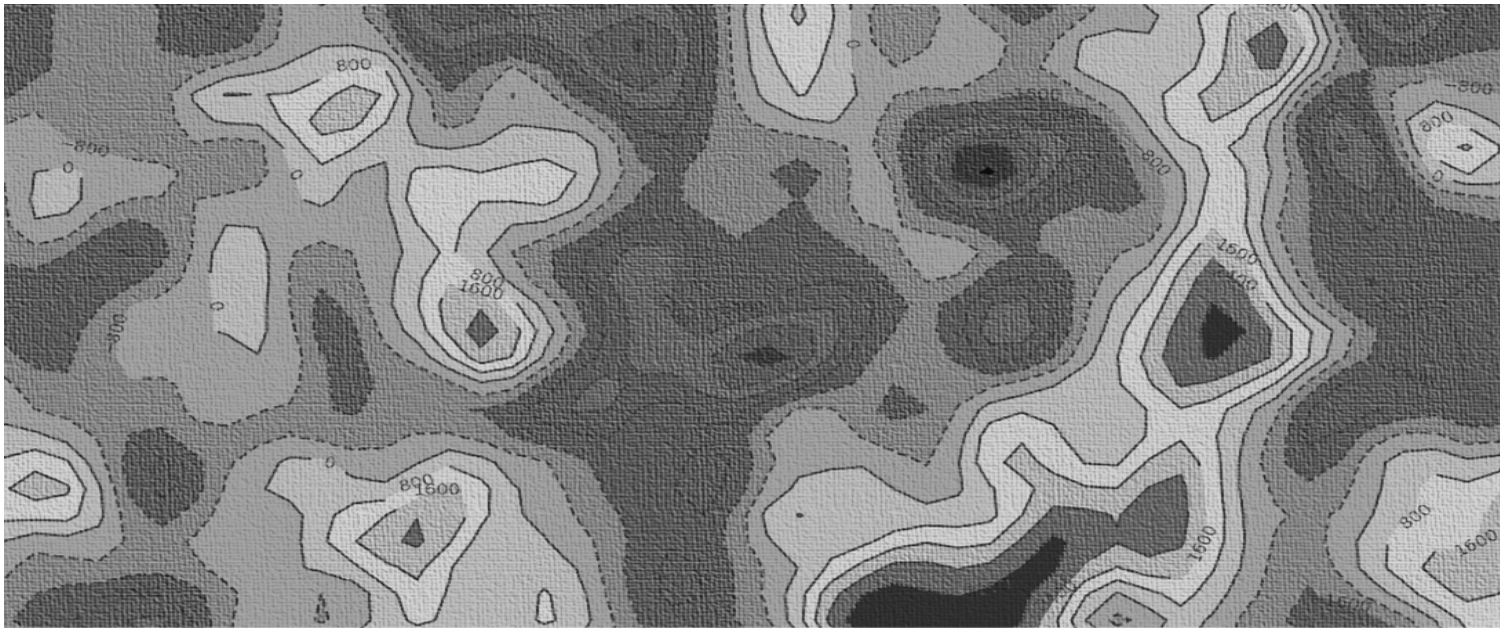

SandFlow module

version 1.0

User manual

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Introduction

The SandFlow module as part of the NaviTerra software allows you to calculate reservoir connectivity maps in clastic formations. Gamma ray logging is used as the basis for the calculation as the most informative for the lithological characteristics of the clastic formation. The module evaluates in pairs the degree of similarity of the shape of Gamma-ray logging curves in the selected reservoir interval and builds connectivity lines between wells. The resulting connectivity ranges from 0 to 1, where 0 is a completely unconnected formation between wells, and 1 is an absolutely identical formation in wells.

The resulting lines and connectivity map can be further used in the construction of conceptual, facies models, during drilling support and in the analysis of field development. The module will be especially effective for highly dissected, extremely heterogeneous formations, for example, of fluvial origin with channels. The method can also be used as a cheap analogue of well testing and tracer studies.

To calculate the connectivity map, you need to load the initial well data into the NaviTerra software: trajectories, logging, well tops and run the calculation of the SandFlow module.

Loading well trajectories

Well trajectories can be loaded in three ways:

1. **Import trajectories in .dev format** – click on the  button, select the .dev file type, select one or more .dev format files, and then the loading of well trajectories will begin. The .dev file must contain the well name, wellhead coordinates and altitude, and data columns MD X Y Z TVD DX DY AZIM_TN INCL DLS AZIM_GN. The well name will be taken from the information in the file, not from the file name.
2. **Import trajectories in RMS well format** – click on the  button, select the .rms well file type, select one or more files in the .rms well format, and then the loading of well trajectories will begin. The well name will be taken from the information in the file, not from the file name.
3. **Loading trajectories in the form X, Y, Z or MD, INCL, AZIM** - click on the  button, insert three columns of data X, Y, Z or MD, INCL, AZIM, enter the name of the well, if necessary, the wellhead coordinates and altitude, and click on the *“Calculate inclination”* or *“Calculate coordinates”* button.

Loading gamma ray logs

Gamma ray logs can be downloaded in three ways:

1. **Import logs in .las format** – click on the  button, select one or more files in .las format, and then the logs will begin loading. The log from the file that has the unit of measurement μR/hour or gAPI will be loaded as a gamma ray log from the file.

2. **Import of logs in RMS well format** – if you have loaded well trajectories in this format, you do not need to download the GR curves separately, because with this format, both the trajectory and the well logging are loaded simultaneously.

Loading well tops

Well tops can be loaded in two ways:

1. Import fills in the petrel well tops format – click on the  button, select one or more files in the petrel well tops format, and then the download of fills will begin.

2. Loading selections as a table – create an Excel table with the following columns:

Well name	Formation name	Measured depth (MD)
…	…	…

Next, click on the plus sign button and paste these columns into the program via Ctrl+V and click on the "*Save"* button.

Launching the SandFlow module

In the functional window of the SandFlow module, select the top and bottom of the formation for which you want to build a connectivity map. Select the radius multiplier in which the connectivity coefficients will be calculated. The higher the multiplier, the more wells around each well will be analyzed and the longer the calculation time. Next, click on the calculation button and wait until the operation is completed.

As a result, a connectivity line map and a continuous connectivity map will appear in the Map tree. The colors of the connectivity lines from purple to red indicate an increase in the connectivity coefficient. A continuous connectivity map can be exported in irap classic grid format using the  button.

Working with project in NaviTerra

All your work and data in the NaviTerra program can be saved into a project and, if necessary, opened later.

To save the project, click on the button with the blue floppy disk icon. Next, select the directory and name of your project, click on the “*save*” button. The project file will be saved with .ntp (naviterra project) resolution.

To open a previously saved project, click on the button with the folder image. Select a file with .ntp resolution and click on the “*open*” button.

You can also create a new project by right-clicking on this button with the image of a folder and selecting the appropriate context menu. When you right-click on the save button, you can select a menu to save the current project under a different name.