



ResInsight Advanced User Course

Q1 2024

Agenda

1. Welcome, course layout and introductory remarks
2. Hands-on Exercises
3. Summary and feedback



Ceetron Solutions



Table of Contents

Table of Contents.....	2
Support and Resources	4
Preparations.....	5
a) Grid Cross Plot with formations.....	7
b) Grid Cross Plot with filtering.....	8
c) Sector model export	9
d) Ensemble Grid Case Statistics	10
e) Grid Property Calculator	11
f) Well Log Extraction	13
g) Well Log Data	14
h) Well Measurements in 3D	15
i) Well Measurements in plots.....	16
j) Well Picks	18
k) Well Path Creation	19
l) Well Path Completions	20
m) Export LGR for Completions.....	21
n) Valve Modeling and Export.....	22
o) Project file manipulations.....	23
p) Seismic Data	24
q) Seismic Data along a well path	25
r) Correlation analysis (taken from ResInsight Intro Course).....	26





s)	Analysis Plot (taken from ResInsight Intro Course)	28
t)	Python scripting	29
u)	Description of Flow Diagnostics.....	30
v)	Improvements and new features 2023.12	31
w)	Improvements and new features 2023.10	32
x)	Improvements and new features 2023.06	33





Support and Resources

Main help page

<https://resinsight.org/>

Yammer

Internal Equinor Yammer channel "*ResInsight users*"

<https://web.yammer.com/main/threads/eyJfdHlwZSI6IlRocmVhZCIsImkljoiNzMzMzA5MDI1MjgwMDAwIn0>

Tutorials – introduction

There are a few tutorials available, and we also have recorded videos for some of them.

<https://github.com/CeetronSolutions/resinsight-tutorials>

https://www.youtube.com/channel/UCEJoH_ti1YZXz4hPMeAKMgw

Overview of the interface for 3D visualization

<https://github.com/CeetronSolutions/resinsight-tutorials/blob/main/tutorials/graphical-user-interface/graphical-user-interface.md>



Ceetron Solutions

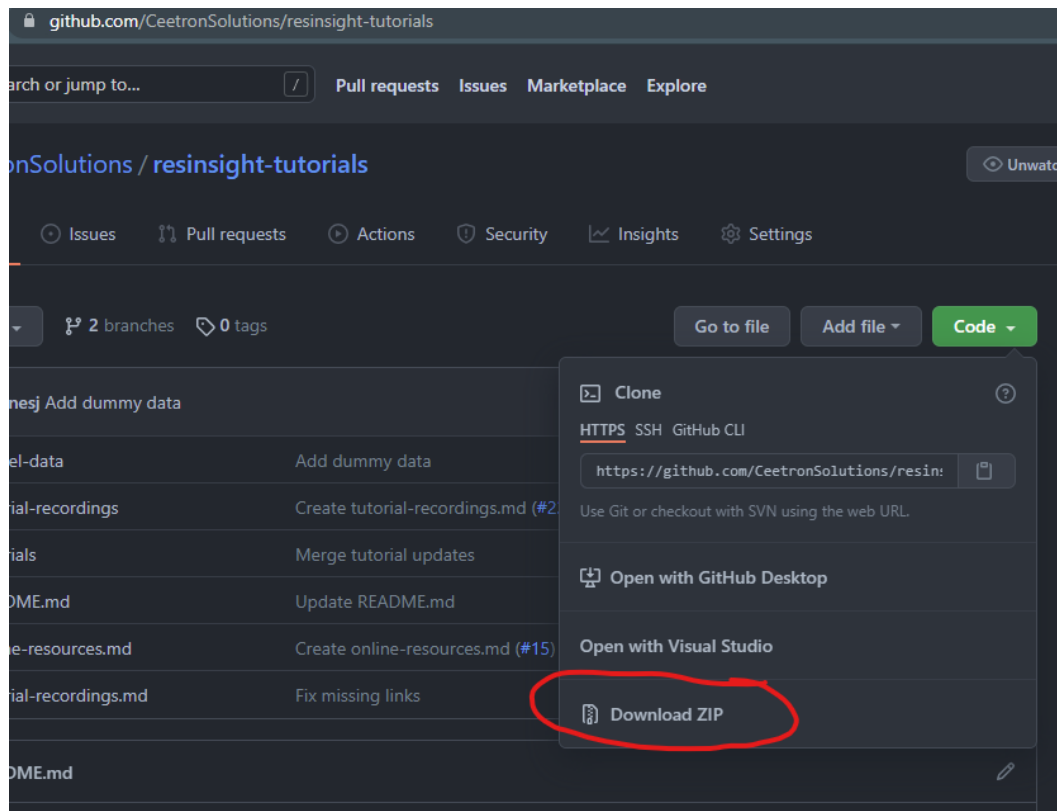


Preparations

Test models used in tutorials are available from <https://github.com/CeetronSolutions/resinsight-tutorials>

The data to be used in tutorials is in the folder **model-data**.

Either clone the GitHub repository, or select “**Download ZIP**” from the **Code** menu



Ceetron Solutions

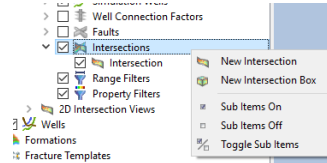


Conventions

In this document, **bold text** indicates an object in the property tree. Menu item text is “written in quotes”.

Example

Select “New Intersection” from **Intersections**.



Tips and tricks

Please close the existing project (“File->Close Project”) before starting a new tutorial. This will help you to avoid confusion caused by data from previous tutorials.



Ceetron Solutions

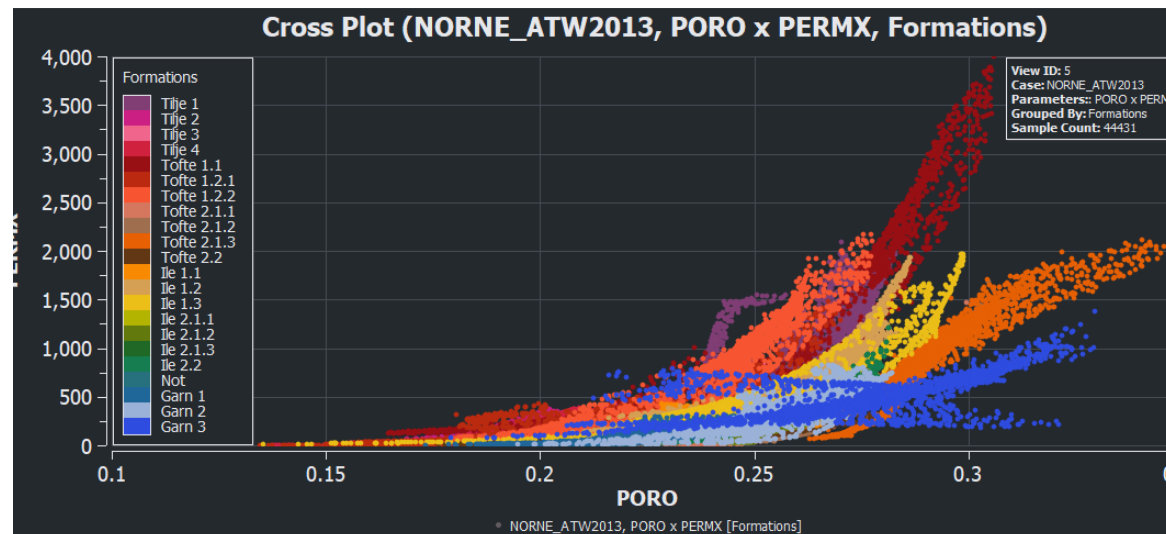
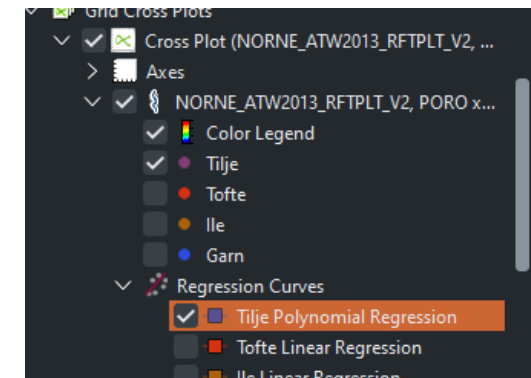
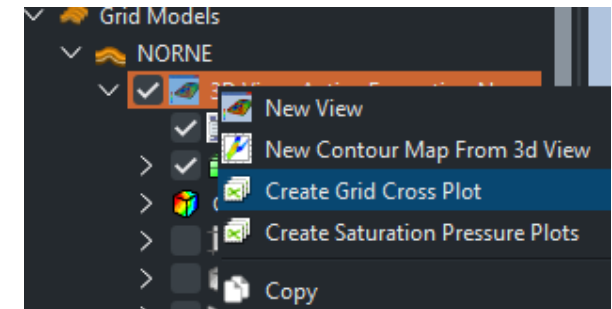


a) Grid Cross Plot with formations

Objective: Create grid cross plot with automated categories based on formations

1. Import grid data using "Import Eclipse Case" from folder "model-data/norne"
2. Import formations from folder "model-data/norne/Norne_subZones.lyr"
3. In **Cell Result**, select **Static->PORO**
4. In the **Project Tree**, open the right-click menu of the view, Select "Create Grid Cross Plot".
The default **X-Axis Property** is defined by the **Cell Result** in the 3D view, and default **Y-Axis Property** is **Depth** with the Y-axis inverted with increasing values at the bottom of the plot
5. Select **PERMX** as the **Y-Axis Property**
6. Click on a sample in the plot to highlight all samples for a group
7. Regression curves
 - a. Disable all other cross plot curves except one from Tilje formation
 - b. In the **Property Editor**, enable the regression curve for this formation
 - c. Adjust the regression curve properties in the **Property Editor**

