

Декомпозиция сейсмических данных и RGB/CMYK смешивание

Содержание

- Амплитудная декомпозиция
- Оффсетная декомпозиция
- Спектральная декомпозиция
- Энергетическая декомпозиция
- RGB и CMYK смешивание сейсмических атрибутов
- FX куб

Амплитудная декомпозиция (аналог eXchroma)

1. Создаем стратиграфические слайсы между горизонтами для спрямленного куба [flatt cube]

IP Project = sci_salym.ipx IP_Seismic ver 2025.3 HostID=BC0AE966BFBFBFF00040651 - [Cross section # 2]

File Document Windows Help

seismic

- full_stack
 - full_stack
 - @InLine = 465
 - Xline = 492
 - Slice = 750
- angle_stacks
- wavelets
- horizons
 - Bottom
 - Top
 - M_time
 - AC10_time
 - AC11_2_time
 - BS1_time

Input Windows

- Loaders
- UnLoaders
- Surface attributes
 - 1 Proportional stratigraphic slicing across multiple layers
 - Stratigraphic slices for merging non-overlapping cubes
 - Create a regular grid (surface) by points
 - Merging surfaces with different geometries
 - Faults simulation based on surface data
 - NN Machine Learning surface property prediction
 - Surface properties factor analysis
 - Clustering of surface properties
 - Seismic waveform facies analysis
 - Calculator for surface properties
 - SurfaceCoordinateFLGrid
 - Surfaces in the layer tracking
- Seismic modules
- Seismic inversion/neural network
- Time2Depth procedures
- Wells attributes
- Points attributes
- SeismicPrestack
- GraviMag

Seismic2Surface version: 2025.3, data: 06/27/2025 3:11

Extract slices

Options Additional surfaces

2 Seismic cubes Seis0 full_stack

Output slices ☐

Output aver/std ☐

CrossCorrelation ☐

Output subsurface ☐

Gradient radius ☐ 1 ?

Heff ☐ Cutoff > 0 ?

FX cube ☐ Max frequency 100 alpha 0.1 ?

3 Output flatt cube ☒ cube name Flatt_ ?

4 Use Surface ☐ Use Constant ☐ shift +up/-down ?

Top - T1_time ☐ 0 0 ?

Bottom - T2_time ☐ -100000 0 ?

5 Refresh number slices 58 ?

6 Calculate Cancel

InLine = full_stack.InLine = 465

Full stack InLine = 465

XL 300 350 400 450 500 550 600 650 700 750 800 850

X: 561455.6, Y: 6678787.6, Z: -2154.7 | InLine: 465.0, XLine: 258.6, Slice: 1077.4

3

Амплитудная декомпозиция (аналог eXchroma)

2. Визуализируем стратиграфические слои

File Document Windows Help

seismic
full_stack
angle_stacks
wavelets
horizons
Well tops
Poly_maps
Wells
topT1_time_botT2_time
Flatt_full_stack
Inline = 465
Xline = 492
@Slice = 36

Input Windows

Loaders
UnLoaders
Surface attributes
Proportional stratigraphic slicing across multiple layers
Stratigraphic slices for merging non-overlapping cubes
Create a regular grid (surface) by points
Merging surfaces with different geometries
Faults simulation based on surface data
Machine Learning surface property prediction
Surface properties factor analysis
Clustering of surface properties
Seismic waveform facies analysis
Calculator for surface properties
SurfaceCoordinateFLGrid
Surfaces in the layer tracking
Seismic modules
Seismic inversion/neural network
Time2Depth procedures
Wells attributes
Points attributes
SeismicPrestack
GraviMag

section # 2

InLine = Flatt_full_stack.Inline = 465

0
-50
-100

XL 200 400 600 800

stack: -2069.6775 X: 563506.7 Y: 6673136.1 Z: -73.0 InLine: 237.4 XLine:

InLines

d: 2
t: 300 InLine:

XLines

d: 2
t: 300 XLine:

Slices

d: 2
t: 300 Slice: 36 Indexes

Auto apply Auto limit Apply Close

XY map # 3

XL200 XL300 XL400 XL500 XL600 XL700 XL800

IL800
IL700
IL600
IL500
IL400
IL300
IL200
IL100

well_2
well_1

Flatt_full_stack.Slice = 36.0

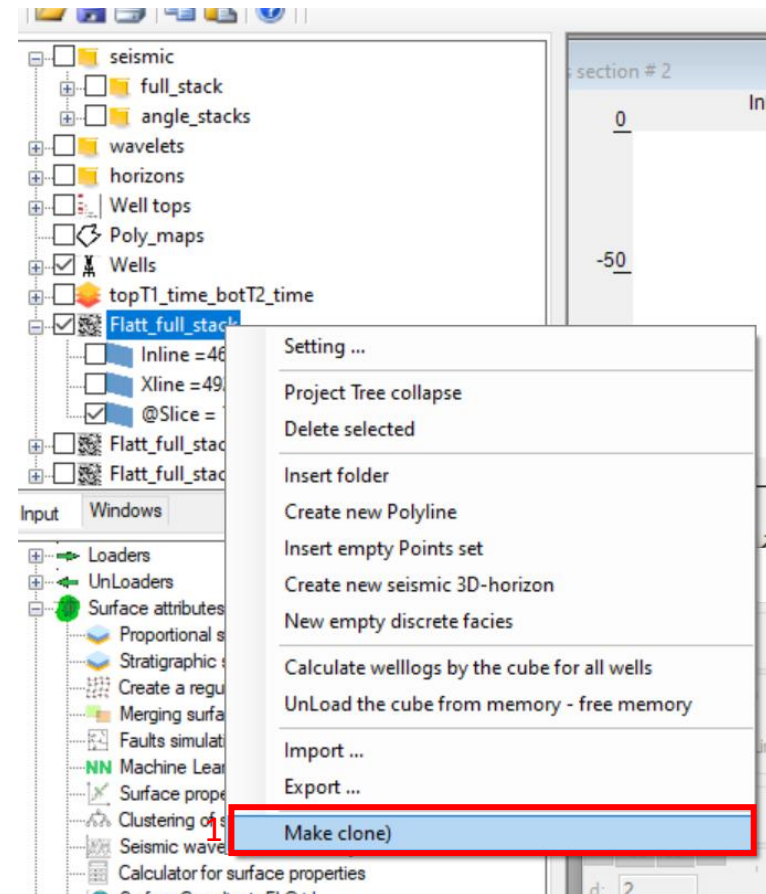
Common settings
Display settings
Wells appearance
Grid settings
Surface pruning
Export image
Intersection player ...
Turn OFF smooth mode
Find object in project
Make this Map as Master document

latt_full_stack: -2069.6775 X: 563506.7 Y: 6673136.1 Z: -73.0 Slice: 36.0

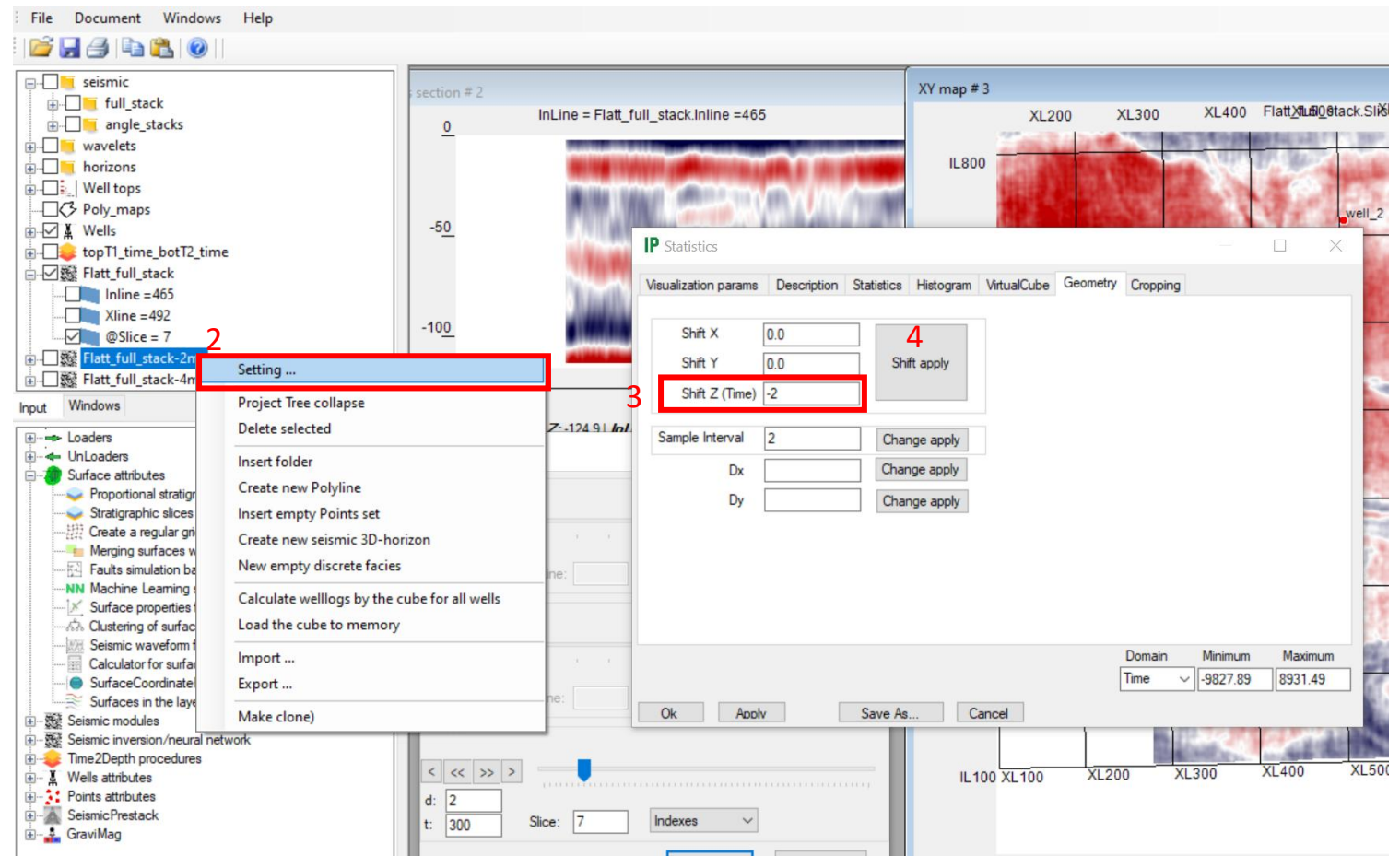
4

Амплитудная декомпозиция (аналог eXchroma)

