



This session illustrates the workflow offered by Emeraude for Multiple Probes Tools (MPT) around a Multiple Array Production Suite™ (MAPS) example.

The data comes from a 30° deviated well, logged with a SAT (Spinner Array Tool™), a CAT (Capacitance Array Tool™) and a RAT (Resistivity Array Tool™). The flow is 3 phases from a flowing survey. The flowing passes, after a data quality check, will be processed to obtain average values that will serve as inputs for the PL interpretation.

B09.1 • Loading the Flowing Survey Data

- We will start this session by opening the file B09.ke2 which contains the GWD info (Deviation, GR, ID, Roughness and Perforations) and an empty survey called 'Flowing'.
- In 'Survey' tab, click on 'Information'.
- Enter the surface rates: Qw= 0 stb/D; Qo= 4790 stb/D; Qg=17370 Mscf/D.
- Load the files B09Up1, B09Up2, B09Up3, B09Down1, B09Down2 and B09Down3.
- Define RATDEV and SATDEV mnemonics as deviation.
- Be sure to enter up, down and pass numbers as appropriate.
- Reset the depth range to view data properly on the screen.


In addition to the combination SAT CAT RAT, the tool string includes a density tool, a capacitance tool (we will not use it) and two spinners, inline and fullbore. They need to be defined.

- Go to Survey 'Tool info', 'Production Tool String' tab.
- Define the density tool DENR as a nuclear tool.
- Enter the CFB blade diameter at 3.5 in and ILS at 1.68 in.

B09.2 • Data Quality Control

The Quality Ccontrol (QC) can be greatly facilitated by displaying the data in an appropriate way, using view templates.

A view template is a model that allows creating one or several views (user views, image views, etc...) with predefined settings in a given order. The views resulting from a view template are created (or displayed if already existing) when the template is invoked. It is not part of this session to show how a view template can be created and we will use a set of predefined view templates dedicated to the Sondex tools to generate the displays of interest.


- Go to Settings – Default display – Templates tab.
- Use the file open button  to load the template file called 'SondexTemplates.kvt' located in the Emr260 folder.

A new folder is added to the available templates list, below the local templates folder. If you open this folder, you will see several templates dedicated to the Sondex tools.

The link with the SondexTemplates.kvt file will be saved with your Emeraude settings (unless the file is deleted or renamed). Among the templates, we will use the full layout templates.

- Close the window with OK.

B09.2.1 • CAT Data Display

- From the display toolbar, call the template button .
- Among the Sondex Templates, Full layouts, select 'CAT N Probes'. On OK, the display is modified accordingly, and a snapshot is created automatically with the full layout template name.
- Add 'Zones Display' track.
- Update the snapshot.

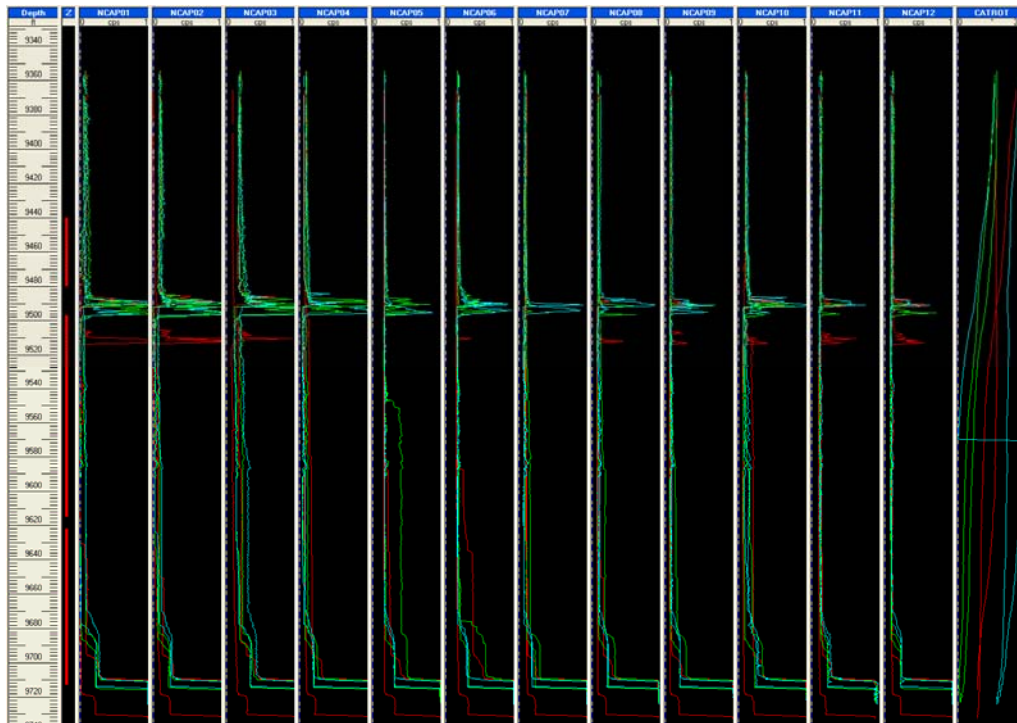


Fig. B09.1 • CAT-N probes display

Some sensors show negative values (NCAP01) and too high values (NCAP03, NCAP05, NCAP06) compared to the others. We will ignore them.

- Go to Survey – ‘Tool info’, ‘Multiple probe’ tab and select CAT-N tool.
- Ignore probes NCAP01, NCAP03, NCAP05 and NCAP06.

To obtain the holdups from the probe readings, the CAT needs to be calibrated on the basis of pure gas/water/oil readings: for a normalized tool, these readings usually are: 0 in 100% gas, 1 in 100% water and ~ 0.2 in 100% oil.

- Click on ‘Calibration’, check ‘Use normalization’ and enter the values for oil as shown in picture below and OK to close both windows.

‘Fit normalized...’ forces fitting the values within the 100% gas and water reading intervals.

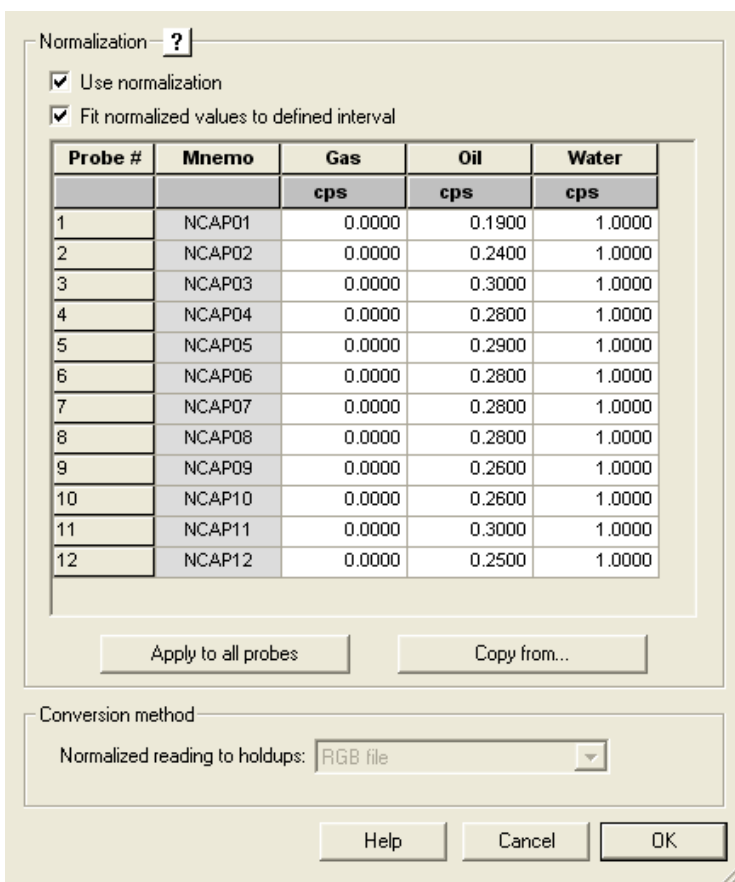



Fig. B09.2 • CAT calibration dialog

In addition to the above, we can build image views for every pass to help us understanding what is happening in the well (and compare with what we have seen on the previous display).

- Click on  and in Sondex templates, Image views, select ‘CAT’ and OK.
- In the window that pops up, make the choices as shown below and click OK.

