

## G17.71P

# LES ONGONITES DE BLOND: UN FACIES EVOLUE DE MAGMA LEUCOGRANITIQUE A ALBITE ET TOPAZ (HAUT LIMOUSIN-MASSIF CENTRAL FRANCAIS)

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La cartographie détaillée du massif granitique de Blond a permis de mettre en évidence trois entités pétrographiques, dans l'ordre de mise en place : Un leucogranite commun à protolithionite et Li-muscovite, un leucogranite à Li-muscovite et un faciès à topaze correspondant à une lame de leucogranite fin, un dyke de microgranite et un réseau filonien d'aplite.

Certains filons d'aplite présentent une partie pegmatitique à phénocristaux de feldspath potassique. Ces derniers sont soit dispersés, soit organisés en stockscheider à l'éponte supérieure (Carrière de NOUIC). Ce faciès à topaze présente une paragenèse tout à fait comparable à celle des ongonites Russes (1) : albite, quartz, feldspath potassique, Li-muscovite, topaze, + lépidolite. Il présente un enrichissement important en éléments lithophiles (Li: 459-1688ppm, F: 0.46-1.2%, Sr: 21-438ppm, Rb: 664-1345ppm, Be: 16-82ppm, W: 11.8-55.7ppm).

Dans le diagramme Q-Ab-Or, les ongonites de Blond, décalées vers le pôle albite, se situent au Minimum ternaire correspondant à 1% de fluor. Ceci indique une cristallisation directe à partir d'un magma leucogranitique évolué de type ongonitique.

Dans le diagramme Al<sub>2</sub>O<sub>3</sub>-Na<sub>2</sub>O-K<sub>2</sub>O (2), les ongonites de Blond se disposent dans le "puit endogranitique", en accord avec leur caractère endogranitique.

L'association d'une minéralisation disséminée en sulfures et cassitérite au faciès à topaze de Blond, et son analogie avec les coupoles granitiques de Montrebas et d'échassière (3) et avec l'ongonite de Transbaikal (4) responsables de minéralisation Sn-W, permettent d'attacher un intérêt métallogénique aux roches à topaze de Blond.

(1) V.I KOVALENKO et al. Dok.Acad. 199 (1971)

(2) C.I. GAGNY 10 RAST Bordeaux (1984)

(3) G. AUBERT Mem BRGM 46 (1969)

(4) V.I KOVALENKO et al. Dok.Acad. 220 (1975)

## G17.72P

# ELEMENTAL CONCENTRATIONS IN GEOLOGICAL REFERENCE MATERIALS BY NEUTRON CAPTURE PROMPT GAMMA-RAY SPECTROMETRY

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A facility for neutron capture prompt gamma-ray activation analysis, installed on a curved thermal neutron guide at the ILL High Flux Reactor, is described. Elemental sensitivities for B, Sm and Gd have been measured. The performance of the facility has been assessed by the measurement of these trace elements in eleven USGS geochemical reference samples and comparison of the results with existing values. Preliminary concentrations of B, Sm and Gd are also reported for twelve French GRS.

## G17.73P

# MULTICOLLECTION STABLE ISOTOPE MEASUREMENTS USING SECONDARY ION PROBE MASS SPECTROMETER: THE <sup>32</sup>S/<sup>34</sup>S EXAMPLE

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Multicollection is the standard technique for light stable isotope measurements. We have developed a secondary ion probe mass spectrometer to use it.

The basic design of the machine is double focussing similar with the CAMECA IMS 3F, with a special focussed extraction optic, an electrostatic sector with energy aperture, but with a specially large aperture magnetic sector. The ion collection uses three collectors, else two faraday cups and one electron multipliers for <sup>32</sup>S, <sup>34</sup>S, <sup>36</sup>S; else one faraday cup and two electron multipliers for <sup>16</sup>O, <sup>17</sup>O, <sup>18</sup>O. They are positioned on the mass focal plane, with a 23.8° angle versus the optical axis, and their espacement is adjustable to assure the centering of each one position. Signal measurement is provided by three digital voltmeters set up in parallel behind the amplifiers.

The system has been tested for S isotopes, with O<sup>+</sup>, Ar<sup>+</sup> and N<sup>+</sup> primary beams. The absence of mass interference between S and Ar or N allows lower mass resolution measurements. Measurements have been performed on homogeneous PbS sample with 20 nA primary beam intensity, the secondary beam intensity is about 10-11 nA. The analytical precision reaches 2.0x10<sup>-4</sup> in 30mn, while 60mn were needed to obtain 1.0x10<sup>-3</sup> with the single collection mode on a CAMECA IMS 3F probe. In order to obtain a reproducibility at the same value (10<sup>-4</sup>), we started an inventory of the analytical conditions and their effects, changing primary ions, primary beam intensity and focussing, secondary beam focussing and energy filtration.

