Note about the different levels of ADN data processing – Image derived porosity. IODP 314 Hole C0002A

P. Gaillot

Initial note 22 October 2007
Addition on 23 October 2007 : Comments from SLB – Reception of a 4th version – New comments and action regarding deletion of data sets to avoid any confusion.

1) We first received the field processed data. We plotted RHOB (average) vs. IDRO and were surprised to discover that in some depth intervals IDRO was lower than RHOB. We were expecting IDRO reflecting the maximum azimuthal density. After discussion with SLB field engineer (Mario Jakulj), we understood that the image derived density (IDRO) relies on a quality factor threshold (usually set to 2) and that the output (IDRO) will be either picked from the ADN density image or the bottom quadrant. Knowing this and knowing that the Hole is sub-vertical (and thus that the bottom quadrant is meaningless or randomly picked), we understood why IDRO could be lower then RHOB in some places.
See attached paper for details on the processing – quality factor and choice between ROBB and image.
FOLDER: 314/C0002/C0002A/C0002_ADN_DATA
FILE: 314_C0002A_ADN_DEPTH
***** AFTER DECISION BY CCs, EPM and scientific party, THIS FOLDER HAS BEEN DELETED ***** ON 22 October TO AVOID ANY CONFUSION ON THE DATA

2) SLB field engineer kindly proposed to reprocess the data with a different quality threshold (set to 1) to always pick IDRO from the image (4 bins average) - and not from the bottom quadrant. We now always have IDRO > RHOB.
FOLDER: 314/C0002/C0002A/C0002_ADN-IDD_DATA
FILE: 314_C0002A_ADN-IDD_DEPTH
Saved as 314-C0002A.LWD_ADN_LSF.dlis in Processed DLIS, and as 314-C0002A.LSF_ADN-IDD_LSF.las in Standard Log Curves (added by CDEX later)

3) Then we received the 'Best Mixed Density' from DCS center in China. As expected the best pick is always higher than RHOB (average). In most places, it fits with IDRO (reprocessed = quality threshold set to 1, picked only from the image), but it is sometimes lower than IDRO. In others words, it is an intermediate result between RHOB and IDRO (quality factor set to 1).
FOLDER: 314/C0002/C0002A/C0002_ADNProcessed_DATA
FILE: 314_C0002A_ADNProcessedDensity-Porosity.las
Saved as C0002A_result.las in ADN-IDD_misc.zip in Documents (added by CDEX later)

The sampling of the received file was constant 0.1524m but the data points were offsets by about 8cm (not constant with depth). I thus resample the above file to have this data set and the previous data sets (GVR, ADN) exactly at the same depth –for easy handling and manipulation of data. Interpolation has been made with GMT sample1d tool (Akima interpolation 0.1524 m sampling).

More details on the algorithm used have been requested to DCS – China on Oct 21, 2007.

---------- Oct 22
Response with a 4th version of the data has been received on Oct 22, 2007
Hereafter is the answer and original message

Dear Philippe,

Sorry for reply you so late.

This is the result from the IDD, I ask help from our LWD ID (Interpretation Development------Shim), this is how we would reply.

1. In the default processing where a stabilized ADN is run, the IDRO is tracking the ROBB as shown by the first processing done on board. This is because in normal circumstances, the tool is believed to be lying on bottom of the borehole (due to gravity) with the bottom having a good contact with the formation. However, since this is a vertical well, this parameter selected is not suitable.

2. Setting the threshold to 1 would force the processing to use IDD processed data all the way unless the quality factor is equal to 1. This is a good way to try to force to software to use the IDD output.

3. We were processing the IDD using different parameters (threshold set to less than 1). After looking at the various processing parameter in the last few days, we come to the conclusion that the IDD threshold = 1 is more suitable for this well. Please find the latest data set attached. A paper describing how IDD is done is also attached for your reference.

