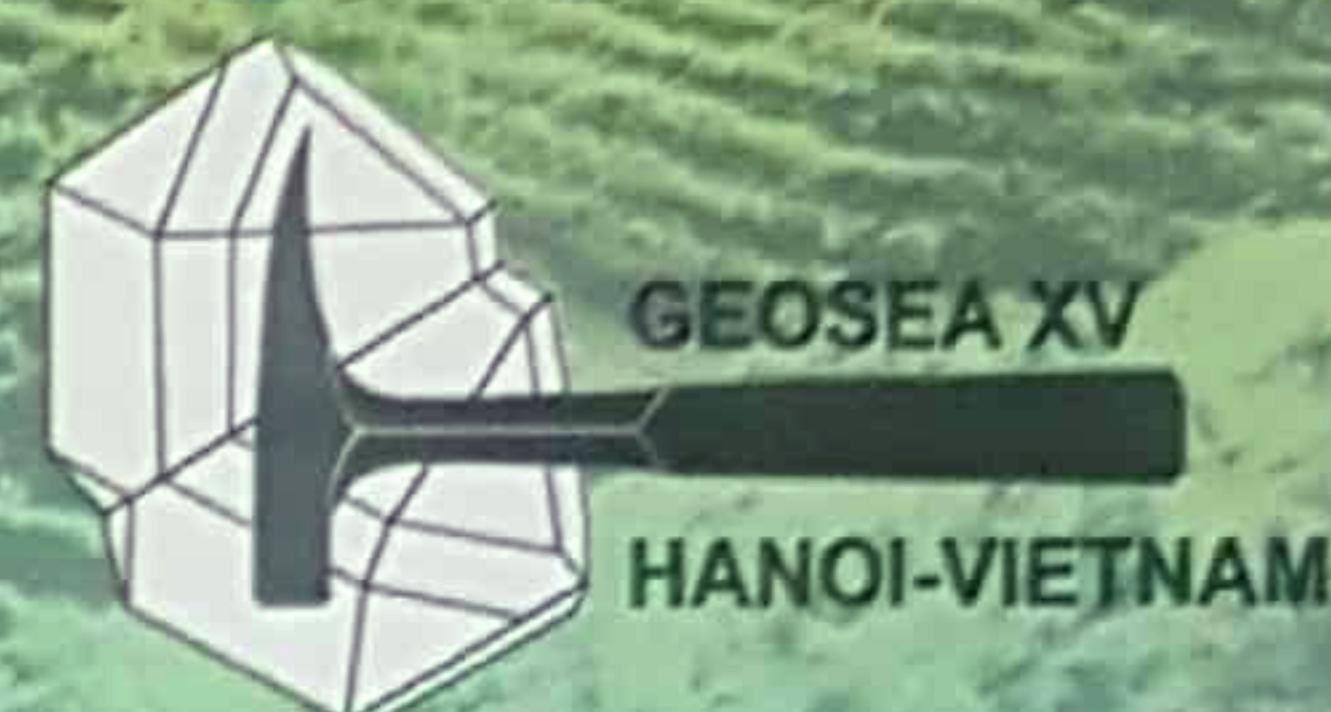


**GEOSEA 2018**

**15<sup>th</sup> REGIONAL CONGRESS ON GEOLOGY,  
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**ASEAN** Geosciences and Earth resources  
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## Establishing geological and geophysical parameters as basis for connection and correlation the Coal seams in the Red River Coal Basin. Applied test in the Tien Hai area

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The Red River Coal Basin is the largest lignite reservoir of Vietnam containing hundreds of billions of tons of Coal with good quality and meeting the need for branches using the fossil fuel energy and others. Currently, the project "Surveying and evaluating the overall Coal resources of the Red River Basin in the mainland part" is being conducted by General Department of Geology and Minerals of Vietnam. Previous studies reported that the structural geology of the Red River Coal Basin is very complicated and the existing depth of Coal seams is large. Stratigraphic and rock facies characteristics of the Coal Basin are widely varied. The Coal Basin is entitled covered with Quaternary sediments. At the beginning of exploration of oil and gas in the Red River Delta, the Soviet and Vietnamese geologists have paid attention to the connecting and correlating Coal seams; However, due to the limit of documents, the Coal seam correlation was namely to connecting strata and separating the Coal-bearing sequences. The main reasons for difficulties in correlation of Coal seams in the Red River Coal Basin are:

- The history of formation and development of Coal seams in the Basin has been subjected to the tectonic activity; Particularly, syn- and post Coal formation faults separated the Basin into many tectonic blocks and each of them has the specific sedimentary regime and Coal formation process. These features make it difficult to link Coal seams in the Basin.

