沉积学数据库在地质盆地分析中的应用

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沉积学数据库存储可由 Foxsedba 或 Paradoxedba 来实现。曾为 IGCP 269 的 SEDBA 项目制作了一个软件，该软件于 1993 年就圆满完成了。全球沉积学数据库将在区域地质研究中得到广泛的应用。

该数据库及其所收集的可供检索的数据可用来解释与地质历史和构造相关的地质模型和模拟。

为了寻找地下含水层，我们加强了中爪哇省南山（Southern Mountain）碳酸盐相的研究。地层解释显示，在灰岩层中夹有一层砂岩层，该砂岩层可望成为储水层。

AN APPLICATION OF SEDIMENTOLOGICAL DATABASE ON GEOLOGICAL BASIN ANALYSIS

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ABSTRACT

The storage of sedimentological data into data base can be done by the Foxsedba or Paradoxsedba. A software was made for SEDBA project of IGCP 269 and was succesfully completed in 1993. A global data base of sedimentology intend for broad geological use in regional area.

An application and retriveal collecting data are used to interprete for modelling and simulation of the geological aspect related to the geohistory and tectonics.

The study of carbonate facies of the Southern Mountain in Central Java are stressed for finding a subsurface aquifer layer. The stratigraphic interpretation shows that between the limestone strata are found a sandstone layer which is expected to be the reservoir of aquifer layer.

INTRODUCTION

The rapid growth of information in geoscience plays an important role to increase an evaluation and explaining of geologic problems. In this case, numerical techniques will be help in the management of geological modelling. In 1980 decade, statisical and numerical methods started to use in quantitative modelling approach either in biostratigraphic, lithostratigraphic or sedimentology by Agterberg, Gradstein, Brower etc. Bice (1988), Bosence and Waltham (1990) and Bosscher and Southam (1992) presented a compute programs to simulate and modelling of carbonate platform.

A global data base in sedimentary petrology (SEDBA), designated as the International Geological Correlation Programme Project No. 269, was successfully completed in 1993. The aim of that project is to construct a global data base in sedimentary petrology intending for broad geological use in regional area. The main objective of that project are used to international exchange of the sedimentological data in which the geologist can solve the problem of regional correlation.

Two system of DBMS have been accepted from a various of software, Paradox and Fox, which are widely distributed and available using by the most part of the world. The design of SEDBA should be transported to every computer system both a mainframe and/or a PC-level system.

The next acition and good choice for continuing of SEDBA idea is to apply the SEDBA for reconstructing geoscience. An application and retrieval collecting data are used to interpretate for modelling and simulation of the geological aspect related geohistory and tectonics.

In the basin study, the most important factor is the documentation of the paleogeographic evolution of a sedimentary basin. Sedimentation proccess should be recognized units using sedimentological data and principles of facies analysis in terms of its component depositional system.

The accuracy of sedimentological parameter is a most important factor to evaluate depositional system which should be combined with tectonic aspect constructing a series of basin models.

DATA BASE IN SEDIMENTARY PETROLOGY

A data base for sedimentary petrology has been successfully completed in which two kinds of DBMS are selected from a various of software. This software are widely distributed using by many peoples in the world and it is available on personal computers. FoxSEDBA and Paradox SEDBA are produced ofr managing all of the sedimentology data.

The data files should be accurated and represented sedimentological aspect. Complete-

ly data of stratigraphic sections from one sedimentary basin are more important than randomly sample of many basins.

The establishment of SEDBA/IGCP Board to manage the storage of global data base of sedimentary petrology is very important to be formed. This organization should be recommended to introduce for every country often, so the geoscientists are easy to get and store their own data in data base.

AN APPLICATION OF SEDBA FOR BASIN EVALUATION

Data collecting of sedimentology in SEDBA should be applied as the various requires. The basin analysis is needed a lot of parameters to be done and too much time is needed for interpretation. For that reason, a quantitative modelling approach is expected to solved that problem rapidly.

