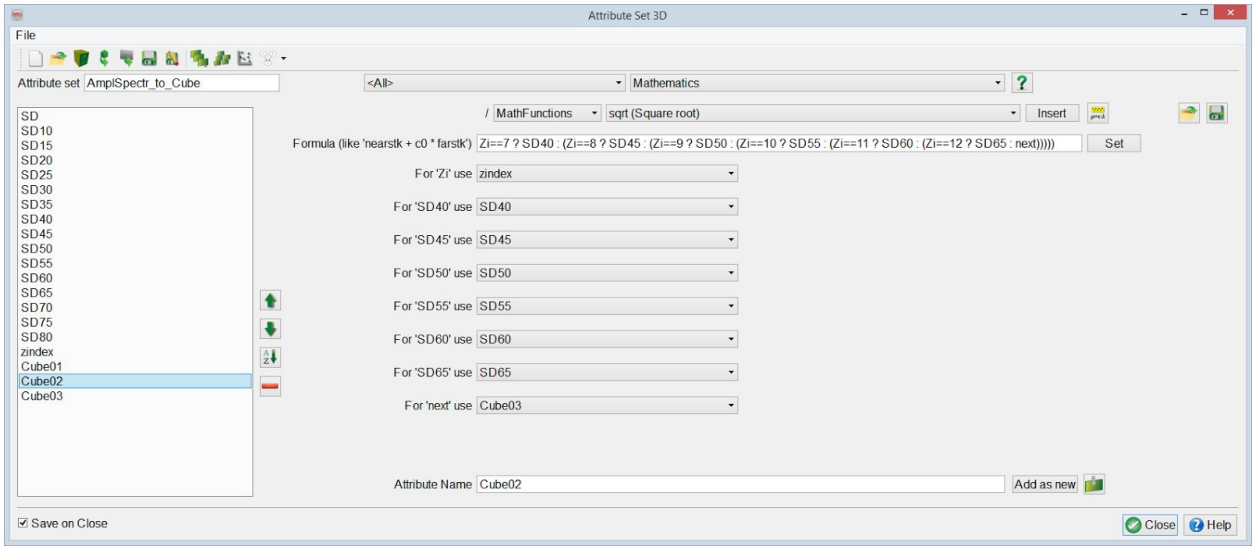


3. Define a chain of *Mathematics* attributes (each *Mathematics* attribute can have the max of 8 variables) as shown below:

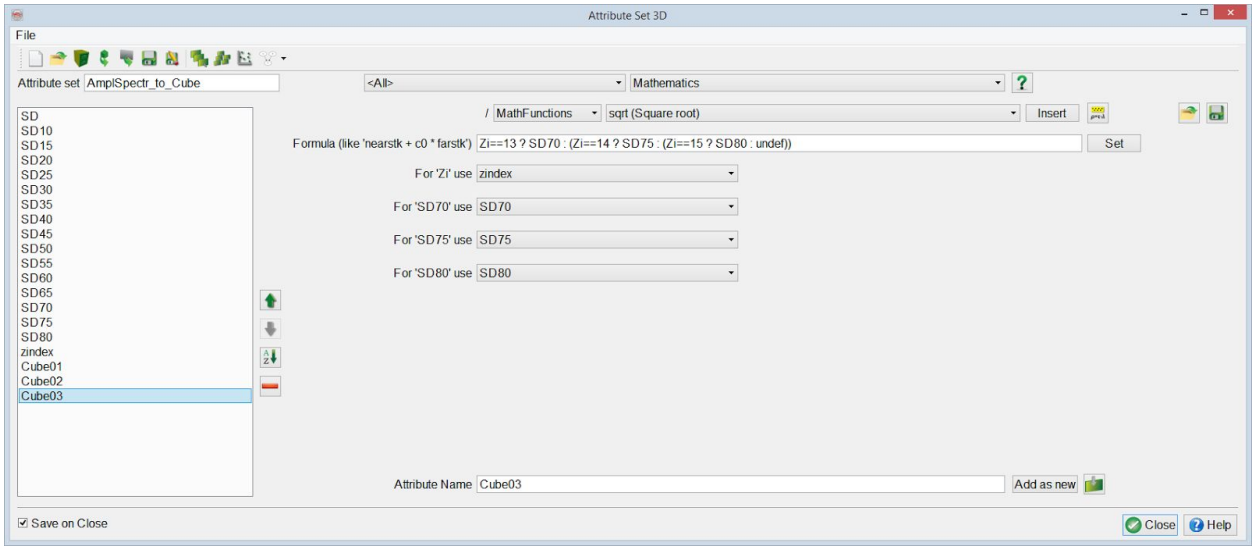
- ***Cube01*** = *SD10* at sample 1, *SD15* at sample 2, ... *SD35* at sample 6, then ***Cube02***