4. As for the BIP processing, we do not think the BNPH (Borehole Invariant Porosity) would be able to provide a better reading in this environment. Since this well is drilled with sea water (high mud salinity) and in some part the borehole is larger than the compensated zone (BIP provides a compensation zone with 2" around borehole), the processed BNPH does not reflect the actual formation porosity. In order to get a better porosity measurement, we provide a borehole corrected TNPH using the computed density caliper. However, a paper about BIP is given for your reference.

For the fifth question, we will give you the answer later.

Because the upper limit of the attachment is 2MB, I will send the IDD&BIP paper to the InterACT, and then Liu Wei, my colleague, will download the file for you.

Hope this is helpful.

Best regards,
Zhao Haipeng

> -----Original Message-----
> **From:** Philippe Gaillot [mailto:gaillotp@lab.chikyu.jamstec.go.jp]
> **Sent:** Sunday, October 21, 2007 7:16 PM
> **To:** 'Moe K. T.'; hzhao3@beijing.oilfield.slb.com; dcs@lab.chikyu.jamstec.go.jp
> **Cc:** 'Harold Tobin'; masa@lab.chikyu.jamstec.go.jp
> **Subject:** RE: C0002A Result - Question about processing done
>
> Dear Zhao Haipeng,
>
> I am Philippe Gaillot working for CDEX as technical support and interface between Schlumberger and the scientific party we have on-board and that is currently analyzing the data.
>
> As you without doubt know, Hole C0002A has been drilled vertically in riser-less mode. Operation and download of ADN data were smooth and successful.
>
> 1) We first received the field processed data. We plotted RHOB (average) vs. IDRO and were surprised to discover that in some depth intervals IDRO was lower than RHOB. We were expecting IDRO reflecting the maximum azimuthal density. After discussion with

SLB field engineer (Mario Jakulj), we understood that the image derived density (IDRO) relies on a quality factor threshold (usually set to 2) and that the output (IDRO) will be either picked from the ADN density image or the bottom quadrant. Knowing this and knowing that the Hole is sub-vertical (and thus that the bottom quadrant is meaningless or randomly picked), we understood why IDRO could be lower then RHOB in some places.

2) SLB field engineer kindly proposed to reprocess the data with a different quality threshold (set to 1) to always pick IDRO from the image (4 bins average) - and not from the bottom quadrant. We know always have IDRO > RHOB.

3) Then we received our 'Best Mixed Density'. Your best pick is, as expected, always higher than RHOB (average). In most places, it fits with IDRO (reprocessed = quality threshold set to 1, picked only from the image), but it is sometimes lower than IDRO. In others words, it is an intermediate result between RHOB and IDRO (quality factor set to 1). We wonder which algorithm/strategy you have been using to define your best pick? Did you set the quality factor to an intermediate value?? 1.5 ?? Do you have any published paper that I could use as reference to explain to the on-board scientists how the data have been processed?

4) So far we did not pay too much caution to the porosity curve, but the same question about the processing will arise. Please send us any information (published papers, technical note) regarding its processing or any information regarding the quality/confidence you have in these logs.

5) Finally, I have a question on 2 acronyms of the geoVISION Resistivity tool.
Please could you tell us what are

ECAL_RAB_AT_0P7RM_RT.IN	:RAB CALIPER, at 0.7 Rm {F13.4}
ECAL_RAB_AT_1P3RM_RT.IN	:RAB CALIPER, at 1.3Rm {F13.4}

I guess they are related to mud-cake and filtrate, but what are physically those 2 calipers. What do they reflect/mean?

Waiting for prompt answers.
Thanks in advance,

Philippe Gaillot on behalf of the IODP Scientific Party 314.

P. Gaillot

---------- Oct 23

The data IDRO field reprocessed vs the 4th version have been plotted – see cross-plot density 3.pdf or the combined data set (field reprocessed, China version 1 – china version 2 data file = IDDqqt1-SLFbproc1-SLBproc2.txt).

Phys props group in agreement with Ccs, EPM and myself decided to use the field reprocessed version. To avoid any confusion with the data the 2 processed data set from China have been deleted from the main data server (but are available here IDDqqt1-SLFbproc1-SLBproc2.txt for reference in their non-depth-shifted version).