give (within some degree of error) valuable information for the domain state of lower coercivity minerals when mixed in a rock with higher coercivity minerals. Comparison of these modified crossover points to crossover points obtained using the normal methodology for non-hematite-bearing specimens from the Red River carbonates in the subsurface shows similar distributions. We also suggest that if the acquisition curves are extended to at least 2000 mT, it will be significantly easier to identify samples containing a mixed population of low coercivity (magnetite or pyrrhotite) and high coercivity minerals (hematite or goethite).

GP41A CC: 220 C-E Thursday 0830h

Climatic and Anthropogenic Changes to the Environment: Contributions From Magnetism Posters *(joint with GC, PP)*

Presiding: **S K Banerjee,** University of Minnesota**; F Lagroix,** University of Minnesota

GP41A-01 0830h POSTER

Magnetoclimatological Results From the Pampean Loess of Argentina

Adry J. Van Velzen[1] (velzen@geophysik.uni-muenchen.de)

Juan Carlos Bidegain[2] (jcbidegain@way.com.ar)

Ted Evans[1,3] (evans@phys.ualberta.ca)

[1]Department of Earth and Environmental Sciences, LMU, Theresienstrasse 41, Munich 80333, Germany

[2]LEMIT-CIC, Calle 52 e/121 y 122, La Plata 1900, Argentina

[3]Institute for Geophysical Research, Physics Department, University of Alberta, Edmonton, AB T6G 2J1, Canada

Loess deposits in the northern hemisphere have proved to be excellent magnetoclimatological archives. Their southern hemisphere counterparts have been much less intensively investigated. We report results from a study of Argentinean loess exposed in three sequences in the city of La Plata, Buenos Aires Province that span the last million years. Magnetic susceptibility values span one decade (20-250x10^{-8}m^3/kg), but hysteresis parameters, IRM acquisition and thermomagnetic curves all indicate a remarkably uniform magnetomineralogy dominated by magnetite. Magnetic susceptibility tends to be higher in loess than in the inter-bedded paleosols. This favours the wind-vigour model as opposed to the pattern resulting from pedogenesis. However, values of frequency-dependent susceptibility (F) differ significantly from either model: at La Plata, F=3.5±1.2% (st.dev.)(n=130), at Kurtak, Siberia (a wind-dominated site) F=0.8±0.4% (n=340), and at Luochuan, China (a pedogenically-dominated site) F=8.3±1.9% (n=111). These differences may be compositional in that Argentinean loess contains a large fraction of volcanic material. We are currently pursuing this suggestion by grain-size and magnetic separation studies on a ∼100,000yr-old volcanic ash layer embedded in a typical eastern Argentinean loess profile. First results indicate that the ash has F values ranging from 0.8% for the grains smaller than 63 μm to 2.6% for the 100-140 μm fraction.

GP41A-02 0830h INVITED POSTER

Enviromagnetism - Quo Vadis?

Friedrich Heller[1] (411 6332625; heller@mag.ig.erdw.ethz.ch)

Ramon Egli[2] (411 6334053; egli@geod.baug.ethz.ch)

Simo Spassov[3] (30 2310 998 534; simo@lemnos.geo.auth.gr)

[1]Institute of Geophysics, ETHZ Honggerberg, Zurich 8093, Switzerland

[2]Institute of Geodesy and Photogrammetry, ETHZ Honggerberg, Zurich 8093, Switzerland

[3]Department of Geophysics, Aristotle University of Thessaloniki, Thessaloniki 54124, Greece

Environmental magnetism is a rapidly growing research field which often is tied technically to paleomagnetism and rock magnetism investigators. The magnetic signals and the refinement of magnetic measurement techniques of environmental materials (e.g. dusts, soils or other sediments) are in the focus of enviromagnetists. For the characterisation of environmental processes, the magnetic properties are just one of a variety of proxies such as sedimentological or geochemical signatures. Hence enviromagnetic interpretation is strengthened by an interdisciplinary proxy approach, which is necessary to understand the complex and still poorly known interaction between geological, physical, chemical, biological and anthropogenic processes involved in the production and transport of environmental materials. This was already recognized by Gustaf Ising when he interpreted the susceptibility of varved clays in Sweden. Here we want to focus on the importance of more open-minded active cooperation amongst all environmentalists. Cooperation provides environmagnetists with better tools for interpreting their measurements. On the other hand, the unexpensive, fast and non-destructive characterization of environmental materials using magnetic methods offers a unique possibility of monitoring natural and anthropogenic processes for a broad range of disciplines. We plan to review the present state of enviromagnetism using a few examples from different environments. We will illustrate with a case study how forces amongst environmentalists could be joined better when dealing with problems of urban pollution.

