

SFD® Case Example: Folded Wedge Structure **Chuchupa-Ballena Gas Field, Offshore Northern Colombia**

Discovered in 1973, Chuchupa-Ballena is an offshore natural gas field within the Lower Guajira Basin. It produces from shallow marine sediments deposited in a low-relief folded wedge structure.

NXT has conducted various SFD® surveys in the area to quantify the response of the SFD® survey system. These fields were used as templates for surveys conducted in similar geological settings.

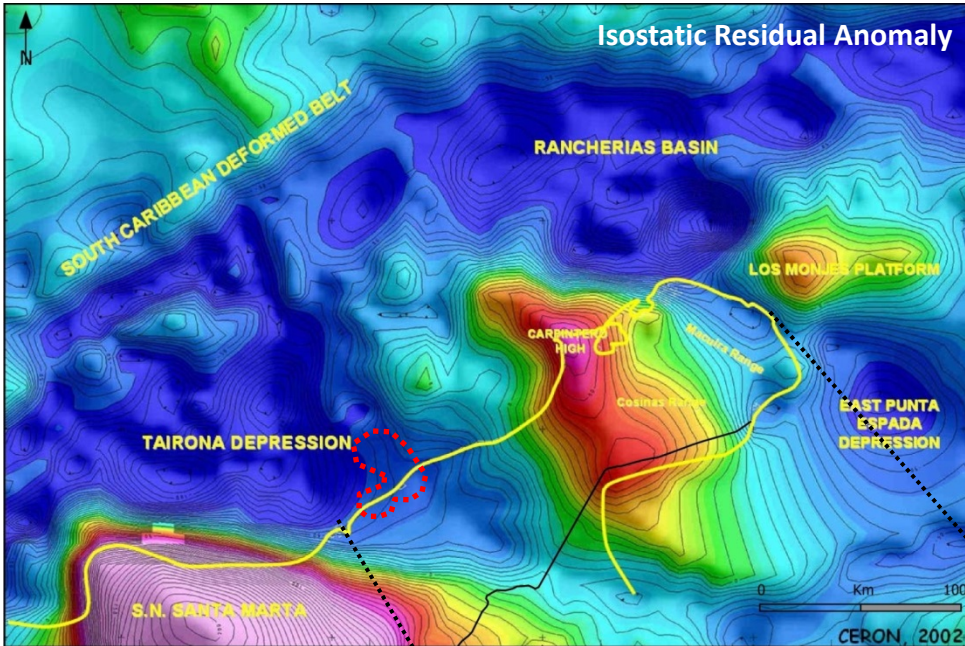
References:

Rivera, N., Meza, N. S., Munoz, J., Joya, P., & Mora, C. A. (2009, January 1). Incremental Reserves and Production Potential From Horizontal Wells in Chuchupa-Ballena Field, Colombia. Society of Petroleum Engineers. doi:10.2118/124675-MS.

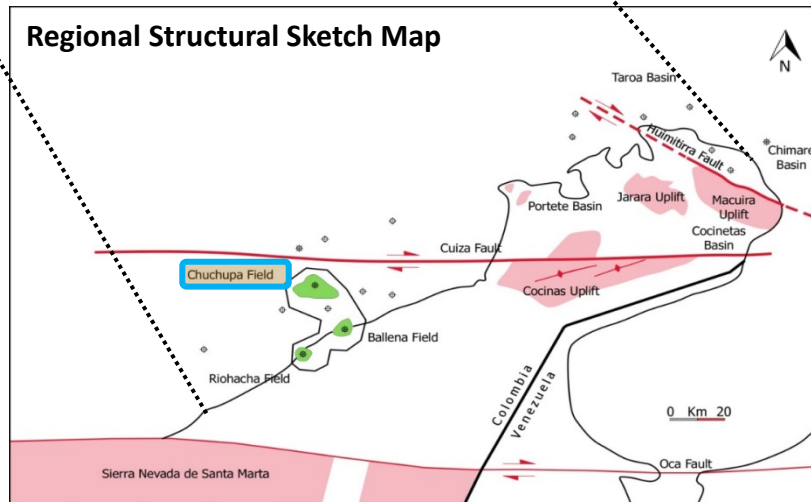
Rivera, N., Meza, N. S., Kim, J. S., Clark, P. A., Garber, R., Fajardo, A., & Pena, V. (2007, August 1). Static and Dynamic Uncertainty Management for Probabilistic Production Forecast in Chuchupa-Ballena Field, Colombia. Society of Petroleum Engineers. doi:10.2118/100526-PA.



