Seismic high amplitude anomaly in Namurian sandstones on 2D seismic data in Lichtaart

A seismic high amplitude anomaly has been observed underneath the community of Lichtaart on the recent (2010) southwest-northeast oriented 2D seismic line 01of the Mol-Herentals survey. This anomaly is visible in Namurian strata in which it is delimited by major faults (faults 94 and 35), which form a graben structure. The continuity of this anomaly towards the northwest and southeast is uncertain, as there are no other good quality seismic lines in the vicinity. The faults that border this graben were active during the Kimmerian phase and have vertical throws of over 200 and 100 meters. The northeastwards dipping fault has also been reactivated during the recent Neogene extension phase.

See also

Seismic ampliture anomalies in Flanders

Anomaly

Standard intercept-gradient AVO (Amplitude Versus Offset) analysis using Shuey's approximation has been conducted on this seismic line in order to characterize the anomaly. Based on the classification schemes of Rutherford and Willams (1989) later updated by Castagna and Swan (1997) a class 1 anomaly could be detected. This type of anomaly is typical for gas- or water filled strongly compacted sandstone units within claystone sequences. Such sandstone units were indeed observed within the Namurian succession in nearby geothermal wells. No quantitative estimates can be made on the gas or water content as no wells are drilled into this graben structure.

Data

ID	Coordinates (EPSG: 3034)		AVO anomaly	Depth
	X	Y	Class	m
Lichtaart seismic high amplitude anomaly	3658815.62	2727608.69	1	2500-2650

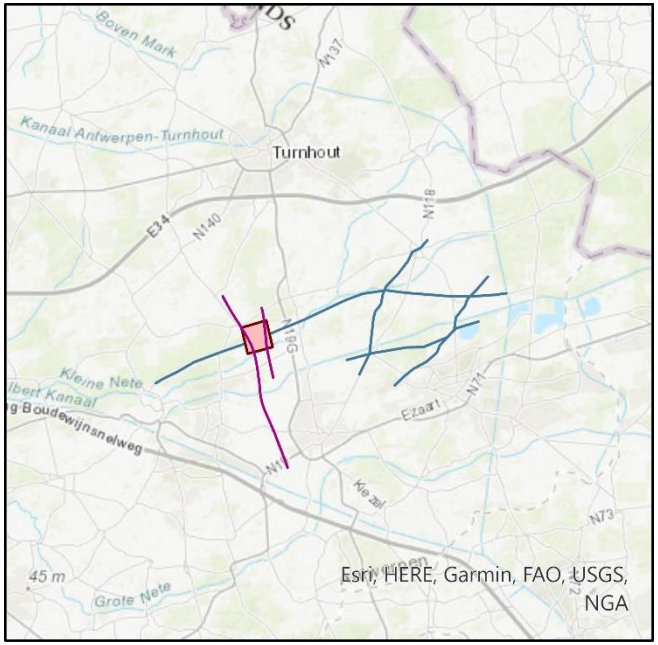

Figure 1: Location of the Lichtaart anomaly (red square). Blue lines mark the seismic lines of the 2D Mol-Herentals survey on which the geomanifestation was inferred. The purples line are the intersection of the top of the Dinantion with Faults 94 and 35, also present in the Structural Framework.

