AVO anomalies in Mol-Dessel

AVO (Amplitude variation with Offset) anomalies have been detected in the Westphalian and Namurian strata on lines 02 and 04 of the recent (2010) 2D seismic Mol-Herentals survey. These anomalies seem to be often limited by faults and have been analysed in the vicinity of three geothermal wells in the city of Mol (MOL-GT wells) (Bos & Laenen, 2017). The faults that limit these anomalies were active during the late Jurassic up to early Cretaceous Cimmerian phase and have variable throws (in the order of 10 to over 100 meters).

See also

[Seismic ampliture anomalies in Flanders]

Anomaly

Standard intercept-gradient AVO analysis using Shuey's approximation has been applied on the Westphalian and Namurian of these seismic 2D lines in order to identify AVO anomalies. Based on the classification schemes of Rutherford and Willams (1989) later updated by Castagna and Swan (1997) class 1 and 4 anomalies could be detected. The majority of the anomalies are class 1, which is typical for gas- or water filled strongly compacted sandstone units within claystone sequences (Rutherford and Williams, 1989). Indeed, the reflectors with class 1 anomalies are correlatable with - often coal bearing - sandstone units within claystone dominated intervals of the Westphalian A and upper part of the Namurian in all of which substantial amounts of gas or gas condensate were measured while drilling through these layers in at least one of the MOL-GT wells.

In the lower Westphalian B measures class 4 anomalies occur, which can be typical for coal bed methane gas. Indeed the class 4 anomalies can be correlated with interbedded coal sequences also containing methane gas in two of the MOL-GT wells.

Total gas content within these specific layers is highly variable in the wells. Based on well correlations it seems that the gas content within these layers is fault block dependent.

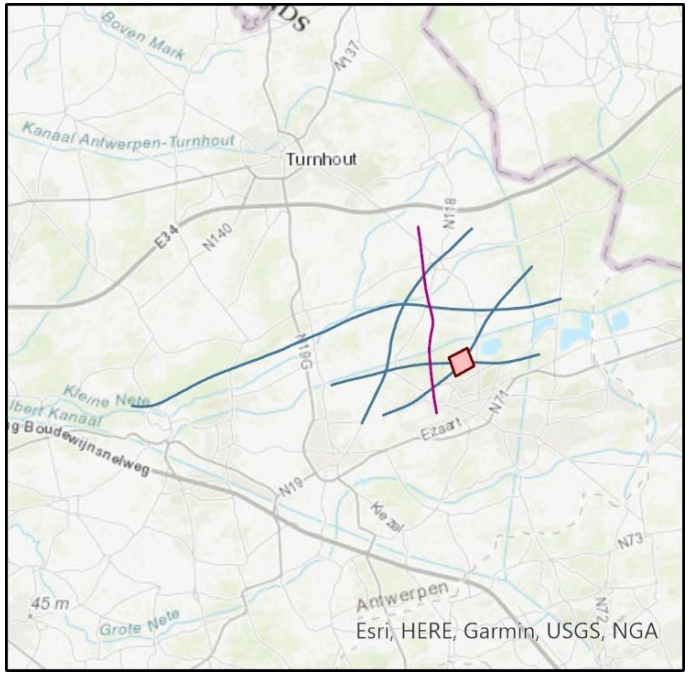

Figure 1: Location of the Mol-Dessel anomaly (red square). Blue lines mark the seismic lines of the 2D Mol-Herentals survey on which the geomanifestation was inferred. The purple line is the intersection of the top of the Dinantion with Fault 1, also present in the Structural Framework..

Data

ID	Coordinates (EPSG: 3034)		AVO anomaly	Depth
	X	Y	Class	m
Mol-Dessel seismic facies differences related to gas	3669703.27	2726245.09	1 and 4	900-2800

This file is part of the GeoConnect³d project that has received funding by the European Union's Horizon 2020 research and innovation programme under grant agreement n.731166.

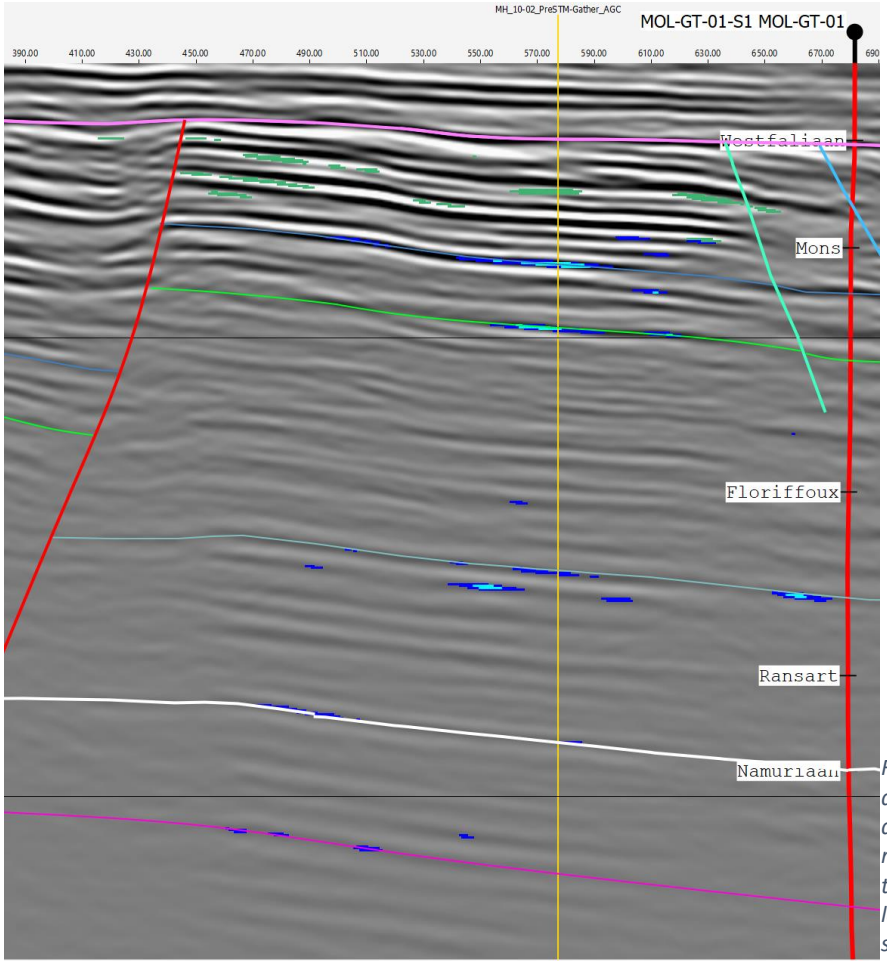

Figure 2: Part of MH10-04 line showing a fault block just east of the MOL-GT wells, where class 1 anomalies are indicated in blue (lighter blue = stronger anomaly than dark blue) and class 4 anomalies in green. The top Westphalian is indicated in pink, underneath which 5 thin AVO class 1 related reflectors can be linked with locally gas-rich layers from the MOL-GT wells, among which the top Namurian in white. Also three fault trajectories (Fault_1 of the structural framework on the left and two minor faults on the right) and the projection of the MOL-GT-01 well are visible on the section. The central yellow vertical line represents the crossing of line MH10-02.

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References

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