6TH QUANTITATIVE STRATIGRAPHY SHORTCOURSE

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During the last decade mathematical treatment of stratigraphic data has become increasingly important. For biostratigraphy the general principle may be explained as follows:

As long as only chronologically distant biostratigraphic events (first and last occurrences of species) are compared, their succession will be the same everywhere. Background noise due to ecological factors, sampling or selective preservation are neglible. This is no longer the case when it is tried to establish a more refined relative time scale, particularly on large data sets. Due to background noise mentioned above, field data become contradictory and it is no longer possible to tell whether species A or speices B (dis) appear first. Under these circumstances an appropriate mathematical and/or statistical treatment of the data can be used to find the most likely succession or grouping of stratigraphic events.

In lithostratigraphy significant challenges are in petrophysical log interpretation and correlation of varved-type (rythmic) sediment sequences. New techniques are evolving to increase stratigraphic resolution using various kind of filters and signal processing tools.

Significant insight in the rate of change of geological processes is obtained when geological data are placed in a linear time perspective. A more dynamic and quantitative geologic model of for example sedimentary basin evolution or a succession of tectonic events will evolve. Relative simple techniques are available to aid the paleontologist, sedimentologists, stratigrapher and geologist/geophysicist in obtaining such linear time models using conventional stratigraphic data.

Standardization of stratigraphic input data and use of objective methods gives non-specialists better access to the data and their interpretation. Particular useful is that unlike in subjective stratigraphy, quantitative stratigraphy provides more than one possible solution depending on thresholds, akin to multiple working hypotheses. Under certain conditions it is possible to provide quantitative geological correlations including confidence limits to the lines that connect corresponding zones or events. Analysis of accuracy in correlation is a major challenge in earth sciences.

The new techniques organize and display data in a novel way. It is not always necessary to use (micro) computers. Smaller data sets often can be successfully treated by graphical-type methods.

A large segment of research development and application in quantitative stratigraphy has been under the umbrella of the International Geological Correlation Project (IGCP) no. 148 on Quantitative Stratigraphy, which was completed in 1985. This project sponsored five workshops and shortcourses in Quantitative Stratigraphy in Canada, Indian and Scotland, U.K. As a result of the success and scientific potential of IGCP 148, particularly in the field of quantitative correlation, the International Committee on Quantitative Stratigraphy was formed. This committee is a body of the Internation Commission on Stratigraphy of the International Union of Geological Sciences(UGS). The new

committee, in cooperation with the Chinese Bureau of Petroleum Geology and Marine Geology and the Chinese Academy of Geological Sciences, co-sponsored the 6th Quantitative Stratigraphy workshop, during October 8-17, 1986 in Jiangling County, Hubei Province. Dr. Jinshen Yu of the Chinese Academy of Geological Sciences did an excellent job in organization and liaison. Five lecturers provided overviews and computer demonstrations in the following fields of modern research.

1. Quantitative lithostratigraphy using single section data and correlation type information—Dr. Walther Schwarzacher, Belfast, N. Ireland.

2. Stratigraphy and linear time (geohistory analysis)—Dr. Jan Van Hinte, Amsterdam, The Netherlands.

3. a) Subsidence history with computer programs; b) Principles and application of probabilistic and correlation—Dr. Felix Gradstein, Dartmouth, Nova Scotia, Canada.

4. Mathematice and computer programs of probabilistic biozonation and correlation—Dr. Frits Agterberg, Ottawa, Ontario, Canada

5. An overview and comparison of methods in quantitative biostratigraphy with computer demonstrations—Dr. Jim Brower, Syracuse, New York, U.S.A.

The excellent lecture facilities of the Comprehensive Institute of Petroleum Geology in Jiangling County, director Shao Wei Zhang, hosted over 70 Chinese colleagues and students in geology and geophysics, paleontology and mathematics together with the five guest lecturers for this workshop. Mr Lu Fang Zen implemented the Ranking and Scaling and Decompaction and Subsidence programs on the Institute microcomputers. Proceedings of this workshop, as directed by Dr. Jinshen Yu, include Chinese translations of 1) the Ranking and Scaling (RASC) program for biostratigraphic zonation, 2) the Correlation and Scaling in Time (CASC) program for quantitative correlation with error analysis, and 3) the Decompaction and Subsidence programs (DEPOR AND BURSUB). Later this year there will be a Chinese edition of the 1985 textbook "Quantitative Stratigraphy", written by F.M. Gradstein, F.P. Agterberg, J. Brower and W. Schwarzacher.

One of the driving forces for quantitative stratigraphy is the need to handle stratigraphic data in a more objective manner and if possible provide error bars in geological correlations. Another driving force is to place as many stratigraphic data as possible in a linear time perspective. The lively discussion and exchange with our Chiness colleagues during this 6th Workahorp in Quantitative Stratigraphy show that there is a growing interest in this new interdisciplinary science and its applications. Ranking and Scaling and Subsidence programs have seen many successful applications in basin analysis for coal and petroleum exploration and this is a potential economic application in China.

In order for this new science to be successful it is necessary that scientists organize data sets and become familiar with operational aspects of quantitative stratigraphy programs using (micro) computers. The workshop has clearly showed the potential for this development. We welcome our Chinese colleagues to participate in the science fostered under the International Committee on Quantitative Stratigraphy.