Methods of analysis concerning basin evaluation was the evolution of sedimentology, explaining of facies study and facies models, genetic approach i. e. depositional systems. In the past, a fundamental aspects for interpreting/and correlating stratigraphy was in the formation of units. Developments of a new frontier areas required an entirely new approach at which the formation should be leaved, ideally through seismic methods. These methods are trying to approach a different kind of formation or depositional setting by the sequence stratigraphy.

Depositional systems are widely used to enable interpretation of facies. Facies analysis related an interpretation of sedimentary structures, geological structures, fossils, texture and lithologic associations of sedimentary rock in which should be depicting a geographic evolution of the basin. This analysis is interpreting sedimentary thickness to close relation in hydrocarbon prospects and more specific aspects for modelling conceptual of a basin. Stratigraphic genetic approaches are based on depositional environment and syndepositional tectonics.

The depositional systems are needed more often to apply computer techniques for modelling of a basin in two or three dimensional aspects.

Bice (1988), Bosence & Waltham (1990) and Booscher & Southam (1992) successfully used applying the computer modeling to illustrate a carbonate platform. According to Bossence and Waltham (1990) the main value of computer modelling provides a visual image of the internal architecture of carbonate platforms in which can be analyzed either outcrop or seismic section.

Van Hinte (1978) proposed a quantitative stratigraphic techniques to unravel and potray geologic history in which micropaleontology applied to express depositional environment and calculating rates of sediment accumulation, rates of subsidence and uplifting. The technique is designated for a geohistory analysis. The paleontologic analysis can be used to paleobathymetry and timing of geologic events. The parameters are used to construct a

geohistory as follow:

a. Unconformity

b. Paleontologic analysis

c. Thickness

Lithostratigraphic correlation is defined to identify of lithological boundaries and it can be made when the key marker was observed in several localities and individual horizons can be traced continuously from a completely section in one locality to another. The lithostratigraphic similarity depends on the type of data which is available. The correlation problems are concerned with complex facies changes and sequences of cyclic sedimentation. Besides, the sedimentation model can be constructed by the quantitative equivalent which relates to the distribution of lithological units and the sedimentation (Schwarzacher, 1985). Ideally, the sedimentation model is showing the three dimensional shape of lithostratigraphic units. But it is rather difficult, concerning with the geometry of rock bodies.

SEDIMENTATION MODEL OF CARBONATE FACIES IN CENTRAL AND EAST JAVA INDONESIA

The lithology of the western part of the Southern Mountain is made up of sedimentary and volcanics rocks of Miocene to Pliocene age. The basement rocks in that area are volcanic rocks of the Old Andesite Formation and the young sediments are limestone units of the Wonosari Formation.

The carbonate facies of the Wonosari Formation are important to evaluate since on that area many people are living and the water was very crucial to obtain. The groundwater level in the limestone cannot be predicted in certain layers. A sedimentation model applying quantitative stratigraphy to be the best way to solve the problem of facies and combining with geophysical approach is expected to know the characteristics and composition of lithology.

The carbonate facies are widely spread over the Southern Mountain in Central and East Java. An interesting bedded limestone represents a beautiful karst topography showing different facies of carbonates from north to south area in which the sedimentation took place from south to north.

Stratigraphic section from north to south and from west to east shows a different composition carbonate in biological content. An algae is most dominant in the south and east area. Coral rich grainstone to packstone spread over a restricted area in the northwest indicating slope environment. An alternation of calcarenite, calcilutite and marls are dominant in the slope facies. Northwards, the characteristics of lithology or the depositional environment changes from shallow water to a basinal plain and deep marine facies. The limestone units of the Wonosari Formation as shown in Figure 1, can be divided into four facies as follows: the first is a lower slope reef facies, the second an upper slope reef facies, the third

a coral reef facies and the fourth an algae limestone facies.