3. Создаем две виртуальные копии flatt cube



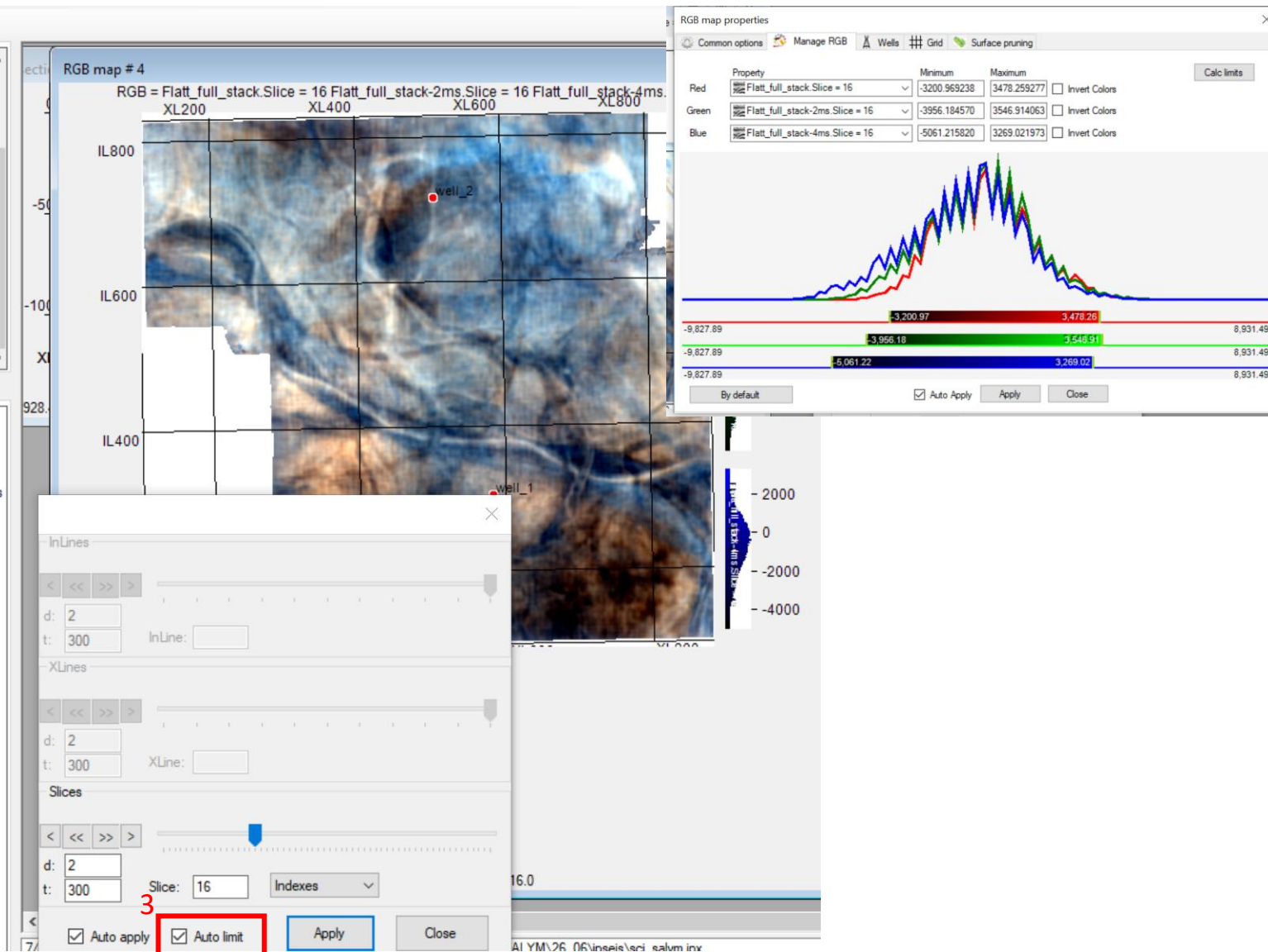
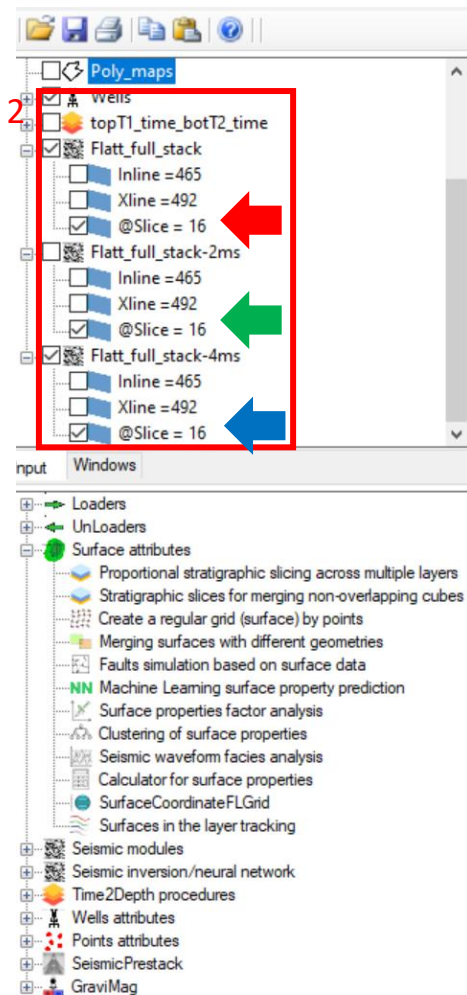
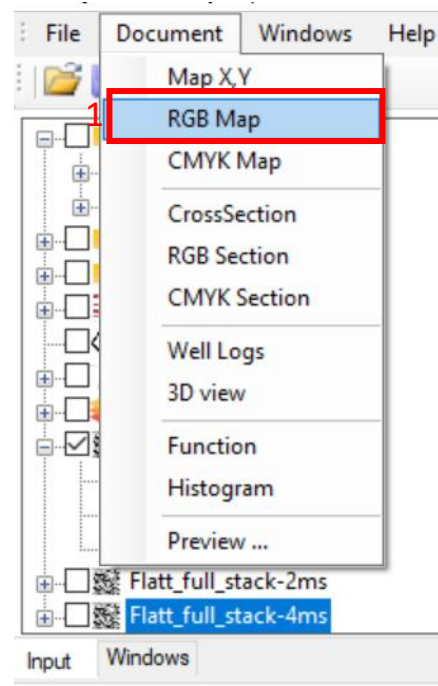
4. Сдвигаем по времени первую копию на 2мс, а вторую на 4мс



Амплитудная декомпозиция (аналог eXchroma)

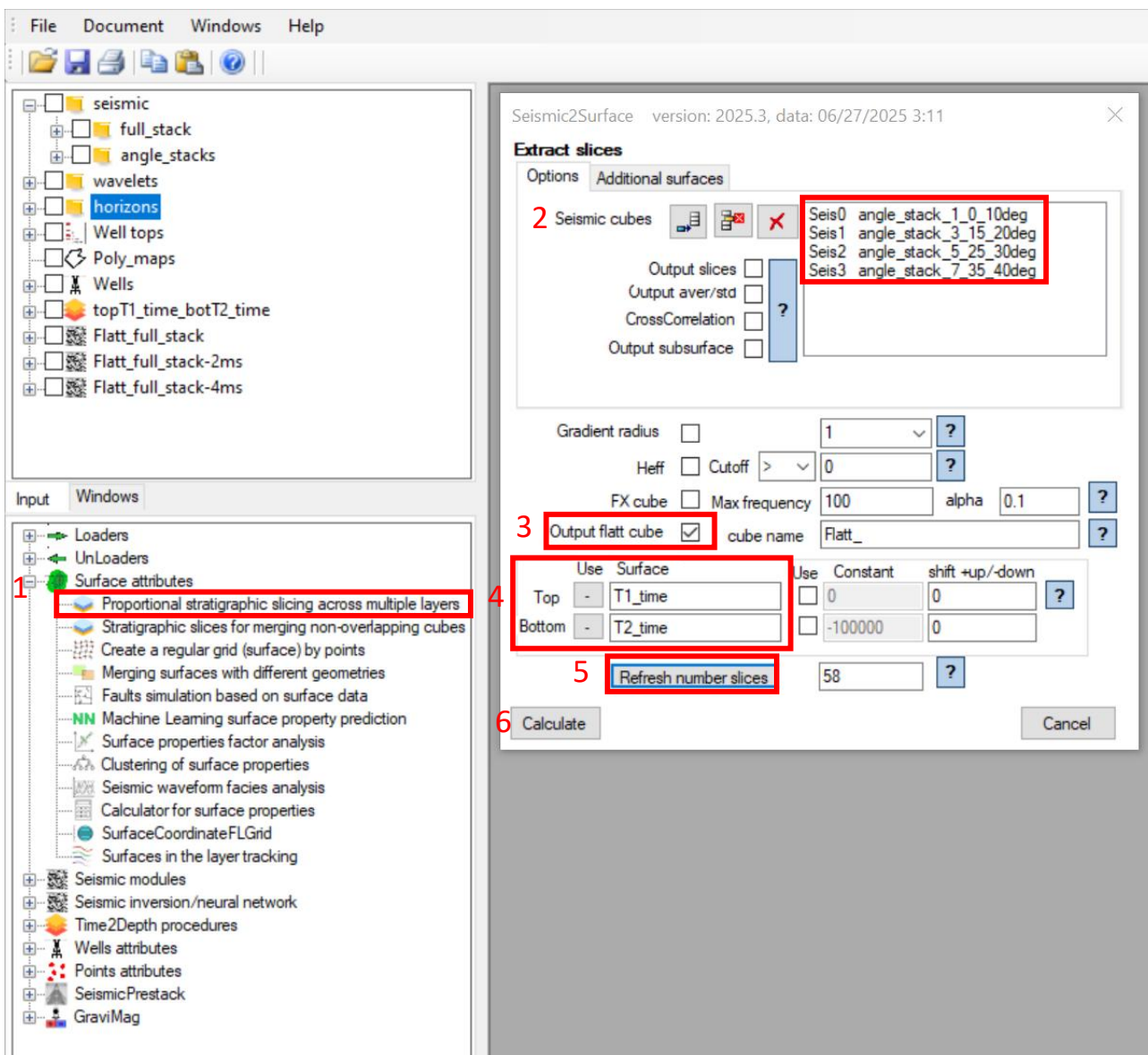
5. Сделаем RGB смешивание:

6. Настройка визуализации [Пр.кн. → Display Settings]



Оффсетная декомпозиция

1. Создаем стратиграфические слайсы между горизонтами для спрямленных кубов разных углов (удалений)



Оффсетная декомпозиция

2. Сделаем RGB смешивание:

3. Настройка визуализации [Пр.кн. → Display Settings]

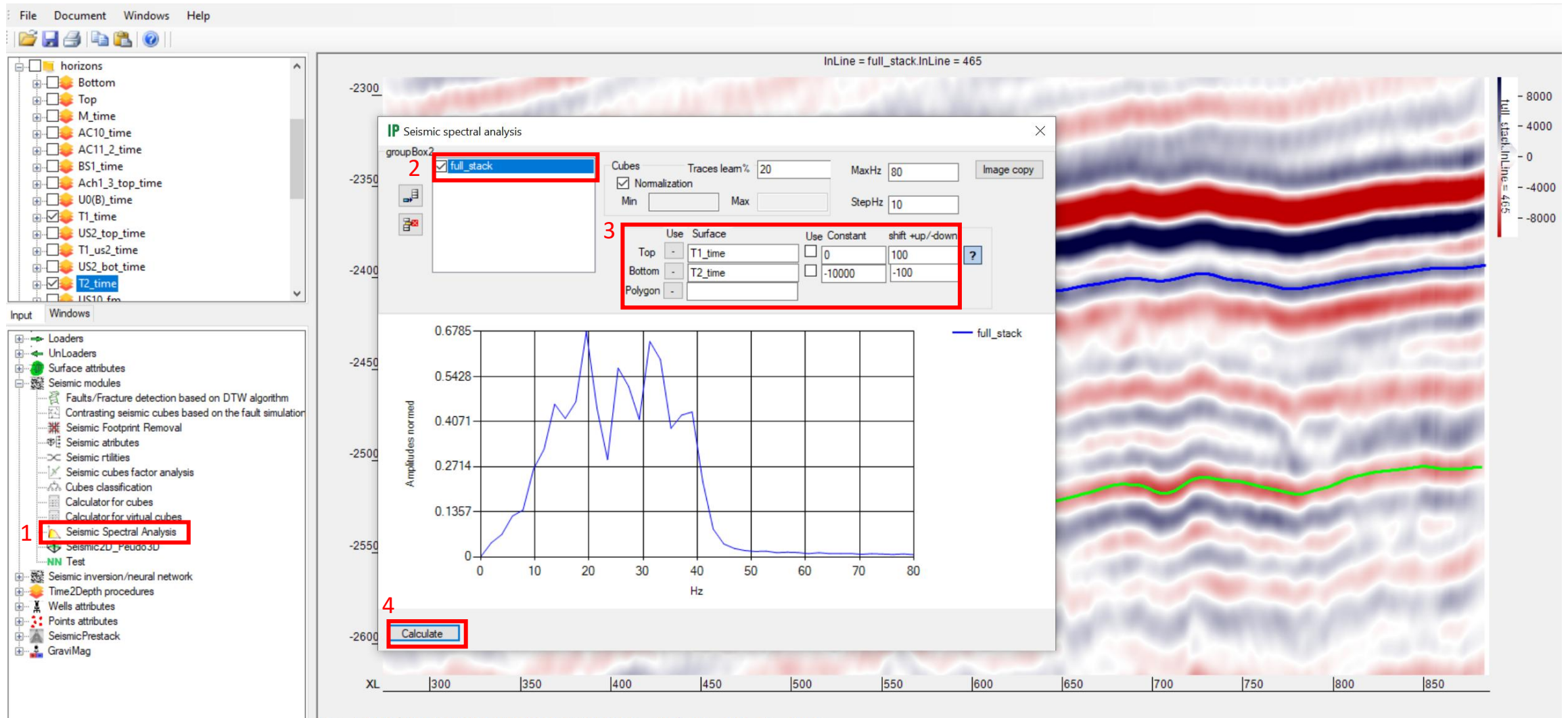
The image shows a software interface for creating and visualizing an RGB map. It is divided into several panels:

- Left Panel (Map X,Y):** A list of maps and sections. The "RGB Map" option is highlighted with a red box and a red arrow. Other options include CMYK Map, CrossSection, RGB Section, CMYK Section, Well Logs, 3D view, Function, Histogram, and Preview ...
- Input Panel:** A list of input data. The "Flatt_full_stack-4ms" map is selected. Other maps include "Flatt_full_stack-2ms", "topT1_time_botT2_time", "Flatt_angle_stack_1_0_10deg", "Flatt_angle_stack_3_15_20deg", "Flatt_angle_stack_5_25_30deg", and "Flatt_angle_stack_7_35_40deg".
- Windows Panel:** A list of windows. The "RGB map # 5" window is selected. It shows a 3D visualization of the RGB map with a grid overlay. The grid is labeled with "IL800", "IL600", "IL400", and "IL200" on the vertical axis, and "XL200", "XL400", and "XL600" on the horizontal axis. A red dot labeled "Well_2" is visible. The status bar at the bottom shows coordinates: "X: 554833.0, Y: 6689086.9, Z: -33.0 | InLine: 881.9, XLine: 1.5, Slice: 16.0".
- RGB map properties Panel:** A panel for configuring the RGB map. It includes a "Common options" tab and a "Manage RGB" tab. The "Manage RGB" tab shows a table of properties for Red, Green, and Blue channels. The "Auto limit" checkbox is checked and highlighted with a red box.
- Histogram Panel:** A panel showing a histogram of the RGB map. It includes a "By default" button and an "Auto Apply" button.