SFD® Case Example – Offshore Northern Colombia
 Folded Wedge – **Chuchupa-Ballena Field**



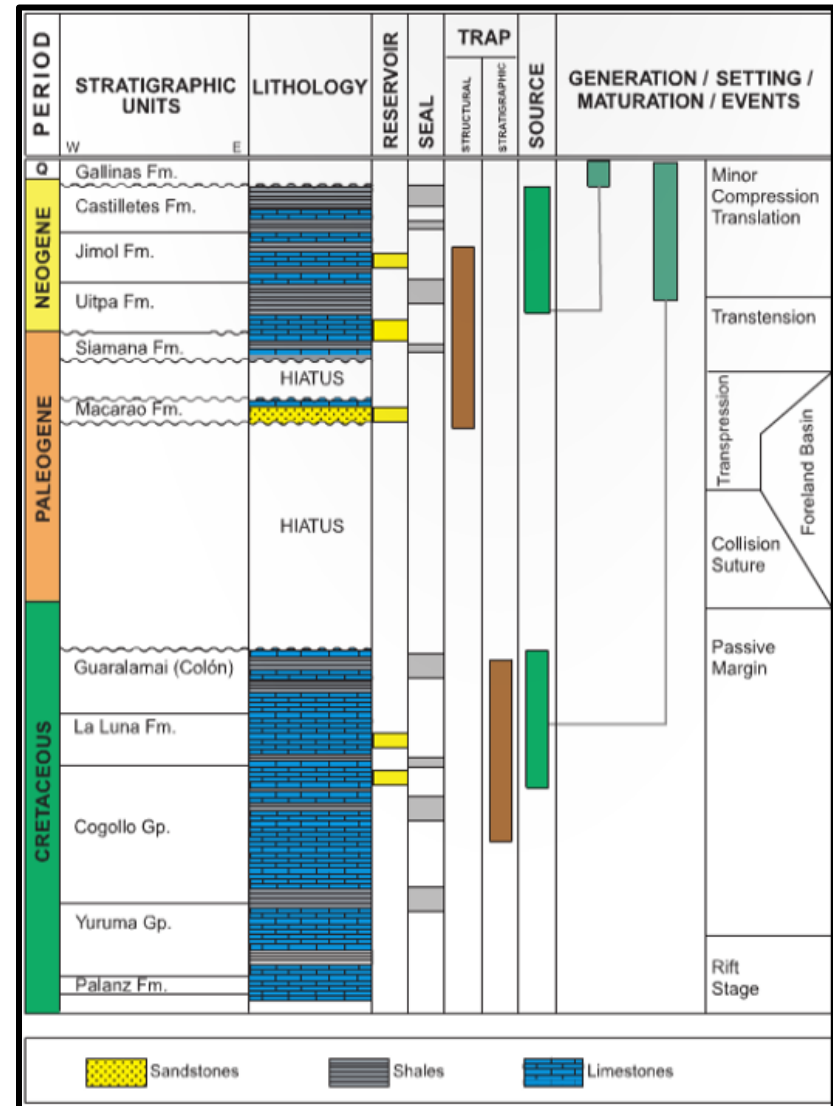
- The Chuchupa-Ballena Field in the Tairona Depression produces from the Lower Miocene to Middle Miocene calcareous sands.
- The calcareous rocks in this Neogene age group, are geologically significant, since this is similar to what is observed in La Paz and Mara fields in Venezuela.
- The structural arrangement of the Guajira Sub-basin is defined by a north-south semi-graben bounded by the Cuiza and Oca faults. However, there are compressive structural styles associated to thrusting that involve cretaceous rocks in the southeast sector of the Guajira Basin.



NXT Energy Solutions Inc.