<https://resinsight.org/plot-window/gridcrossplots/>



Ceetron Solutions



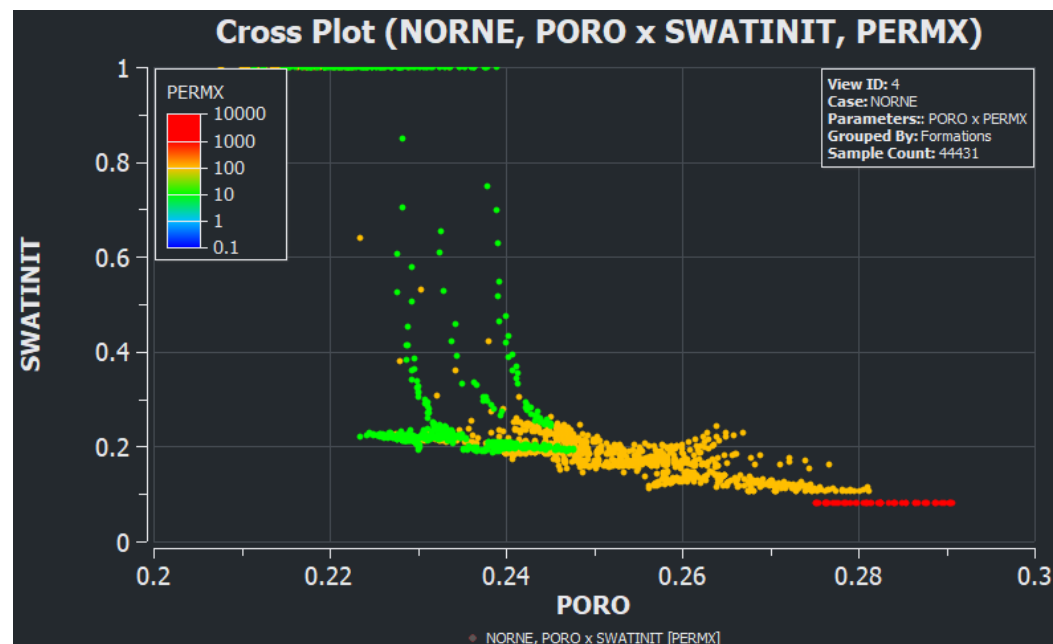
b) Grid Cross Plot with filtering

Objective: Create grid cross plot with filtering

1. Import grid data using "Import Eclipse Case" from folder "model-data/norne"
2. Import formations from folder "model-data/norne/Norne_subZones.lyr"
3. In the 3D view, set **Cell Result** to **Static -> FIPNUM**
4. In the **Project Tree**, open the right-click menu of the view
5. Select "Create Grid Cross Plot"
6. Set Static **PORO** as x-axis
7. Set Static **SWATINIT** as y-axis
8. Set **Group Data by** "Result Property", select **Static -> PERMX**
9. Select color legend in Project three

a. See how manipulation of "Number of intervals" affects the plot

10. In the grid cross plot, select **Filter by 3D view**
11. Go back to the 3D view, and create a property filter based on **FIPNUM**
 - a. Select FIPNUM value 6 the category selection (multiple selection is supported)
 - b. Hide faults to see the filtered grid cells
12. Make sure both the 3D view and the plot window are open at the same time. Modify the selected FIPNUM values in the property filter and see how the plot is updated as visible cells in the 3D view changes.
13. Right-click the **Cross Plot** in the Plots tree view and select "Show Plot Data" to see the plot values.



Ceetron Solutions

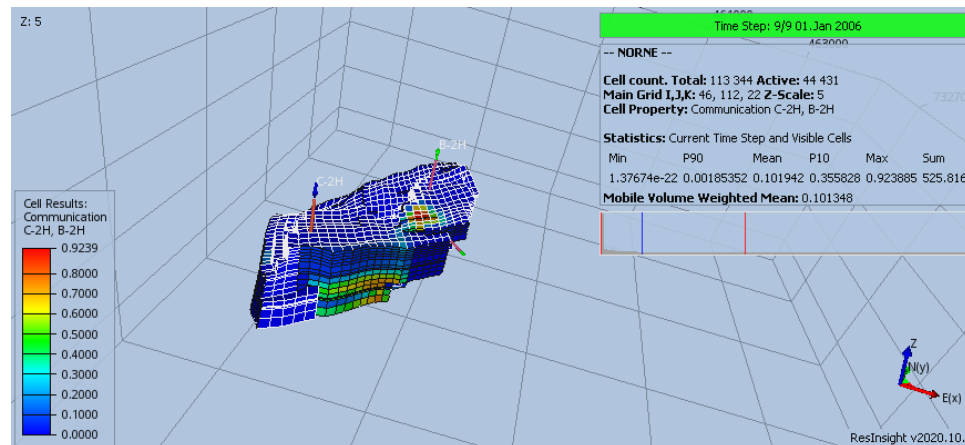


c) Sector model export

Objective: Export a subset of the grid based on visible cells

1. Import grid data using "Import Eclipse Case" from folder "model-data/norne"
2. Move to the last time step as there is no flow at the first time step
3. In the 3D view, set **Cell Result** to **Flow Diagnostics**
4. Select "By Selection"
5. Select injector **C-2H** and producer **B-2H**
6. Select **Injector Producer Communication**
7. Create a property filter on communication between **C-2H** and **B-2H**
8. Hide the faults to see the cells
9. In the right-click menu in the 3D view, select "Export Eclipse Sector Model"
10. Select Export Folder and additional settings, and click **Export** button
11. Import the exported data
 - a. Select "Import Eclipse Input Case"
 - b. Select all files exported in the previous step (use multiselect in file dialog)
12. Compare the imported data with the original binary case
 - a. Select **PERMX** in both views
 - b. In the right-click menu in the 3D view, activate **Compare to**

