Development of web-based framework oriented heterogeneous geochemistry data integration

S. DONG, H. YIN AND Z. WANG

Deparment of Earth Science, Nanjing University, Nanjing, 210093, China (dsc@nju.edu.cn)

Heterogeneous geochemistry data, originated from different sources, standards, terminologies and data formats leads to great problems in data sharing and integration [1]. These problems can be divided into three categories [2]: syntactic, structural and semantic heterogeneity. In order to make geochemistry data easily accessible, sharing, interoperable and visualized through the Web, we have developed a prototype of Web-based 4 tier framework based on metadata schema and ontology.

The four layers, from the bottom up, are the storage, description, service and application layer, respectively. The bottom layer, storage layer stories data sets in different formats. The relational database in the bottom layer and the geochemistry metadata schema encoded in XML in the second layer are used to handle the syntactic and structural heterogeneity. The geochemistry ontology based on SWEET and encoded in OWL in the second layer are responsible for the problem of semantic heterogeneity. The third layer, service layer contains browsing, searching, analyzing and some other Web services. The top layer, the application layer is oriented to the end user for data visualization and also provides interfaces for other Web-based applications. This prototype is flexible and is capable of extensibility.

We have applied this prototype to construct China Southeast Geochemistry Database. This framework is our first attemp to make large scale geochemistry data sets sharing and integration.

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High-resolution radiocarbon calibration from 30-50 ka based on stalagmite ^{14}C and ^{230}Th ages

J.A. DORALE[1]*, J.R. SOUTHON[2] AND R.L. EDWARDS[3]

[1]University of Iowa, Iowa City, IA 52242, USA (*correspondence: jeffrey-dorale@uiowa.edu)
[2]University of California, Irvine, CA 92697, USA (jsouthon@uci.edu)
[3]University of Minnesota, Minneapolis, MN 55455, USA (edwar001@umn.edu)

We present a high-resolution radiocarbon calibration curve from 30-50 ka that in broad form agrees nicely with the calibrations of Hughen *et al*. [1] and Fairbanks *et al*. [2], but refines and potentially improves certain segments of the record, especially from 39-50 ka and a disputable section circa 36-37 ka. Our stalagmite-based calibration is based on 66 ^{14}C determinations, with 54 of those from 39-50 ka.

Because some of the carbon in calcite stalagmites is derived from carbonate bedrock, this dead carbon fraction (DCF) must be accounted for in the radiocarbon age determination. While we cannot rule out the possibility that our stalagmite DCF has varied through time, by assuming that it has not, and by appying a consistent DCF age offset of 2,600 years uniformly to all data points we have achieved a very good fit to the existing calibration curves of Hughen *et al*. [1] and Fairbanks *et al*. [2].

Our stalagmite-based calibration appears to offer a rare suite of strengths in comparison to the other available data sets used for calibration in this time period: 1) direct ^{14}C and ^{230}Th age determinations on the materials used for calibration, 2) equivalent or superior analytical precision for both ^{14}C and ^{230}Th age determinations, 3) very high resolution, and 4) no indication whatsoever of any diagenetic alteration, and a solid basis for ruling out diagenesis (dense, non-porous calcite). We believe these characteristics account for the integrity of the data set, which is impressively consistent in trend over the entire 30-50 ka period, contains no outliers requiring alternate hypotheses about the data, and appears more informative on the issue of calibration compared to the exisiting data sets in the relatively poorly constrained window from 43-50 ka. Finally, we do not observe in our data the large variations in $\Delta^{14}C$ reported by Beck *et al*. [3] from 40-45 ka.

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