SFD® Case Example – Offshore Northern Colombia
Folded Wedge – Chuchupa-Ballena Field

- Chuchupa-Ballena is an offshore dry-gas field located on the North Coast of Colombia in water depths of 6.0 m to 22.5 m. The field was discovered in 1973 and covers about 113 km². Cumulative production since then has been almost 2.2 Tcf. The Chuchupa-Ballena Field produces from the Lower Miocene to Middle Miocene calcareous sands. These sands are separated from the basement by up to 180 m of clastics that mainly underlie the field area and the wedge thins out to the west at a regional basement high.
- The Chuchupa reservoir is sealed by a thick sequence of deep water Middle Miocene to Pliocene shales. The reservoir sands were deposited unconformably over the Chuchupa basement complex within a continental to shallow marine environment.



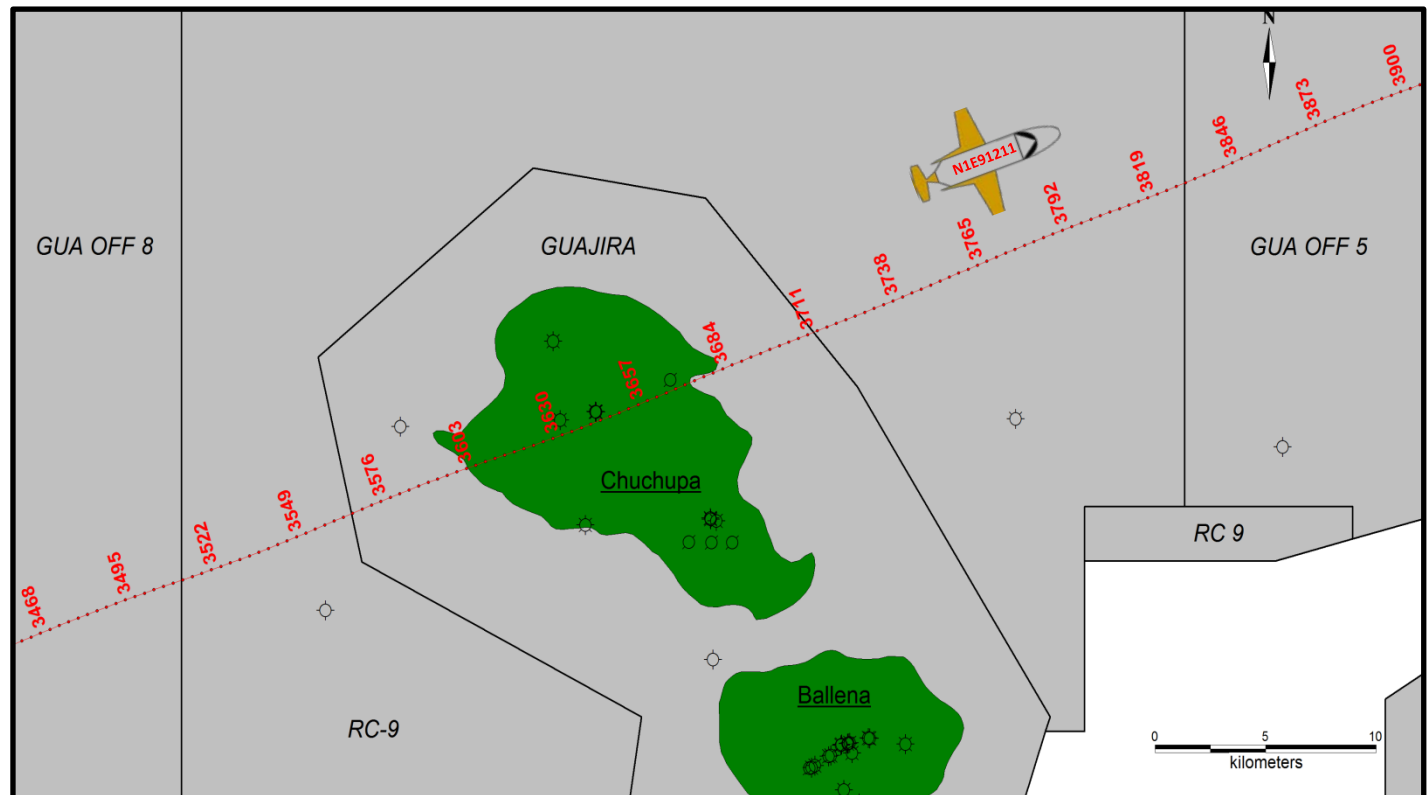
Stratigraphic Column

SFD® Case Example – Offshore Northern Colombia Folded Wedge – **Chuchupa-Ballena Field**

