

Paper Number: 2456

Heterogeneity of Silurian and Ordovician shale gas deposits in Poland investigated by Factor Analysis applied to well logging data

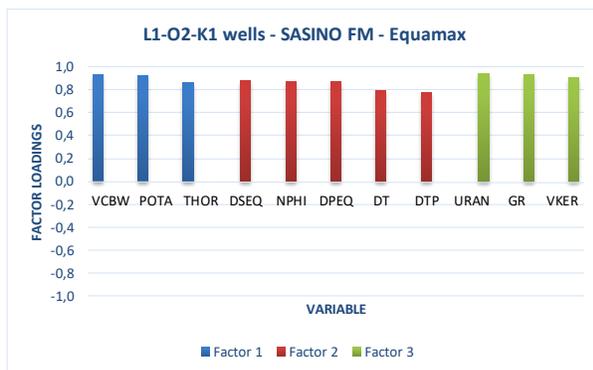
Wawrzyniak-Guz, K., Jarzyna, J.A., Zych, M., Bala, M., Krakowska P.I., and Puskarczyk, E.

AGH University of Science and Technology, Krakow, Poland, al. Mickiewicza 30, 30-059 Krakow, Poland; wawrzyni@agh.edu.pl

The Lower Palaeozoic basin located on the western edge of the East European Craton in Poland has become a major target for unconventional shale gas exploration. Research were focused on the Upper Ordovician and Lower Silurian shales that may contain natural gas. Sasino Formation (Upper Ordovician shale) and Jantar Member within Paslek Formation (Lower Silurian, Llandovery shale) were considered as sweet spots.

Shale gas reservoirs are highly heterogeneous. This study focused on understanding the complex geophysical responses of organic-rich Polish Ordovician-Silurian shales. Factor Analysis (FA) was introduced to logging data from three wells (L1, O2 and K1) located in the Baltic Basin. A primary goal of FA was to achieve a meaningful petrophysical interpretation of the observed variables (here: well log data) through the factors (latent or unobservable variables).

Figure 1. presents sample results for Sasino Fm obtained from FA with Equamax rotation (rotation usually make the results of FA more understandable and easier in interpretation).



The first factor was loaded clearly by clay minerals (potassium and thorium concentration and clay bound water volume are characteristic for clays), the second factor – by slowness of P and S waves that define mechanical properties of rock, and the third one by organic matter.

Results for Jantar Member and other analysed formation were different and varied from one well to another.

Figure 1: Sample results of FA applied to Sasino Formation (all three wells were processed together)

FA results proved that analysed formations displayed significant heterogeneity between each other, between adjacent sediments, as well as between wells. Similar research done with the use of laboratory data [1] again highlighted complicated nature of Polish shale gas deposits that clearly differ from the literature known American or other shale gas formations [2]. In this study FA helped to select the most representative logs in characterization of the Polish shale gas formation and reduced the number of petrophysical parameters that were taken into account in other analysis [3].

References:

- [1] Krakowska et al. (2016) Abstract submitted for the 35th IGC
- [2] Brindle S et al. (2015) First Break 33:79-86
- [3] Jarzyna et al. (2016) Abstract submitted for the 35th IGC