GP41A-03 0830h INVITED POSTER

Environmental Application of Sedimentary Magnetic Measurements: Successes and Problems

Leonardo Sagnotti (39 0651860321; sagnotti@ingv.it)

Istituto Nazionale di Geofisica e Vulcanologia, Via di Vigna Murata 605, Roma 00143, Italy

Environmental changes affect sedimentary basins, inducing either clear (i.e. stratigraphic cycles) or subtle oscillations in sedimentary sequences. The study of past environmental changes requires determination of reliable and sensitive proxies in sedimentary sequences at an appropriate resolution. Magnetic particles in sediments may be promptly detected, and semi-quantitatively characterized, with non-destructive magnetic measurements in specialized laboratories, taking advantages of progressive developments in instrumental technology and analytical protocols. Environmental magnetism developed as a viable and original approach to the study of present anthropogenic pollution as well as of past environmental changes. Detailed analyses of stratigraphic trends in composition, abundance, grain-size and shape of magnetic particles in sedimentary sequences were often successful in revealing climatically driven signals at a wide range of time scales and in pointing out analogies and differences in the response of various sedimentary basins to past climatic and tectonic events. Some selected examples will be discussed in this talk. Diagenesis, however, is also liable to induce significant changes in the magnetic mineralogy of sediments, compromising the evaluation of original magnetic signatures. Bacterially mediated synthesis of new magnetic phases as well as oxidation or reductive dissolution of iron in marine sediments are widespread phenomena that needs to be properly addressed in environmental magnetic studies. In this talk, I will provide a personal perspective on the challenges facing applications of sedimentary magnetic measurements to reconstructions of past climatic changes and on the broad problems related to diagenetic effects in sedimentary sequences.

GP41A-04 0830h POSTER

Magnetic Properties as an Assessment Tool for the Distribution and Fate of Heavy Metals in Estuarine-like Environments. The Study Case of the Galician Rias (NW Spain)

Daniel Rey[1] (+34 986 812004; danirey@uvigo.es)

Kais Mohamed[1] (+34 986 812004; kmohamed@uvigo.es)

Belen Rubio[1] (+34 986 812003; brubio@uvigo.es)

Ana Bernabeu[1] (+34 986 812004; bernabeu@uvigo.es)

Federico Vilas[1] (+34 986 812654; fvilas@uvigo.es)

[1]Dept. Geociencias Marinas, Universidad de Vigo, Vigo 36200, Spain

Magnetic properties are successfully used to assess the heavy-metal adsorption capabilities of coastal sediments in NW Spain. A double approach using geographically and vertically distributed data provides a valuable insight into the response and evolution of coastal systems under increasing anthropogenic pressure, and a critical information for environmental management of these areas. The study is based in measurement of low-field susceptibility of over 200 samples of from the top 10 cm of seabed sediment of the Rias of Vigo and Pontevedra in NW Spain (1 per square km). The basic pattern showed a significant increase of susceptibility towards the open sea and away from polluted continental influenced areas, mostly controlled by sediment texture, provenance and local hydrodynamic regime. Vertical variability of the susceptibility was also studied in 80 samples (1 every 3 cm) obtained from three 60 to 80 cm long gravity corers in the Ría de Pontevedra. This showed a very strong decrease in susceptibility with depth related to the early diagenetic evolution of iron oxides and oxyhydroxides. Further analysis comprised measurement of basic hysteresis parameters, ARM, IRM, temperature and frequency dependence of the susceptibility, sediment texture, analysis of major and trace elements, SEM and TEM investigation of the magnetic fraction. Statistical analysis of all the available data showed a significant negative correlation between elemental contaminants and magnetic susceptibility, ultimately controlled by wave climate that strongly drives the sediment distribution and their early diagenetic path. This work underlines the capabilities of magnetic properties to identify and assess coastal processes conditioning the biodisponibility of certain heavy metals, particularly in areas in which there is a significant coupling between the hydrodynamic and geochemical processes. Special consideration will be given to the dissolution and nucleation of relevant magnetomineralogical phases during the early stages of diagenesis.

GP41A-05 0830h POSTER

Rapid In-situ Measurement of Magnetic Susceptibility in Unconsolidated Lake Sediments

C. T. Clark[1] (clarkc3@mcmaster.ca)

J. I. Boyce[1] (boycej@mcmaster.ca)

[1]McMaster University, 1280 Main St. W., Hamilton, ON L8S 4K1, Canada

Magnetic susceptibility measurements can provide a useful indicator of anthropogenic effects in lake basins, including the onset of land clearance, forest fires, soil erosion and as a proxy for estimating contaminant levels in sediment. Susceptibility is commonly measured on whole or split cores, or on core sub-samples, but coring can be expensive and time consuming where a large number of profiles are required to correlate and map sediment volumes. Post- sampling mineralogic changes in cores are also a potential concern. An alternate approach investigated in this study is to obtain near continuous in-situ measurements of sediment volume susceptibility (k) using a probe driven into the lake bottom. An inexpensive proto-type probe was constructed using a Bartington MS2-F sensor mounted in waterproof housing with an extendable 10 m handle. Several calibration runs were made in a laboratory test column to determine the probe response characteristics and repeatability. Testing showed that the effective sensing volume is a 0.8 cm radius around the probe tip and that edge effects from sensor shoulders are negligible. The probe was then used to measure the thickness and distribution of a post-colonial sediment layer in a shallow coastal lagoon (Frenchman's Bay) in western Lake Ontario. Volume susceptibility profiles were collected at 40 locations by driving the probe up to 2.5 m into the lagoon bottom sediments at 2 cm measurement intervals. The in-situ volume susceptibility profiles were then compared with volume and bulk susceptibility measurements obtained on 10 vibracores extracted from the lagoon. The probe measurements showed comparable resolution to the core-derived data and closely paralleled the core susceptibility curves. The base of the post-colonial sediment layer was identified by an abrupt increase in magnetic susceptibility at 0.5-1.5 m depth. The marker horizon was correlated across the lagoon and the thickness and volume of the anthropogenic layer was estimated. The results demonstrate that in-situ susceptibility measurements using a sediment probe can provide a rapid and highly repeatable method for correlating shallow stratigraphic boundaries within unconsolidated lake bottom sediments.