## G17.74P

# TECTONIC AND VOLCANIC DEVELOPMENT OF NEW HEBRIDES BACK-ARC TROUGHS (SW PACIFIC)

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New Hebrides (NH) arc is associated with the Australian plate subduction beneath North Fiji Basin (NFB). The back-arc area is divided into 3 tectonic provinces. The central one, east of Maewo and Pentecost islands, is characterized by compressive features related to subduction of the d'Entrecasteaux ridge beneath the NH arc. North and south of this central zone, in the 2 others provinces lie discontinuous grabens related to tensional stresses. The purpose of SEAPSO 2 cruise (R/V J. Charcot, 1985) was the study of the back-arc extension and volcanism.

In Coriolis province, the Vate troughs are two side by side NNW-SSE grabens separated by a small horst. The east one is the deepest but the west one shows thicker sediment filling coming down from the arc. The Futuna trough, a N150° elongated dissymmetric graben reaching 3500m wd is limited by normal faults trending either N135° or N165°. These trends and the N135° magnetic anomalies observed are not parallel to trough axis and infer a NE-SW tensional stress, oblique with regard to the plate convergence. In the northern J. Charcot province, the Vot Tande trough, a N10° graben, steps southward against the N100° NFB Hazel Home FZ. This indicates a nearly N100° extension, that greatly differs from the NE-SW one defined in Coriolis troughs but is also oblique to plate convergence.

The dredged volcanics have generally a low LOI (<0.7%). Basalts and acid lavas are the main types whereas intermediate lavas are less frequent. If 2 main geochemical affinities may be recognized (oceanic type lavas OTL and arc type lavas ATL) nevertheless some anomalous K<sub>2</sub>O and TiO<sub>2</sub> rates appear.

Whole-rock K/Ar data and geochemistry lead to the following conclusions: 1- The volcanic activity in the back-arc area is discontinuous, from 9.5 to 0.6 Ma; the youngest ages have been obtained in Coriolis province. 2- The volcanic history is: in J. Charcot troughs: \* Vanikoro: OTB before 6 Ma; ATL around 5 Ma; arc andesites and oceanic differentiated rocks between 1.7 and 1 Ma; \* Vot Tande: OTB and ATL between 5 and 2.5 Ma; \* Hazel Holme FZ: OTB before 6 Ma; ATL around 5.7 Ma; K dacites at 3.5 Ma. In Coriolis troughs, volcanism is mainly of ATL, but sometimes K enriched and similar with lavas from NH islands: \* Vate: K enriched dacites, 5.3 and 0.6 Ma; \* Erromango: K enriched OTB around 4 Ma; K dacites and ATL between 3 and 2.5 Ma; \* Futuna: OTB around 8.5 Ma; K enriched andesites at 6.5 Ma; andesites and K enriched OTB at 3.5 Ma; ATL at 0.6 Ma.

The whole data allow to distinguish two back-arc extensional tectonic provinces. The Hazel Home FZ could be the mutual limit. The observed complexity of volcanism throughout the time with its intermittent K enrichment must be related with a major NH subduction geodynamic process. The troughs could result from a middle Miocene rifting stage of a Vitiaz paleo-arc, taking place before the rotation of N.H. arc and the initial NFB oceanic opening.

## G17.75P

# GEOCHEMISTRY OF TWO SEDIMENT CORES FROM THE SEA OF MARMARA

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This paper deals with the major and trace element geochemistry of two sediment cores collected from

the northeastern part of the Marmara Trough.

The data indicate that the sediment composition is consistent all along the cores except for the upper 10-20 cm, where, chemical reactions near the sediment-water interface occur.

The geochemistry of sediments is shown to be controlled primarily by lithogenous sedimentary source and secondarily by hydrogenous precipitation. Evidences for minor post-depositional diagenetic reactions are also indicated.

In general the element concentrations are closely comparable to those of standard shales. In particular, Mn, Pb and to a less extent Ni, Cr and Co showed higher values relative to their counterparts in shales. This is explained by the precipitation of hydrogenous manganese phase which is probably resulting in the enrichment of other metals. However, chemically and/or organically precipitated carbonates are considered to be of primary importance in precipitation of lead from Sea Water.

#### G17.76P

### RARE EARTH ELEMENTS IN SAANICH INLET, BRITISH COLUMBIA

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Saanich Inlet is an intermittently anoxic fjord on Vancouver Island, British Columbia. The inlet has a maximum depth of 220m, with a sill that rises to a minimum depth of 70m. Typically, water is isolated behind this sill during Winter, Spring and early Summer, becomes strongly depleted in oxygen, and sulphide bearing below about 150m. Strong coastal upwelling in late Summer and Autumn can frequently cause overspill of dense oxygenated water which flushes out the stagnant water.