<https://resinsight.org/export/sectormodel/>



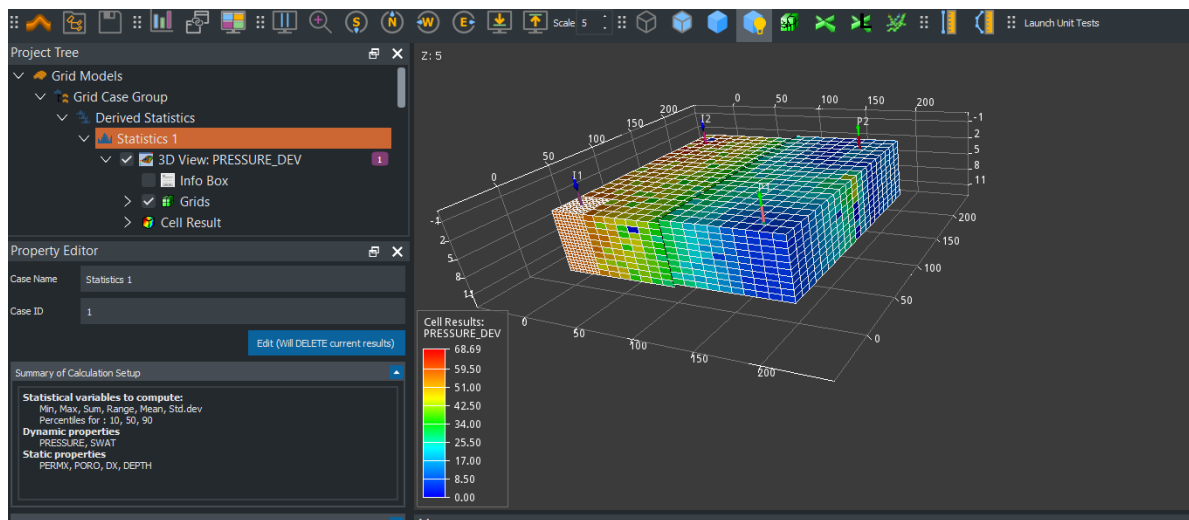
Ceetron Solutions



d) Ensemble Grid Case Statistics

Objective: Import an ensemble of grid cases and compute statistics cell by cell

1. Use data located in folder “model-data/grid_ensemble”
2. Import data using “Create Grid Case Group”
Use the **Find** button to search the folder for files matching the search filter.
The imported cases can be investigated in **Source Cases** folder in the **Project Tree**
3. In the property panel, click the button “Compute” to compute default statistics
4. Select dynamic property **PRESSURE_DEV**, move to last time step
PRESSURE_DEV represents the standard deviation of pressure based on source cases
5. Select **Statistics 1**, and in the **Property Editor** in group **Case Options**, select one of the source cases to use for well data. This will display simulation wells in the view.
6. Create a new view and create a property filter
 - a. Select **PRESSURE_DEV** (pressure standard deviation) larger than 40
 - b. If you will set the cell result to match the property filter, open the right-click menu of a property filter and select **Apply As Cell Result**
7. **[Optional]** Select **Statistics 1**. In the **Property Editor**, click the button “Edit(Will DELETE current result)”
Add **PORV** to the list of static variables. The user interface for selection of properties supports multiselect of items by pressing and holding **CTRL** key when clicking items in the list.
8. **[Optional]** Handling of inactive cells (Use Zero as Inactive Cell Value)
 - a. When computing statistics on **PRESSURE**, it is usually required to leave this option off (total cell count is active)
 - b. When computing statistics on **PORO/PERM**, it is usually required to enable this option (total cell count is active + inactive)



<https://resinsight.org/3d-main-window/casegroupsandstatistics/>

The statistics case can be used as data source for well log extraction of grid cell data as described in the next section.



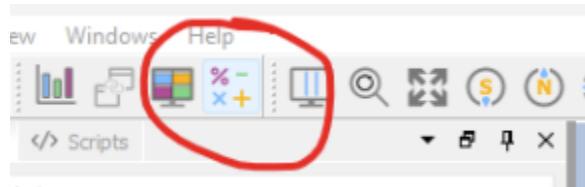
Ceetron Solutions



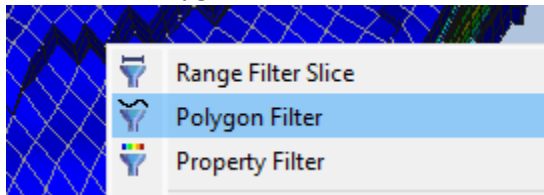
e) Grid Property Calculator

Objective: Compute mobile oil using a grid property calculator

1. Import grid data using "Import Eclipse Case" from folder "model-data/norne"
2. Open the grid property calculator



3. Add the expression text and click **Parse Expression**
$$\text{MOBILE_OIL} := \text{if}(((\text{SOIL-SOWCR}) < 0.00), 0.00, \text{PORV} * (\text{SOIL-SOWCR}))$$
4. Assign corresponding properties to the variables using the **Edit** button
5. Select the **Cell Result** "Generated ->MOBILE_OIL"
6. Create a contour map, and set **Map Projection**, "Result Aggregation->Sum"
7. In the 3D view, create a polygon cell filter for a section of the grid where there is a lot of mobile oil. Activate the the right click menu, and select "Polygon Filter"



8. Open the Grid Property Calculator, and create a new expression
$$\text{SUM_MOBILE_OIL} := \text{sum}(\text{MOBILE_OIL})$$
9. Expand the **Cell Filter** group, and for **Filter by 3d View Visibility**, select "3D View: MOBILE_OIL"

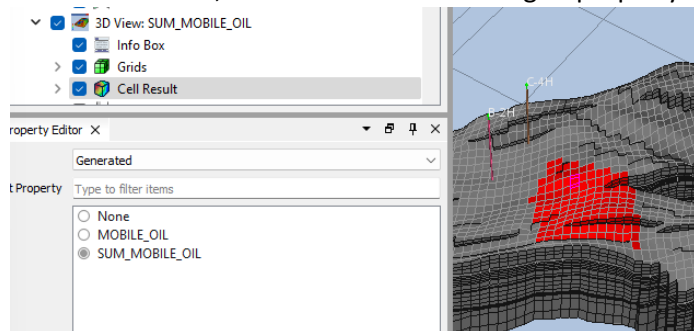




10. Click **Parse Expression**, and assign the **Generated** variable **MOBILE_OIL**

Variable Name	Grid Case	Type	Variable	Time Step	
MOBILE_OIL	NORNE_ATW2013_RFTPLT_V2	Generated	MOBILE_OIL	All timesteps	Edit

11. Click on calculate, and create a view of the grid property **SUM_MOBILE_OIL**



The aggregated sum is assigned to all cells participating in the calculation. The value can be seen in **Result Info** by clicking on a cell.

Note that expressions can be stored to a text file for reuse in other projects. This is available from button operations in the **Grid Property Calculator**.

<https://resinsight.org/calculated-data/gridpropertycalculator/>

<https://resinsight.org/calculated-data/calculatorexpressions/>

See the following description on how to calculate this on an ensemble of grids.

<https://github.com/OPM/ResInsight/discussions/10913>



Ceetron Solutions

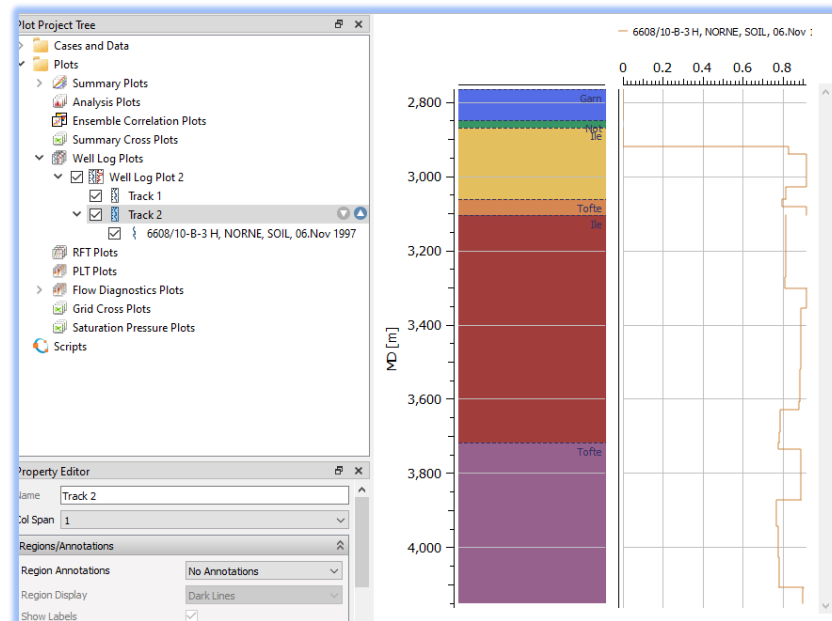


f) Well Log Extraction

Objective: Plot well log extraction curve in 2D plot window

1. In 3D main window
 - a. Import grid case from “norne” and import formations from “norne/Norne_Fm.lyr”
 - b. Import well path "model-data/norne-well-logdata/dummy-B-3H.dev"
 - c. Select cell result **Dynamic** -> **SOIL**
 - d. Select well path **DUMMY-B-3H**, and from the right click menu select “Well Plots->New Well Log Extraction Curve”
 - e. Activate the plot main window
2. In plot main window
 - a. In the project tree, activate right-click menu of the plot and select “New Track”
 - b. Select the new track in the Project tree
 - c. In the Regions/Annotations group, set **Region Annotation** to **Formations**
 - d. Make sure **Formation Case** is set to **Norne** and **Well Path** is set to **DUMMY-B-3H**

