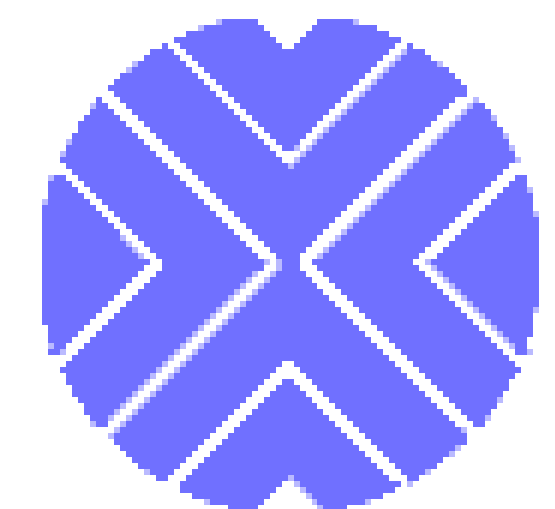


# DETACHMENT PLANES



PDVSA

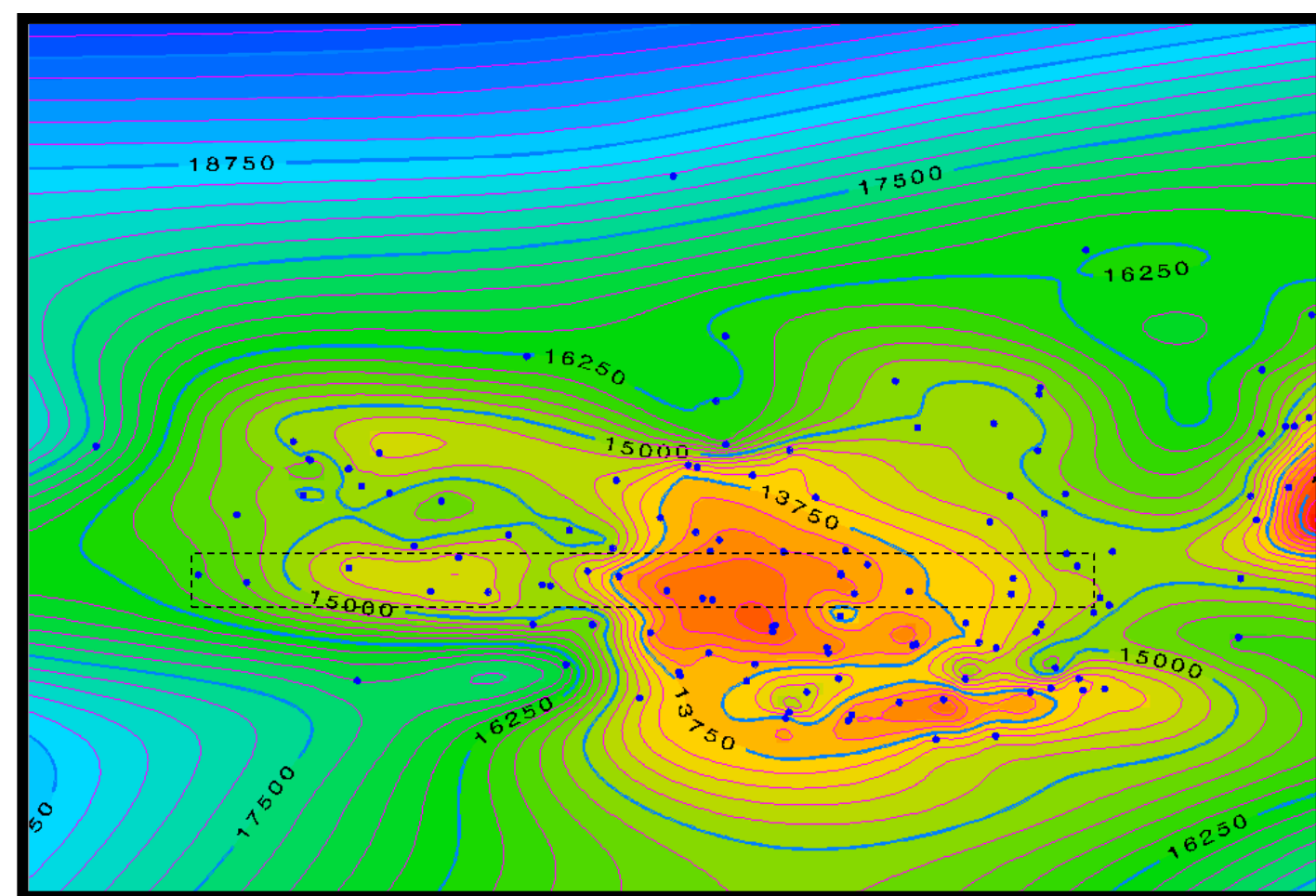


Figure 1: Map of Santa Barbara and location of wells used in the West-East 2-D projection

