THE BRAZILIAN NATIONAL GEOCHRONOLOGICAL DATABASE: CHRONOBANK

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INTRODUCTION

Geochronological and isotopic data represent important tools to help unraveling the geological and metalogenetic evolution of large areas of the continental crust. Good quality isotopic data has been progressively more used as a fundamental piece of information for scientific research as well as for mineral exploration programs and the existence of easy-to-use and up-to-date geochronological databanks have been demanded by both the academic and mining sectors.

The absence of a national geological database in Brazil, including the isotopic record, led several institutions, geochronology laboratories and private exploration companies to produce isolated, non-relational and incomplete geochronological databanks. The most comprehensive of them was that produced by the CPGEO/Universidade de São Paulo (Mellito et al., 1997). However, since the early 90's these efforts did not respond to the growing necessity and demand of the academic and industrial sectors for a complete and up-to-date isotopic data bank. In 2001, a larger initiative carried out by the Geological Survey of Brazil - CPRM, in association with the universities of Brasília, São Paulo and Pará, and some private mining companies started the setting up the first national geochronological database in the country. The major difficulties in building such a large database are: i) the size of the country; ii) the lack of precision on the location of the data produced before the introduction of GPS tool; iii) the very large amount of available data, by far the largest isotopic databank in Latin America, and, iv) the lack of a national management group allowing permanent feeding of the database and development routines. The recent accomplishment of the "Geological, Tectonic and Mineral Resources Map of Brazil, Scale 1:2,500,000" and the "Geological Chart of Brazil, 1:1,000,000" on a GIS basis by the Geological Survey of Brazil (CPRM), highlighted the necessity of organizing the Brazilian gechronological data, fragmented between several individual databanks. As a consequence, a group of researchers are presently modelling the first national GIS-based geochronological database (CHRONOBANK), which represents a specialized module of the CPRM's national geological databank (GEOBANK). The work is supported by an agreement between the Ministry of Science and Technology (MCT/FINEP), the isotopic laboratories from the universities of São Paulo (USP), Pará (UFPA), Brasília (UnB), the Agency for the Development of the Brazilian Mineral Industry (ADIMB) and CPRM.

ORGANIZING THE NATIONAL GEOCHRONOLOGIC DATABASE, ON A GIS: THE PROBLEM OF ASSESSING PRECISE SAMPLE LOCATION

The major problem that had to be tackled during the initial data collecting phase was the scarcity of precise sample location data. To make the compiling process faster, the availability of precise location information was used as a criterion for quality control of the data. The analyses were divided into three classes: a) those located by means of a GPS; b) those which had been plotted on accurate location maps and; c) those plotted on inaccurate maps or for which no location information was provided (Table 1). The procedure to include samples from group 'b' consisted in scanning and geo-referencing the available map, using the ArcView tool to extract the approximate coordinates. In the present stage only samples with relatively precise location (groups 'a' and 'b', Tab.1) were included into the CHRONOBANK (Tab.1). Samples from the last group (group 'c', Tab.1) were catalogued but their inclusion in the bank depends on a posterior attempt to obtain more precise location data trough direct contact with the authors and/or laboratories.

Table 1 shows the number of registered data in each situation.

Table 1: Total stored data in the initial phase of the project: (a) samples with field-measured coordinates (GPS) or located in ArcView georeferenced maps, (b) samples with maps to be georeferenced; (c) samples with no precise location. The GEOBANK/CHRONOBANK system was developed with three-layer architecture: &#61623: Client – interface with user in the internet, &#61623: Applying – definition and development of the applying of interface with user – Oracle 91AS, &#61623: Data Storage – Data Bank Oracle 91.

Group	**(a)**	**(b)**	**(c)**
Ar-Ar Pooled Age	51	10	22
U-Pb (TIMS) Pooled Age	150	144	78
U-Pb (SHRIMP) Pooled Age	157	133	114
Sm-Nd (isochronic)	15	39	5
Sm-Nd (T_{DM})	570	258	182
Pb-Pb (evaporation)	10	78	19
Pb-Pb (Laser ablation)	10	6	12
Total stored analyses	733	401	303

MAIN CHARACTERISTICS OF THE BANK

The basic focus of the modelling is on the relational nature of the bank, based on the inter-linking of several key-data columns and on the portability of the bank, in order to permit its insertion in any platform. Other main characteristic of the bank is its easy-to-use nature being accessible in multiple media, including the internet, permitting even easy raw data reprocessing. Owing to the very large amount of information to be joined and analyzed, this initial modelling phase priorized the conventional U-Pb, SHRIMP U-Pb, Sm-Nd, evaporation and laser ablation Pb-Pb data produced in the last decade (Table 1).

In the present modelling phase the bank was fed by the data available in the literature, primary data from the isotopic laboratories or even, unpublished data, when authorized by the researchers. In this experimental phase the bank was submitted to multiple modelling tests under distinct situations and analytical peculiarities. In order to become useful to a wide universe of users, with different needs, a complete list of general, isotopic and equipment analytical information is provided. The information is stored in sixteen normalized linked tables, separated into three groups of entrance data. The first group contains general information common to all the analyzed samples: identification of the sample according to the GEOBANK sample/outcrop code, geographic location (coordinates) geologic and stratigraphic data and source references. When available, original geological and location maps, outcrop photos, etc, are also stored. The second group of entrance data contains analytical data with information on the age calculation, uncertainty, value of statistical parameters indicating the quality of the data, etc. The third group of entrance data includes the measured contents of the elements, isotopic ratios, images of the analyzed minerals and concentrates, diagrams (isochrones, concordias, etc).

To make the feeding process easier and more homogeneous, lists of options were created for the fields: “Geological Unity”, " Pooled Age", "Interpretation of the Age: crystallization, metamorphism, Inheritance, hydrothermal alteration, source, etc”, “Position of the Spot”, “Statistical Parameters”, “Standards Parameters”, “Laboratory”, “Analyzed Material” and “Reduction Program”. All ages are recorded and registered in Ma, even in the case of the model ages.

The access to the stored data will be available to all internet users as soon as the operational routine for the bank is established. Insertion of new data, as well as updating of the stored data will also be available in the internet to authorized users, as soon as the system starts working in routine. Any interested user will have access to a specific electronic storage form created for this purpose. The user interaction control will be made through selective password getting in touch with CPRM/UnB/USP/UFPA scientific administrators of the bank (Drs. Luiz Carlos da Silva: luizcar@unb. br; Márcio Martins Pimentel: marcio@unb.br; Celso Colombo Gaeta Tassinari: ccgtassi@usp.br; Michel Lafon: lafon@ufpa.br).

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