

spectrometry showed disequilibrium between ^{226}Ra and ^{238}U .

The obtained ($^{238}\text{U}/^{232}\text{Th}$) and ($^{230}\text{Th}/^{232}\text{Th}$) activity ratios allowed to estimate a 140,000 y age for the Morro Vermelho Formation. — (*December 14, 2001*).

METAHALLOYSITE CLAYS OF POÇOS DE CALDAS ALKALINE COMPLEX, MG-BRAZIL

HANS D. SCHORSCHER AND RENATA A.R.N. DE-OLIVEIRA

Instituto de Geociências, USP, São Paulo, SP.

Presented by ANTONIO C. ROCHA-CAMPOS

Based on field work and mineralogical-petrographical optical, XRD and SEM methods, we compared a clay deposit (Mineração Varginha) located in the western part of the domain of 'potassic rock' hydrothermal alteration hosting the Osamu Utsumi uranium mine, SE-Poços de Caldas Complex (PAC), to the unweathered hydrothermalized protoliths. The deposit occurs in the swampy upper hillside of an S-to-N-draining open valley within an area of moderately hilly morphology with gentle slopes, open valleys and altitudes of 1280-1380m. Here, different generations of mutually intrusive leucito-hololeucocratic nepheline syenites and phonolites were transformed by potassic-pyritic alteration into hydrothermalites referred to as 'potassic rocks' (with K_2O of 12.5-13.8wt.-%), having low-grade U-Th-REE-Zr-F-Mo mineralization. Deep chemical weathering originated the clay deposit and exhumed this part of PAC to a subvolcanic level.

Studied deposit hosts two types of clays: one is grey with millimetric to centimetric white argillized pseudoleucite phenocrysts (ACP) representing a weakly porphyritic pseudoleucite phonolite of fine matrix weathered in situ to clay, with preserved magmatic structure; the other is a homogeneous white clay (ABM) formed from a fine hololeucocratic aphyric phonolite. Combined optical, XRD and SEM studies of ACP and ABM clays and of unweathered 'potassic rocks' (hydrothermalites of hololeucocratic aphyric and pseudoleucite phonolites), considered as analogous to the clay protoliths, always showed highly crystalline hydrothermal kaolinite with the same habit of fine idiomorphic plates and booklets ($\emptyset \leq 5\mu\text{m}$); equivalent idiomorphic hydrothermal illite is also omnipresent yet much coarser ($\emptyset \geq 15\text{-}50\mu\text{m}$), practically representing fine sericite/muscovite. Feldspar occurs only in the hydrothermalites, being a low-temperature pure K-feldspar of maximum triclinicity formed by hydrothermal

alkali-exchange reactions (K for Na) and structural readjustments from magmatic sanidine.

Kaolinite and illite of low crystallinity occur only in the clay samples; the former predominates by far over the kaolinite of high crystallinity and proved to be in fact tubular metahalloysite (SEM). XRD studies with heating techniques at 60°C showed the illite of low crystallinity to be in fact (hydrated) halloysite partially preserved from dehydration (to metahalloysite) due to water-saturation in the clay deposit. — (*December 14, 2001*).

LATE PALEOZOIC EXHUMED GLACIAL EROSION LANDSCAPE IN SALTO, SP*

JULIANA B. VIVIANI** AND ANTONIO C. ROCHA-CAMPOS

Instituto de Geociências, USP, São Paulo, SP.

Outcrops of the Itu granite (early Paleozoic) in the Tietê river valley, in Salto, SP, expose a variety of glacial erosional landforms of meso-scale extremely well preserved. Structures occur on land or eventually emerge above the water inside the river channel.

The most notable landforms correspond to streamlined bedrock (whalebacks) and stoss and lee features (roches moutonnées). The first category includes the classic roche moutonnée from Salto. Another reported occurrence of glacially abraded granite in the area could not be properly examined. Submerged depressions in the granite that separate landforms inside the river may correspond to rock basins.

Exposed dimensions of landforms vary from 1-15m of length to 1-1.5m of height. Their plan view shape is roughly elliptical. Micro-scale erosional features on the structures include striae, grooves, polishing and quarrying. Orientation of micro-features varies locally, but is in general SE-NW, parallel to elongation of landforms. They indicate a sense of movement of glacier towards NW.