<https://resinsight.org/plot-window/welllogsandplots/>



Ceetron Solutions



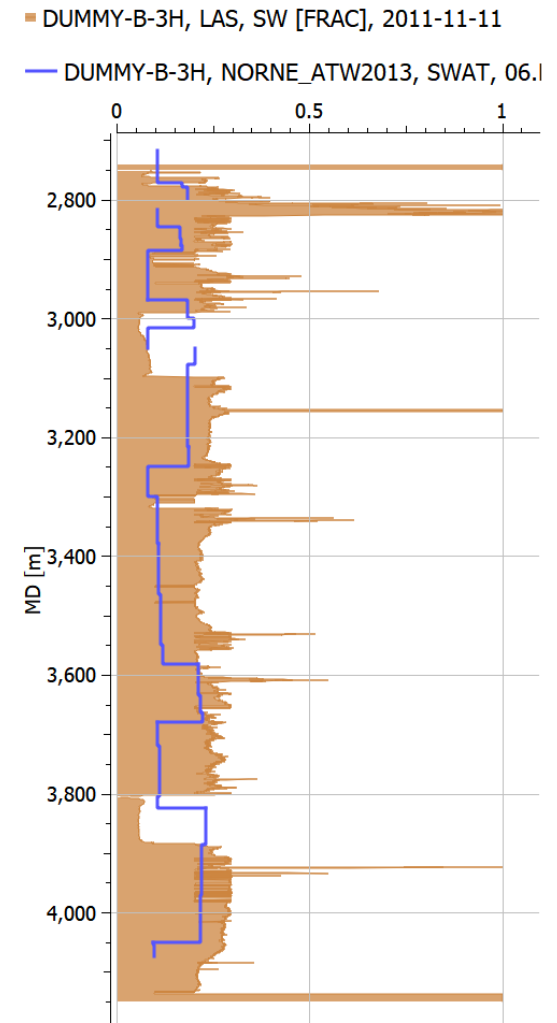
g) Well Log Data

Objective: Plot well log extraction curve in 2D plot window

1. Import grid case from "norne"
2. Import well path "model-data/norne-well-logdata/dummy-B-3H.dev"
3. From the right-click menu of well **DUMMY-B-3H**, select "Import Well Logs from File" and select "model-data/norne-well-logdata/dummy-B-3_H.LAS "
4. From the right-click menu of **SW**, select "Add to New Plot"
5. From the right-click menu of the track, select "New Well Log Extraction Curve"
6. Select **Dynamic** -> **SWAT**
7. Select the **SW** curve object and enable Area fill. Drag and drop curves to make sure the LAS curve is located at the top of the list and will be drawn behind other curves. You can also toggle the curve visibility to control the drawing order.
8. Compare data from the two data sources. They do not have a good match, as the data set contains dummy data

<https://resinsight.org/plot-window/welllogsandplots/>

Well Log Plot 1



Ceetron Solutions

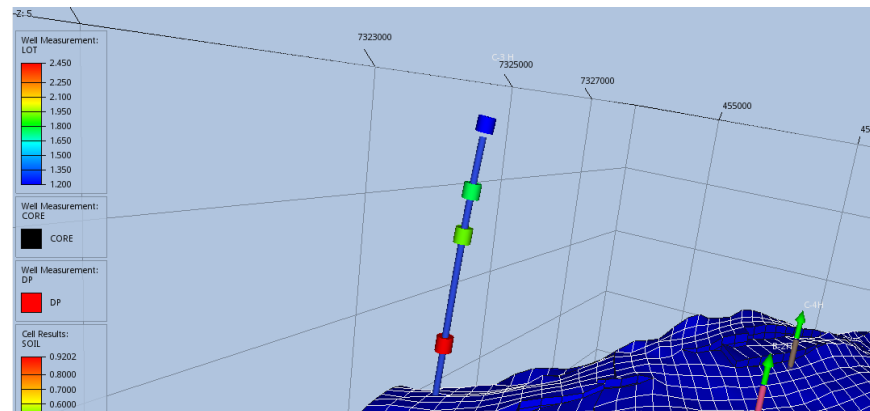


h) Well Measurements in 3D

Objective: Import well measurements, display in 3D view

1. Import norne
2. Import formations for norne
3. Set **Cell Result** to **Static** -> **PORO**
4. Import well paths **C-3H** and **E-3H** from folder "model-data/norne-well-measurements". Use multi-select in the file import dialog to import both in one operation.
5. From the right-click menu of **Wells**, select "Import Measurements"
6. Show measurements in the view
 - a. Create a new view
 - b. Select **Wells** in the **Project Tree**, and disable clipping of wells to be able to see the well path all the way up to the sea surface
 - c. Uncheck **Grid Cells** and **Faults**. Optionally uncheck **Simulation Wells** to make the view cleaner.
 - d. Make sure the checkbox in front of **Well Measurements** is enabled (Located above **Simulation Wells**)
 - e. Manipulate the filtering options for each measurement type in the property editor
7. Continue to next tutorial without closing the project

<https://resinsight.org/wells-and-completions/wellmeasurements/>



Ceetron Solutions



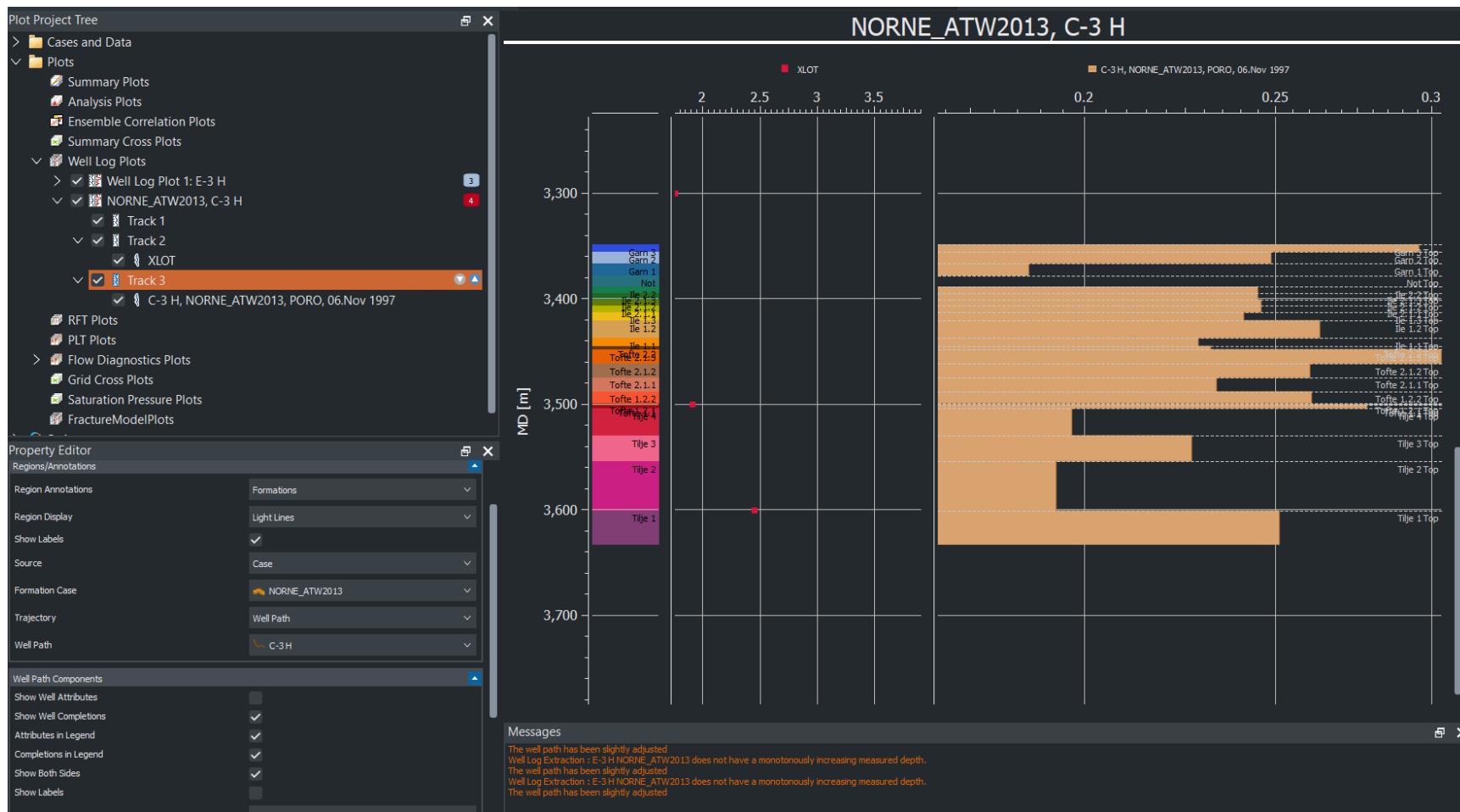
i) Well Measurements in plots

Objective: Import well measurements, display in plots

1. Import data (see import in previous tutorial or continue with same project)
2. Well log extraction curve for well **C-3H**
 - a. Create a **Well Log Extraction** curve for **C-3H**, open the plot window
 - b. Show data for **Static -> PORO**
 - c. In **Curve -> Appearance**, set **Area Fill Style** to **Solid Fill**
3. Create measurement track
 - a. Create a new track
 - b. From the right-click menu of the track, select "New Well Measurement Curve"
 - c. Select well **C-3H** and **XLOT**
 - d. Use the zoom all button to make sure all measurements are visible, or toggle visibility of curve to make the well measurements visible
 - e. Make the measurement symbols larger
 - f. The measurements are outside the grid, and the depth axis min/max values can be defined in the **Depth Axis** section of the plot or by zoom using **CTRL**+mouse wheel
4. Create formation track
 - i. Create a new track
 - ii. From the property editor of the track, in group **Region/Annotation**, set the **Region Annotation** to **Formations**
 - iii. Select case and well path, the formations appear as colors in the track
 - iv. Change the color legend to the same as the formations, usually "Category"
5. Use the up/down arrow to the right of a track to modify the ordering of tracks
6. Add formations as lines to the **PORO** track
7. Change the track width distribution
 - a. Set col span to 2 for **XLOT**
 - b. Set col span to 5 for **PORO** track
8. See next page for an example plot