In August 1982, no such flushing had occurred for 4 years, and  $O_2$  was absent from the water column below 1.5m. The presence of a maximum in particle concentration has been reported previously. It comprises predominantly Fe and Mn oxy-hydroxides. Such features are characteristic of anoxic basins.

In the Cariaco Trench, it has been shown that the strictly trivalent REE, (i.e. all except Ce), mimic the concentration of Fe and Mn in particulate matter. Further, in Saanich Inlet, dissolved REE concentrations decrease steadily from surface values to distinct minima, 20-25m above the  $O_2/H_2S$  interface, and coincident with the particulate maximum, before rising sharply again to return to near-surface values in the deepest samples. Nd falls from 28 pmol/l, 10m below the surface, to 13 pmol/l at 150m, rises sharply to 19 pmol/l at 160m and on to 30 pmol/l in bottom waters. Again, as seen before in Cariaco, Ce is anomalously enriched in the anoxic waters, and shows a ten-fold concentration increase from 7 pmol/l to 75 pmol/l across the interface.

It is evident that the behaviour of the strictly trivalent REE is controlled by the scavenging and regeneration effects associated with the redox cycling of Fe and Mn, independent of any competing effects, (e.g. Sulphate-Sulphide reduction). Ce, which is oxidised to an insoluble Ce(IV) state in open, oxic sea-water, shows preferential release into solution below the interface as it is reduced to its trivalent state, directly comparable with the other REE.

#### G17.77P

### THE ION INTERACTION APPROACH TO THE VOLUMETRIC PROPERTIES OF NATURAL WATERS

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Pitzer's ion interaction model has been used to analyse the densities of solutions in the system Na-K-Ca-Mg-Cl- $SO_4$ - $HCO_3$ - $CO_3$ - $H_2O$  at 25°. The standard volumes of the major components of natural waters as well as the

first derivatives with respect to pressure, of Pitzer's interaction parameters for the activity coefficients have been calculated, which allows the representation of the data up to high concentration within experimental error.

For complex systems, the ion interaction approach proposes mixing rules that do not require either to define a scale of ionic volumes or to extrapolate the properties of binary solutions beyond the solubility limit of the salts in pure water, as demanded by Young's rule (mixing rule at constant ionic strength). Provided that the standard volumes are additive, which is here verified for a number of chlorides, sulfates and carbonates, the density of a solution of any complexity can be calculated from its composition. Examples show that with only the binary parameters, the accuracy of the model is better than 10 ppm below an ionic strength of 1, while it raises up to 300 ppm at  $I=8$ . The introduction of the ternary mixing parameters lowers the discrepancy between the model and the measurements below 100 ppm even at the highest concentrations.

#### G17.78P

### HEAVY METAL CONTENT IN SEDIMENT CORES OF 40 LAKES IN SOUTHERN BAVARIA AND THE ALPS AS A SIGN OF LONGTERM ENVIRONMENTAL IMPACT

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The great age of lake sediment in comparison with the history of man makes it possible to give a plausible estimation of the extent, the distribution and the origin of the heavy metal contamination caused by man directly by their use in the catchment area and/or in the case of transport in the atmosphere in a wider area in comparison with the natural background of heavy metal sedimentation resulting from the natural environment (geochemical standard) of the catchment area. The heavy metal content in sediment cores of more than 40 Southern Bavarian lakes has been determined. The cores, with lengths up to 6 m, reflect the history of sedimentation over periods of up to 15000 years and therefore allow good estimates of the natural heavy metal background. The enrichment in natural lakes amounts up to 20 times for zinc, 8 times for cadmium, 10 times for lead, 30 times for mercury (Lago Maggiore), in artificial basins up to 50 (Zn), 500 (Cd) and 400 (Pb) times in comparison with the natural background. The Igeo-value was used to give a normalized value for the heavy metal contamination in these lakes. The investigation of the heavy metal content in certain lakes permit conclusions regarding the currents, the eutrophication status and the annual circulations of the water body.

#### G17.79P

### HEAVY METAL CONTENT IN A SEDIMENT CORE FROM LAKE MAGGIORE

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In connection and cooperation with EURATOM/Ispra 12 sediment cores have been taken out of Lake Maggiore. The results of a core from Pallanza basin are presented and compared with surface sediment samples of MUNTAU et al., who found max. 17 ppm of Hg, more than 100 ppm of Pb and 100-200 ppm