Northern Colombia

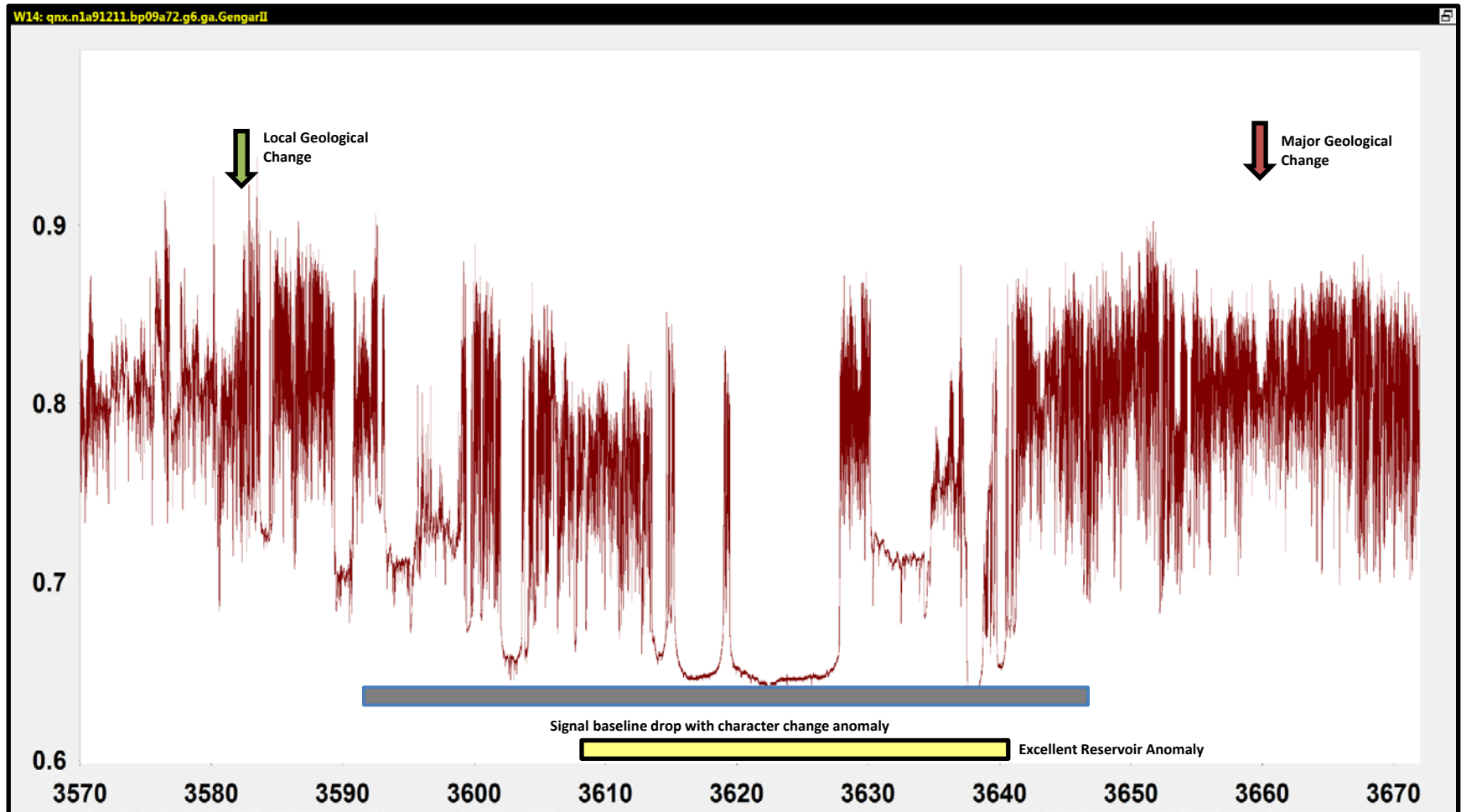
- SFD® flight 91211 was acquired in offshore northeastern Colombia in the Guajira Basin.
- The Chuchupa-Ballena Field was picked to evaluate the SFD® signal responses.
- Surface Area: 113 km²
- In-Place Volume: 5.5 Tcf.