Projection  
of all  
of the  
wells

→  
→  
→

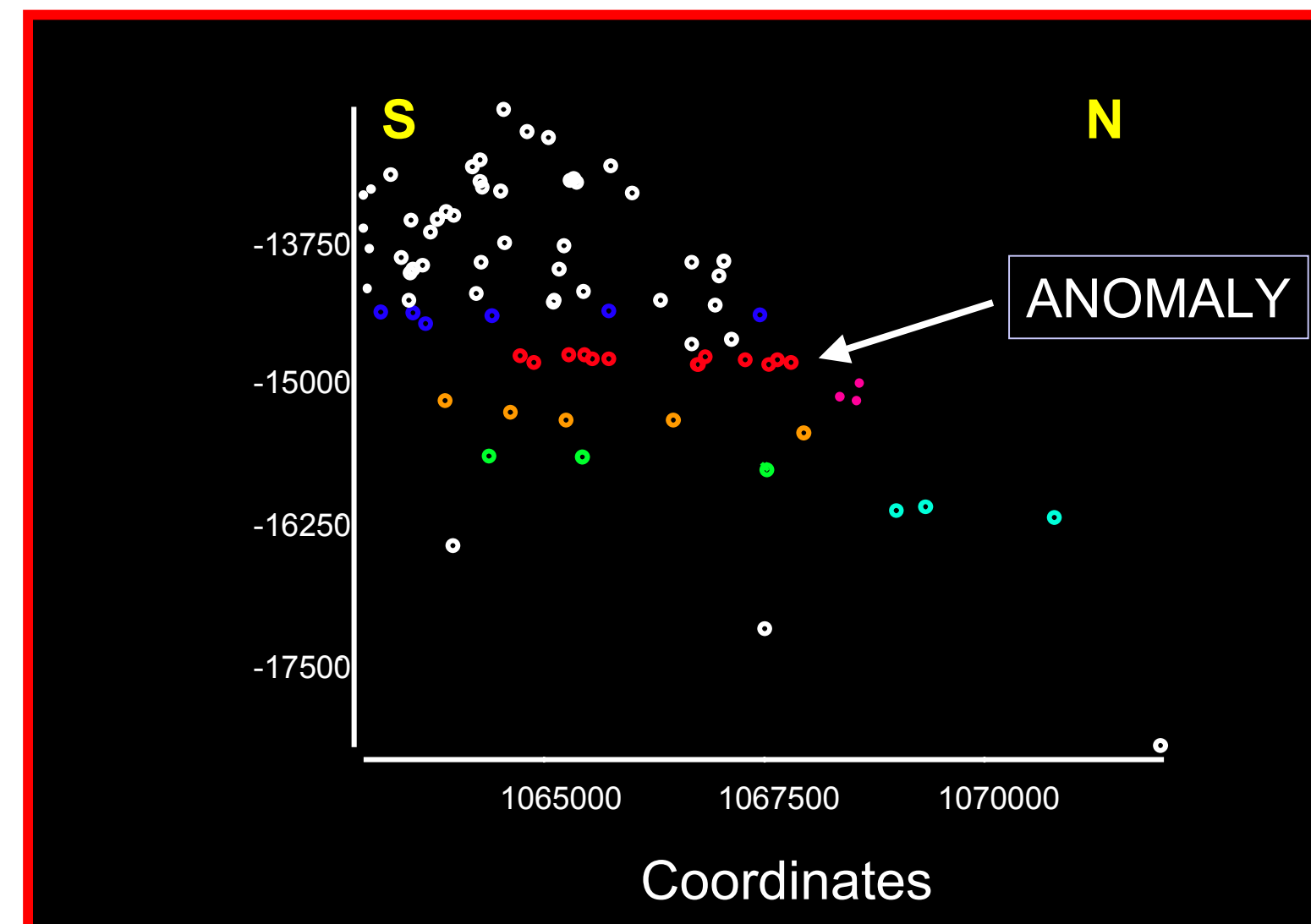


Figure 2: 2-D projection of all Narigual Superior tops

A 2-D projection of all of the tops of the Narigual Superior shows anomalous alignments that have been outlined with different colours.