- ***Cube02*** = *SD40* at sample 7, *SD45* at sample 8, ... *SD65* at sample 12, then ***Cube03***



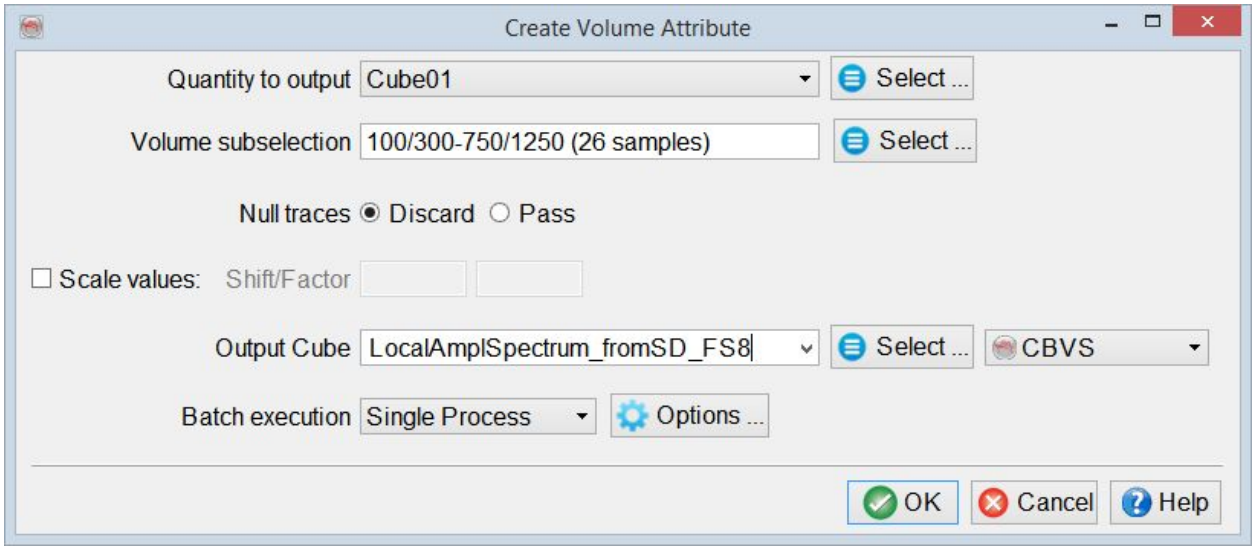
- ***Cube03*** = *SD70* at sample 13, *SD75* at sample 14, *SD80* at sample 15.



This attribute consists of multiple nested ***Statement ? Outcome_If_True : outcome_If_False*** (OpendTect *Mathematics* attribute syntax for IF … THEN … ELSE …).

4. QC the defined attribute ***Cube01*** by computing it on-the-fly along an *Inline*:
    - Add Inline to 3D scene: *Inline* > *Add and Select Data*
    - Choose ***Cube01*** from the *Attribute* list
    - Optionally, right-click on *Inline* > *Display* > *Properties* and in the *Texture* tab switch to *Classification* to see individual samples.

5. Create a seismic volume (physically stored on disk) via *Processing* > *Create Seismic Output* > *Attributes* > *Single Attribute* > *3D*



(optionally, limit Z range of the output cube via *Volume Subselection* for example, in this case it is limited to 0 - 100 ms as only samples 1-15 have actual data).

References

1. Greg Partyka, 1999, Interpretational Applications of Spectral Decomposition: http://www.freeusp.org/RaceCarWebsite/TechTransfer/OnlineTraining/Spec_Tutorial/SpecDoc.html
2. Greg Partyka, 2001, Seismic Thickness Estimation: Three Approaches - Pros and Cons: http://www.freeusp.org/RaceCarWebsite/TechTransfer/OnlineTraining/Wedge_Thickness/WedgeThick.html