Areal distribution of landforms over a distance of at least 1.2km in the Tietê river valley configures an extensive, exhumed, well preserved late Paleozoic landscape of glacial erosion.

The glacially eroded features of Salto indicate the action of a warm based glacier with subglacial meltwater. The ice mass probably flowed on an irregular, fractured granite floor, generating a complex pattern of effective ice pressure that resulted in different erosional landforms.

Itararé Subgroup rocks overlying the glacially eroded basement in the area vary from lodgement and meltout tillites, and lacustrine (?) rhythmites and sand-

stone with dropstone on the roche moutonnée from Salto, to cross-bedded and “convoluted” sandstone beds in the river channel, toward NW. They are interpreted as proximal and distal glacial facies respectively, associated with an advance and retreat of the glacier.

Those rocks are overlain by an extensive and thick shale (pellitic) section that may represent the deposit of a marine transgressive post-glacial episode. Dropstones in the shale denote presence of icebergs and permanence of glacial influence during sedimentation. — (*December 14, 2001*) .

* Supported by FAPESP 00/6039-6.

**E-mail: jbviviani@aol.com

MULTIDISCIPLINARY THEMES

ALCIDES N. SIAL AND VALDEREZ P. FERREIRA
(ORGANIZERS)

EFFICIENT ALGORITHMS FOR PACKING BOXES INTO CONTAINER

SOSTENES L. S. LINS

Departamento de Matemática, CCEN, Universidade Federal de Pernambuco, Recife, PE, Brazil.

The problem of packing boxes into bigger boxes (containers) is a practical problem which, by its economical significance, deserves a serious and inspired scientific approach. From a strictly mathematical point of view, it is an incredibly challenging problem which badly needs good heuristics to solve it. We have been involved in trying to find such heuristics since 1997. These heuristics use new concepts in graph theory (the tets), in data structure (the phormas), and used some classical algorithms as topological sorting and the coding of combinatorial objects to approach real world packing problems. A distinguished feature of our approach is the visual treatment of the spatial packing: we produce a sequence of homogeneous increments (a loading plan) in the packings which makes it easy to visualize and to actually produce the solutions found.

We have produced a set of effective heuristics for dealing with real world box packing problems: we permit various types of boxes, various types of containers, demand requirements on the boxes and the information on which box types can change its vertical direction. The implementation of our heuristics produces very good packings as compared with non-scientific ones: typically we

put 7% to 12% more boxes. The full paper related to these matters is scheduled to be published this year (2002) in the European Journal of Operations Research.

A computer package named ExpedPlex is under development, where the pertinent algorithms are being efficiently implemented. — (*May 24, 2002*) .

MAGNETOMETRY USING SQUID

FERNANDO L. A. MACHADO

Departamento de Física, UFPE, Cidade Universitária, 50670-901 Recife, PE.

Presented by ANTONIO CID B. DEARAÚJO

Superconducting Quantum Interference Device (SQUID) is by far the most sensitive device ever built. It is a magnetic flux detector that can be used to measure magnetic field as low as few femtoTesla. Because of its high sensitivity, SQUID are being employed in detecting magnetic field generated by neural brain activity, non-invasive detection of metallic pieces inside the human body, nondestructive evaluation of corrosion and flaws, and in characterizing magnetic properties of materials, just to list few applications. Perhaps, the main limitation to replace most of the available magnetic sensors with SQUID's is the need of using liquid helium to operate them. However, with the recent progress made in the high temperature superconductor research field, there are SQUID being built that operate with liquid nitrogen and this makes them even more attractive.

Nowadays, there is a couple of companies around the world which sales SQUID magnetometers. However, they are too dedicated with almost no flexibility, the price is still too high and it is quite difficult to get maintenance when they fail. Another drawback is that these systems are true black boxes, not allowing graduate students and technicians to be trained in this very important technology. In my talk, I will describe a homemade magnetometer that uses a SQUID as the sensing element to investigate magnetic properties of materials. Our SQUID system operates from room temperature down to 1.5 K in a superconducting solenoid that generates magnetic field as high as 8 T. The SQUID system is particularly important when only a small amount of the magnetic material is available or to investigate system that presents weak magnetism. Some results of the magnetic studies made in magnetic polymers, thin-films and manganites will also be presented. — (*May 24, 2002*) .