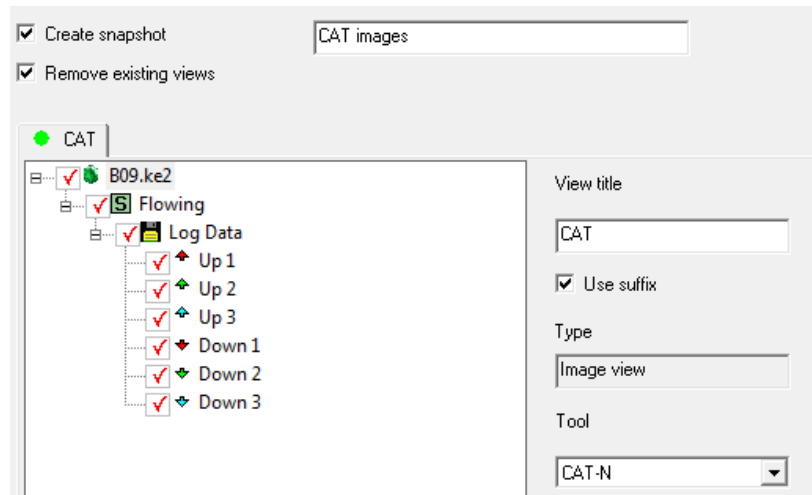


Fig. B09.3 • Image views dialog

The screen has been cleaned (only the depth and Z tracks have been kept) and a new snapshot 'CAT images' is created with the image for each pass (the view title contains survey and pass short name, thanks to the 'add suffix' option selected when invoking the template). In the color scale chosen, red is gas, green is oil and blue is water: the scale limits have been automatically set to the same range from one view to the other (form min = min of views min to max = max of views max), in order to allow easy comparison of the images.

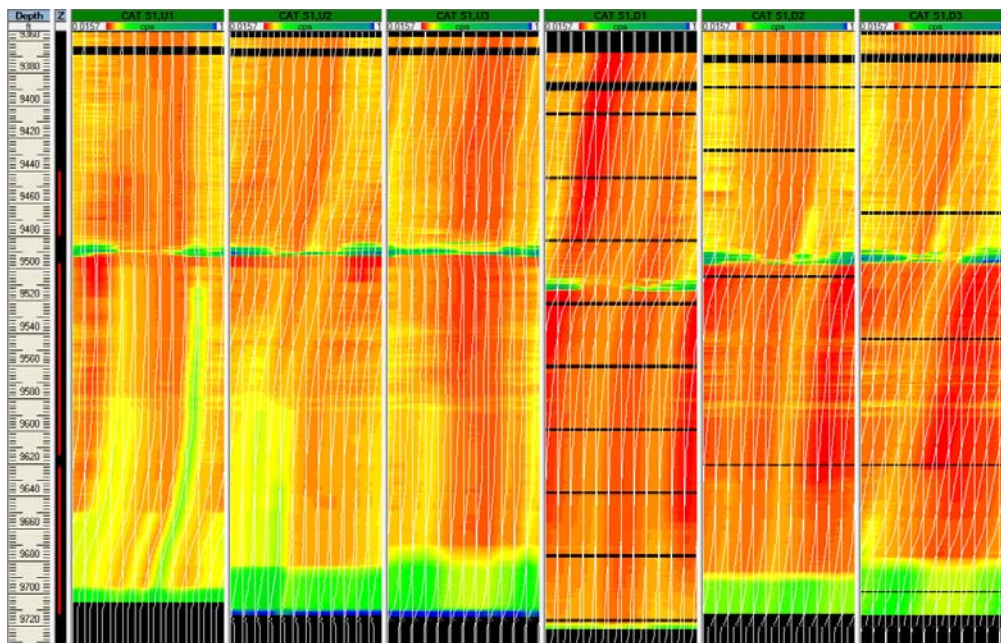


Fig. B09.4 • CAT image views display

Passes down 2 and down 3 look fairly consistent and will later be used in the processing. Note that none of the probes have failed. If probes had failed, it could be interesting to combine different passes in the same image view. Let us create a combined pass view (D2 and D3) for the sake of demonstration.

- In the browser, go to 'image view'.
- In the window, enter a view title like 'CAT D2-D3'.
- Click on the Pass drop down menu and select 'Combined passes'.
- Click on 'Select' and select only passes Down 2 and 3. OK.
- Select 'CAT-N' tool.
- Select 'CAT rgb' for the colors. Then OK.

The image shows mainly gas (red) with some oil (green) and a little bit of water (blue). The measured points are displayed honoring the combined pass colors (the image view is clearer when turning off this display option).

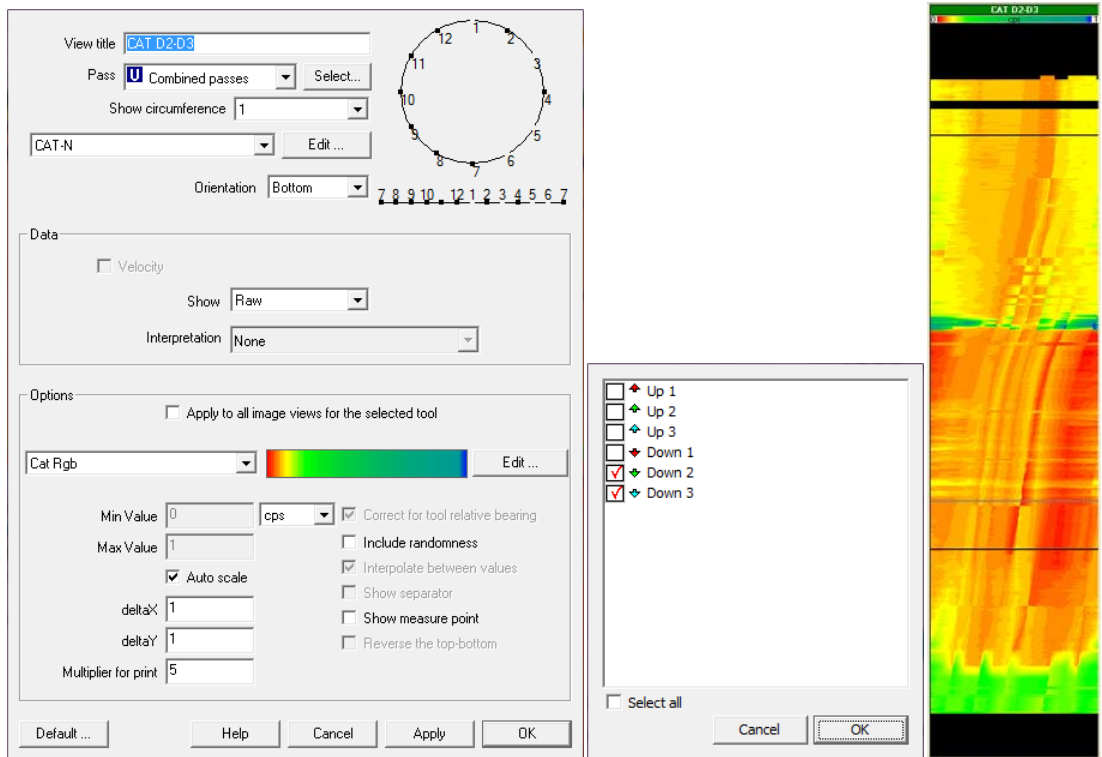


Fig. B09.5 • Creation of an image view with 2 passes

Let us call the cross-section of the combined passes view.

- Right click on the image view and select Cross-section.

The following window opens. The cross-section changes when pressing shift and moving the mouse in the image view.

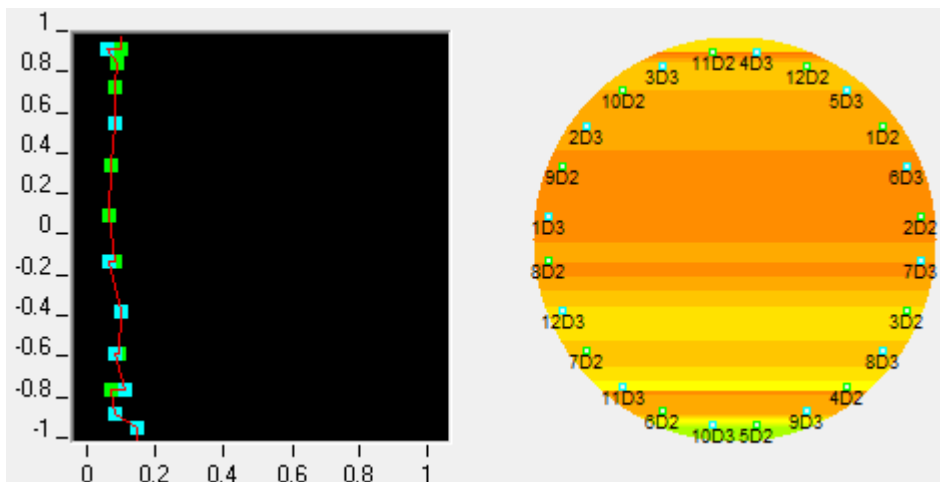


Fig. B09.6 • Image view cross-section


On the right, the position of the probes is indicated for passes D2 and D3. On the left, markers indicate probe raw measurements at their relative position projected on the vertical axis, and honoring the pass colors (green for pass D2, blue for pass D3: for ease of probe identification, a popup window displaying the probe number concatenated with the pass short name is displayed when the mouse cursor points at one of the probe marker). The red line corresponds to the model chosen, linear in this case. Note that, if a probe is not active, the corresponding marker will not be shown on the left plot.