3

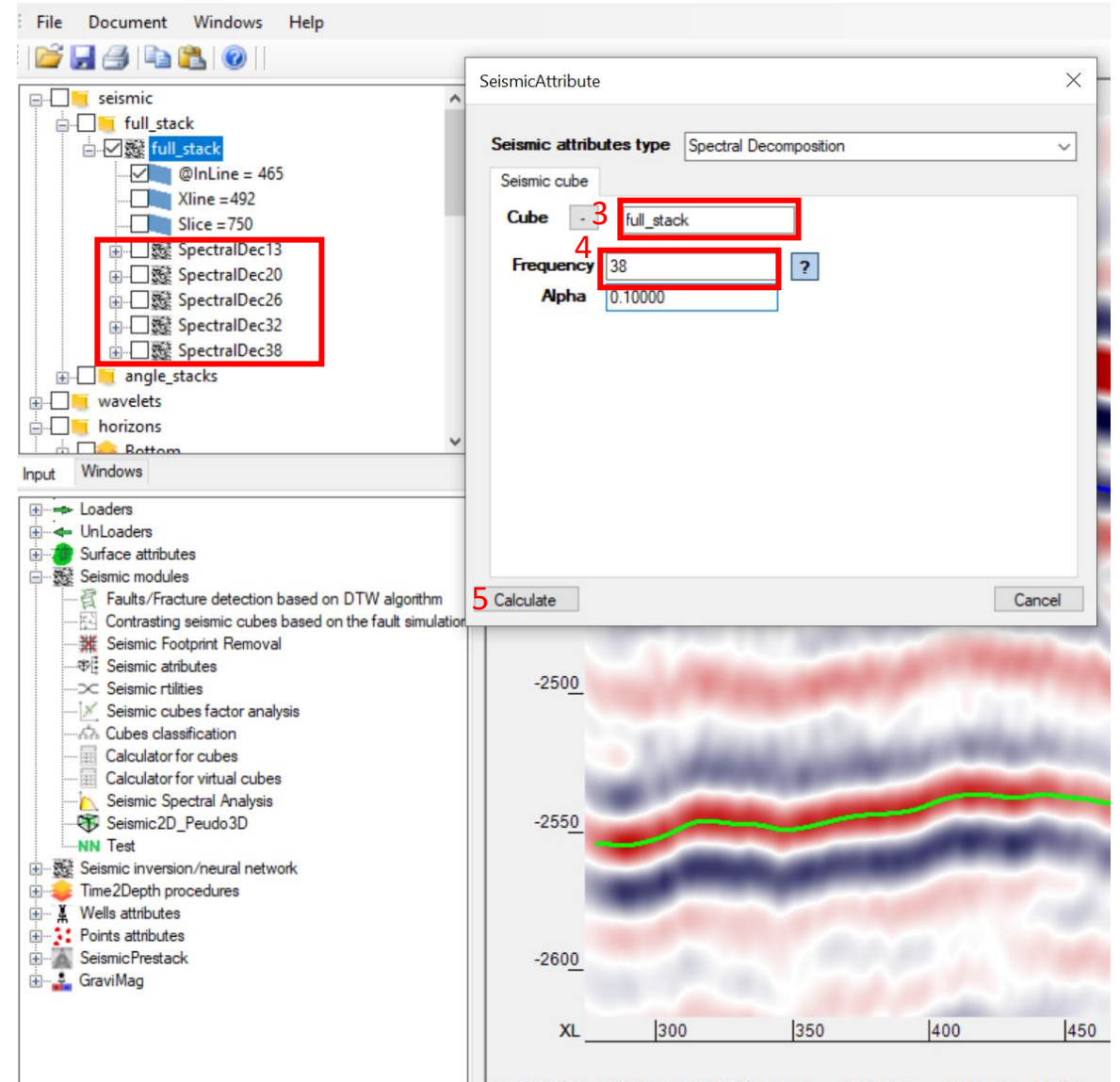
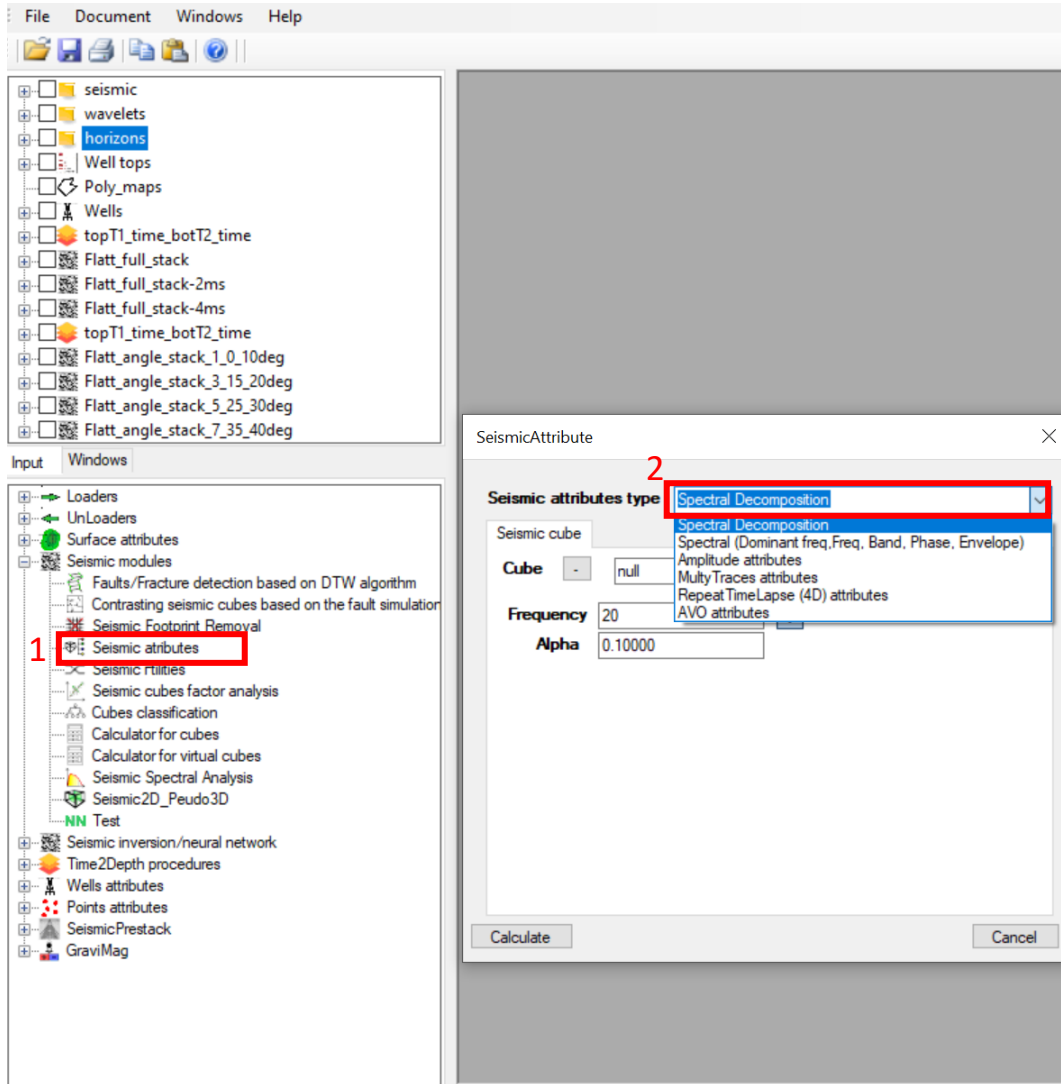
Спектральная декомпозиция

1. Расчет амплитудно-частотного спектра данных



Спектральная декомпозиция

2. Расчет кубов моночастот



Спектральная декомпозиция

3. Создаем стратиграфические слайсы между горизонтами для спрямленных кубов разных частот

The screenshot displays the Seismic2Surface software interface. On the left, a file tree shows the project structure, including 'seismic', 'full_stack', and 'angle_stacks'. The 'Input' panel on the left lists various processing steps, with 'Proportional stratigraphic slicing algorithm' highlighted by a red box and labeled '1'. The main window shows a seismic cross-section titled 'Cross section #2' with 'InLine = SpectralDec13.InLine = 465'. A color scale on the right indicates values from -100 to 150. Overlaid on this is the 'Seismic2Surface' dialog box, version 2025.3, dated 06/27/2025 3:11. The 'Extract slices' tab is active, showing options for 'Seismic cubes' (labeled '2'), 'Output slices', 'Output aver/std', 'CrossCorrelation', and 'Output subsurface'. A table lists five seismic cubes: Seis0 (SpectralDec13), Seis1 (SpectralDec38), Seis2 (SpectralDec32), Seis3 (SpectralDec26), and Seis4 (SpectralDec20). Below this, there are settings for 'Gradient radius' (1), 'Heff' (0), 'FX cube' (100), 'Max frequency' (100), and 'alpha' (0.1). The 'Output flatt cube' checkbox is checked (labeled '3'), and the 'cube name' is 'Flatt_'. The 'Use Surface' section (labeled '4') shows 'Top' and 'Bottom' horizons with 'T1_time' and 'T2_time' respectively. The 'Refresh number slices' button is highlighted by a red box and labeled '5', with the value '58' displayed. The 'Calculate' button is labeled '6'.

File Document Windows Help

seismic
full_stack
full_stack
@InLine = 465
Xline = 492
Slice = 750
SpectralDec13
SpectralDec20
SpectralDec26
SpectralDec32
SpectralDec38
angle_stacks
wavelets
horizons

Input Windows

Loaders
UnLoaders
Surface attributes
Proportional stratigraphic slicing algorithm
Stratigraphic slices for merging no
Create a regular grid (surface) by p
Merging surfaces with different ge
Faults simulation based on surface
Machine Learning surface properti
Surface properties factor analysis
Clustering of surface properties
Seismic waveform facies analysis
Calculator for surface properties
SurfaceCoordinateFLGrid
Surfaces in the layer tracking
Seismic modules
Seismic inversion/neural network
Time2Depth procedures
Wells attributes
Points attributes
SeismicPrestack
GraviMag

Cross section #2
InLine = SpectralDec13.InLine = 465
-2400
SpectralDec13.InLine = 465
150
100
50
0
-50
-100

Seismic2Surface version: 2025.3, data: 06/27/2025 3:11

Extract slices

Options Additional surfaces

2 Seismic cubes

Output slices ☒
Output aver/std ☐
CrossCorrelation ☐
Output subsurface ☐

Seis0 SpectralDec13
Seis1 SpectralDec38
Seis2 SpectralDec32
Seis3 SpectralDec26
Seis4 SpectralDec20

Gradient radius ☐ 1 ?
Heff ☐ Cutoff > 0 ?
FX cube ☐ Max frequency 100 alpha 0.1 ?
Output flatt cube ☒ cube name Flatt_ ?