Chuchupa-Ballena Gas Field



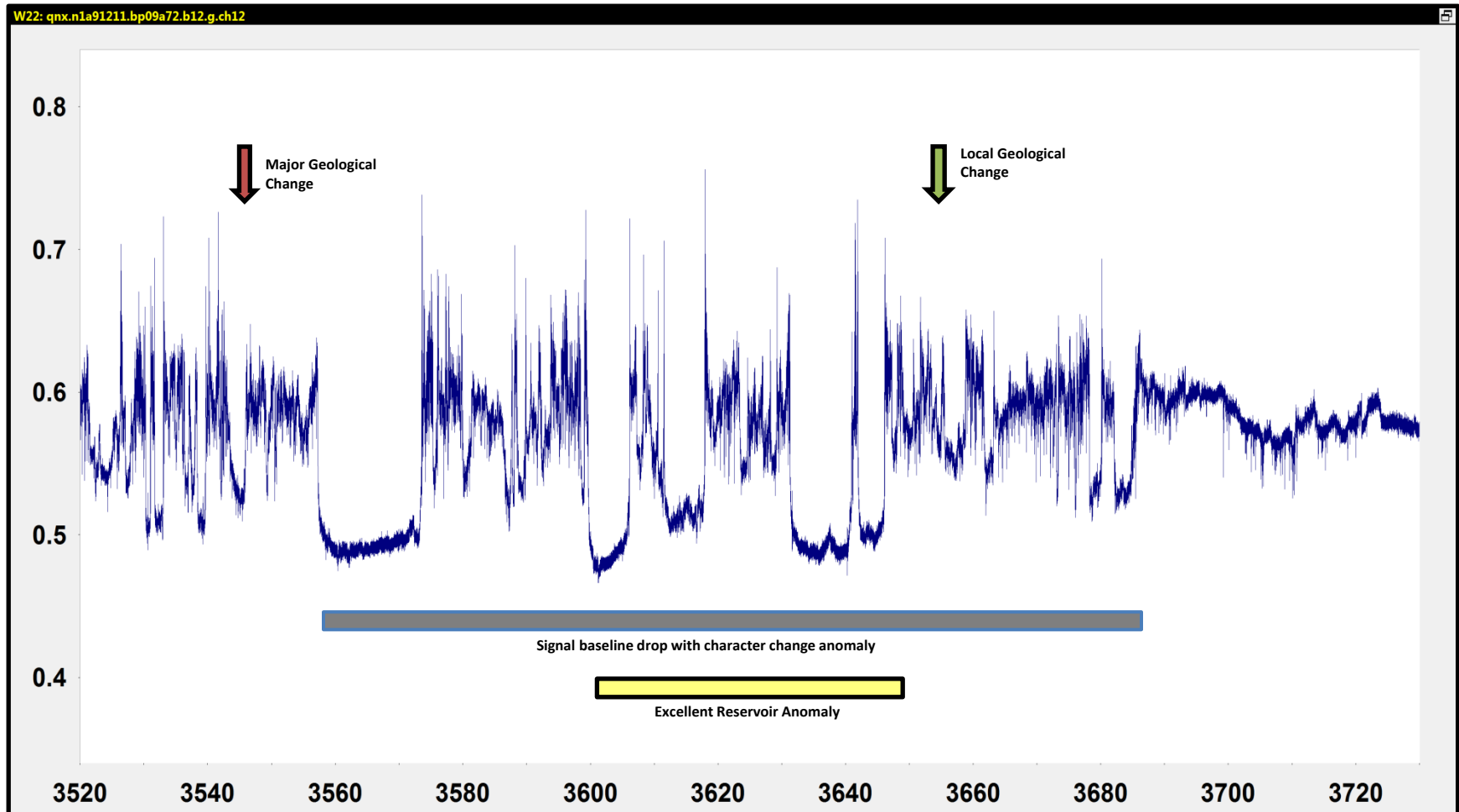
SFD® Case Example – Offshore Northern Colombia
Folded Wedge – Chuchupa-Ballena Field