B09.2.2 • RAT Data Display

To differentiate between water and hydrocarbons, the RAT needs to be calibrated and typical values are 0.5 for 100% water and 1 for 100% hydrocarbons.

- Go to Survey – ‘Tool info’, ‘Multiple probe’ tab and select RAT-Mean tool.
- Click on ‘Calibration’, check ‘Use normalization’ and ensure that ‘Fit normalized values to defined interval’ is checked.
- Click OK twice to close both windows.

‘Fit normalized...’ forces fitting the values within the 100% hydrocarbon and 100% water reading interval for each probe.

- From the display toolbar, call the template button .
- Among the Sondex Templates, Full Layouts select ‘RAT MEAN Probes’.

To compare the probe readings, the scale of all tracks should be the same. This can be set at once.

- Right click on any track and select ‘Horizontal Scale...’.
- Enter the information as shown in the next window (do not forget to tick ‘Apply to all water holdup data from the same MPT’) and click OK.

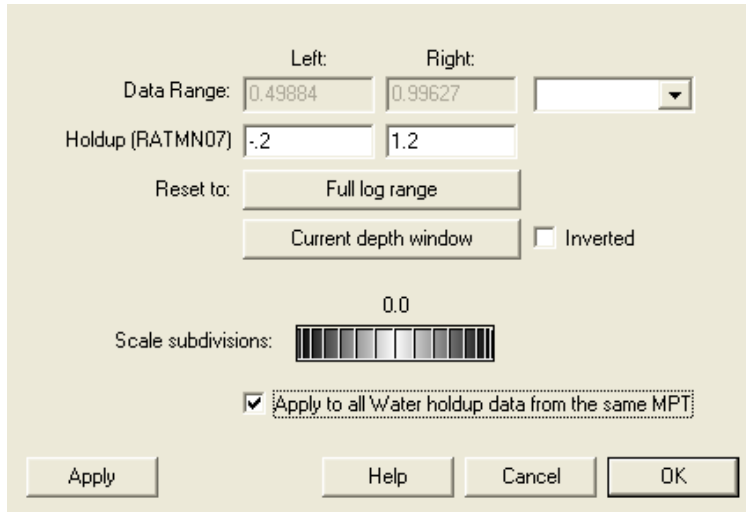


Fig. B09.7 • Data scale dialog

Then we get the following screen showing all the RAT probes and the RAT bearing.

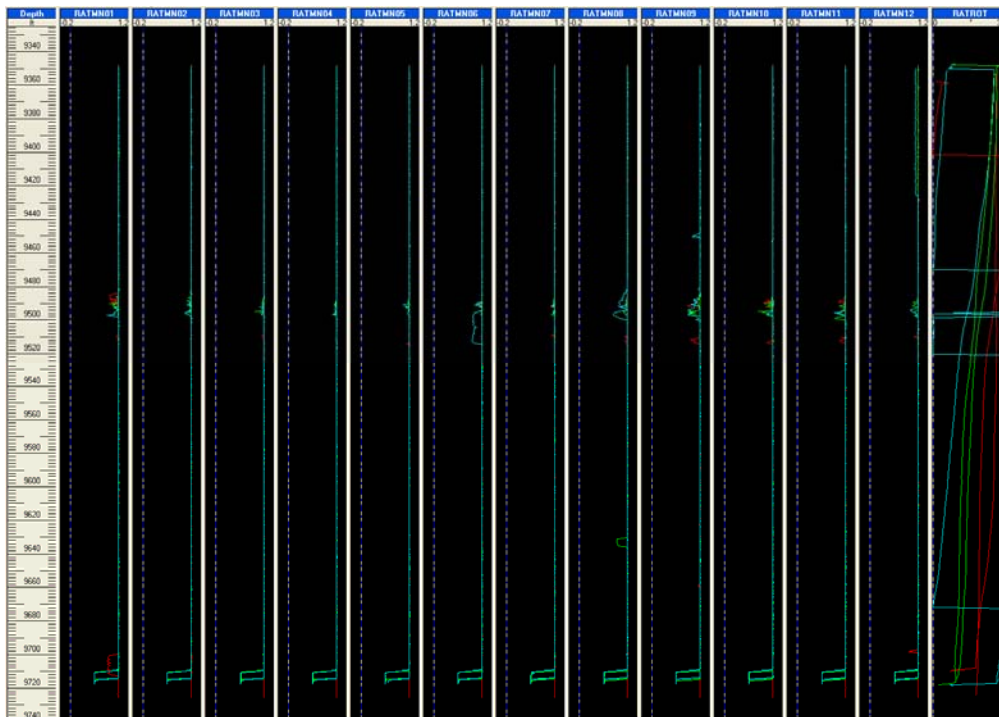


Fig. B09.8 • RAT probes display

The data looks fairly consistent, all probes exhibiting the same behavior with little water at the bottom and a very small water entry seen in the middle (seen also with the CAT).

B09.2.3 • Basic Sensors Display

- Display the basic sensor measurements GR, CWH, DENR, QP, TEMP, ILS, CFB, LSPD with the zone display.
- Create the corresponding snapshot 'Basic sensors'.

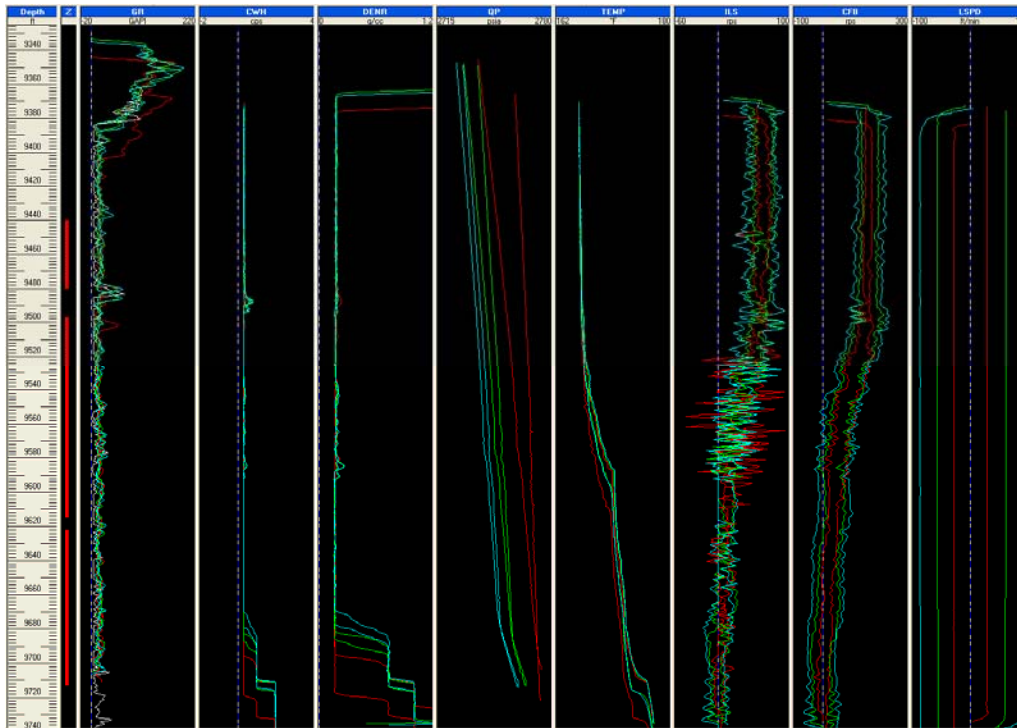



Fig. B09.9 • Basic sensors display

The capacitance and the density tools are confirming the water at the very bottom, oil just above water and gas all the way up, assessing the measurements of the CAT and RAT. In addition, the capacitance tool sees an entry around 9490 ft, like the RAT and CAT.

Note that, since the beginning, snapshots have been created although there was no existing interpretation. Such snapshots are labeled with the survey short name preceding their name (e.g. '[S1] CAT N probes'). They will be available for any interpretation created later. If such a snapshot is modified by adding a view created under an interpretation or containing interpretation dependent data, the snapshot name will change with the short name of the interpretation replacing the short name of the survey (e.g. '[I1] CAT N probes'). Such a snapshot will then only be available when Interpretation I1 is active. This will be illustrated below when dealing with the SAT data.

B09.2.4 • SAT Data

- From the display toolbar, call the template button .
- Among the Sondex Templates, Full Layouts select 'SAT Spinners'.
- Add the LSPD view and Update the snapshot.