Ceetron Solutions





j) Well Picks

Objective: Import well picks, display in plots

1. Import norne case
2. From folder "model-data/norne-well-picks", import well path **dummy-B-3H**
3. Open the file "report.csv" in a text editor to see how the well picks are defined
4. From the right-click menu of **Wells**, select "Import well picks" and select "model-data/norne-well-picks/report.csv"
5. Create a well log extraction curve, use **PORO**
6. Use area fill for **PORO**
7. Add a new track for formations
8. In Region/Annotations, in dropdown **Region Annotations**, select **Formations**
9. In dropdown **Source**, select **Well Picks for Well Path**
10. Select **DUMMY-B-3H**
11. The well picks are displayed as horizontal lines

<https://resinsight.org/3d-main-window/formations/#well-picks>



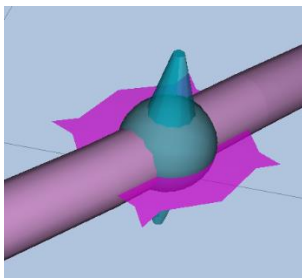
Ceetron Solutions



k) Well Path Creation

Objective: Create a new well path using well targets

1. Import grid data using “Import Eclipse Case” from “model-data/norne”
2. Create intersection
 - a. From the right click menu in 3D view, select “Intersections->Polyline Intersection”
 - b. Add points to intersection, and click button “Stop picking points” when you have added all points
 - c. Disable **Grids** and **Faults** to see the intersection in the 3D view
3. Select “Create Well Path” from right-click menu of **Wells**
 - a. Click on several locations on the intersection to create target points

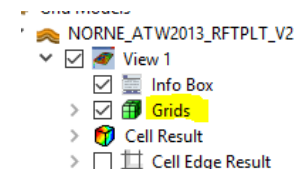


- b. Manipulate the location by using dragger items in 3D

4. Investigate data when selecting “Show well plan” from the right-click menu of **Well-1**
5. Export the well path to a text file from **Well-1**, “Export Visible well path”. Investigate the exported text file.
6. Import the exported well path using “Import Well Path”, investigate the potential geometry differences as the exported file is discretized
7. Save project, as the created well path is intended to be used in other tutorials

Well target move operations

<https://resinsight.org/wells-and-completions/createnewwellpaths/#well-target-interaction-operations>



Property Editor

UTM Reference Point: 456305.40 7321233.77 2610.61

Air Gap: 0

MD at First Target: 0

Generate Target at Sea Level: ☒

Well Targets (4)

		Point	DL in	DL out	Dir	Azi(deg)	Inc(deg)
1	<input checked="" type="checkbox"/>	0.00 0.00 0.00	3	3		62,692	80,273
2	<input checked="" type="checkbox"/>	1484.65 766.55 105.61	3	3		77,7654	88,415
3	<input checked="" type="checkbox"/>	2471.69 825.78 111.42	3	3		77,4047	90,3201
4	<input checked="" type="checkbox"/>	4455.63 2258.87 29.73	3	3		0	0

Start Picking Targets



Ceetron Solutions

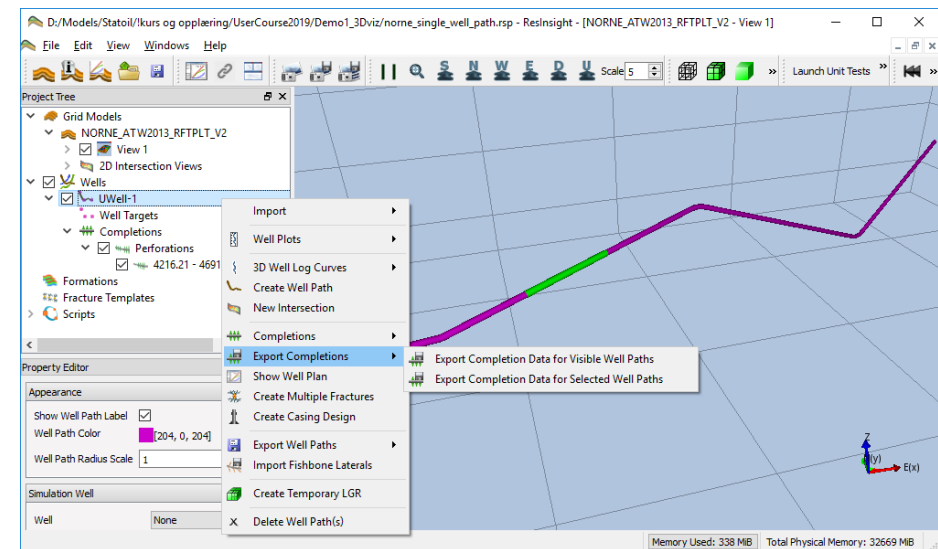


I) Well Path Completions

Objective: Export computed transmissibility factors based on completion along a well path

Continue with the user defined well path from previous tutorial.

1. Find a location along the well path inside the grid, and from right click menu when clicking on the well path in 3D view select “Completions->New Perforation Interval”
2. From **Well Targets**, select “Export Completions for Visible Well Paths”. Create a new folder as destination for the export operation. Open the **Messages** window to see the location of the exported file.
Inspect the exported file in a text editor and try to match the exported data with the perforation intervals in the 3D view.
3. Add one more perforation interval
4. Export completions, and investigate exported text file
5. Combined export
 - a. Create fracture template
 - i. Select “New Stim Plan Fracture Template” from the right click menu of **Fracture Templates**
 - ii. Import template from “/model-data/norne-well-hydrfrac/StimPlan_HydrFrac.XML”
 - iii. Find a location for the template, and launch the right click menu in the 3D view when clicking on the well path geometry
 - iv. Select “Completions->New Fracture”
 - v. Select “3D View”->Fractures”
Toggle the view if “Fractures” object is missing.
Select “Result Color->Conductivity [md-ft]”
 - b. Add a fishbones section “Completions->New Fishbones”
 - c. Export completions, and select **File Split** “Split on Well and Completion Type”
 - d. Investigate the exported files in export folder



<https://resinsight.org/wells-and-completions/completions/>



Ceetron Solutions

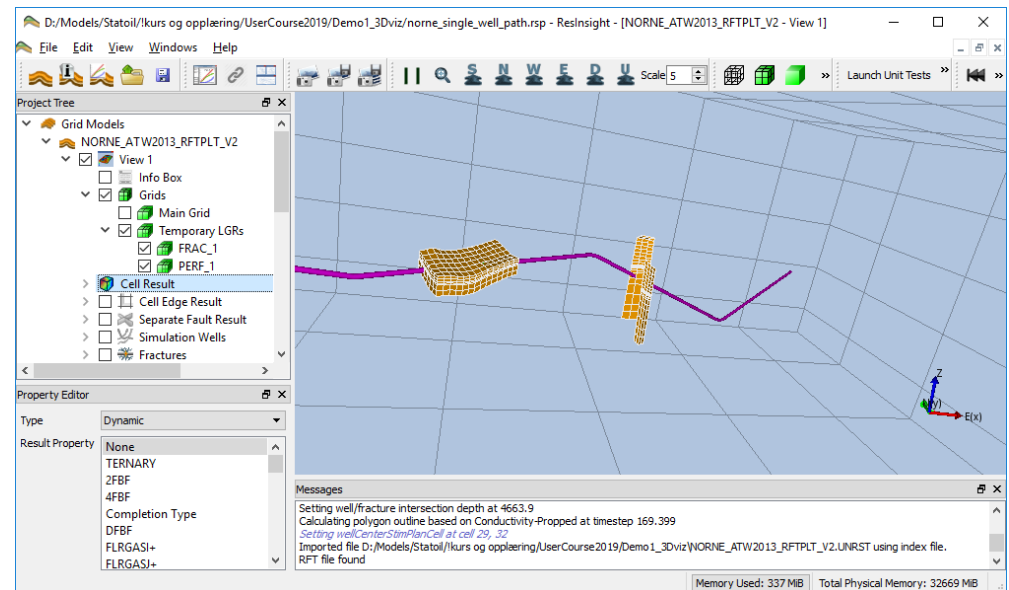


m) Export LGR for Completions

Objective: Create and export local grid refinement (LGR) based on completions

Continue with the user defined well path from previous tutorial.