SFD® 91211 Chuchupa-Ballena Field Crossing



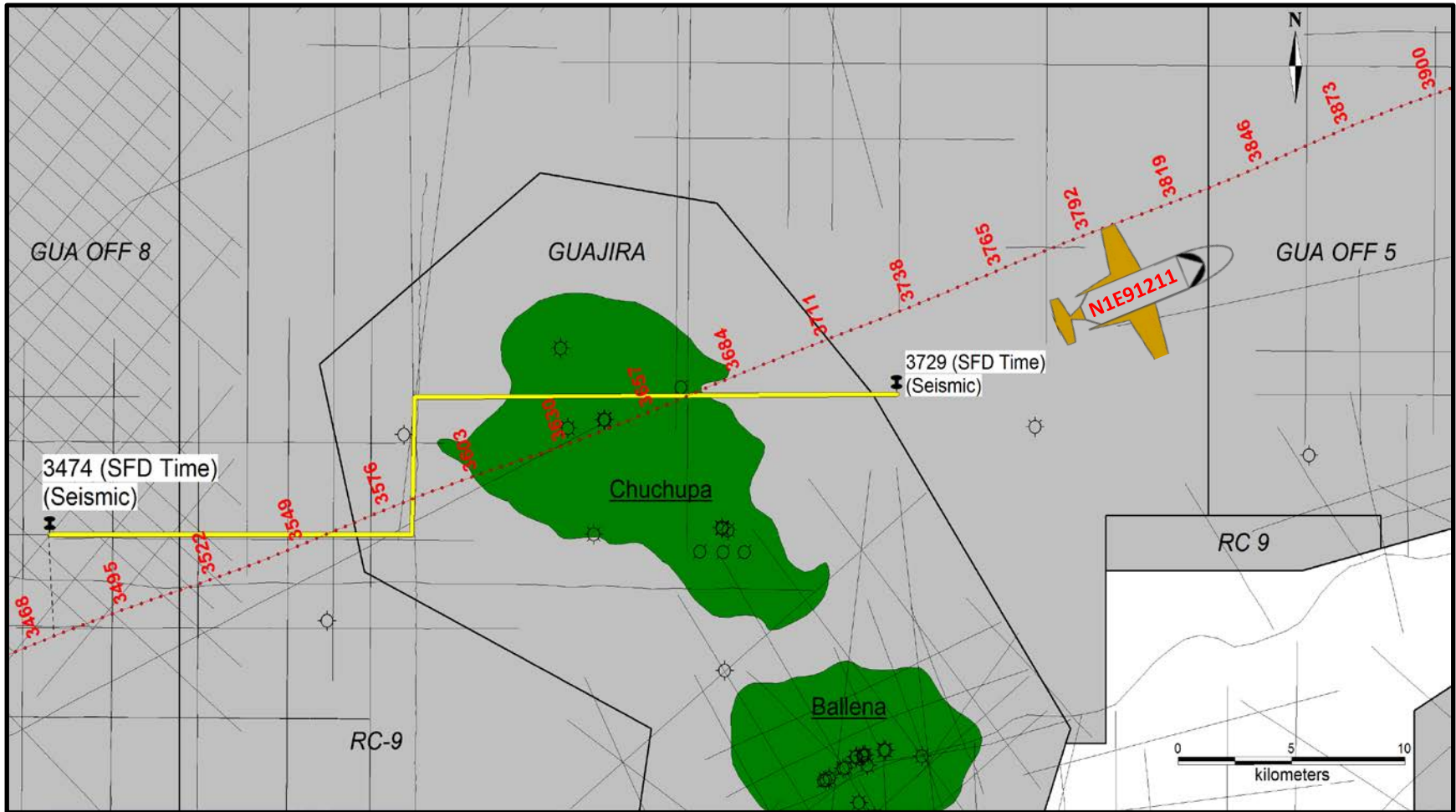
SFD® Case Example – Offshore Northern Colombia
Folded Wedge – Chuchupa-Ballena Field