The red alignment is centered around a depth of 14850' feet TVDs.

Understanding the 2-D projection of the Figure 2 is not straight forward. The anomaly is better understood on an histogram as seen on Figure 4.

However, that anomaly is just the

## Tip of the Iceberg

Figure 3 shows a 2-D projection of a selected group of wells that best express the geometry of the stratigraphic anomaly

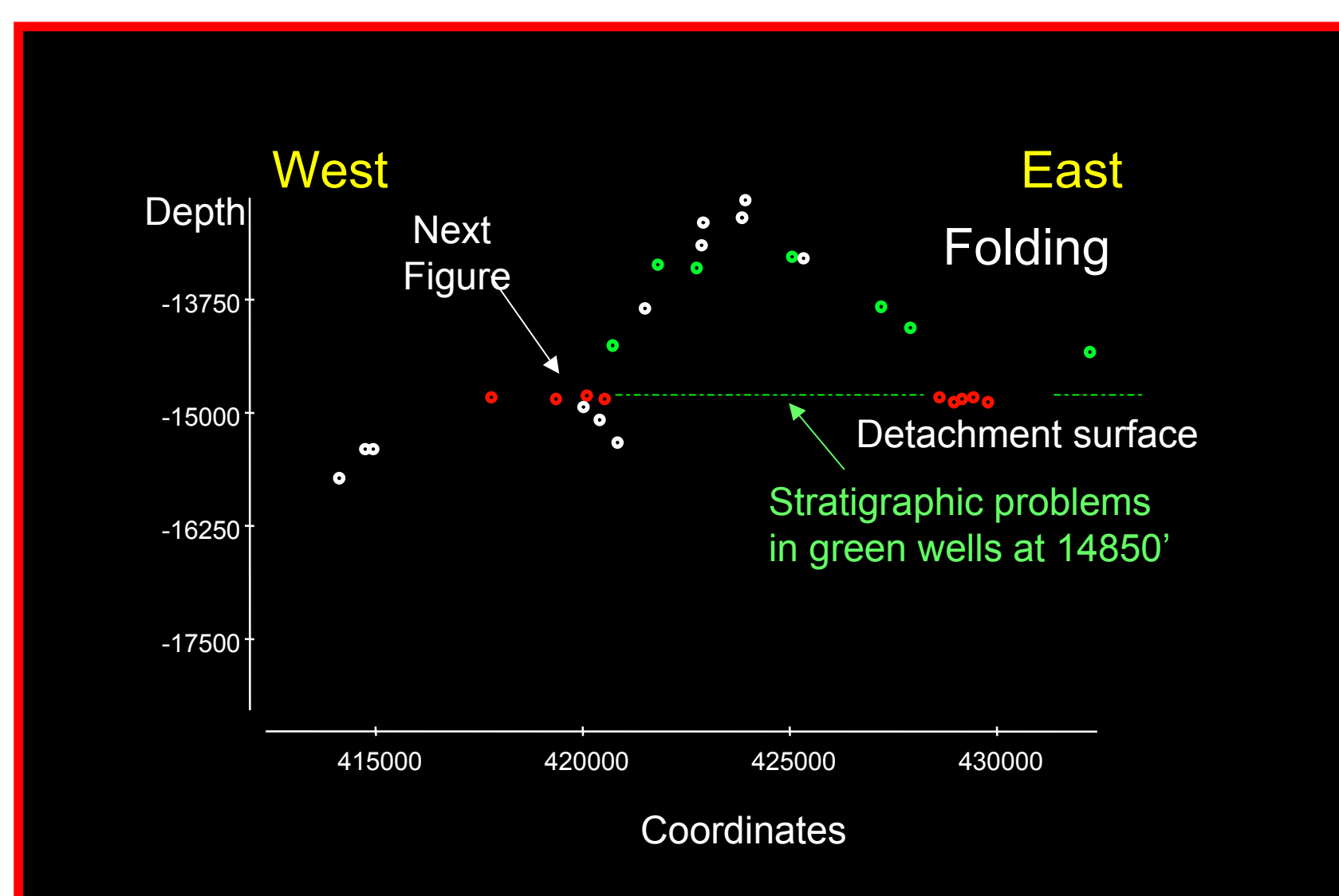


Figure 3: 2-D projection of tops of the Narigual Superior from a narrow geographic window