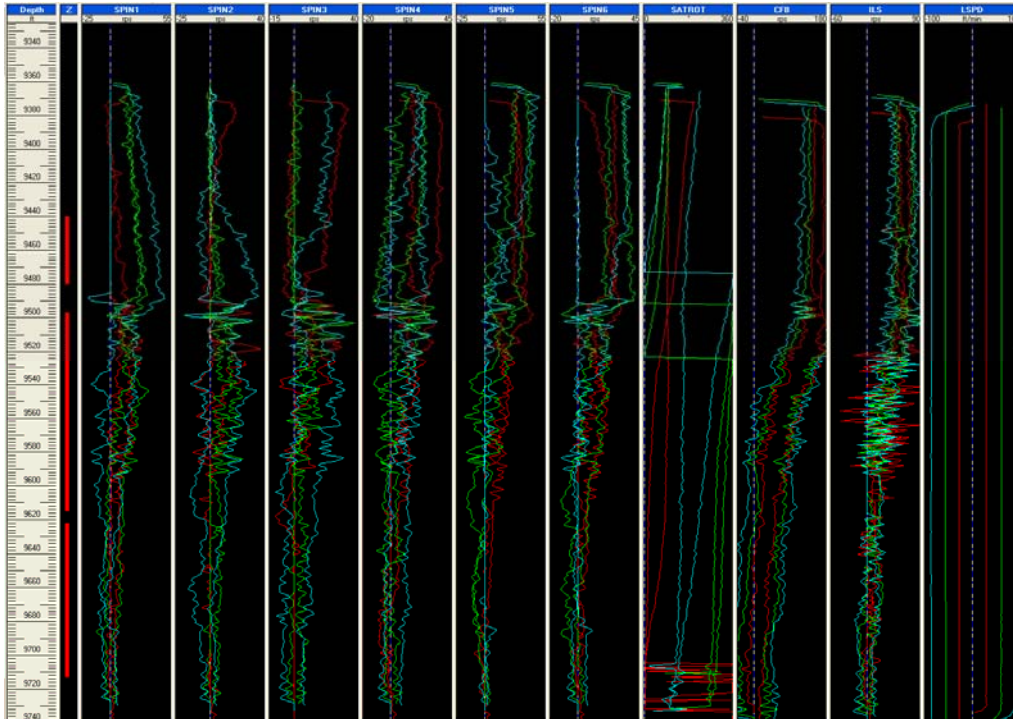



Fig. B09.10 • Spinners display

From the SAT spinner data, it is not possible to do proper individual spinner calibrations. For all spinners, a threshold of about 30 ft/min and a slope of 0.08 rps/ft/min will be used. This will be done by using a SAT constant calibration (no need for calibration zones).

We will also calibrate the ILS and CFB spinners. For this, we need to create a new PL interpretation and define calibration zones.

- Create a new PL Interpretation. Accept default name.
- In the 'Interpretation Settings' window, 'Calibration' tab, set the spinner calibration to 'SAT - Constant'.
- Click on the button next to above choice to access the SAT calibration: .
- Enter the values of 0.08 rps/ft/min and 30 ft/min.
- Tick CFB and ILS and close the window with OK.
- Enter two spinner calibration zones [9405 – 9419 ft] and [9640 – 9670 ft].
- Go to 'Calibrate'. Select CFB and for the bottom zone, enter thresholds 3.5 ft/min and - 3.5 ft/min.
- Select ILS and for the bottom zone, do not use point for pass down 3 and recompute positive line.

The positive line of the bottom zone has now a slope similar to the one of the upper zone. We will apply the slope of the positive line to the negative line.

- Click on button 'Slope (-)' negative and use the slope of the positive line. OK.
- Enter thresholds 14 ft/min and -14 ft/min. OK.
- Select 'Apply to all' and click Yes to generate the apparent velocities. Each apparent velocity appears in an automatic view.
- Create a layout with the Vapp views and a snapshot (call it 'Vapps') or use the full layout template 'SAT V apparent' available in the SondexTemplates file.
- Set all views horizontal scale to [-300ft/min, 700ft/min] to facilitate comparison.

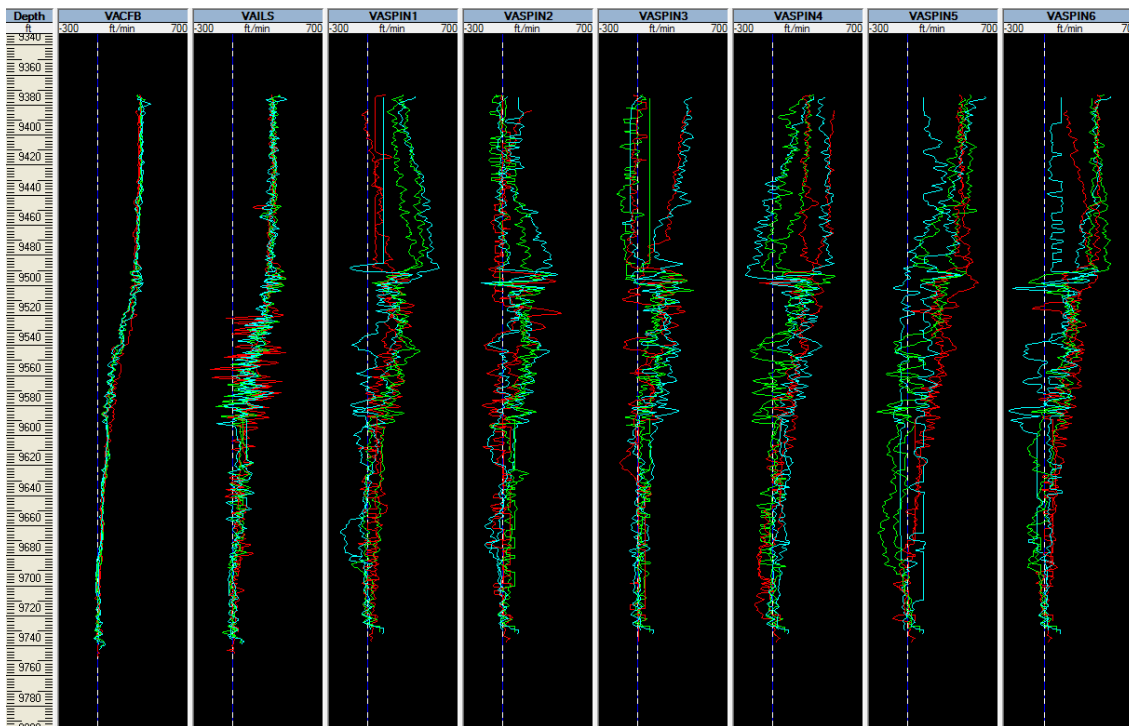



Fig. B09.11 • Apparent velocities display

Looking at all passes, one by one, it is obvious that they require some cleaning (using 'Hide parts' option in the browser).

- Use the 'Nearest curve' button  and click close to pass Down1 of VASPIN1.
- The browser opens with the curve highlighted. Select 'Hide parts'.
- Click and drag in the VASPIN1 track with the left mouse button in order to select the area of the curve to hide: from 9370 to 9500 ft.

When the mouse button is released, the following window pops up.

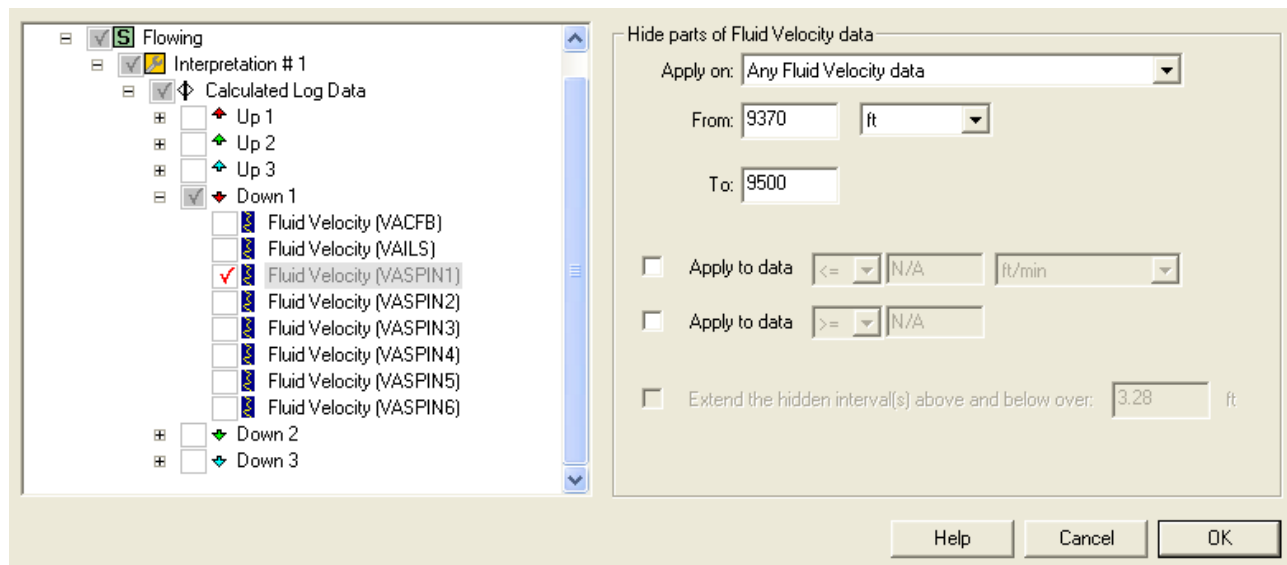


Fig. B09.12 • Hide parts dialog

The user is offered the possibility to hide parts of the selected pass on the depth interval just defined with the mouse, above or below a certain value. The choices can be applied to other passes too and/or to any other type of data.