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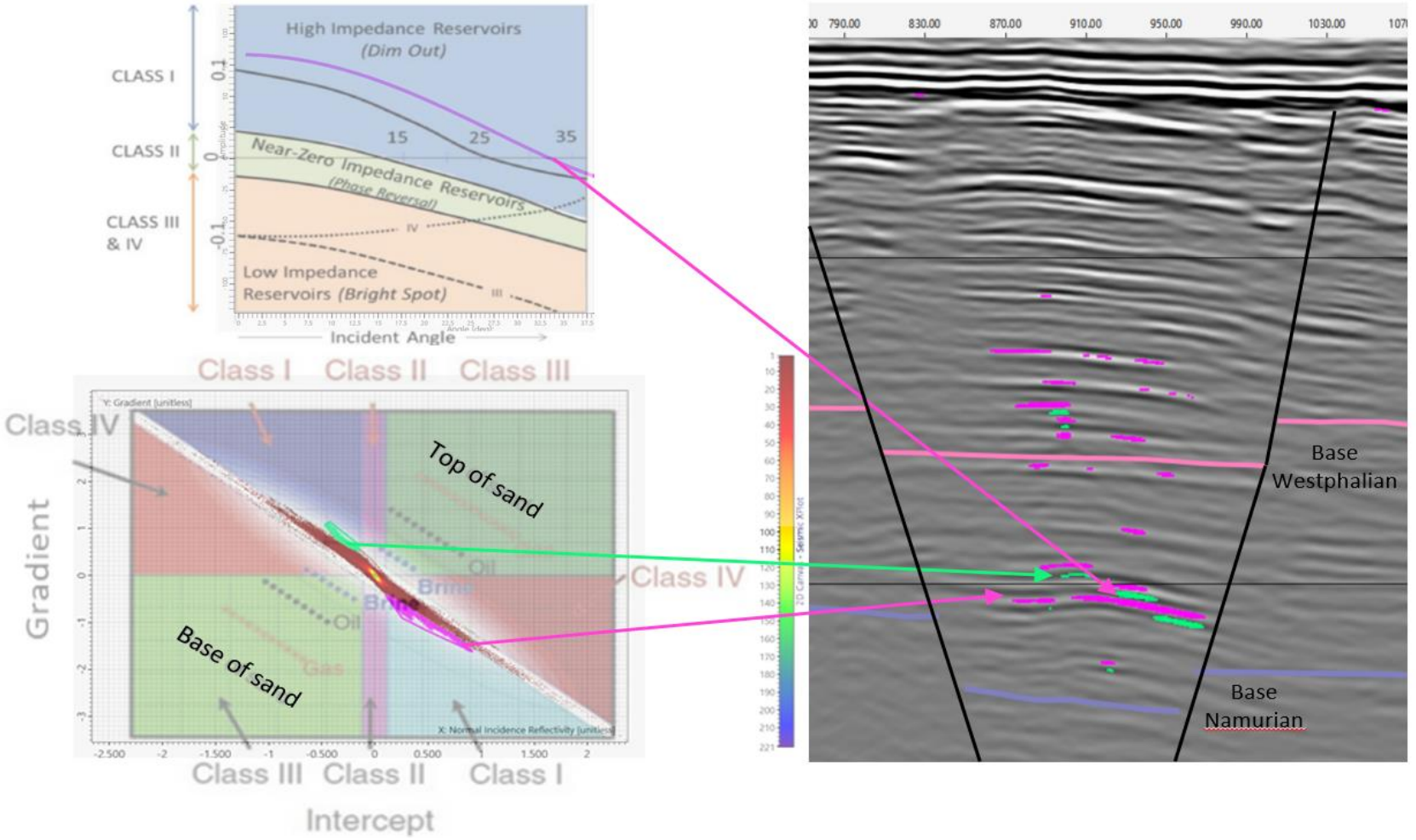

Figure 2: Visualization of the AVO workflow using the classification schemes of Rutherford and Willams (1989) later updated by Castagna and Swan (1997). Upper left: Amplitude with adjacent AVO classes versus incident angle. Lower left: Intercept-gradient plot containing the data from the anomalous zone on the Mol-Herentals 2D seismic survey (2010). The intercept represents the reflectivity at normal incidence angle and

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the gradient shows the change of reflectivity with changing incidence angle. Deviating points from the trendline can be indicative for the presence of fluid or gas. In this case the deviating points fall in the Class 1 anomaly type
quadrant. Right: the Lichtaart seismic anomaly related to faults 94 (left) and 35 (right). Purple and green marks represent the top and bases of possible sand layers where AVO analysis indicates Class 1 type anomalies. The base of the Namurian and Westphalian are indicated by blue and pink lines, respectively.

References

Castagna, J.P. and Swan, H.W., 1997, Principles of AVO crossplotting: The Leading Edge, 16, 337-342.

Rutherford, S. R., and R. H. Williams, 1989, Amplitudeversus-offset variations in gas sands: Geophysics, 54, p. 680-688.

Shuey, R.T., 1985. A simplification of the Zoeppritz equations: Geophysics, 50, p. 609-614.

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