1. Add two perforation intervals and one fracture to the well path
2. In the Wells folder in the Project Tree, select the well you are working on. From right click menu of this well, select “Create Completions->Create Temporary LGRs”
3. Export completion data into an empty folder
4. Investigate **CARFIN** section in generated file **LGR_Well-1.dat**
5. Untick all filters, and untick **Main Grid** in the **Grids** folder
6. From right click menu of the well, select “Create Completions->Create Temporary LGRs” and set number of cells in K direction to 5
7. Export and Investigate **CARFIN** section in generated file **LGR_Well-1.dat**
8. Add fishbones
9. Optional: Possible to create multiple fractures using Stim Plan fracture
 - a. From the right click menu of **Well-1**, select “Create **Multiple Fracture**”
 - b. Select “Replace Fractures” and close the dialog
10. Use the checkboxes in **Grids** to investigate the generated LGR grids



NB! Please note that the temporary LGRs will not be restored if you save the project and open the project again.

<https://resinsight.org/wells-and-completions/completionslgr/>



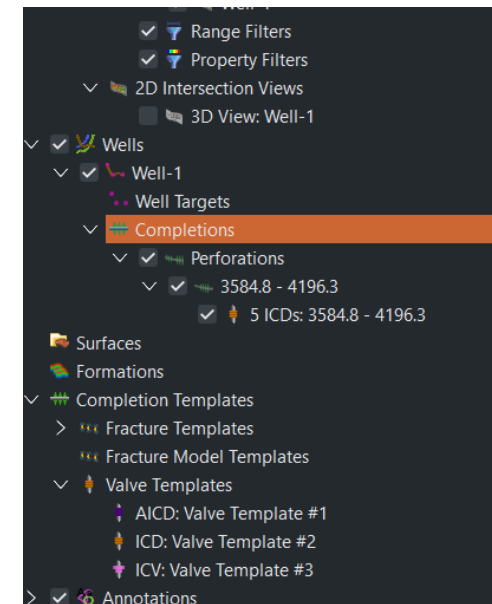
Ceetron Solutions



n) Valve Modeling and Export

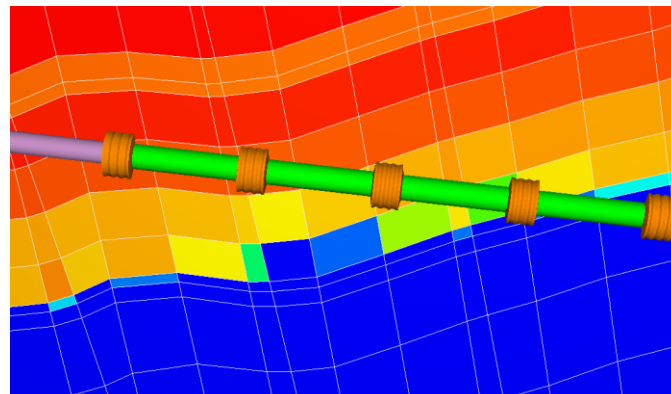
Objective: Create valves and export completion

1. Create a well or import modeled well path from previous tutorial
2. Create a perforation of length 500m
3. Add a valve from the right-click menu of a perforation interval
4. ICD Export
 - a. Select an ICD template, and click **Edit** for easy navigation to the valve templates
 - b. Set Number of Valves to 5
 - c. Select “Export Completions” from the context menu of the well
 - d. Investigate the exported text files
5. Export AICD
 - a. Change valve to **AICD template**
 - b. Set the following values in the **AICD template**
 - i. Strength of AICD: $1e-5$
 - ii. Calibration Fluid Density: 1000
 - iii. Calibration Fluid Viscosity: 1
 - iv. Volume Flow Rate Exponent: 2
 - v. Viscosity Function Exponent: 0.7
 - c. Select “Export Completions” from the context menu of the well
 - d. Investigate the exported text files



Import of templates from text files is supported using the right-click menu of **Valve Templates** and select “Import Valve Templates”. Valves can be imported from **Completor** or **Eclipse** text files.

<https://resinsight.org/wells-and-completions/completions/#perforation-interval-valves>



Ceetron Solutions



o) Project file manipulations

Objective: Know how to manipulate selected parts of the project file

- Show path section <ReferencedExternalFiles>
 - o Discuss how these can be changed by external scripts
- Show well path targets <WellPathTargets>
 - o Discuss how these can be changed by external scripts
 - o Create a copy of the well path target project file
 - o Move one target 50 meter in x-direction
 - o Save project as copy with new name
 - o Open copy, and investigate the modified location of the well path target
 - o Discuss how to manipulate model from scripting

```
<?xml version="1.0" encoding="UTF-8"?>
<ResInsightProject>
  <DocumentFileName>C:/Users/Magne/norne_geo_range_filter.rsp</DocumentFileName>
  <ProjectFileVersionString>2020.04.0-dev.01</ProjectFileVersionString>
  <ReferencedExternalFiles>
    $PathId_001$ D:/gitroot-ceesol/ResInsight-regression-test/ModelData/CaseDataODB/norne/norne_case2.oddb;
    $PathId_002$ D:/gitroot-ceesol/ResInsight-regression-test/ModelData/norne/NORNE_ATW2013.EGRID;
    $PathId_003$ D:/gitroot-ceesol/ResInsight-regression-test/ModelData/norne/INCLUDE/FAULT/FAULT_JUN_05.INC;
    $PathId_004$ D:/gitroot-ceesol/ResInsight-regression-test/ModelData/norne/NORNE_ATW2013.SMSPEC;
  </ReferencedExternalFiles>
  <OilFields>
    <ResInsightOilField>
      <AnalysisModels>
```



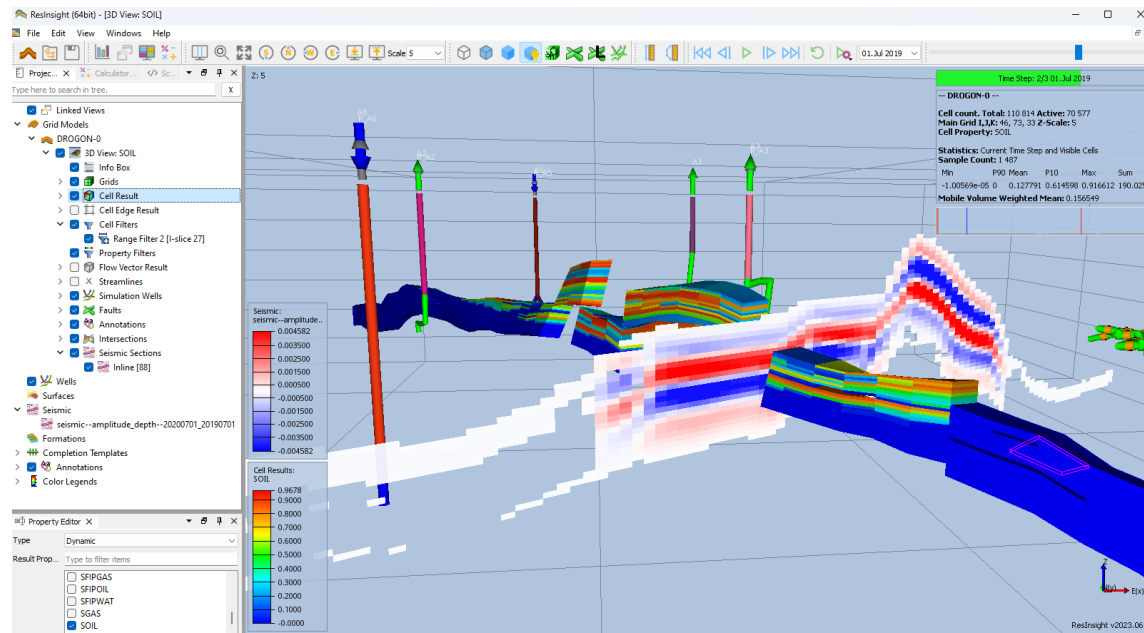
Ceetron Solutions



p) Seismic Data

Objective: Import and visualize seismic data. Compare with reservoir data.