4 Use Surface
Top - T1_time Use Constant shift +up/-down ?
Bottom - T2_time Use Constant shift +up/-down ?

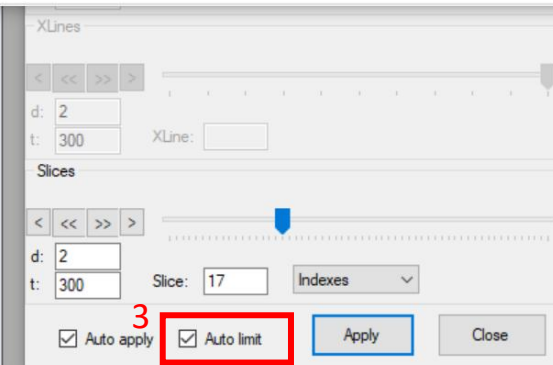
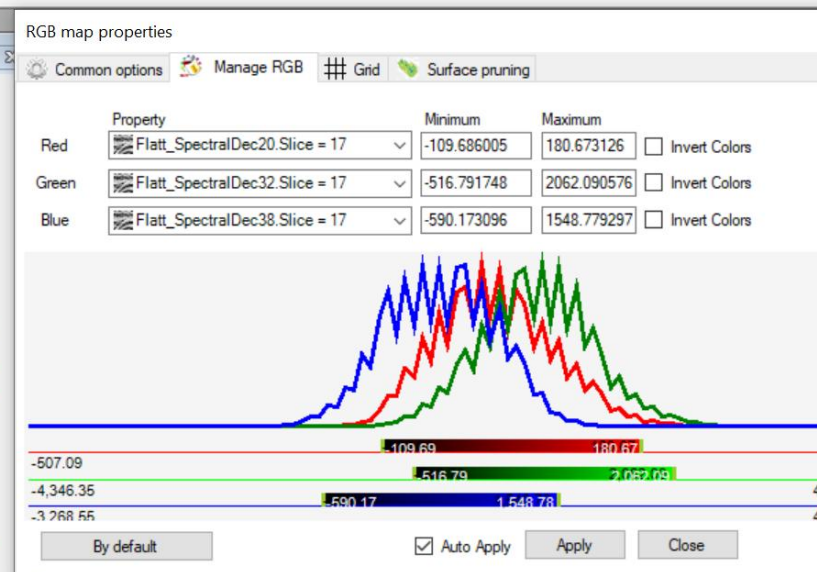
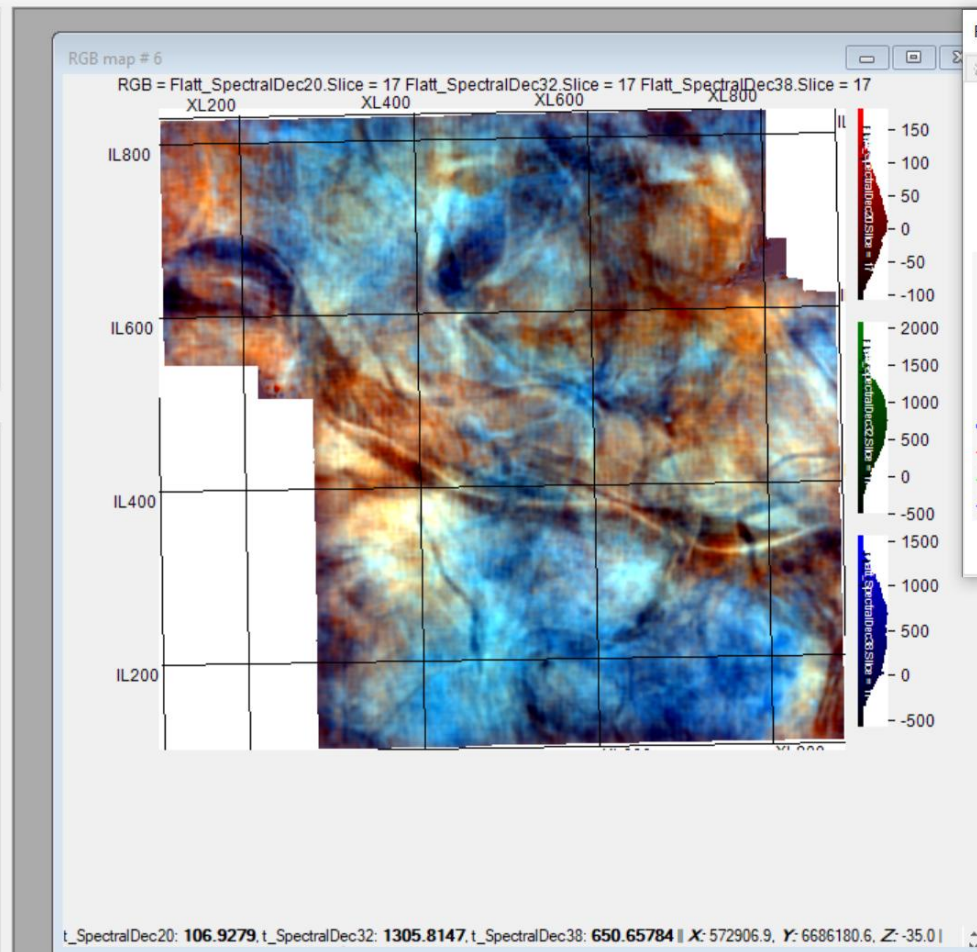
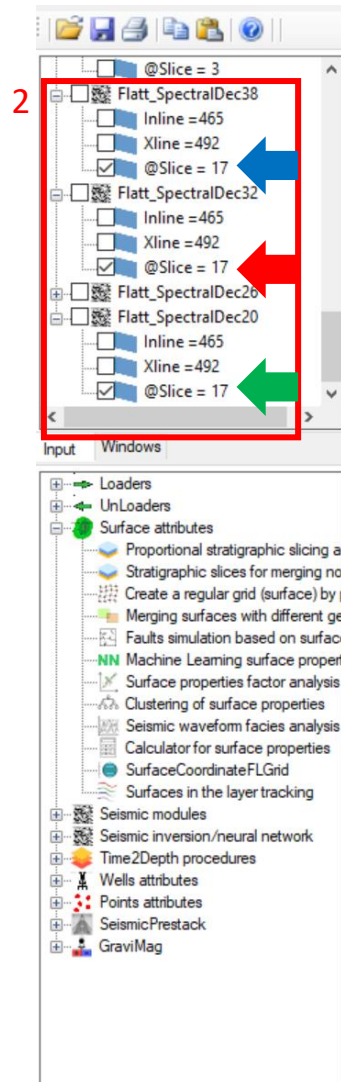
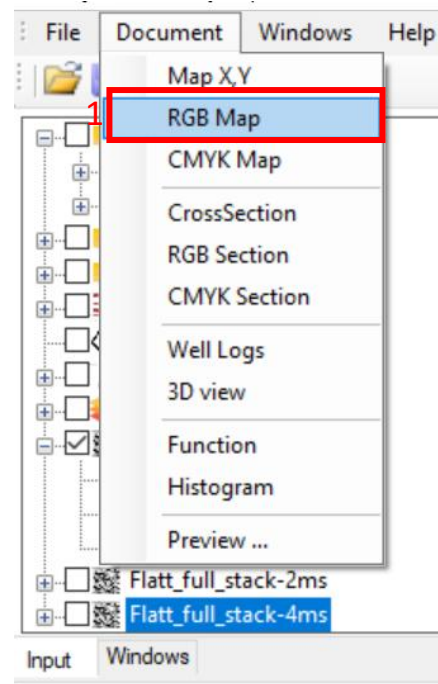
5 Refresh number slices 58 ?

6 Calculate Cancel

Спектральная декомпозиция

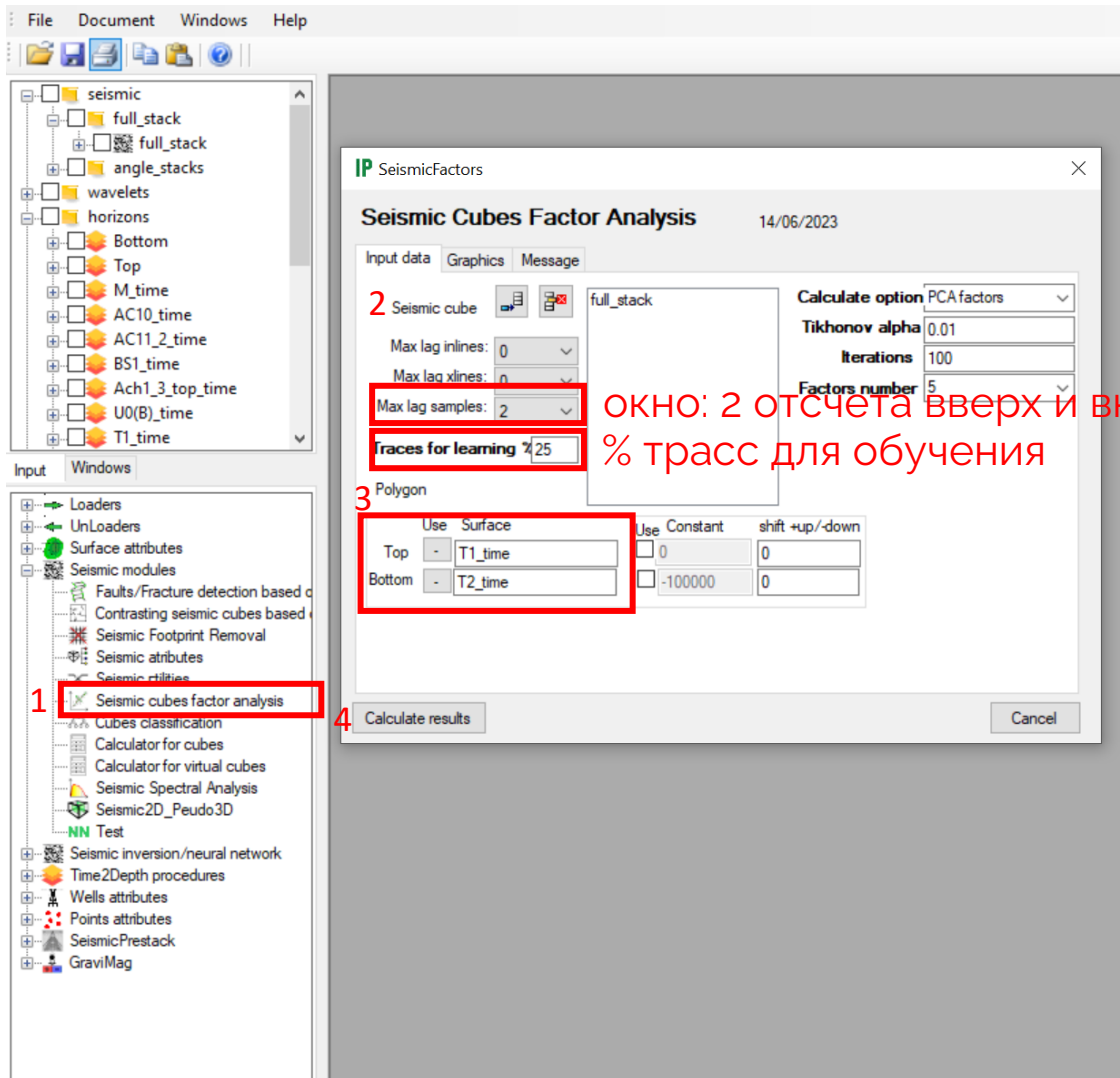
4. Сделаем RGB – смешивание:

5. Настройка визуализации [Пр.кн. → Display Settings]