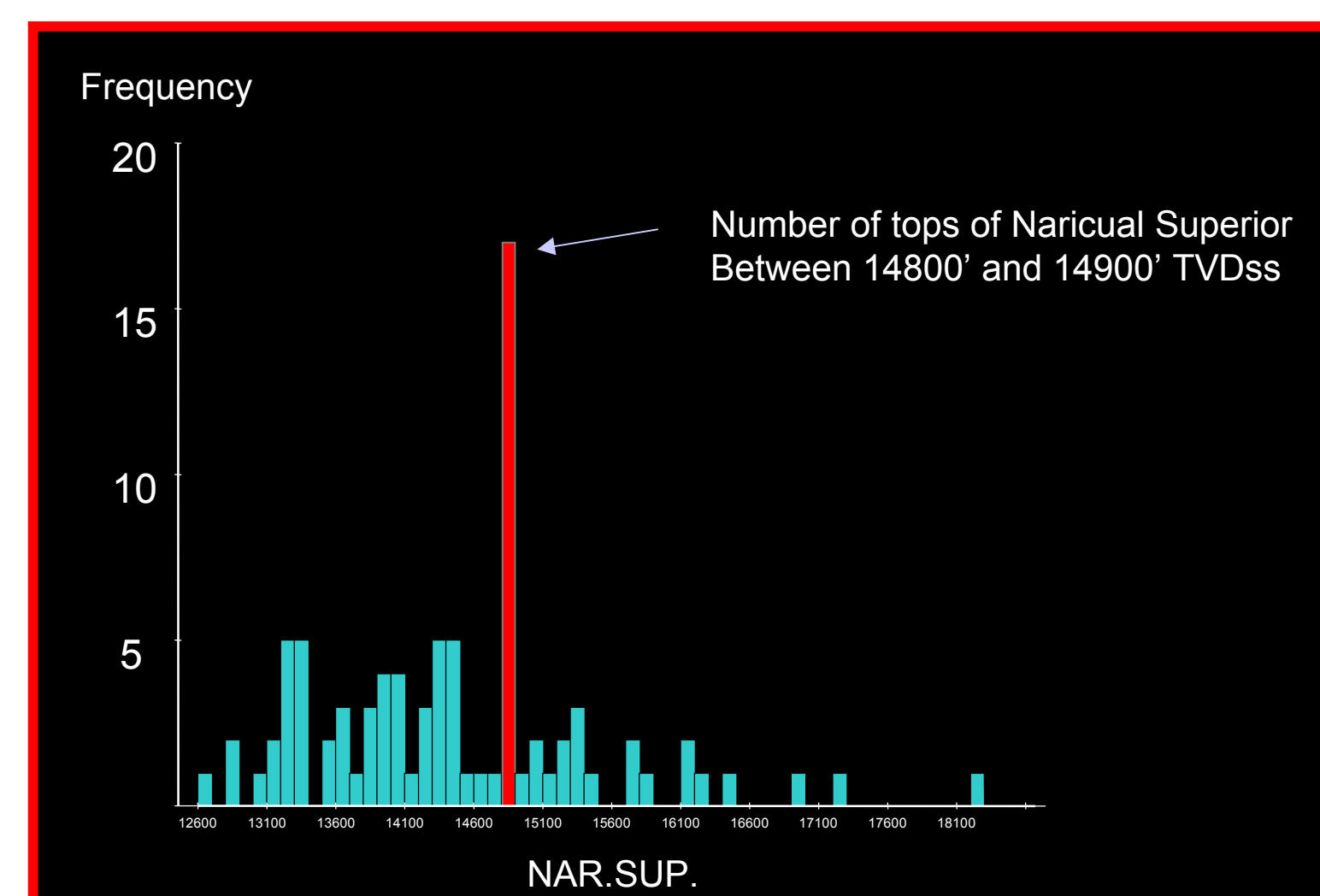


Figure 4: Frequency of occurrence of Top Narigual Superior at a defined depth