- The Coal seam is a geological entity, characterized and governed by a wide range of geological parameters, such as the size of the seam (thickness), the area and the distribution volume of Coal seams. Characteristics of the internal structure of the Coal seam (strike and deep, intercal). Tectonic factors (faults, folds and cracks) and physical characteristics (radioactivity, conductivity, magnetism, density, resistance, etc.).

- The methods used in the former time by geologists to connect and correlate Coal seams have not yet corresponded to the complexity of formation and deposition conditions of Coal seams in the Coal Basin. Often, authors used only some of numerous geological and geophysical parameters, in many cases these parameters are not the key parameters to link Coal seams. Therefore, the connection of Coal seams on a geological cross-section is difficult and sometimes stuck.

Apart from the above three reasons, another reason is understanding the structural geology of the Coal Basin is not enough basis for correlation of Coal seams. Therefore, connecting Coal seams on a geological section by using a simple geological method is very difficult. On the other hand, specific properties of each Coal seam/sequences of Coal or Coalfield are often covered and controlled by general rules of Coal basin formation, leading difficulty in distinguishing one from the other Coal seams. In order to distinguish Coal seams and Coal sequences, the method of geology and geophysics should be used together

with logic information and other geo-maths.

Applying the method of logic information combining with multi-dimensional statistic mathematical method has identified the geological and geophysical parameters, which are considered as important signs in connecting and correlating Coal seams in the Basin are:

- The elements which have high information value including 9 trace elements (Sr, Mg, Cr, Ca, V, Zn, Th, Mo and K) Er- Tm- Lu- Dy - Sc- Yb-Y and Tb);
- The typical parameters for morphology, size of Coal seams and Coal sequences are thickness of Coal seams and sequences and Coal bearing coefficient;
- The typical parameters for Coal quality are  $W^{pt}$ ,  $A^d$ ,  $V^d$ ,  $V^{ch}$ ,  $Q^d$ ,  $Q^{ch}$ ;

The typical physical parameters for the Coal seams include natural gamma, resistivity, gamma - gamma, reflective velocity, average amplitude and the absolute average amplitude. However, the result of reflected velocity and average amplitude are available only for few boreholes, therefore in fact it is possible to exclude these two parameters.

The correlation of Coal seams in the Red River Basin based on geological and geophysical parameters is conducted as the following:

- Step 1: Collecting and synthesizing documents;
- Step 2: Analyzing sedimentary Basin: Determining the formation and ending process of a sedimentary Basin; mechanics of sedimentary basin formation; determine the boundary of the sedimentary basin as well as cycles of sedimentation; dividing the secondary basins; Determine the sites and boundary of the secondary basins.
- Step 3: Dividing the structural blocks "relative homogeneous structures".
- Step 4: Correlating initially Coal seams (modelling Coal seams by method of geological cross-sections): This step is carried out as follows:
  - + First: Connecting initially each block of structural geology "relative homogeneity";
  - + Second: Connecting Coal seams in the whole of the Coal Basin;
- Step 5: Applying mathematical methods in the linking process of Coal seams,
  - + Modeling geological and geophysical parameters of Coal seams and Coal sequences in the form of statistical distribution function;
  - + Comparing Coal seams or Coal sequences which are initially correlated in the step 4 by method of multi-dimensional statistical standards.
- Step 6: Correcting the name of the Coal seams in each the "relative homogeneity" structural block and in the whole of the Coal Basin.
- Step 7: Checking the final results by artificial neutron network.

The results of the applied test in the Tien Hai area show that the above math-informative model, in combination with traditional geological methods to link and correlate the Coal seams in the Red River Coal Basin brought good results with high the reliability and meet the requirements for the investigation and assessment of Coal resources in the Red River Coal Basin.

**Keywords:** *Geophysical and geological parameters, Coal seam correlation, Red River Coal Basin.*



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