- Select 'Apply on: Any Fluid velocity Data'.
- Tick VASPIN1, VASPIN2 and VASPIN3 for pass Up1.
- Tick VASPIN2 and VASPIN3 for pass Up2.
- Tick VASPIN1, VASPIN2 and VASPIN6 for pass Up3.
- Tick VASPIN1 and VASPIN2 for pass Down1.
- Tick VASPIN2 and VASPIN3 for pass Down2.
- Tick VASPIN2, VASPIN3 and VASPIN4 for pass Down3.
- Click on OK.

Passes Up1 and Down1 show bad data and will be ignored in the MPT processing later.

B09.3 • MPT Processing

The MPT processing allows calculating, at any depth, one centered value from distributed measurements. This possibility is offered by reconstructing the probe measurements on the basis of a 2D representation of the holdups and the velocity, with the possibility of adding external constraints. The 2D model parameters are evaluated by matching the reconstructed data on the raw data, using a non linear regression.

Once obtained, the reconstructed values for the holdups and the velocities are combined to calculate the local phase velocities. By integrating this information over the cross-section at every depth, the average phase rates and holdups are produced, waving the need for slippage models. These averages are then used to feed a conventional PL interpretation.

Two 2D models are available for the MAPS suite (linear for the holdups and linear for the velocities) and as indicated before, physical constraints can be added to the non linear regression: phase absence, vertical segregation (e.g. water holdup decreasing from bottom to top), conventional tool measurements (density, capacitance, spinner).

The job will be analyzed with the SAT measurements, using the constant calibration already defined, and the central spinner measurements. CAT and RAT measurements will also be used.

- Go to 'PL Interpretation', 'Information', 'Reference channels' tab and define the interpretation inputs: TEMP, QP, and DENR with pass Up1.
- Go to 'PVT' and define fluid type as saturated oil with water. Enter 903 cf/bbl for the solution GOR, salinity = 18000 ppm, gas SG = 0.78, oil gravity = 26.3° API.

The definition of pressure, temperature inputs and PVT are required for the reconstruction of central tools measurements during the processing.

- Press the 'MPT processing' button in the Control Panel.
- The settings button on the 'Tool type' line allows selecting the MAPS tools to be considered. Click on it and select all tools as shown below.

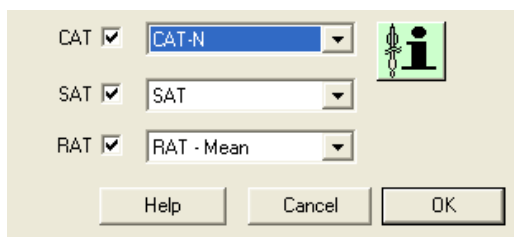


Fig. B09.13 • MAPS tools selection

- The 2D model is by default 'Linear Velocity – Linear Holdups'.
- Select Average 'Areal'.
- In Range, choose to process at 'Interval' with a value of 1ft. This interval value also governs the depth spacing for the averages.
- Phase constraints: the choice depends on the tools selected. The logic is that a phase constraint is offered unless an included tool gives the holdup of that phase directly. In our case, we use all MAPS tools so the choice is none or $Y_o=0$. We keep 'none' as we know that oil is produced.
- Physical constraints: we select both choices to force water and gas gravity segregation.
- Tool constraints: choose to simulate VAILS, VACFB and DENR to check for consistency.
- Select passes D2 and D3 as combined passes. Note that, if you have unchecked pass Down1 before checking passes Down2 and Down3, the SAT has been automatically unselected in the Tool type settings (re-select it).

In independent mode, the readings of the selected passes are matched pass by pass at every depth, fitting a new 2D model on each pass. In combined mode, the readings of the selected passes are all matched simultaneously at each depth, using the same 2D model: this mode behaves as if there was, for instance, a SAT tool with twice the number of probes when processing a SAT in two passes in combined mode. This can be of great interest when some probes failed in one pass but not in another. Bear in mind that this mode is valid only if the flow conditions have not changed or are very similar between the passes.

- Choose to generate 'Error channels', 'Average of the outputs' and 'Phase rates'.

'Error channels' are the relative errors between the raw and the reconstructed data. 'Average of the outputs' generates the MPT process averages for the interpretation input (e.g. the combined process average or the lateral average of the selected passes in independent mode). 'Phase rates' will produce the reconstructed rates of the phases.

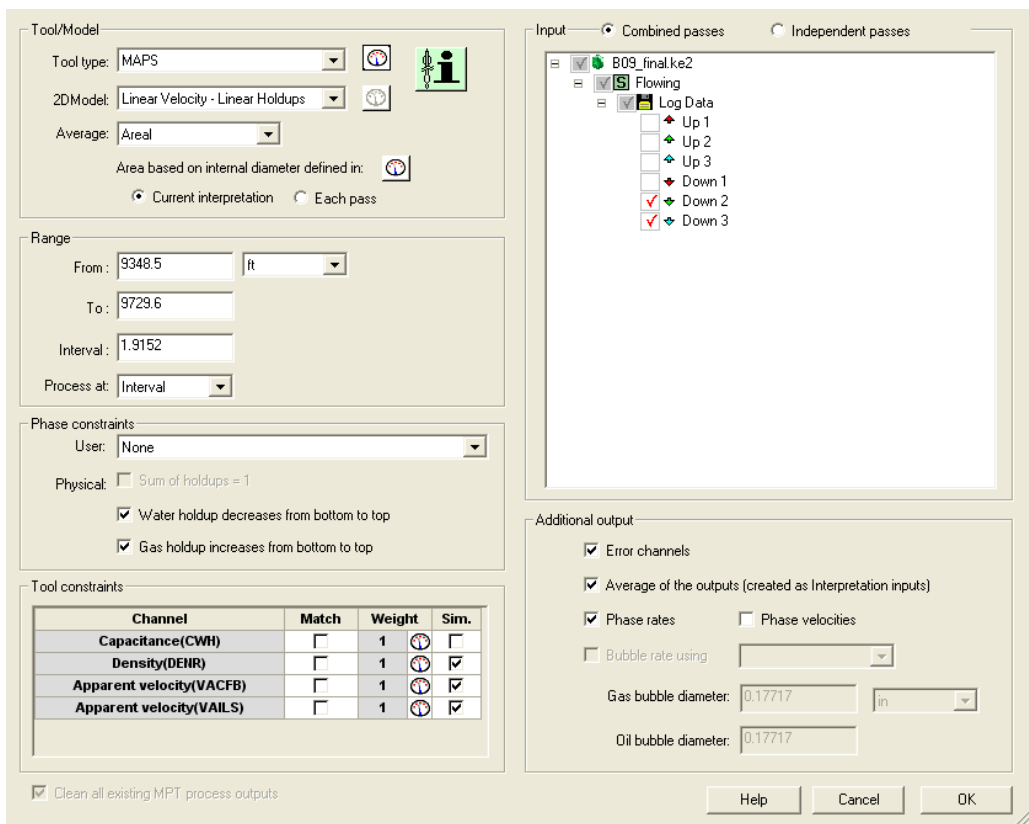


Fig. B09.14 • MPT processing dialog

When OK is given Emeraude indicates that the process will generate more points than a maximum defined in 'Settings – Interpretation – Misc'. The interval will be changed automatically to honor this condition. Accept with OK.

At the end of the process a number of new channels have been created under the 'Calculated Log Data' folder in the browser. The next figure gives the details.