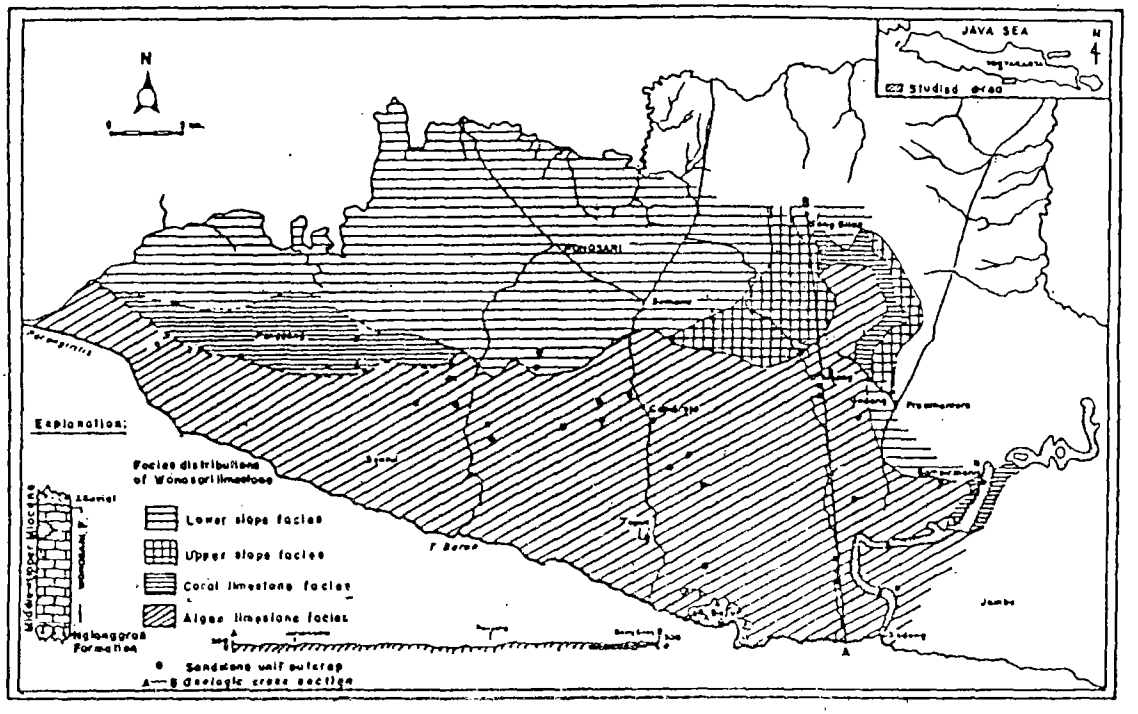
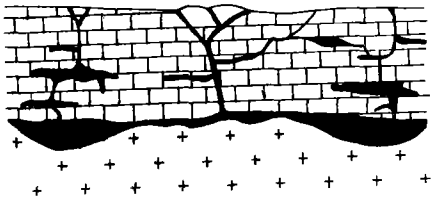
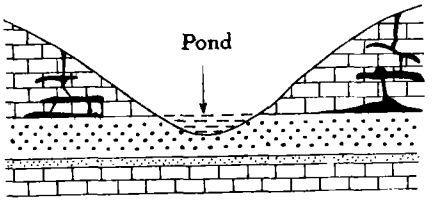


Fig. 1 Geologic map of the Wonosari—Wonogiri area

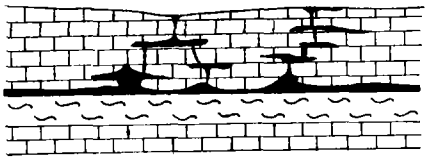
During the sedimentation of carbonates in the middle part of the formation, a bedded black sandstone and clay layers are deposited indicating a tidal or embayment environment. This happening is expected that during the sedimentation of carbonate, uplifting area took place and in some restricted area a basement of volcanic rock is exposed subaerially. These volcanics are expected to be the provenance of sandstone and clay material. A model of sandstone layer interbed the limestone and expecting of aquifer layer between the limestone strata as shown in Figure 2.



a. Contact between Nglanggran Formation and Wonosari Formation



b. Sandstone Units in Wonosari Formation



c. Lower Slope Reef Facies

Fig. 2　Karstic aquifer models of the Wonosari—Wonogiri area

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