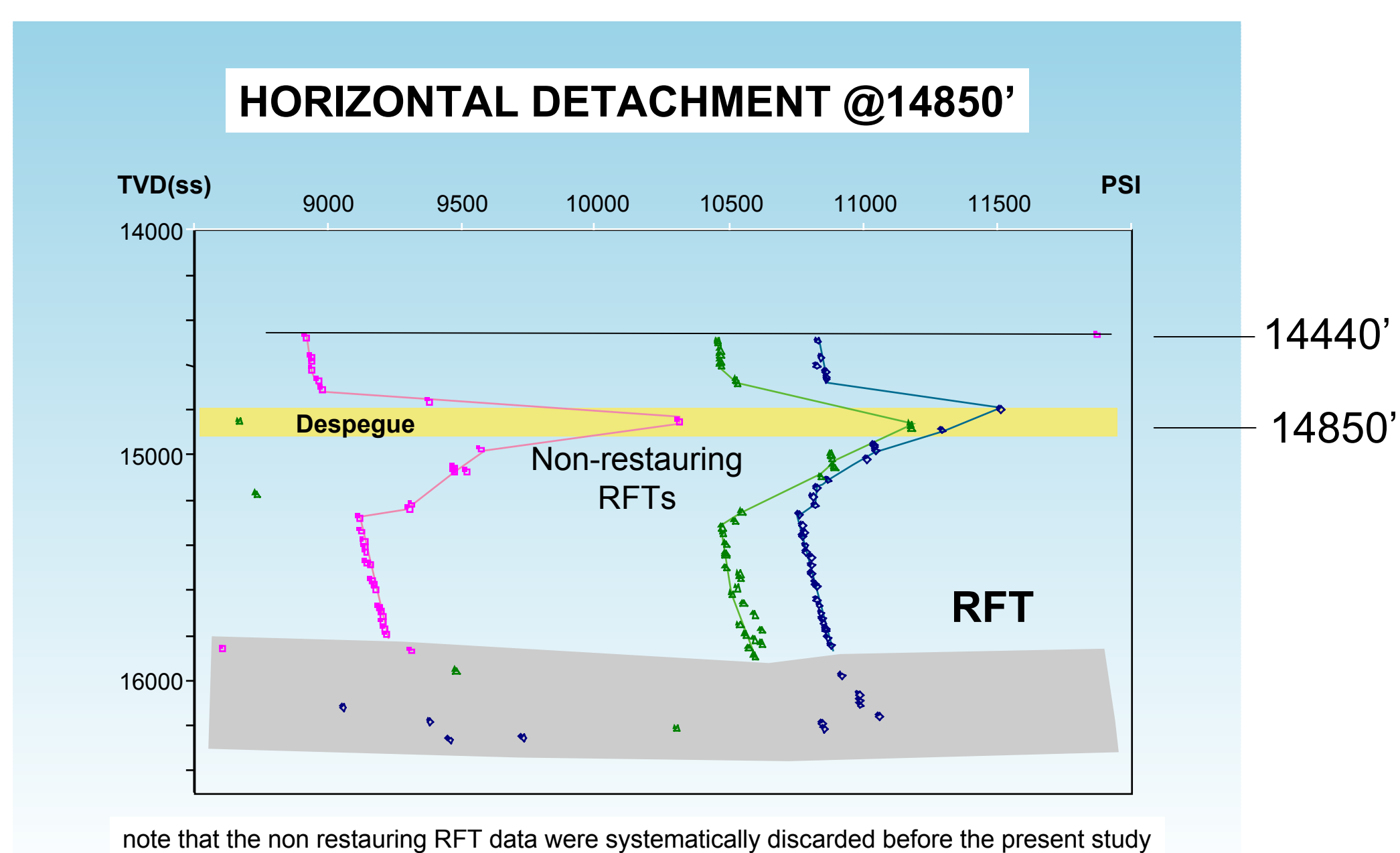


Figure 5: Reduced reservoir quality below the 14850' detachment plane as shown by RFT data.