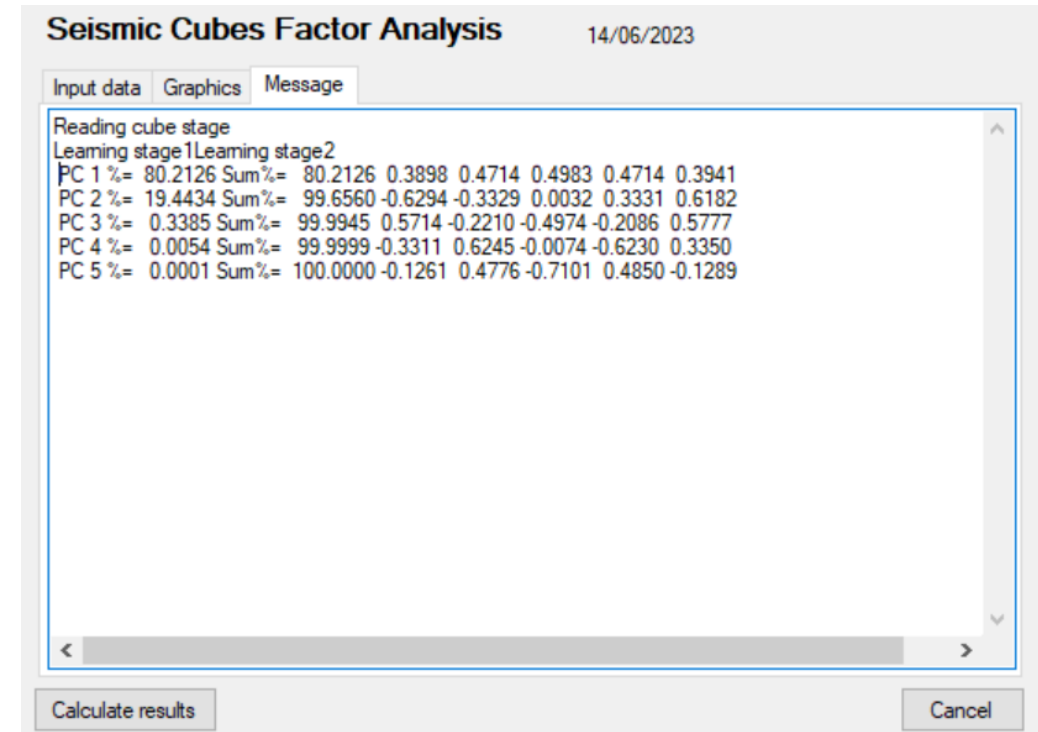


Энергетическая декомпозиция

1. Выполним факторный анализ сейсмического куба



окно: 2 отсчета вверх и вниз
% трасс для обучения

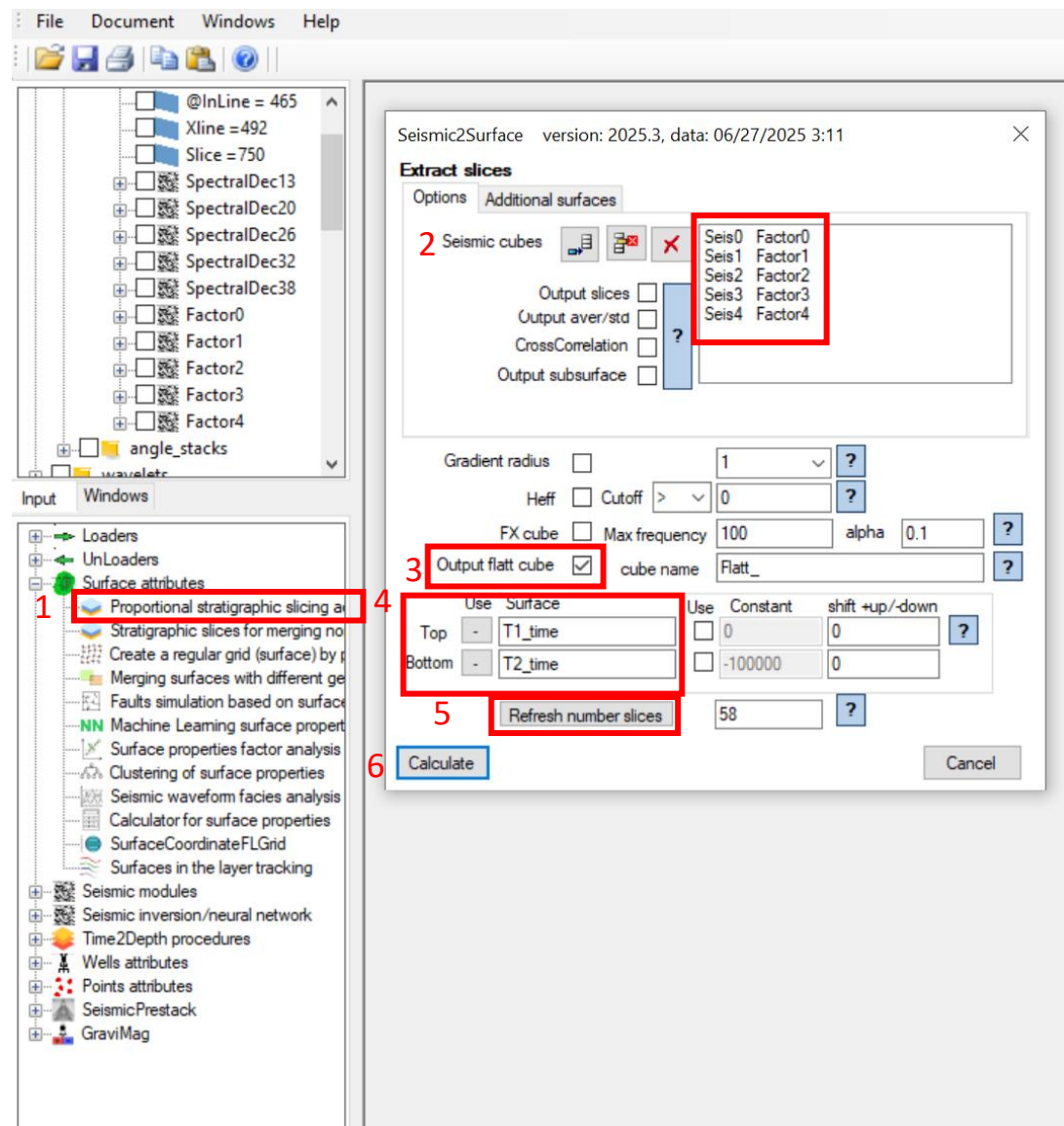


Первая компонента (PC1) содержит 80.2126% дисперсии исходных данных
Вторая компонента (PC2) содержит 19.4434% дисперсии исходных данных

...

Энергетическая декомпозиция

2. Создаем стратиграфические слайсы между горизонтами для спрямленных кубов всех факторов



Энергетическая декомпозиция

3. Сделаем RGB – смешивание:

4. Настройка визуализации [Пр.кн. → Display Settings]

The screenshot displays a software interface for creating and visualizing an RGB map. The interface is divided into several panels:

- Map X,Y Panel:** A menu on the left with options like "RGB Map", "CMYK Map", "CrossSection", "RGB Section", "CMYK Section", "Well Logs", "3D view", "Function", "Histogram", and "Preview ...". The "RGB Map" option is highlighted with a red box and a red arrow.
- Input Panel:** A list of input data sources including "Flatt_full_stack-2ms" and "Flatt_full_stack-4ms".
- Windows Panel:** A list of windows and layers. The "Flatt_Factor0" window is highlighted with a red box and a red arrow. Other windows include "Flatt_Factor1", "Flatt_Factor2", "Flatt_Factor3", and "Flatt_Factor4".
- RGB map #8 Panel:** A central visualization area showing a 3D map of the data. The map is color-coded and has a grid overlay. The axes are labeled "IL" (Inline) and "XL" (Crossline). The map is titled "RGB map #8".
- RGB map properties Panel:** A panel on the right showing the properties of the RGB map. It includes a table of properties and a graph of the data.

The "RGB map properties" panel contains the following data:

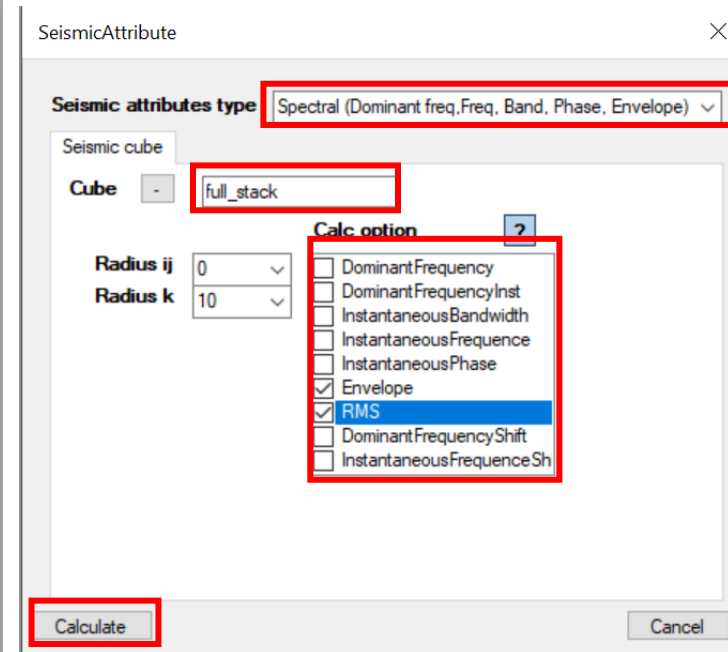
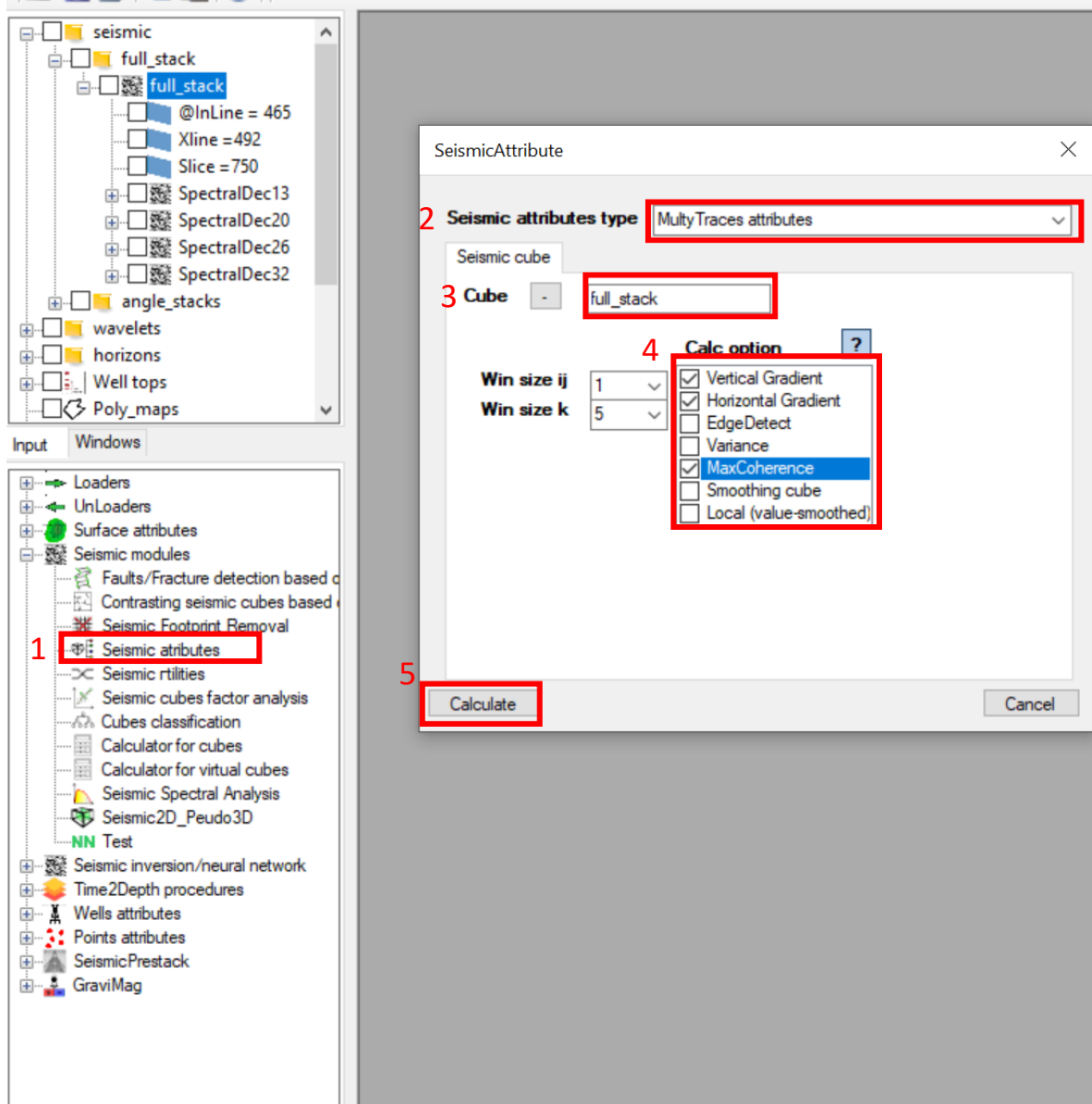
Property	Minimum	Maximum	Invert Colors
Red	-2729.223633	2602.422852	<input type="checkbox"/>
Green	-812.343018	976.345825	<input type="checkbox"/>
Blue	-20.010197	2.248848	<input type="checkbox"/>

The graph shows the distribution of the data across the three channels (Red, Green, Blue). The x-axis represents the data range, and the y-axis represents the frequency. The graph shows three distinct peaks, one for each channel.

At the bottom of the "RGB map properties" panel, there are checkboxes for "Auto apply" and "Auto limit", both of which are checked. A red box highlights the "Auto limit" checkbox, and a red arrow points to it.

