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ATLANTIC UNIVERSITIES GEOLOGICAL CONFERENCE 1995

October 19-21, 1995

Abstracts

Saint Francis Xavier University
Antigonish, Nova Scotia

Again this year, abstracts from the annual Atlantic Universities Geological Conference (AUGS) are published in "Atlantic Geology". This provides a permanent record of the abstracts, and also focuses attention on the excellent quality of these presentations and the interesting and varied geoscience that they cover.

The Editors

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Amazon deep-sea fan facies classification scheme

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The Shipboard Scientific Party of Ocean Drilling Program Leg 155 drilled 17 sites on the Amazon deep-sea fan in spring of 1994. The data collected on this cruise have been used to create a classification scheme for 11 different facies types present throughout all of the drill sites. The tops of individual turbidite units are distinguished by the presence of bioturbation, diagenetic fronts and by the presence of coccoliths (D.J.W. Piper, personal communication, 1995). This classification scheme is restricted to fine grained turbidites and related facies. The different facies types are interpreted to be the result of flow patterns of turbidity currents within the channels (D.J.W. Piper, personal communication, 1995). The depositional processes by which these are formed are not fully understood as of yet. Additional Coulter Counter analysis has been used to clarify facies types and have been arranged into stacked line graphs allowing for the easy identification of grain size trends.

The purpose of creating the facies scheme is two-fold. Primarily, it is intended to be used to identify any systematic variations of the facies types within the deep-sea fan itself. Distribution patterns of the facies types can be used as proximal/distal indicators for both distance downfan and distance from the channel. In this way the facies types can be used as indicators of paleofacies. Secondly, the facies types of the modern Amazon deep-sea fan have been compared with ancient fine grained turbidites of the Meguma Group rocks near the LaHave Islands (Mosher Island Member). Facies types from the Amazon turbidite classification scheme have been identified within the Mosher Island Member of the Meguma rocks. By using ancient turbidites, these similarities may help to shed light onto the depositional processes of the Amazon fan deep-sea turbidites.

Characterizing atmospheric sulphur in eastern Newfoundland using lichens and rain

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Epiphytic lichens are useful for atmospheric monitoring as they provide an indirect method of measuring levels of atmospheric pollution. They are particularly sensitive to SO_2 and metals. These pollutants can also be measured directly through method of precipitation collection. Stable isotopes are measured in combination with the chemical data to trace specific sources of sulphur to the atmosphere.

By analyzing both types of samples from the same area it will be possible to assess the degree to which they provide the same chemical information about the atmosphere.

The area of study spans from Bonavista to the Isthmus of the Avalon in Newfoundland. Bonavista represents a coastal area remote from industrial development, whereas the isthmus of the Avalon is the site of two industries, Come by Chance oil refinery and the Hibernia GBS construction.

Samples were analyzed for SO_4^{2-}, Cl-, and NO_3-. Sulphate was then extracted from the samples and analyzed for its S-isotopic composition. The rain samples were measured by pH, conductivity, and trace metals. Values of pH range from 3.97 to 5.36 with a mean of 4.77, below the pH of unpolluted rain (5.5). Conductivity ranged from 13.9 to 162.6 with a mean of 55.46 µs/cm.

Preliminary results show that the ^{34}S values have a large range from 14.07 to 4.98 ‰. Samples from Bonavista have the highest values whereas Come By Chance has lower values. This suggests that the study area is influenced by both marine (high values) and continental sources (lower values) with the possibility of anthropogenic influence near Come By Chance.

Noncylindrical single phase folding, an example: the Oldham anticline, Meguma Terrane, Nova Scotia

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Cylindrical folds are traditionally represented as a classical approximation for single phase fold geometry. The Meguma Group of Nova Scotia represents an interbedded sandstone/slate stratigraphy predominantly deformed by a single phase of folding in the mid-Paleozoic. Non-cylindrical fold properties have been reported for this deformation but not well documented.

On the basis of published data and field-checking, a test area, near Oldham, Halifax County was selected for detailed study to examine possible non-cylindrical models. Detailed mapping and structural analysis of approximately 200 outcrop locations in this area shows the Oldham anticline to be a 2 km by 20 km upright periclinal (i.e., noncylindrical) structure terminating to the northeast and southwest. The northeast termination of the fold is best approximated by a conical rather than cylindrical geometry with a cone axis plunging 56 at 056 and a 40 ± 20 apical angle. Adjacent beds show roughly parallel cone geometries. The study shows

the northeast termination "dying out" described by the widening cone, increasing wavelength and decreasing amplitude. The cone profile shows greater angularity and tightness in its centre than in its termination.