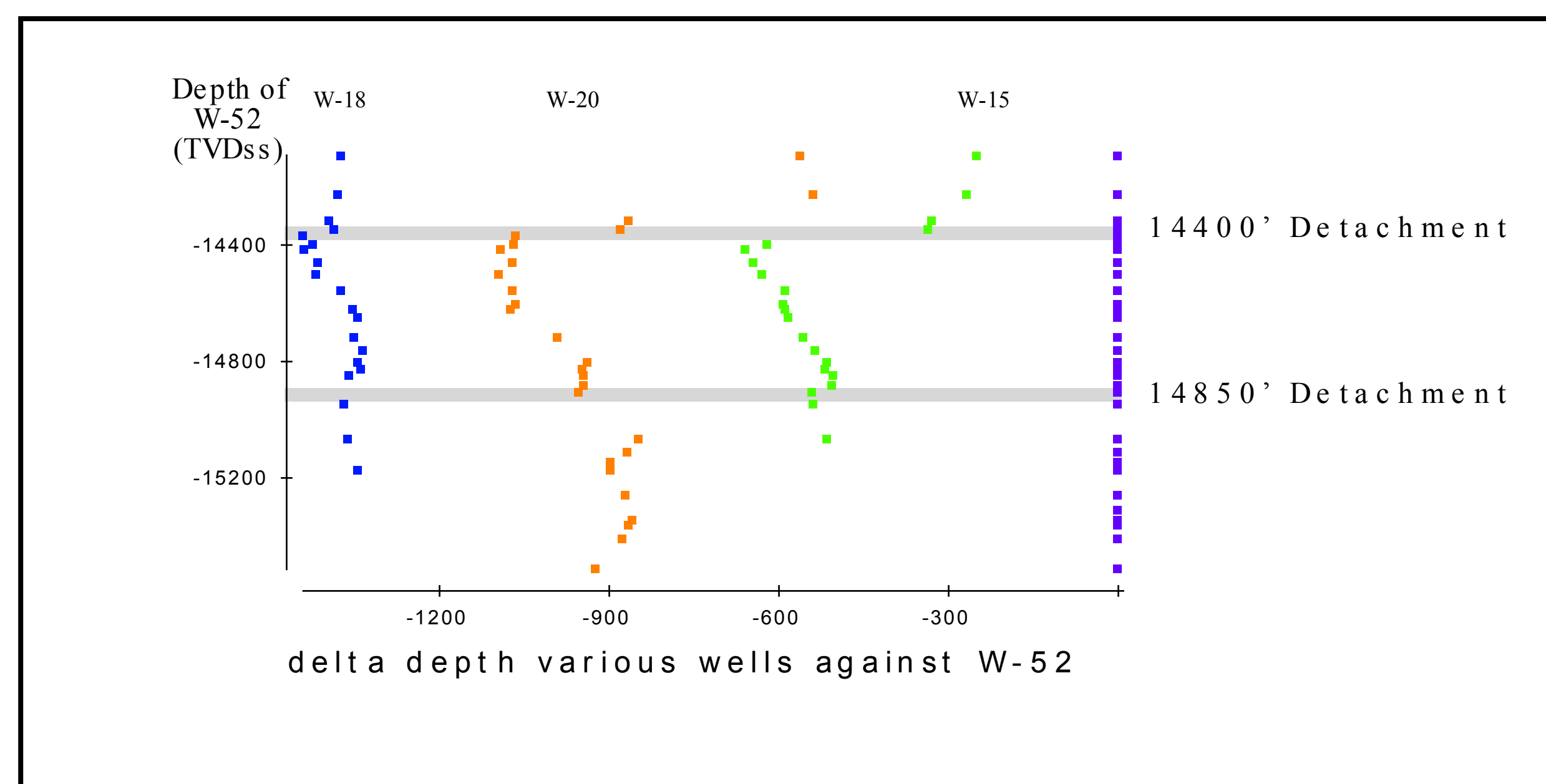


Figure 6: Inverted Stacked Multiple Bischke Plots showing two levels of detachments

