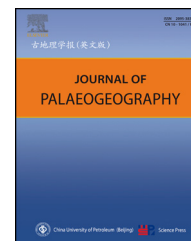


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Lithofacies palaeogeography and sedimentology

On palaeogeographic map



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ABSTRACT

The palaeogeographic map is a graphic representation of physical geographical characteristics in geological history periods and human history periods. It is the most important result of palaeogeographic study. The author, as the Editor-in-Chief of *Journal of Palaeogeography*, Chinese Edition and English Edition, aimed at the problems of the articles submitted to and published in the *Journal of Palaeogeography* in recent years and the relevant papers and books of others, and integrated with his practice of palaeogeographic study and mapping, wrote this paper. The content mainly includes the data of palaeogeographic mapping, the problems of palaeogeographic mapping method, the “Single factor analysis and multifactor comprehensive mapping method — Methodology of quantitative lithofacies palaeogeography”, i.e., the “4 steps mapping method”, the nomenclature of each palaeogeographic unit in palaeogeographic map, the explanation of each palaeogeographic unit in palaeogeographic map, the explanation of significance of palaeogeographic map and palaeogeographic article, the evaluative standards of palaeogeographic map and palaeogeographic article, and the self-evaluation. Criticisms and corrections are welcome. Copyright © 2015 China University of Petroleum (Beijing). Production and hosting by Elsevier B.V. on behalf of China University of Petroleum (Beijing). This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

1. Introduction

The palaeogeographic map is a graphic representation of physical geographical characteristics in geological history periods and human history periods. It is the most important result of any palaeogeographic study.

Palaeogeography is a science that studies the characteristics and evolution of physical geography in geological history periods and human history periods (Feng, 2003, 2009; Feng and Bao, 2012; Feng et al., 2012).

The geological history periods include all the geological history periods before the Quaternary.

The human history periods are the periods of humankind activity after the Quaternary. The Quaternary is a transitional period.

The characteristics of physical geography are the features and distribution of lands and seas and their subunits in lands and seas.

According to different aims and emphases, the palaeogeographic map can be divided into different types, such as the lithofacies palaeogeographic map or sedimentary palaeogeographic map, the biopalaeogeographic map, the tectonopalaeogeographic map, the qualitative palaeogeographic map, the quantitative palaeogeographic map, the palaeogeographic map of present boundary, the palaeogeographic map of non-present boundary, the palaeogeographic map of “fixism”, the palaeogeographic map of “mobilism”, the palaeogeographic map of different periods, the palaeogeographic map of different areas, the palaeogeographic map of different scales, etc.

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In recent years, in the articles published in or submitted to the *Journal of Palaeogeography* (Chinese Edition and English Edition), and in the relevant papers and books of others, problems have appeared. Some of them are serious.

These problems mainly include the data of palaeogeographic mapping, the methods of palaeogeographic mapping, the nomenclature and explanation of palaeogeographic units in palaeogeographic map, the explanation of significance of palaeogeographic map and palaeogeographic article and book, the evaluative standards of palaeogeographic map and palaeogeographic article and book, etc.

The author, as the Editor-in-Chief of the *Journal of Palaeogeography* (Chinese Edition and English Edition) aimed at these problems in the Journal and the relevant papers and books of others, and integrated with his practice of palaeogeographic study and mapping, wrote this paper. Criticisms and corrections will be heartily welcome.

2. Data of palaeogeographic mapping

The data is the first necessary for palaeogeographic mapping. It means that “mapping must be based on its data”.

“Mapping must be based on its data” means that the determination and drawing of each palaeogeographic unit in a palaeogeographic map must be according to its data. This is the foothold of palaeogeographic maps and articles or books based on their palaeogeographic maps. This is the fundamental evaluative standard of palaeogeographic map and the articles or books based on their palaeogeographic maps.

2.1. Reliability of data

The data of palaeogeographic map mainly comes from outcrop sections and well sections.

The reliability of these data is differential. It can be divided into 3 orders.

The quantitative and qualitative data of the outcrop sections that were studied and measured by me and my research team are reliable. They are the data of first order outcrop sections.

The quantitative and qualitative data of outcrop sections that were reviewed and partially measured by us are basically reliable. They are the data of second order outcrop sections.

The data of outcrop sections that were studied and measured by other researchers, especially by the geological survey teams, and were collected by us, in which the lithological descriptions are very simple and with little quantitative data, only the thickness data are basically reliable. They are the data of third order outcrop sections and they only can be used as reference.

The data from well sections that we were reviewed by us via the original logging data. In addition, we studied the cores, cuttings and their thin sections under polarized microscope. All these quantitative and qualitative data are reliable. They are the data of first order well sections.

The data from well sections that we were not reviewed via the original logging data, in which only the thickness data are

reliable, but the other data can be used as reference. They are the data of second order well sections.

The data from well sections that we were not reviewed but were collected by us, can only be used as reference. They are the data of third order well sections.

We regard the data of first order outcrop sections, first order well sections, second order outcrop sections, and second order well sections as the firsthand data, and the data of third order outcrop sections and third order well sections as the secondhand data.

The firsthand data are most important. The more firsthand data are used, the more reliability of palaeogeographic map is.

The secondhand data are also necessary, however, they have to be selected seriously and they only can be used as the supplement and reference for the firsthand data. The more secondhand data are used, the less reliability of palaeogeographic map is.

2.2. Representation of data

The representation of data means that the data points (section points) in the study area should be with a sufficient amount and distributed uniformly, i.e., should be representative for the study area.

However, in some articles published in the *Journal of Palaeogeography* (JoP) or in some manuscripts submitted to JoP, the distribution of data points was without representation for the study area.

For example, in a manuscript of an article submitted to the JoP, in the isoline map of thickness of a stratigraphic unit of Iran, there were only 7 outcrop sections located in the southern part of Iran; but the article's authors had composed the isoline map of thickness of the stratigraphic unit in the whole area of Iran. Certainly, I don't believe this isoline map of thickness.

The proverb said: “**The cleverest housewife can't cook a meal without rice**”. It contains 3 implications: ① The first is “rice”, i.e., the materials for “cook”. ② The second is the “cleverest housewife”, i.e., the highly skilled cooking method. ③ The third is “meal”, i.e., the cooking outcomes or the delicacies.

In palaeogeographic mapping, it means that: ① The first is the data, especially the firsthand data, like the “rice”. ② The second is the method or methodology, like the cooking craft of the “cleverest housewife”. ③ The third is the palaeogeographic map, like the “meal”.

In a word, about the palaeogeographic mapping, the data is the first necessary. If without the reliable and representative data, any distinguished geologist can't compose a palaeogeographic map.

3. Problems of palaeogeographic mapping method

As mentioned above, the first is the data (rice), the second is the method or methodology (cooking craft of the cleverest housewife). Therefore, after the reliable and representative data obtained by us, the method or methodology of palaeogeographic mapping is the key problem.

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