This style of geometry is interpreted to indicate a diachronous, progressive propagation model for fold development. In this model the fold axis initiates at a point, amplifies and propagates parallel to the incipient fold or cone axis. If other folds throughout the Meguma Terrane developed in a similar fashion, regional fold structure may in fact be a composite of noncylindrical, en echelon and "locked folds" rather than simple cylindrical structures. Diachronous fold development may reconcile apparently conflicting field observations of the relative timing of cleavage and fold formation in the Meguma Group.

Auriferous fluids are known to have permeated and been trapped in Meguma Group structures. The noncylindrical properties and fold tightness of the Oldham anticline appear to control the location of the Oldham Gold District deposit. Such properties may be used as exploration tools for locating future prospects elsewhere. Structural analyses should test the assumption of cylindricity when possible for noncylindrical geometries may significantly enlighten geological interpretations.

Marginal marine foraminifera and thecamoebians in the Upper Cretaceous to Eocene deposits of the south-central Pyrenees, Spain

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The Upper Cretaceous to Eocene marginal marine sediments, in the northeastern Pyrenees of Spain, is a classic area in which to study sequence stratigraphy. Sequence stratigraphy requires strong sea-level control. The lignites found throughout the sequences, once assumed to be freshwater deposits can provide accurate sea-level markers if microfossils reveal them to be marginal marine. This study used samples collected around different lignite layers in the Pyrenees and prepared using new techniques developed for the preparation of such samples. The foraminifera and thecamoebians provide evidence that the lignites and surrounding sediments are marginal marine deposits. Thus the Pyrenean lignites can be used to accurately relocate former sea levels and to supply the vertical limits of the closing of high and low order transgressive cycles. The evidence discussed in this study indicates that the accurate reconstruction of very old paleo sea levels is feasible, and that the methods here developed can be used for a thorough study of the marginal marine sediments of the entire Pyrenean sequence. In addition, the microfaunae from these sequences share similarities with those described in modern day, as well as Cretaceous and Carboniferous estuarine deposits. The similarities suggest two more ideas: (i) that microorganisms in highly stressed areas, such as marshes, did not evolve as quickly as more open marine assemblages; and (ii) that the methods used in this paper can be routinely applied to establish paleo-sea levels in deposits from the Paleozoic to the Present.

Mineralogy and petrology of Antarctic meteorite DOM85505, and the relationship of unknown inclusions to the host meteorite

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Meteorites are generally separated into stones, stony-irons, and irons. Stones are composed predominantly of silicate minerals with a small amount of metallic material, irons are composed primarily of nickel-iron metal, and the stony irons are composed of nearly equal amounts of metal and silicate material. Stony meteorites compose the largest number of recovered falls, and are broken into two groups: (1) the chondrites, which represent early solar system material, and are so named due to the presence of rounded droplets of silicate material known as chondrules; and (2) achondrites, which represent younger material that is igneous in nature and has undergone differentiation.

The object of study is an ordinary chondrite, titled DOM85505, which was recovered in the Antarctic. It has inclusions that have been surmised to be achondritic in nature. The goals of this project are to provide a description of the chondritic portion of this meteorite, and to determine the nature of the inclusion material and propose a hypothesis as to its origin.

The study involved detailed petrographic examination and microprobe analysis on five polished thin sections.

The chondritic portion of DOM85505 is a breccia punctuated by rounded chondrules and angular clasts. The chondrite is composed predominantly of olivine, orthopyroxene, small amounts of metal and the iron sulphide troilite, as well as some plagioclase in the microcrystalline groundmass. The inclusion material is mineralogically similar to the chondrite but is texturally different. It is composed of olivine, orthopyroxene and partially isotropic plagioclase, along with minor spinel.

DOM85505 is an LL-type ordinary chondrite, on the basis of its very low total iron content. The petrologic type has been determined to be of type 5 thermal metamorphism. The inclusion material is not achondritic, but rather represents host chondrite material that has undergone melting and recrystallization. There have been two distinct shock events that have shaped this meteorite. The first event generated the impact melt, which was subsequently incorpo-

rated as inclusion material along with unshocked chondritic material to form DOM85505. The breccia was shocked again at a lower pressure, producing features such as shock veining and planar fractures. It is in this form that DOM85505 found its way to Earth.