SFD® 91211 Chuchupa-Ballena Field Crossing



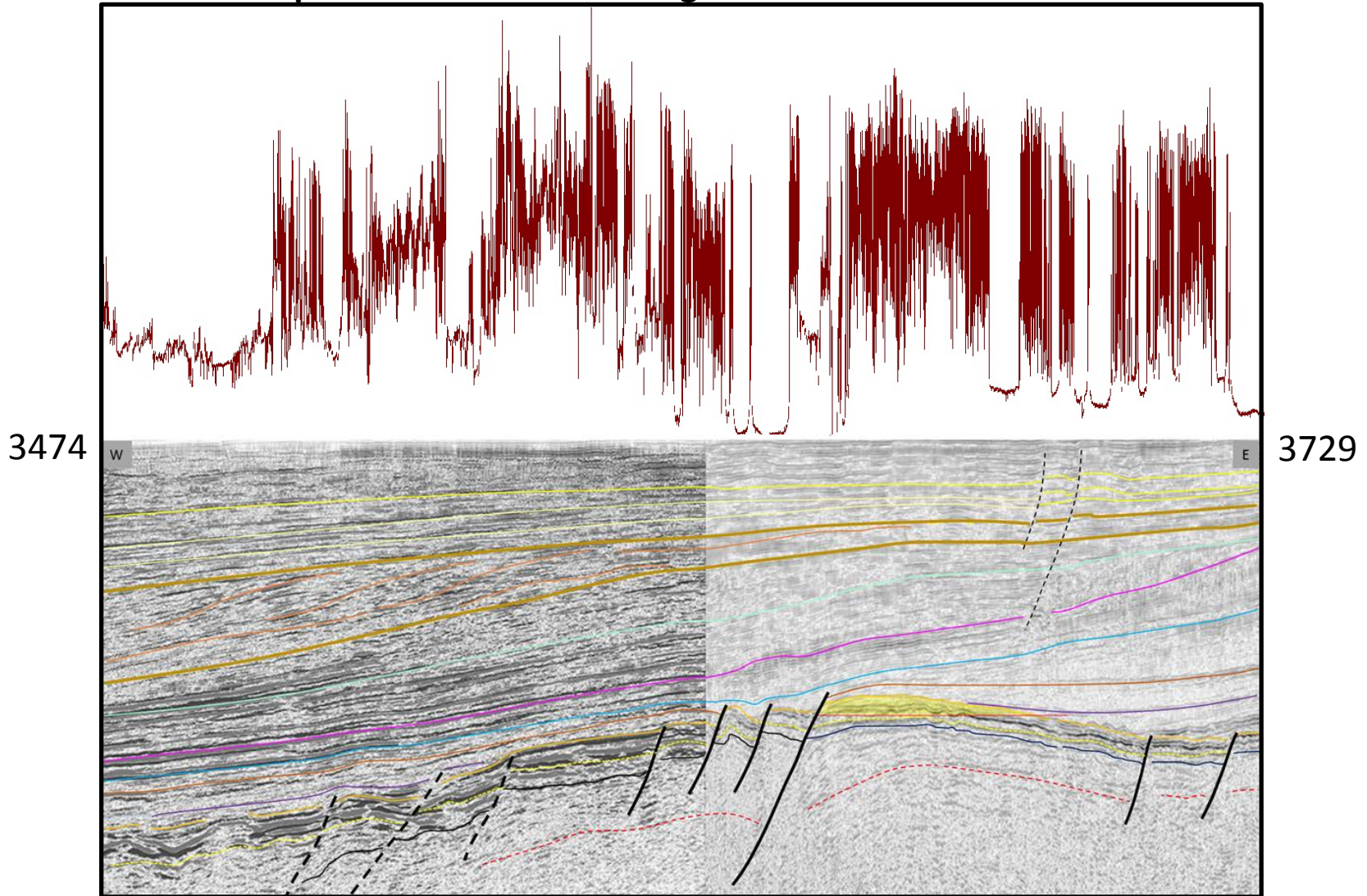
SFD® Case Example – Offshore Northern Colombia
Folded Wedge – Chuchupa-Ballena Field

SFD® 91211 Chuchupa-Ballena Field Crossing



SFD® Case Example – Offshore Northern Colombia
Folded Wedge – Chuchupa-Ballena Field

SFD® 91211 Chuchupa-Ballena Field Crossing



SFD® Case Example – Offshore Northern Colombia Folded Wedge – Chuchupa-Ballena Field

Chuchupa-Ballena Field – Northern Offshore Colombia

Summary

- SFD® flight 91211 detected an excellent reservoir anomaly over the Chuchupa-Ballena field area.
- SFD® showed an anomalous region starting with a local geological change at 3580 and finishing with a local geological change at 3680.
- Within the anomalous region the signal attributes are used to further delineate the core reservoir anomaly between 3600 and 3660.