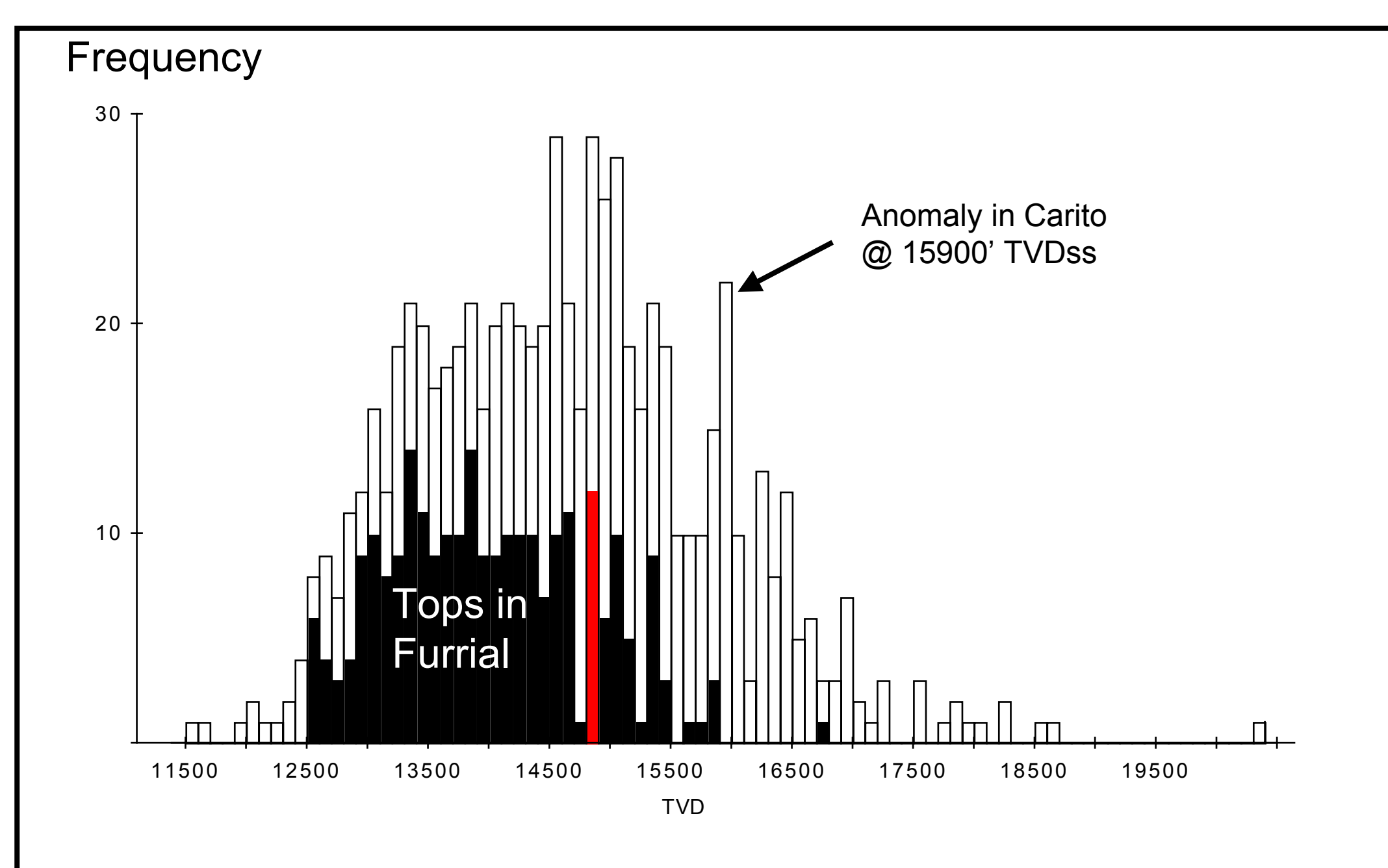


Figure 7: Stratigraphic anomalies at 14850' in Furrial and @ 15900' in Carito, depths of the two major detachments in Furrial Trend

Figures 5 to 7 are examples of various types of evidence of detachments.

Detachment planes are linked to vertical compartmentalization and local destruction of the reservoir quality below the major fault plane. This is expressed by series of anomalous RFT data points that are aligned against the normal RFT versus depth trend (Fig.5). These have been recognized in various part of the field where sandstone units have been transported over other sandstone units.

Drag folding is also commonly associated with detachments planes and is readily visible on inverted stacked Bischke plots (Figure 6).

The two main detachment planes recognized in Santa Barbara seem to be also present in Carito and Furrial (Fig.7), that means that the lateral extent of these structural features is of the order of tens of kilometers.