<ul style="list-style-type: none"> [-] Interpretation # 1 <ul style="list-style-type: none"> [-] Input <ul style="list-style-type: none"> [-] PVT [-] Density (DENR) [-] Fluid Velocity (VACFB) [-] Fluid Velocity (VAILS) [-] Gas holdup (YG_MAPS) [-] Gas rate (QG_MAPS) [-] Mixture velocity (VT_MAPS) [-] Oil Rate (QO_MAPS) [-] Pressure (QP) [-] Temperature (TEMP) [-] Water holdup (YW_MAPS) [-] Water rate (QW_MAPS) [-] Calibration zones (SCZ) 	<p>Average of the MPT process copied into the interpretation inputs (because requested as outputs of MPT)</p>

<ul style="list-style-type: none"> [-] Output - Complete [-] Output - Schematic [-] Calculated Log Data <ul style="list-style-type: none"> [-] Gas holdup (YG_MAPS) [-] Gas rate (QG_MAPS) [-] Mixture velocity (VT_MAPS) [-] Oil Rate (QO_MAPS) [-] Water holdup (YW_MAPS) [-] Water rate (QW_MAPS) 	<p>Combined process averages</p>

<ul style="list-style-type: none"> [-] Up 1 [-] Down 1 [-] Down 2 <ul style="list-style-type: none"> [-] Fluid Velocity (VACFB) [-] Fluid Velocity (VAILS) [-] Fluid Velocity (VASPIN1) [-] Fluid Velocity (VASPIN6) 	<p>Vapparent (generated previously)</p>

<ul style="list-style-type: none"> [-] MPT - Reconstruction <ul style="list-style-type: none"> [-] Capacitance (NCAP01_K) [-] Capacitance (NCAP02_K) [-] Capacitance (NCAP12_K) [-] Density (DENR_K) [-] Fluid Velocity (VACFB_K) [-] Fluid Velocity (VAILS_K) [-] Fluid Velocity (VASPIN1_K) [-] Fluid Velocity (VASPIN6_K) [-] Water holdup (RATMN01_K) [-] Water holdup (RATMN11_K) [-] Water holdup (RATMN12_K) 	<p>Reconstructed channels with '_K' suffix</p>

<ul style="list-style-type: none"> [-] MPT - Error <ul style="list-style-type: none"> [-] Other (DENR_KERR) [-] Other (NCAP01_KERR) [-] Other (NCAP02_KERR) [-] Other (NCAP11_KERR) [-] Other (NCAP12_KERR) [-] Other (RATMN01_KERR) [-] Other (RATMN11_KERR) [-] Other (RATMN12_KERR) [-] Other (VACFB_KERR) [-] Other (VAILS_KERR) [-] Other (VASPIN1_KERR) [-] Other (VASPIN2_KERR) [-] Other (VASPIN6_KERR) 	<p>Errors with '_KERR' suffix</p>

<ul style="list-style-type: none"> [-] Down 3 [-] MPT - Global error <ul style="list-style-type: none"> [-] Constraint errors (CSTR_KERR) [-] Other (DENR_KERR) [-] Other (NCAP_KERR) [-] Other (RATMN_KERR) [-] Other (VACFB_KERR) [-] Other (VAILS_KERR) [-] Other (VASPIN_KERR) 	<p>Overall errors on reconstructed tools</p>

Beware that those additional channels will obviously take some space; this is why for instance the generation of errors is optional. The averages of the channels representing holdups, rates, and mixture velocity have been added in the Interpretation input.

A number of new views have been created (and some appeared in the layout up to the usual limit):

- A global error view is created called 'MPT Errors' + Interpretation short name. It displays the overall errors on the reconstructed tools.
- A 'Constraints' view, indicating how much the constraints are fulfilled.
- Use the hide/show view dialog to organize to create the layout with:
 [Depth – Z – MPT errors I1 – Constraints - QW_MAPS – QO_MAPS – QG_MAPS – VT_MAPS – YW_MAPS – YG_MAPS]
- Add the corresponding snapshot 'Processing'.

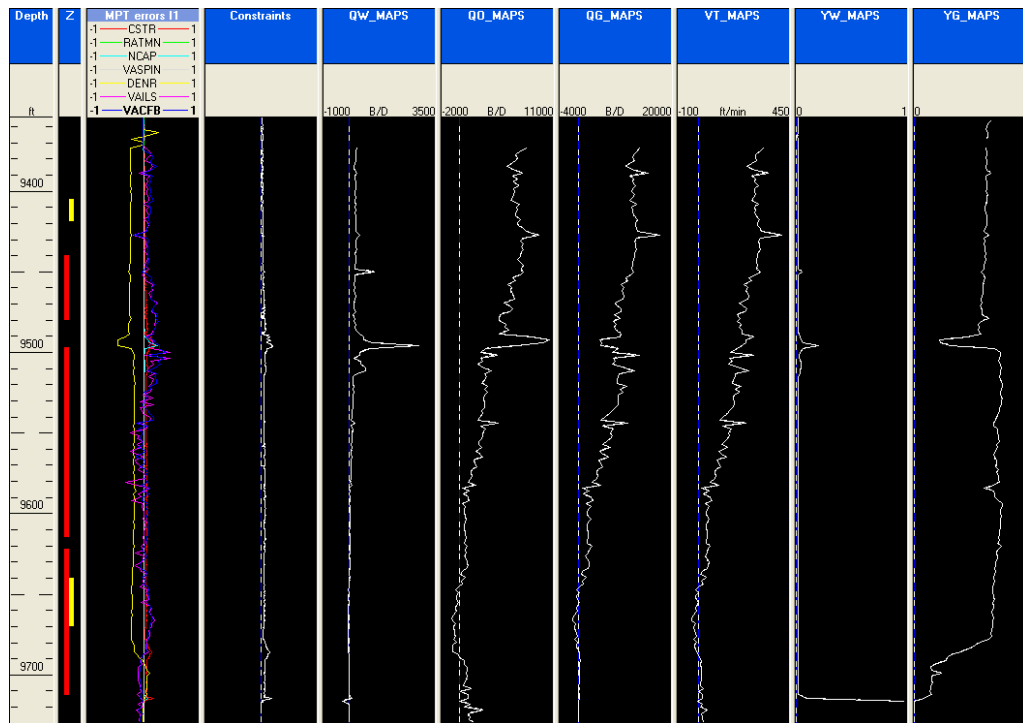


Fig. B09.15 • 'Processing' snapshot


The error view shows that:

- The VASPINx are matched with no error; this is normal with the linear model.
- The NCAPx are not matched closely when the flow appears to be two-phase.
- VAILS and VACFB reconstruction, in the same region of the well, don't agree with the measures.
- DENR is presenting the same problem.

The 'Constraints' view shows how the segregation constraint was honored, 0 being the best answer.

The other views are displaying MPT averages (dashed lines from calculated log data node) and Interpretation inputs (continuous line). Curves are identical because of the combined process.

We take a further look at the results. The newly generated channels (reconstructed, errors) can also be seen on the automatic views.

- Be sure that you saved the Processing snapshot.
- Recall the snapshot 'Vapps'; In the display toolbar, you can display raw vs reconstructed channels, or the errors, using the display options .

Below is the view of the apparent velocities. The reconstructed channels appear in dashed lines. The central spinners are not matched exactly (two first tracks), but the agreement is rather good.

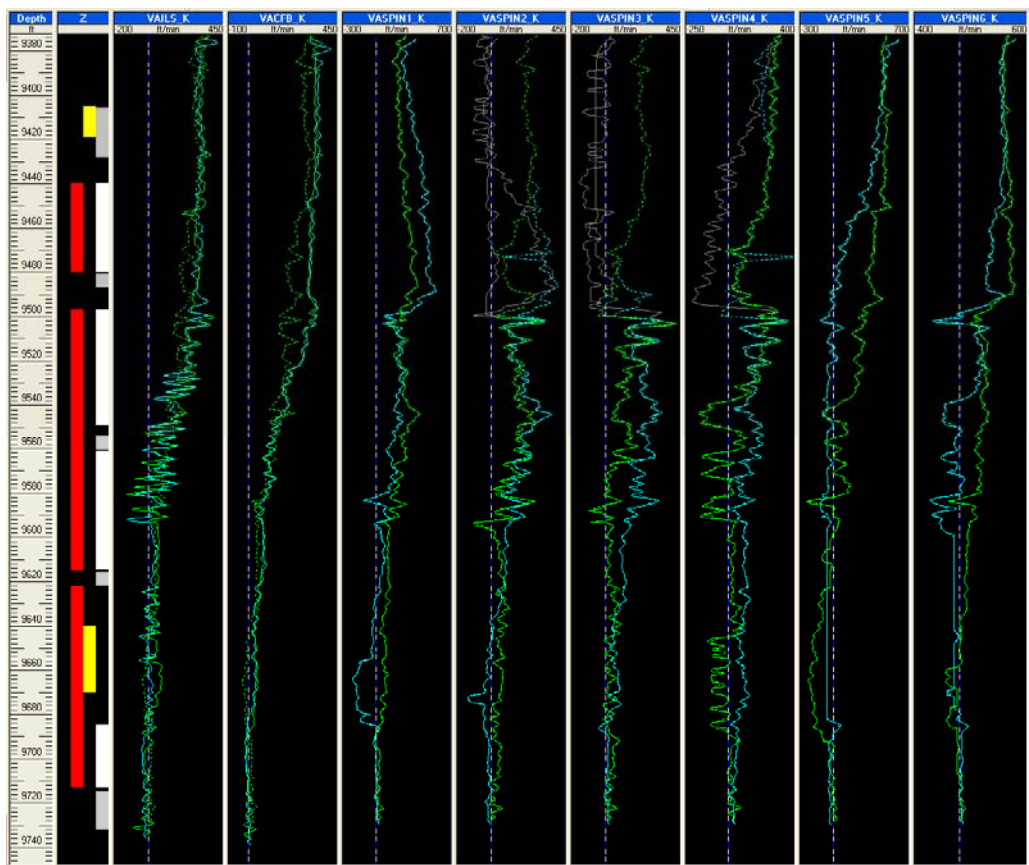


Fig. B09.16 • Apparent velocities: raw vs reconstructed

Agreement is not as good with the density tool (recall the 'Basic sensors' snapshot).