RGB смешивание сейсмических атрибутов

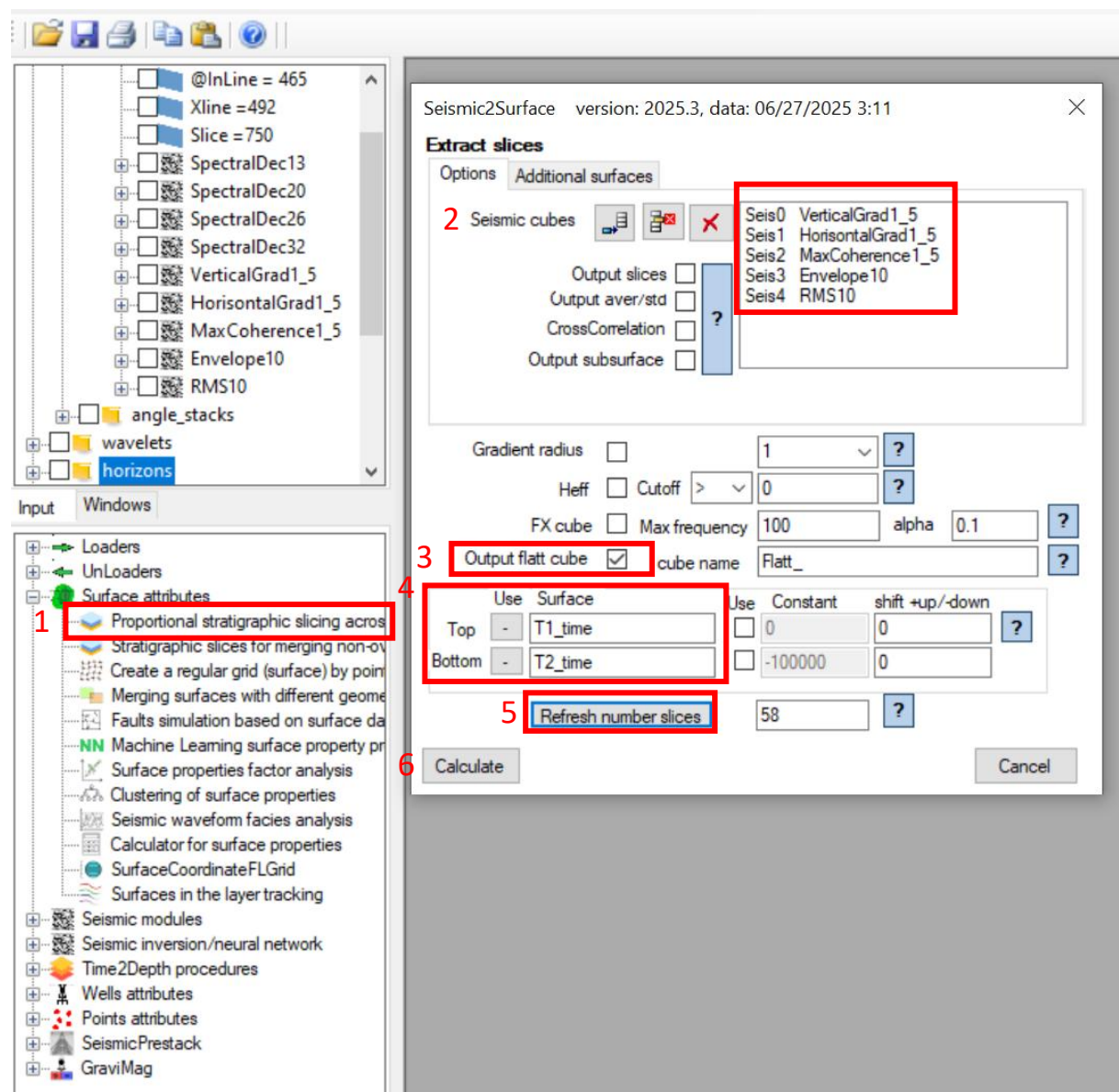
1. Рассчитаем сейсмические атрибуты



Могут быть использованы любые атрибуты

RGB смешивание сейсмических атрибутов

2. Создаем стратиграфические слайсы между горизонтами для кубов сейсмических атрибутов



RGB смешивание сейсмических атрибутов

3. Сделаем RGB – смешивание:

4. Настройка визуализации [Пр.кн. → Display Settings]

The image shows a software interface for creating and visualizing an RGB map from seismic attributes. It is divided into several panels:

- Map X,Y Panel:** A menu on the left with options like "Map X,Y", "RGB Map", "CMYK Map", "CrossSection", "RGB Section", "CMYK Section", "Well Logs", "3D view", "Function", "Histogram", and "Preview ...". The "RGB Map" option is highlighted with a red box and a red arrow labeled "1".
- Input Panel:** A list of seismic attributes on the right. Attributes "Inline = 465", "Xline = 492", and "@Slice = 16" are selected for the Red, Green, and Blue channels respectively, indicated by blue and green arrows labeled "2".
- RGB map #9 Panel:** A central visualization window showing a 3D seismic volume. The title bar indicates "RGB = Flatt_RMS10.Slice = 16 Flatt_Envelope10.Slice = 16 Flatt_HorizontalGrad1_5.Slice = 16". The axes are labeled "IL" (Inline) and "XL" (Xline).
- RGB map properties Panel:** A dialog box on the right for configuring the RGB map. It includes a table of properties, a histogram, and a "Display Settings" section.

Property	Minimum	Maximum	Invert Colors
Red: Flatt_RMS10.Slice = 16	846.917236	4276.992188	<input type="checkbox"/>
Green: Flatt_Envelope10.Slice = 16	486.583618	9617.818359	<input type="checkbox"/>
Blue: Flatt_HorizontalGrad1_5.Slice = 16	-0.032886	0.187216	<input type="checkbox"/>

The histogram shows the distribution of values for the Red, Green, and Blue channels. The "Display Settings" section includes a "Slice" dropdown set to "16" and a checked "Auto limit" option, highlighted with a red box and a red arrow labeled "3".

СМУК смешивание сейсмических атрибутов

5. Сделаем СМУК – смешивание: 6. Настройка визуализации [Пр.кн. → Display Settings]

2

File Document Windows Help

Map X,Y
RGB Map
CMYK Map
CrossSection
RGB Section
CMYK Section
Well Logs
3D view
Function
Histogram
Preview ...

flatt_1full_stack-4ms
topT1_time_botT2_time

Input Windows

Loaders
UnLoaders
Surface attributes
Seismic modules
Seismic inversion/neural network
Time2Depth procedures
Wells attributes
Points attributes
SeismicPrestack
GraviMag

CMYK map # 18
MYK = Flatt_Envelope10.Slice = 14 Flatt_RMS10.Slice = 14 Flatt_VerticalGrad1_5.Slice = 14 Flatt_HorizontalGrad1_5.Slice = 14

IL800
IL700
IL600
IL500
IL400
IL300
IL200
IL100

XL200
XL400
XL600
XL800

flatt_Envelope10: 1036.2004, Flatt_RMS10: 2281.1406, VerticalGrad1_5: -0.013, HorizontalGrad1_5: 0.033, X: 568528.2, Y: 6685883.8, Z: -

7/3/2025 9:19:24 AM: HostID=BC0AE966BFBFBFF0040651
7/3/2025 9:19:34 AM: Loading project: C:\Users\Wydwin\Documents\IP_SEIS\PRJ\SALYM\26_06\ipseis\sci_salym.ipx
7/3/2025 9:19:56 AM: The project successfully loaded.

CMYK map properties

Common options Manage CMYK Grid Surface pruning

Property	Minimum	Maximum	Invert Colors
Cyan	Flatt_Envelope10.Slice = 14	597.107605 10690.55078	<input type="checkbox"/>
Magenta	Flatt_RMS10.Slice = 14	856.005920 4456.948730	<input type="checkbox"/>
Yellow	Flatt_VerticalGrad1_5.Slice = 14	-0.143381 0.043087	<input type="checkbox"/>
Black	Flatt_HorizontalGrad1_5.Slice = 14	-0.028796 0.202611	<input type="checkbox"/>

By default ☒ Auto Apply Apply Close

d: 2 t: 300 InLine: XLines

d: 2 t: 300 XLine: Slices

d: 2 t: 300 Slice: 14 Indexes

☒ Auto apply ☒ Auto limit Apply Close

Для любых карт атрибутов может быть выполнено СМУК - смешивание

RGB смешивание атрибута fault simulation (аналог Ant-Tracking)

1. Рассчитаем атрибут fault simulation

The screenshot displays the software interface for fault simulation. On the left, a project tree shows the hierarchy of data and processing steps. The 'Contrasting seismic cubes based on t' step is highlighted with a red box and labeled '1'. The main window shows the 'Faults simulation 26.07.2020' dialog box. The 'Seismic cube' dropdown is set to 'full_stack' (labeled '2'). The 'Options' tab is active, showing various parameters. The 'Output flatt cube' checkbox is checked (labeled '3'), and the 'cube name' is 'flatt_'. The 'Top' and 'Bottom' surface selection is set to 'T1_time' and 'T2_time' respectively (labeled '4'). The 'Refresh number slices' is set to 58 (labeled '5'). The 'Calculate' button is highlighted with a red box and labeled '6'.

Project Tree:

- seismic
 - full_stack
 - angle_stacks
- wavelets
- horizons
 - Bottom
 - Top
 - M_time
 - AC10_time
 - AC11_2_time
 - BS1_time
 - Ach1_3_top_time
 - U0(B)_time
 - T1_time
 - US2_top_time

Input Windows:

- Loaders
- UnLoaders
- Surface attributes
- Seismic modules
 - 1. Contrasting seismic cubes based on t
 - Faults/Fracture detection based on D
 - Seismic Footprint Removal
 - Seismic attributes
 - Seismic utilities
 - Seismic cubes factor analysis
 - Cubes classification
 - Calculator for cubes
 - Calculator for virtual cubes
 - Seismic Spectral Analysis
 - Seismic2D_Pseudo3D
 - Test
- Seismic inversion/neural network
- Time2Depth procedures
- Wells attributes
- Points attributes
- SeismicPrestack
- GraviMag

Faults simulation 26.07.2020

2. Seismic cube: full_stack

Options Surfaces

Track option: Track positive+negative -lr

Adds to ampl %(max-min): 0.1

Win size Win size ij: 0

Faults or linear features length (points): 100

Number simulation (% total traces): 50

☐ Output surfaces ☐ Output subsurface

3. ☒ Output flatt cube cube name: flatt_

4. Use Surface Use Constant shift +up/-down

Top: T1_time 0 0

Bottom: T2_time -100000 0

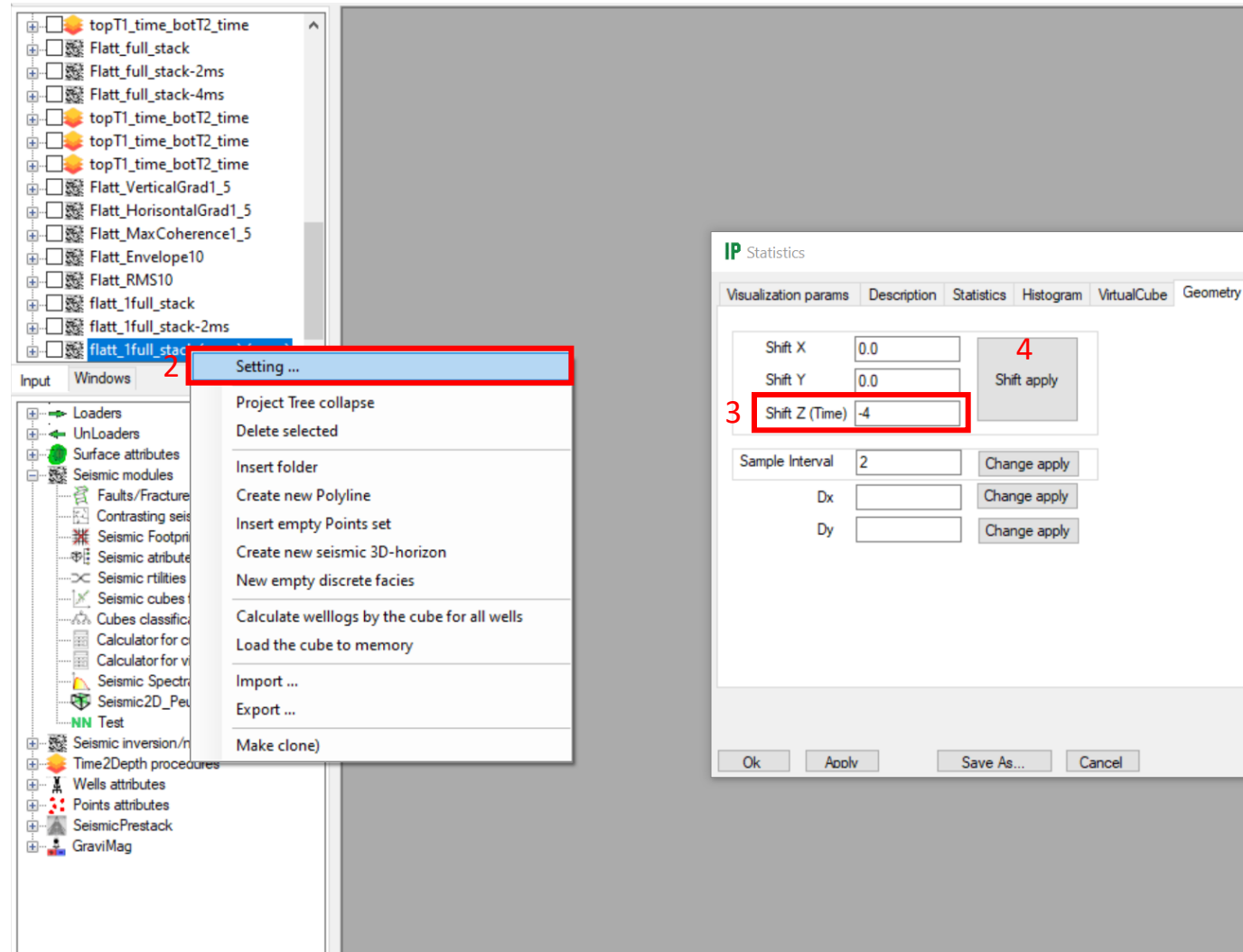
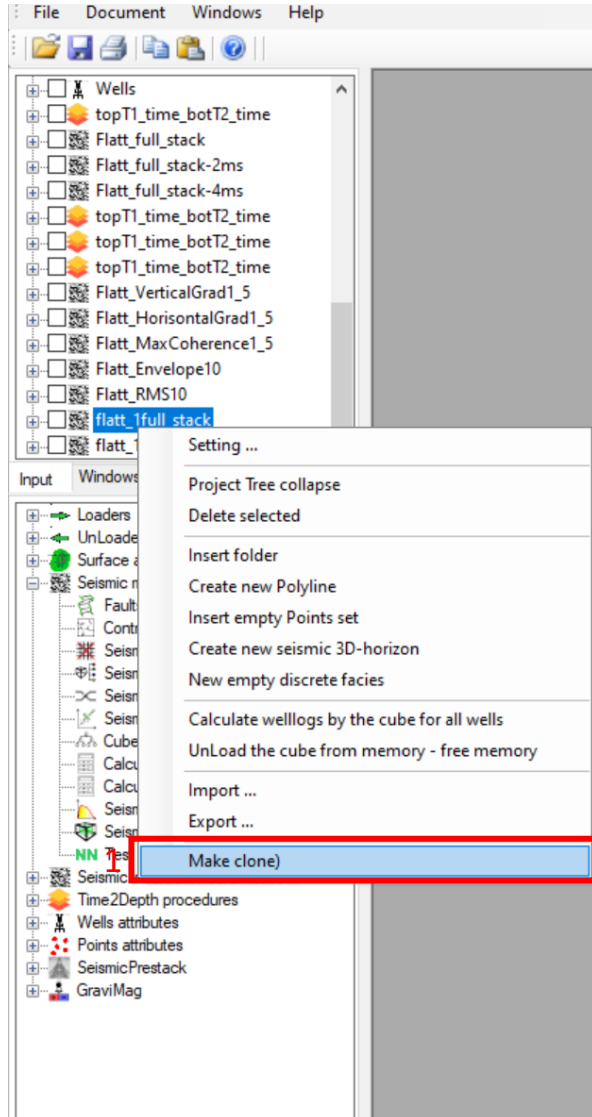
5. Refresh number slices: 58