- Import the Drogon grid model from "model-data/drogon/DROGON-0.EGRID"
- Import seismic data from "model-data/drogon/seismic/seismic--amplitude_depth--20180701_20180101.vds"
- In the **Project Tree**, toggle off **Grids** to be able to see seismic data (optionally toggle off **Faults**)
- From the right-click menu of **Seismic Sections**, select "New Inline Section" and investigate seismic data in the view
 - o Activate the **Seismic Histogram** dialog to see the value distribution
 - o Click on red and blue parts of the seismic slice to see the associated seismic value in the **Result Info** dialog, see how the reported values corresponds to the seismic color legend
 - o Select the **Inline** object, and manipulate the **Inline** value in the **Property Editor**
- Select the seismic data source, and adjust the mute and clip values to filter seismic data
 - o Set **Clip Value** to 0.003
 - o Set **Mute Value** to 0.001
 - o Select the **Inline** object, expand the **Experimental** group and activate **Transparent**
 - o Move the inline to see how seismic data correlates to grid model geometry



Ceetron Solutions



q) Seismic Data along a well path

Objective: See seismic data along a well path

- Import the Drogon grid model from " model-data/drogon/DROGON-0.EGRID"
- Import seismic data from " model-data/drogon/seismic/seismic--amplitude_depth--20180701_20180101.vds"
- Create a user defined well path
- From the right-click menu of **Intersections**, select "New Intersection". Change intersection type to **Well Path**, and select the well path
- From the right-click menu of the generated intersection, select "Create as Seismic Section"
- Select the **Seismic section**, and set it transparent
- Tile the windows to be able to see both views at the same time
- Show only seismic data in one view and grid model data in the other
- Manipulate the well path targets, and see grid is updated
- Advanced manipulation:
 - o Press and hold CTRL to move the target and all downstream well targets
 - o From the right-click menu in a view, select **Compare to**

A seismic view can be created independently of the reservoir view. To create this type of view, select **New View** from the right-click menu of **Seismic Views**.



Ceetron Solutions



r) Correlation analysis (taken from ResInsight Intro Course)

Objective: Create and configure a Correlation Plot

- Import a Summary Ensemble, and use import path "model-data/reek_ensemble/3_r001_reek_50/realization-*/iter-1"
- From the right-click of a curve, select "Create Correlation Plot from Curve Point ->New Report Plot"
- Click on individual cells in the **Correlation Matrix**, and see how the cross plot is updated
Currently selected cell is indicated by a border in green
- Show Pearson calculation
- Change data source to **WOPT** for all wells **OP_1** to **OP_5**
- Click on individual cells in the **Correlation Matrix**, and see how the cross plot is updated
- Right-click in plot, and select **Show Plot Data**

<https://resinsight.org/plot-window/correlationplots/>

Definition of how the Pearson correlation coefficient is computed

https://en.wikipedia.org/wiki/Pearson_correlation_coefficient#For_a_sample

X is input parameter value, Y is simulated value

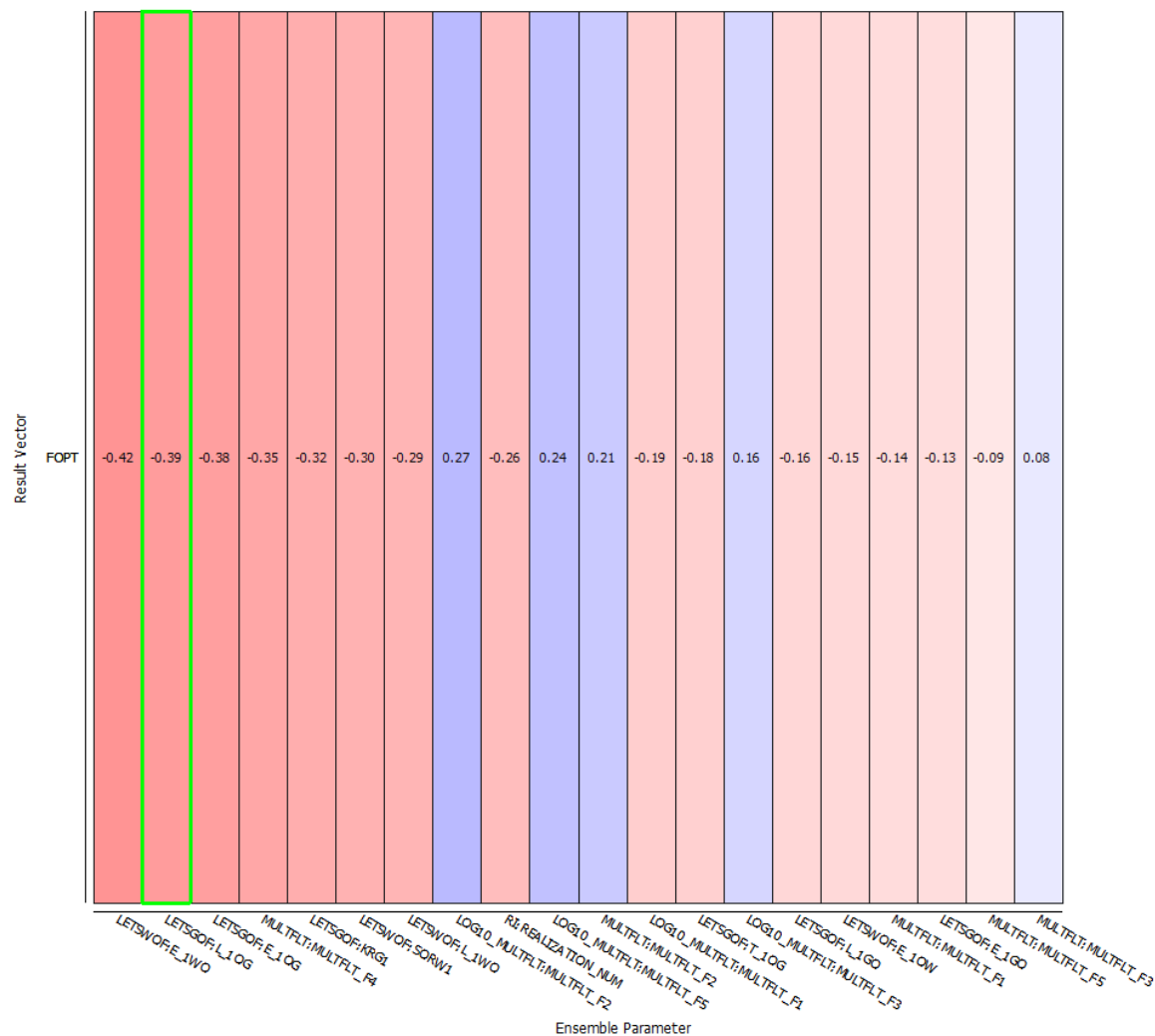
$$r_{xy} = \frac{\sum_{i=1}^n (x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum_{i=1}^n (x_i - \bar{x})^2} \sqrt{\sum_{i=1}^n (y_i - \bar{y})^2}} \quad (\text{Eq.3})$$



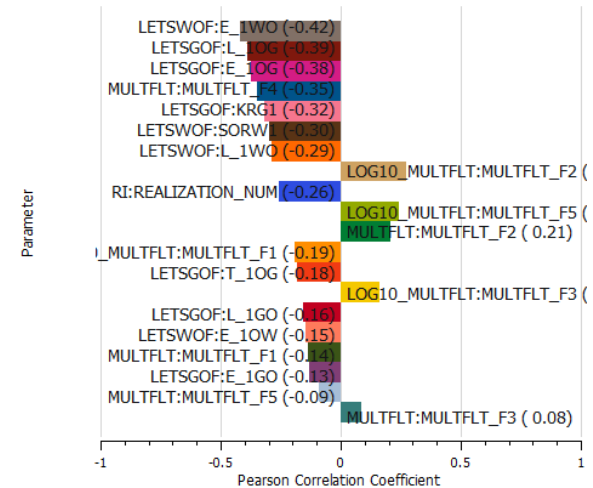
Ceetron Solutions

Correlation Report for base_pred at 2004-01-29 00:00

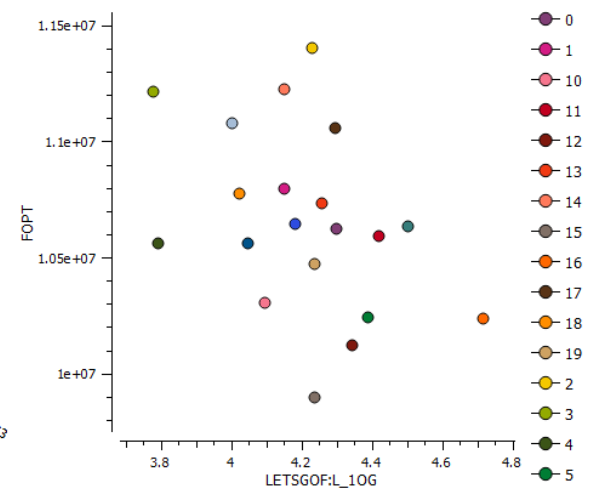
Correlation Matrix for Parameters vs Result Vectors at 2004-01-29 00:00