There are several reasons why we do not see consistent results between the conventional measurements and the value derived from the MPT processing, among which:

- Some tools are focused (e.g. DENR) while we compare it to an average on the cross-section.
- The velocity profile may be different from the imposed stratified model (30° deviated well).
- ...

It is beyond the scope of this guided session to resolve the difference in this particular case, the main goal here being to illustrate the workflow.

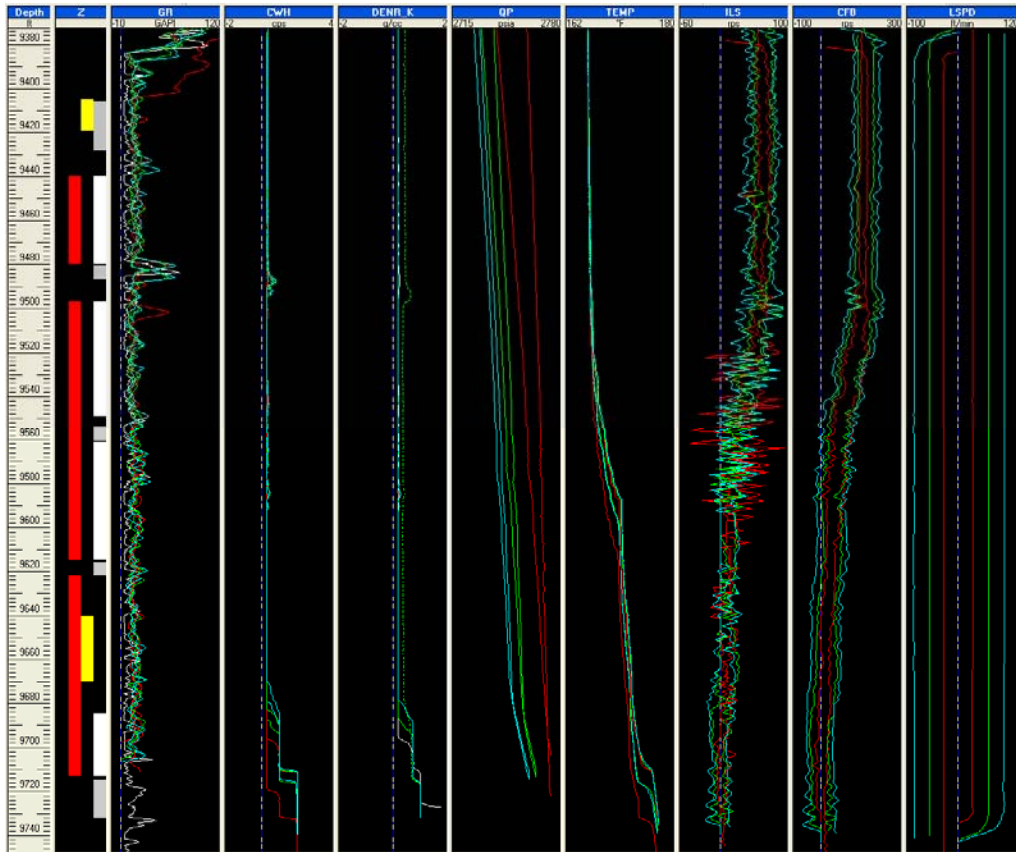


Fig. B09.17 • basic sensors snapshot

We can build image views for reconstructed channels and compare those with the raw ones.

- Empty the screen (keep only the depth track).
- Recall the Holdup image view for combined passes D2 and D3 (CAT D2 – D3).
- Right click on it and in Properties, remove 'show measure point' (if not yet done).
- Create a new Image view in the browser. As a Combined passes MPT processing was run in the current interpretation, the property dialog offers by default 'Combined passes' and 'Reconstructed' for the processed tools and it can be checked that passes D2 and D3 have been correctly selected for combination. Select the CAT-N tool. Remove 'show measure point'. Uncheck the Autoscale option, and keep Min=0 and Max=1 (you may want to Apply to all image views to ensure that this scale setting will be applied to all image views displaying the same tool). Call the image view 'CAT D2 – D3 Reconstructed'.

The reconstructed view exhibits the 2D model prediction in agreement with the segregation constraint. This can be seen on the cross section: display both the raw and reconstructed data cross sections at 9438.1ft. Select 'Areal' for the raw data display: although not perfect (as seen on the 'Constraints' view, the stratification constraint mostly holds on).

When the depth value is entered manually, press the tab key to update the cross-section.

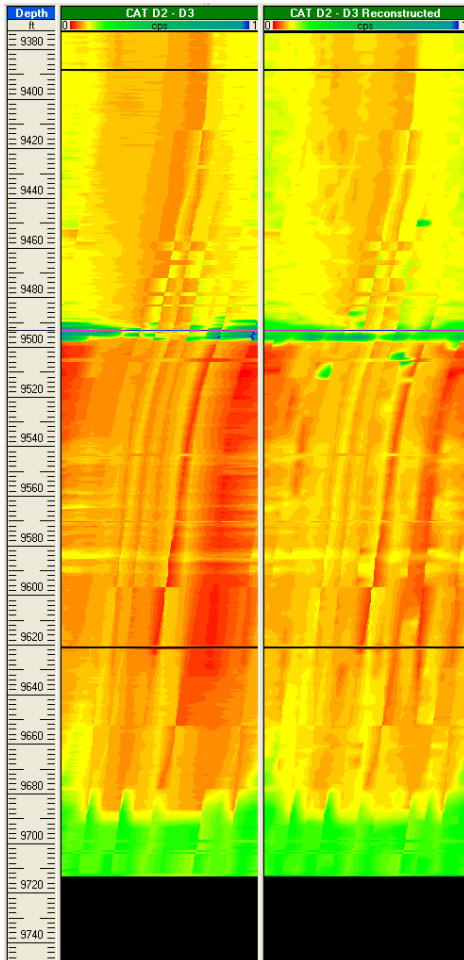
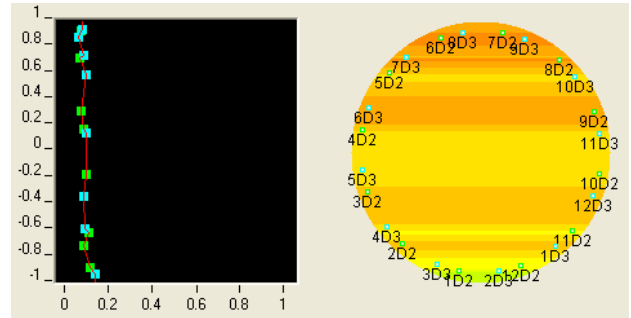
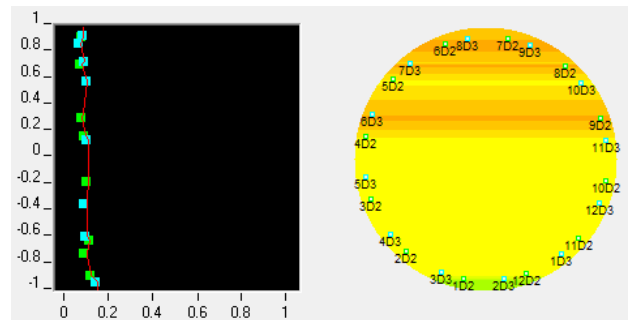


Fig. B09.18 • Combined passes: raw vs reconstructed



Raw data @ 9438.1ft

Fig. B09.19 • Raw cross-section



Reconstructed data @ 9438.1ft

Fig. B09.20 • reconstructed cross-section

B09.4 • PL Interpretation

As mentioned earlier, having checked 'Average of the outputs' in the MPT processing window, Emeraude has generated the MPT process averages and copied them in the interpretation input node.