6. Calculate

RGB смешивание атрибута fault simulation (аналог Ant-Tracking)

2. Создаем две виртуальные копии flatt cube

3. Сдвигаем по времени первую копию на 2мс, а вторую на 4мс



RGB смешивание атрибута fault simulation (аналог Ant-Tracking)

4. Сделаем RGB – смешивание:

5. Настройка визуализации [Пр.кн. → Display Settings]

The image shows a software interface for seismic data visualization. On the left, a 'Map X,Y' menu is open, highlighting 'RGB Map'. Below it, a list of maps includes 'Flatt_full_stack-2ms' and 'Flatt_full_stack-4ms'. In the center, a tree view shows a project structure with 'flatt_1full_stack' and its slices. Red, green, and blue arrows point to the 'flatt_1full_stack-2ms', 'flatt_1full_stack-4ms', and 'flatt_1full_stack-1ms' slices respectively. The main window displays an 'RGB map # 23' with a 3D visualization of seismic data. On the right, the 'RGB map properties' dialog is open, showing settings for Red, Green, and Blue channels. The 'Auto limit' checkbox is checked. Below the dialog, the 'XLines' section shows a 'Slice' value of 4 and an 'Auto limit' checkbox that is also checked.

RGB map # 23

RGB = flatt_1full_stack.Slice = 4 flatt_1full_stack-2ms.Slice = 4 flatt_1full_stack-4ms.Slice = 4

XL200 XL400 XL600 XL800

IL800 IL600 IL400 IL200

att_1full_stack: -4847.1626, 1full_stack-2ms: -4847.1626, 1full_stack-4ms: -4847.1626 || X: 572059.5, Y: 6685874.0, Z: -2476.0

RGB map properties

Property	Minimum	Maximum	Invert Colors
Red	-8208.078125	1356.522949	<input checked="" type="checkbox"/>
Green	-8353.146484	1460.487305	<input checked="" type="checkbox"/>
Blue	-8116.207520	2108.443359	<input checked="" type="checkbox"/>

By default ☒ Auto Apply Apply Close

XLines

d: 2 t: 300 XLine:

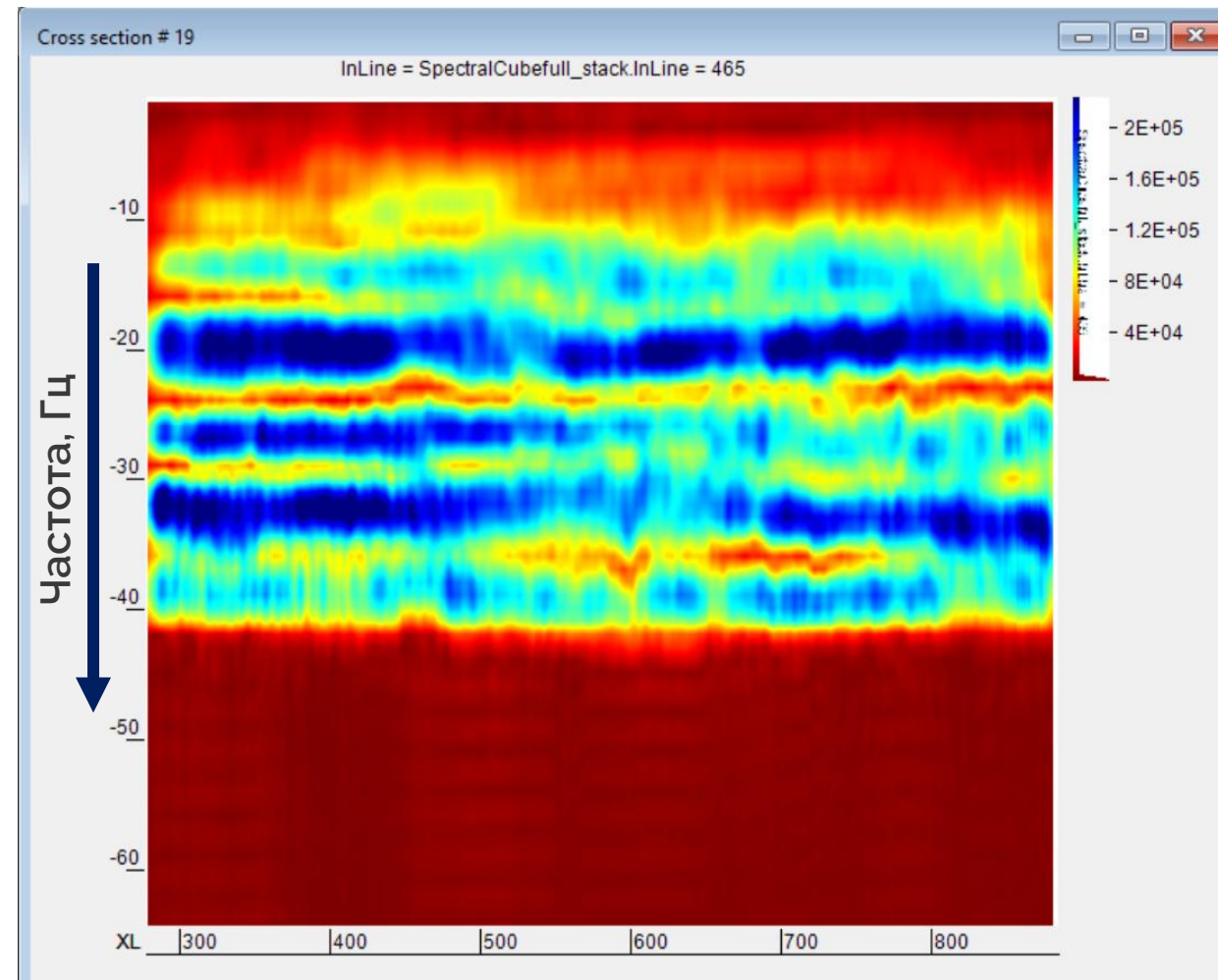
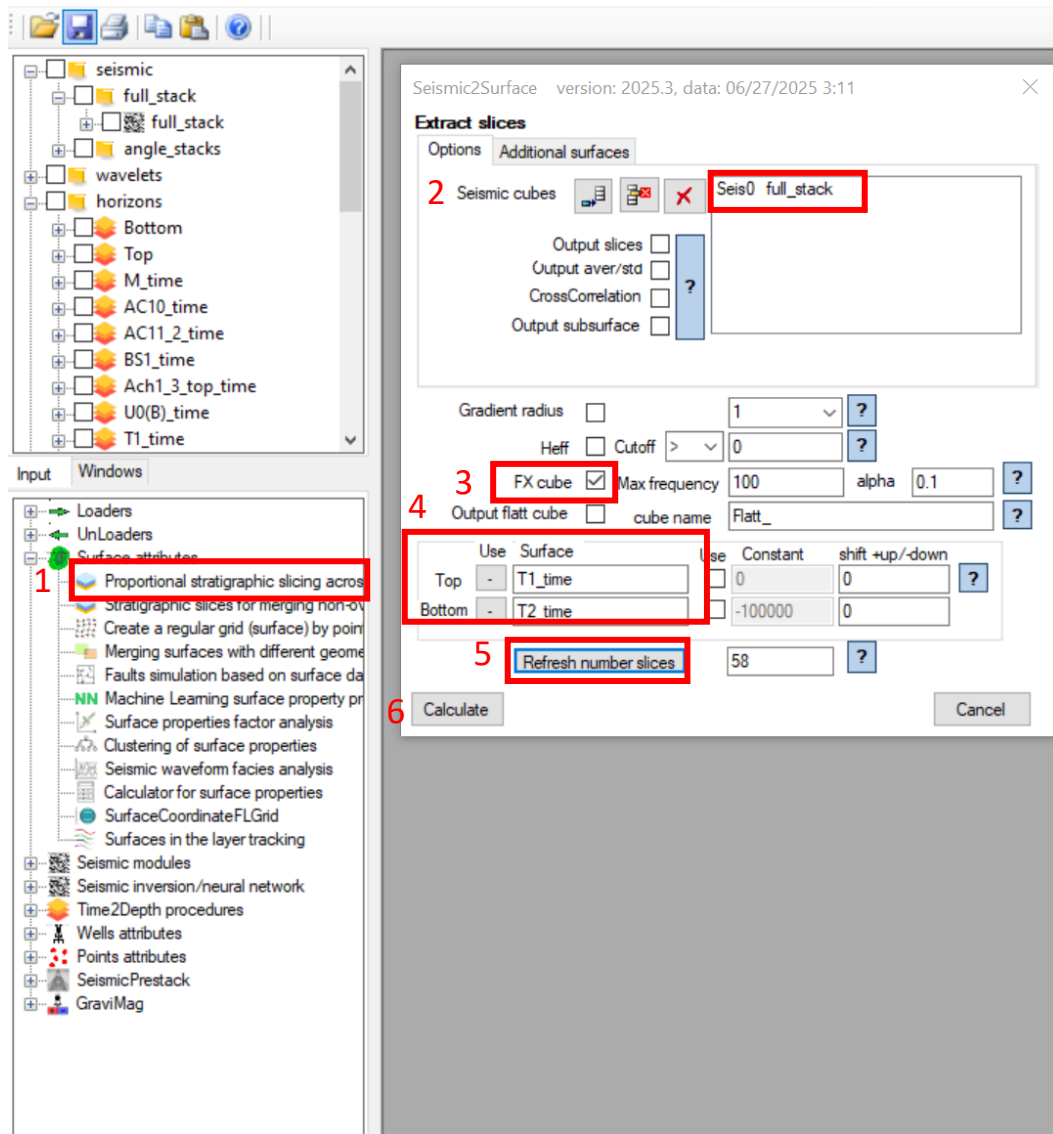
Slices