Correlations for base_pred, FOPT at 2004-01-29 00:00



Cross Plot base_pred, LETSGOF:L_1OG x FOPT at 2004-01-29 00:00



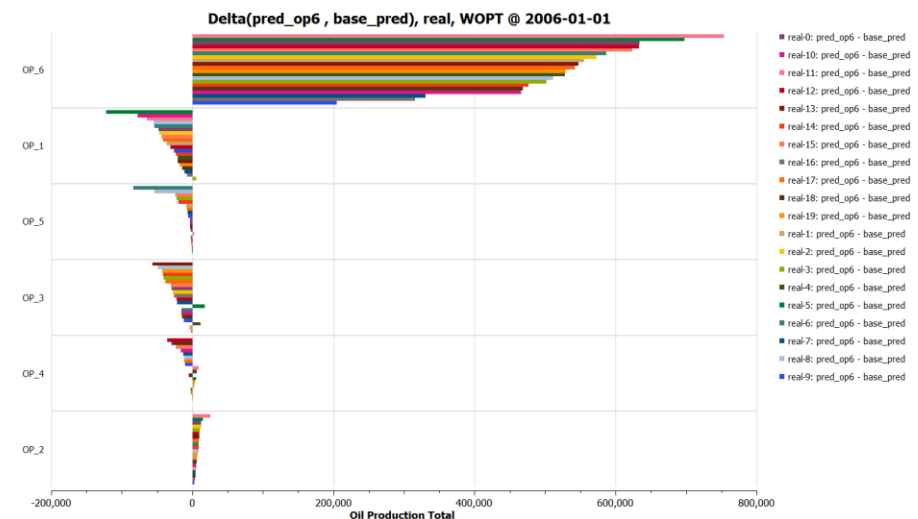


s) Analysis Plot (taken from ResInsight Intro Course)

Objective: Create and configure an Analysis Plot

- Import a Summary Ensemble, and use import path "model-data/reek_ensemble/3_r001_reek_50/realization-0/base_pred"
- Import a Summary Ensemble, and use import path "model-data/reek_ensemble/3_r001_reek_50/realization-0/pred_op6"
- Select New Delta Ensemble from right-click on **Summary Cases**
Create a **Delta Ensemble** as the difference between the two cases (pred_op6 - base_pred)
- Select new **Analysis Plot**
- In Property Editor, in group Selected Vectors, click on the button with three dots "..."
 - o Set source **Delta ensemble**
 - o Select wells **OP_1-5**
 - o Select Summary Vector **WOPT**
- Bar Orientation: **Horizontal**
- Select major grouping **Summary Item**
- Select sort by abs(Value)
- Optionally
 - o Show legend
 - o Bar labels
- Right-click in plot, and select **Show Plot Data**

<https://resinsight.org/plot-window/analysisplots/>



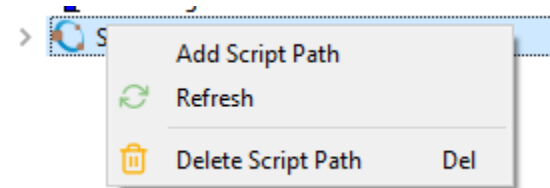
Ceetron Solutions



t) Python scripting

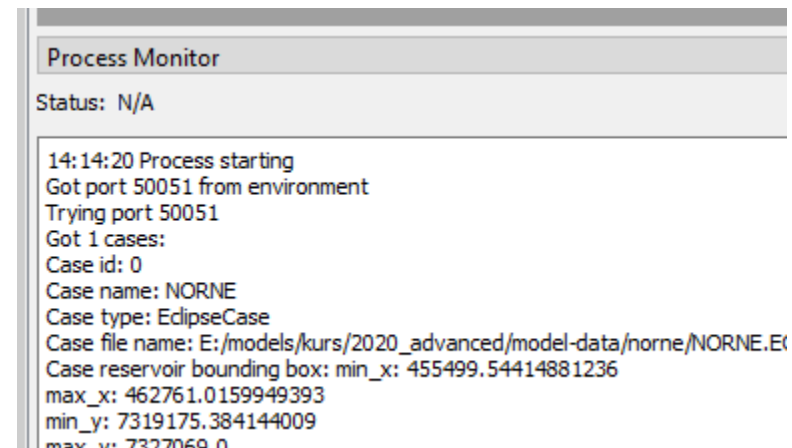
Objective: Learn how to execute a Python script from ResInsight UI

- Configuration of Equinor internal scripts is described in *"ResInsight user Course Preparations 2022.pdf"*
- [Optional] Add a folder containing existing scripts
 - o Right-click on **Scripts** item, and select "Add Script Path"
 - o Select script folder
 - o To edit the text content of a **Script**, select "Edit" from the right-click menu
- Use the right-click menu to execute a script
- Investigate the output from the Python script in **Process Monitor**
- It is also possible to execute a Python script directly from a terminal



<https://api.resinsight.org>

<https://api.resinsight.org/en/stable/PythonExamples.html>



Ceetron Solutions



u) Description of Flow Diagnostics

A **Flow Diagnostics** simulator developed by **SINTEF** based on **MRST(MATLAB Reservoir Simulation Toolbox)** is included in **ResInsight**. The flow diagnostics simulator as described by **SINTEF**:

“Flow diagnostics are simple and controlled numerical flow experiments run to probe a reservoir model, establish connections and basic volume estimates, and measure dynamic heterogeneity. Flow diagnostic quantities are quick to compute and can thus be used interactively to explore fluid communication in a geological model before or after more comprehensive multiphase flow simulations.”

The following table displays the short name used by **ResInsight** and the more detailed description taken from the **SINTEF** documentation.

ResInsight naming	Flow Diagnostics description (SINTEF)
Forward time of flight (injectors) Reverse time of flight (producers)	Travel time for mass-less particles that passively follow the flow field from an injector into the reservoir and from a point in the reservoir to the nearest producer
Drainage/flooding regions	Delineate regions drained by given producers or swept (flooded) by given injectors
Injector Producer communication	Determine whether pairs of injectors and producers communicate or not and measure the relative strength of their connection
Tracer Cell Fraction	Determine how flux is allocated between different injectors and producers

Flow diagnostics use the flux field (flow rates) defined per grid cell (FLROIL/FLRGAS/FLRWAT). These cell properties can be exported from a reservoir simulator by adding the keyword **FLORES** to **RPTRST** in both **SOLUTION** section and **SCHEDULE** section. If no flow rate data is available, **ResInsight** will estimate the flow field. Users are encouraged to export flow rates from the simulator for best precision.

<https://www.sintef.no/projectweb/mrst/modules/diagnostics/>



Ceetron Solutions



v) Improvements and new features 2023.12

- Grid Property Calculation can be applied to multiple grid models
Performance issues seen on large cases, will be improved in next version
- Aggregation operations like **sum** is supported
- Grid Property Calculator expressions can be stored to text file
- Summary Calculator expressions can be stored to text file
- Multiple **RFT** plots can now be created using the **Create Multiple RFT Plots** menu item. The operation will create one plot for each **RFT** well.





w) Improvements and new features 2023.10

Seismic Data

Import and display of 3D seismic cubes in a custom seismic view.

Summary Visualization

- Summary Cross Plot curves is now supported and improved
- Regression curve support for cross plot curves
- Regression curve support for Grid Cross Plots

Analysis Plots and **Correlation Plots** can now display plot values using **Show Plot Data**.

https://resinsight.org/getting-started/whats-new/releasesnotes_2023_10/



Ceetron Solutions



x) Improvements and new features 2023.06

Seismic Data

Import and display of 3D seismic cubes in the same scene as reservoir grid model.

Summary Visualization

- Summary tables used to see summary data for multiple wells in a table view.
- Producer/Injector connectivity table can be used to get an overview of the communication between wells
- Regression and Decline Curves

Improved visualization of Ensemble Curves

https://resinsight.org/getting-started/whats-new/releasesnotes_2023_06/

All release notes <https://resinsight.org/getting-started/download-and-install/>



Ceetron Solutions