- Define the calculation zones in stable regions; Use the manual definition and enter:

	From	To
	ft	ft
1	9405.000	9428.000
2	9480.000	9486.000
3	9554.000	9560.000
4	9615.000	9622.000
5	9714.000	9731.000

Fig. B09.21 • Calculation zones

- Click on Apply and go to the Inflow zones tab to set the inflows as producing zones (left click in the Inflow type cell and select the proper type):

	From	To	Name	Inflow type
	ft	ft		
1	9440.000	9480.000		→ → →
2	9497.000	9549.000		→ → →
3	9560.000	9615.000		→ → →
4	9685.000	9713.000		→ → →

Fig. B09.22 • Inflow zones

- Create a new snapshot (Interpretation), with the following tracks: [Depth – Z – Water holdup match – Gas holdup match – Mixture velocity match - Water rate match – Gas rate match – Oil rate match - Density match]

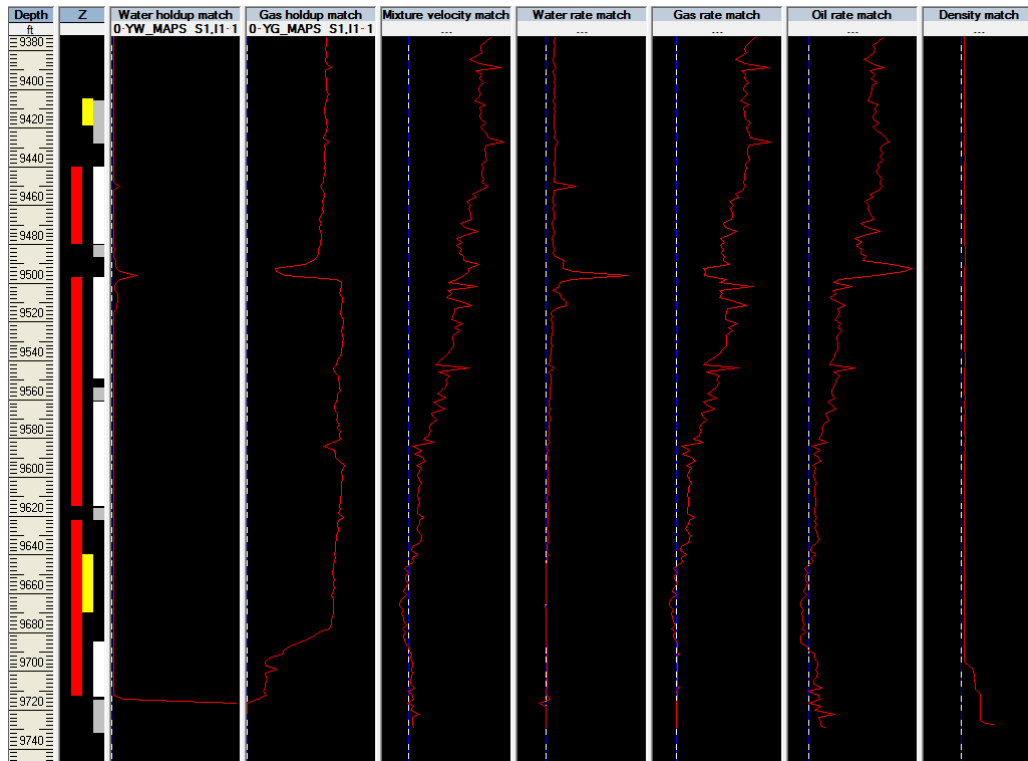


Fig. B09.23 • Data display for interpretation

As opposed to the usual 'Zoned' approach where the residual calculations are made at the calculation zones only, a 'Continuous' approach, offered as an alternative, considers all schematic points when calculating the objective function and allows the holdups to slightly depart from the slip model predictions.

- Go to the interpretation Information.
- Select the Continuous method and validate with OK.
- Go to Inflow Rates; set the model to Liquid-Gas.

The selection of correlations is irrelevant as they will be by-passed in this case (more explanation below).

- Press OK and you are taken to the contribution screen.

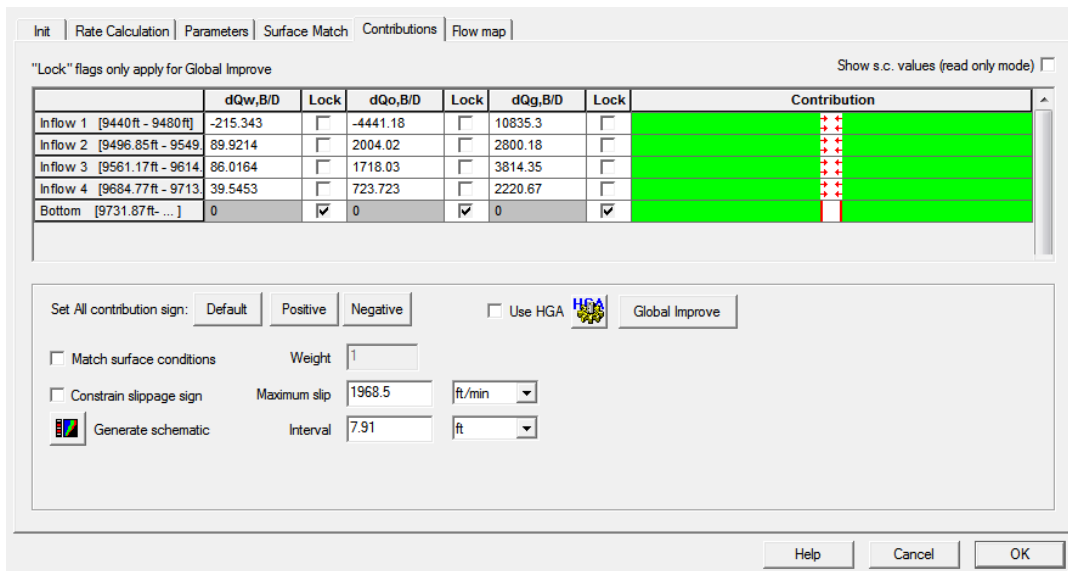


Fig. B09.24 • Contributions

- Go to the Rate Calculation tab, activate the first zone, and do not fit the density (remember that the MPT process was not in agreement with the conventional density measurement): in Continuous mode, this will apply to all zones automatically. The last zone has been set to No Flow automatically.
- Go back to the 'Contributions' tab. Tick 'Match surface conditions', uncheck 'Constrain slippage sign' and press Global Improve. After the first iteration the schematic logs appear on the screen and the successive changes are visible on all the tracks.
- Exit the dialog with OK.
- Update the snapshot 'Interpretation'.

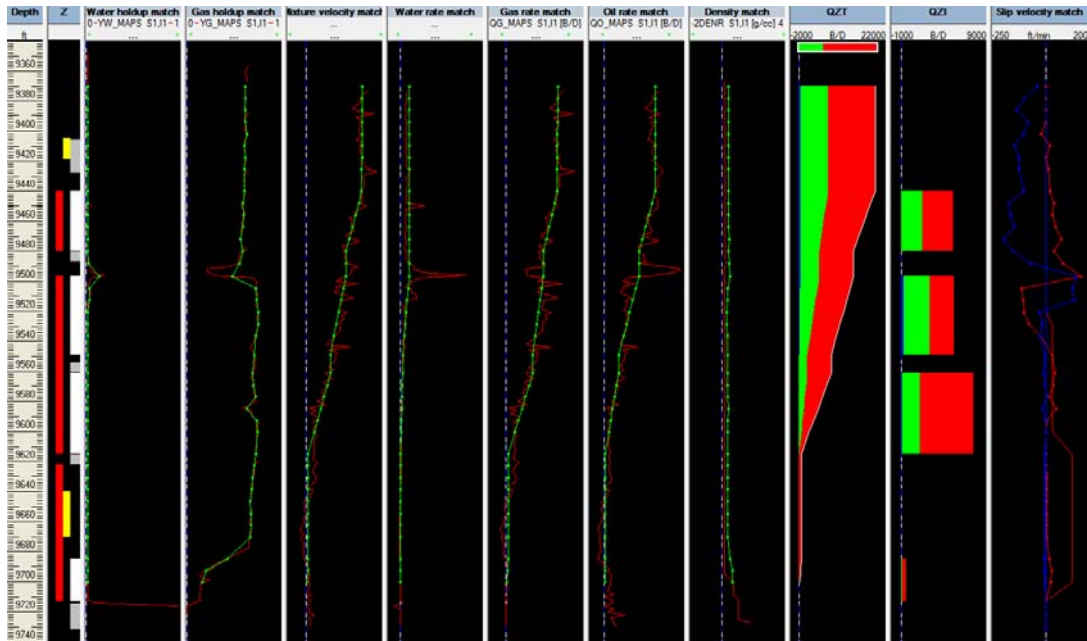


Fig. B09.25 • Interpretation display

Before going further on the solution, it can be noticed that a 'Slip velocity match' view has appeared. This view is meant to show the difference, when interpreting data in Continuous' mode, between the slippage calculated by the regression process, and that calculated by the selected slip model(s). The red curve is for the slippage between gas and liquid (the blue curve is for the slippage between water and oil). The dots appear on the slippage curves coming from the regression.

Overall, match between raw data (in red) and Emerald solution (in green) is good, except for the density, as we did not try to fit this measurement.

However, when creating the survey, we have entered surface rates [Qw=0 stb/D, Qo=4790 stb/D, Qg=17370 Mscf/D]. We can now compare them with the simulated rates given by Emerald.

- Go to 'Inflow rates' and select the 'Surface Match' tab.

Surface conditions and rates		
Temperature:	60	°F
Pressure:	14.7	psia
Qw	Qo	Qg
STB/D	STB/D	Mscf/D
0	4790	17370

Simulated rates			
Surface:	383.54	5344.35	15942.01

Fig. B09.26 • surface match dialog

The simulated results are in good agreement with the surface rates.

This concludes Guided Interpretation#9.