d: 2 t: 300 3 Slice: 4 Indexes

☒ Auto apply ☒ Auto limit Apply Close

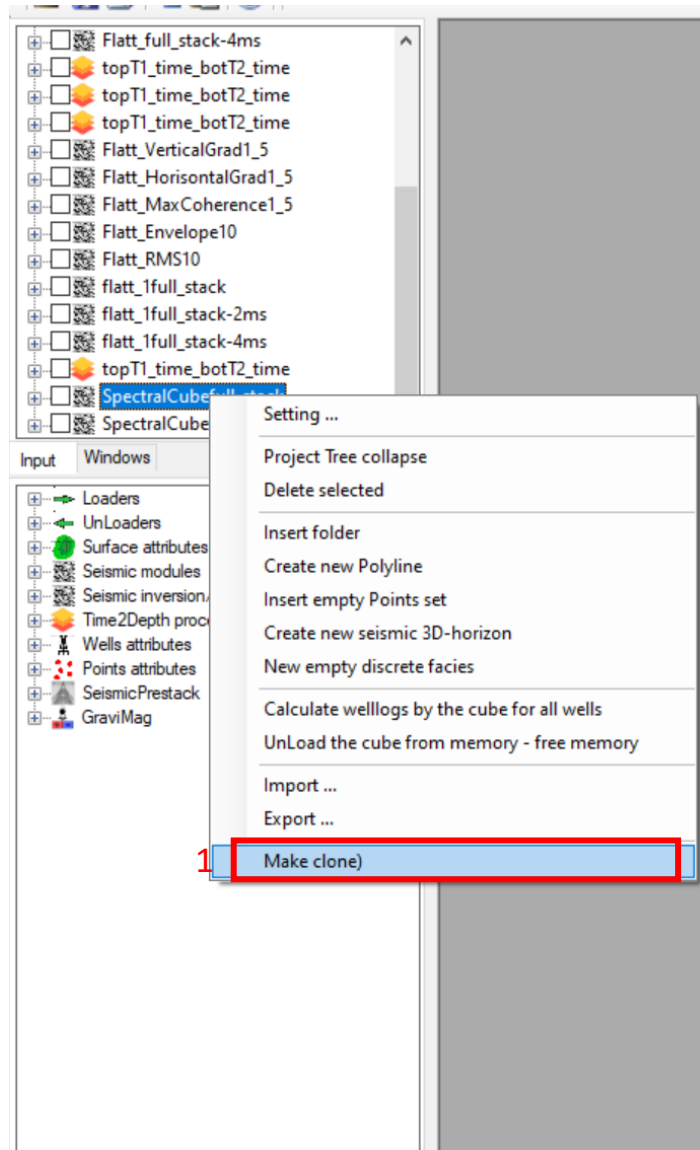
FX куб

1. Рассчитаем FX куб

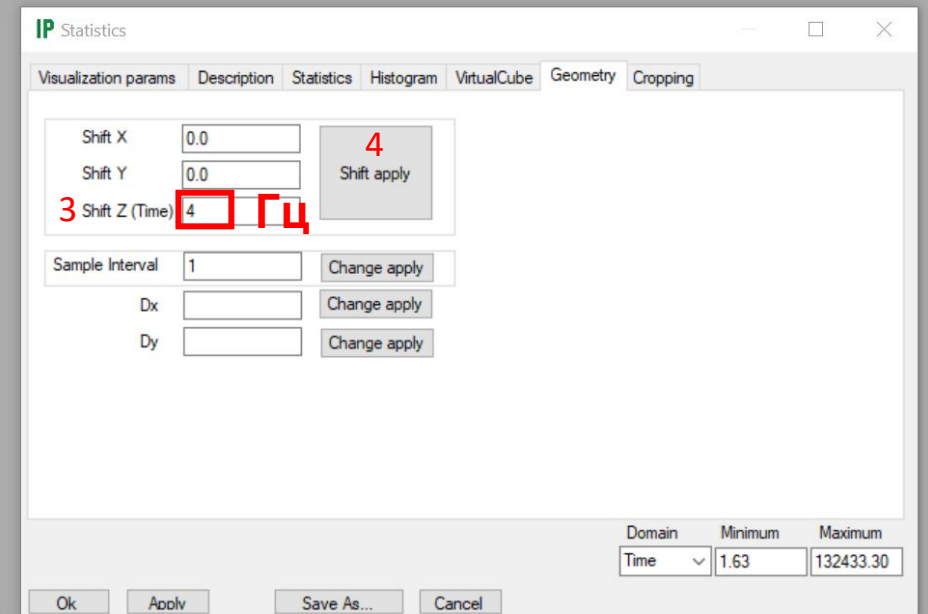
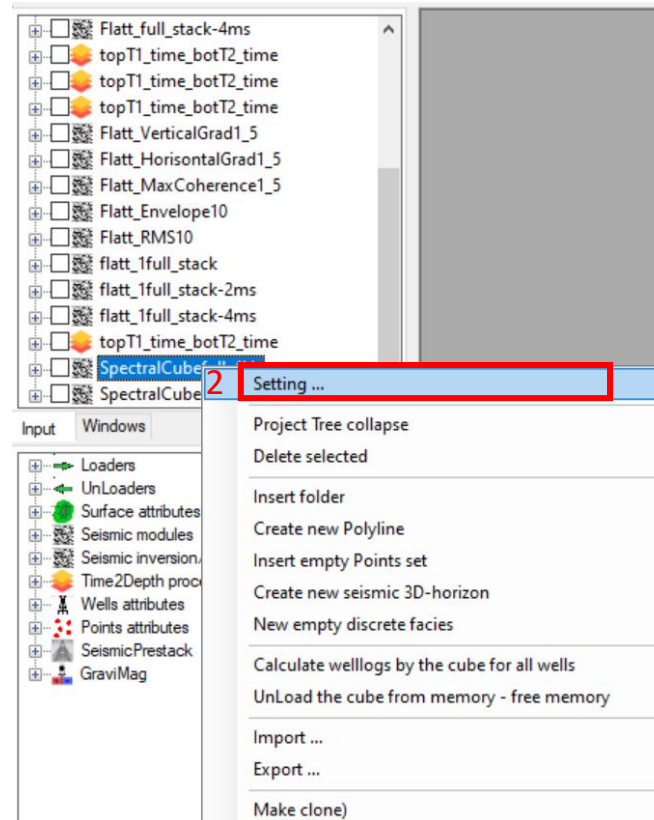


FX куб – куб, в котором каждая трасса представлена амплитудно-частотным спектром

2. Создаем две виртуальные копии flatt cube

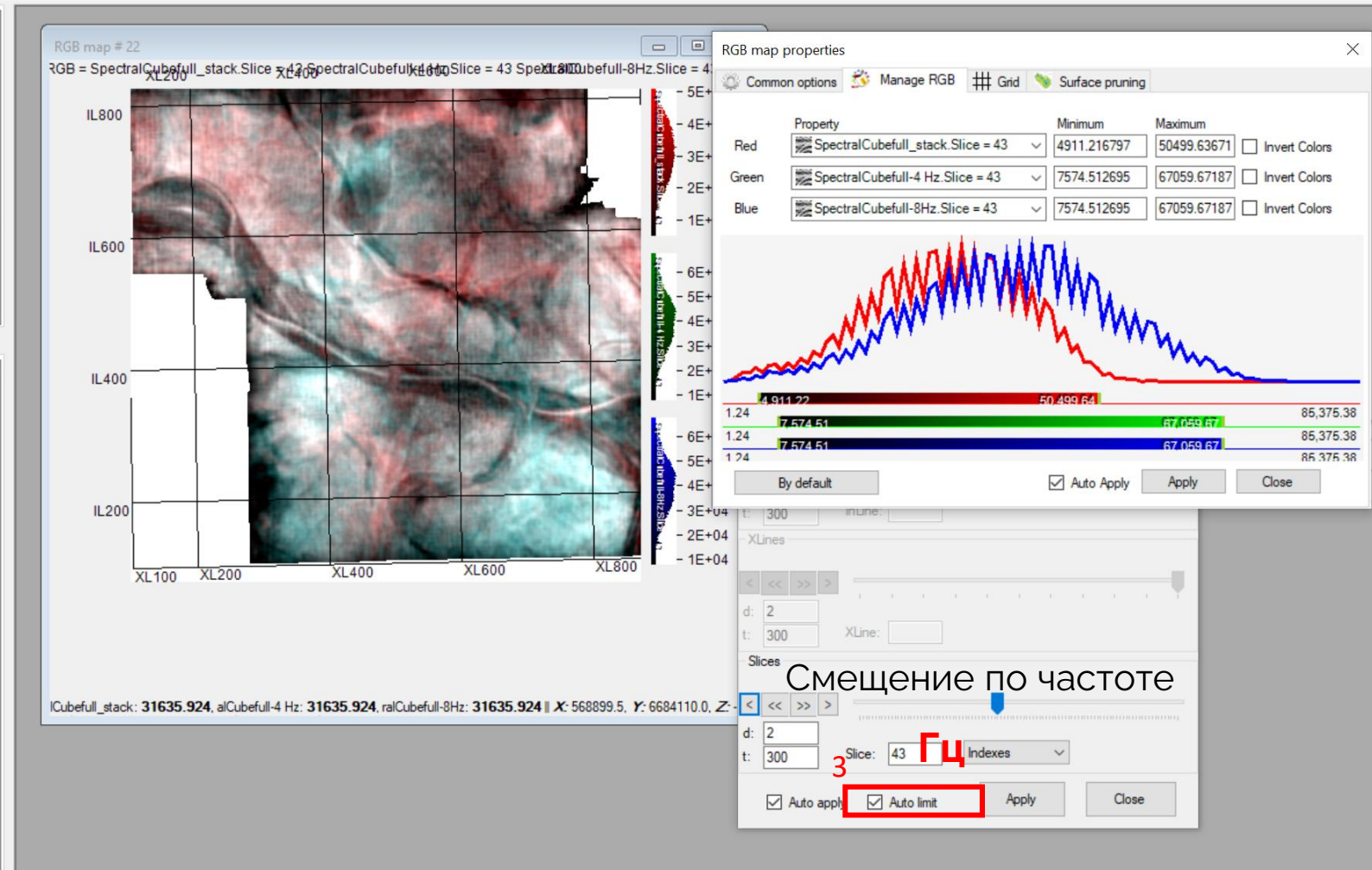
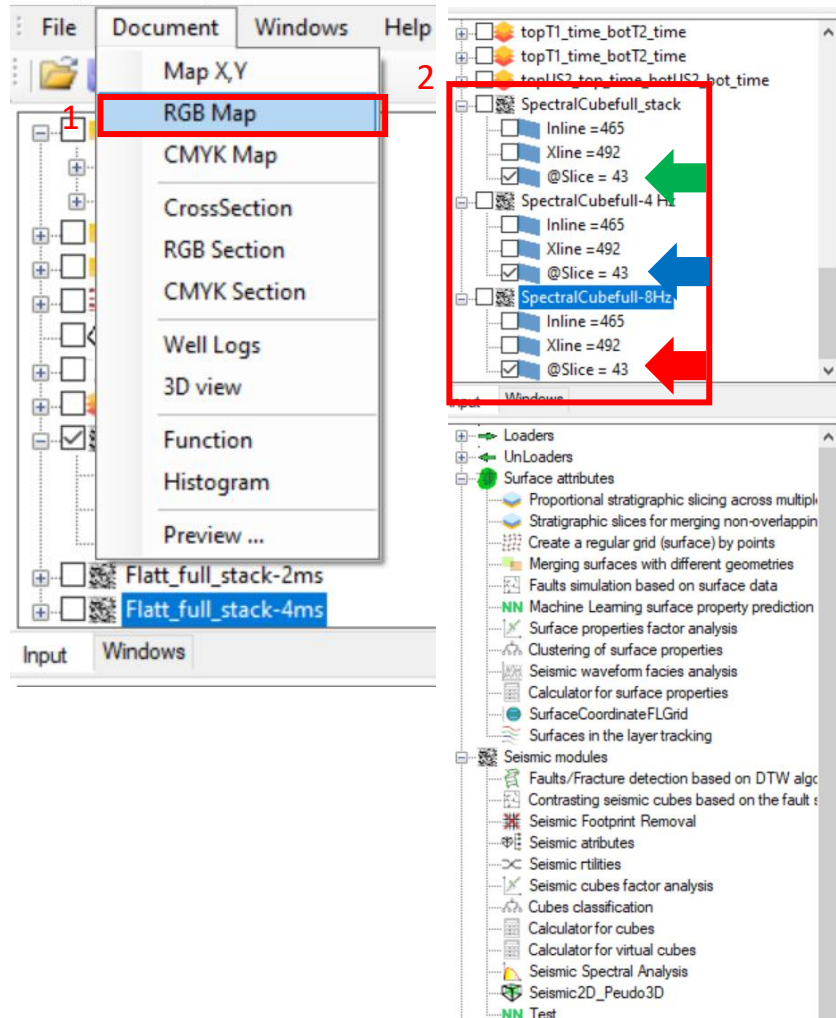


3. Сдвигаем по частоте первую копию на 4 Гц, а вторую на 8 Гц



4. Сделаем RGB смешивание:

5. Настройка визуализации [Пр.кн. → Display Settings]



Контакты

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