Paper Number: 3419

Analysis of geochemical well logs in crystalline rocks using statistical approach: Case study of Chinese Continental Scientific Drilling Main Hole
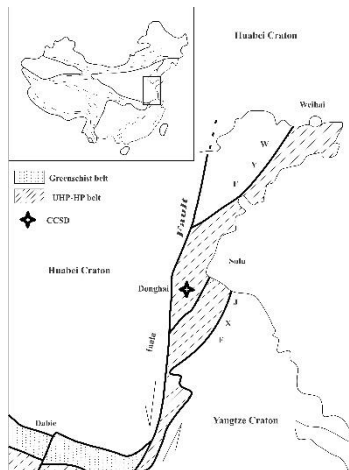
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Well log interpretation is one of the prime sources of information for deep lithology in drilling research. Applications of downhole logs are well developed in the petroleum industry. As a result, log responses in sedimentary rocks are well known; even though, this is not the case for crystalline rocks [1]. Because of the complex geological features of the crystalline rocks, more complex nonlinear functional behaviors exist for well log interpretation purposes. Moreover, up to now, there is no systematic formulated interpretation/classification methods available for crystalline rocks [2] in geophysics; thus posing challenges in accurate identification of log curve for this purpose.

Motived by the success of statistical methods to solve different problems in geophysics, this study will explore the applicability of using Cross Plot and Factor Analysis to recognize metamorphic rocks types using geochemical log data. These methods are calibrated on Chinese Continental Scientific Drilling Main Hole (CCSD-MH) data. The CCSD-MH project was one of the largest and most expensive scientific research projects in geosciences ever undertaken in China [3]. The CCSD-MH is located in the southern part of Donghai County, in the Sulu Ultrahigh pressure metamorphic belt of Eastern China (Figure 1). After 3 years of drilling through UHPM, a final depth of 5158 m was reached in 2005. It is the deepest well drilled into the extremely hard crystalline rocks [3]. The logging engineering employed more than 20 types of well logging tools and used advanced ECLIPS5700 image logging system to obtain a variety of geophysical and geochemical logging data. Therefore the CCSD project database offers a unique opportunity to study log responses in relation to rock composition for metamorphic rocks.

Also of interest in this research will be the comparison of geochemical logs analysis results through statistical methods to those obtained by geophysical logs in order to determine if the geochemical logs evaluation has any advantages over geophysical logs evaluation in crystalline rocks interpretation. These statistical methods can be a very advantageous tool in facilitating the task of geophysicists in the framework of research drillings in continental crust.

Figure 1: The location of CCSD-MH.
WYF: Wuliang–Yantai Fault;
JXF: Jiashan–Xionshui Fault

References:

[1] Bartetzko et al. (2005) in: Petrophysical properties of crystalline rocks: Geological Society, 255-278

[2] Pechnig et al. (2005) in: Petrophysical properties of crystalline rocks: Geological Society, 279-300

[3] Ji SC and Xu ZQ (2009) Tectonophysics, 475: 201-203.