size is relatively constant. Comparison of Thellier double heating and pseudothellier results indicates a ratio of about 3:1 for ARM:TRM (R = 0.79), allowing absolute calibration of our relative intensity data. With this calibration, the distribution of virtual axial dipole moments from the Icelandic samples is virtually identical to that of absolute paleointensities older than 0.3 Ma (Selkin and Tauxe, 2000) with an average value approximately half of the present dipole moment. The general within site consistency, serial correlation, and systematic relationship to directional variations of the resulting paleointensity record all suggest that the pseudothellier technique has provided a reliable estimate of relative intensity fluctuations in these volcanic rocks.

Tauxe, L., Pick, T. and Y.S.Kok, 1995, Geo. Res. Lett., 22: 2885-2888. Selkin, P.A. and L. Tauxe, 2000, Phil. Trans. R. Soc., 358: 1065-1088.

GP51A-0282 0830h POSTER

Limitations on Sedimentary Geomagnetic Analyses Due to Incomplete Age Control

David G McMillan[1] ((858) 822-1560; dmcmillan@ucsd.edu)

Catherine G Constable[1] ((858) 534-3183; cconstable@ucsd.edu)

Robert L Parker[1] ((858) 534-2475; rlparker@ucsd.edu)

[1] IGPP/SIO, 9500 Gilman Drive, La Jolla, CA 92093-0225, United States

Sedimentary paleomagnetic records from diverse locations are often compared or combined to acquire a global record of geomagnetic secular variations over long time intervals (thousands to millions of years). Time series analyses of individual or combined records have been used to seek characteristic time scales for secular variations in Earth's core field. One of the principal limitations of such analyses is incomplete knowledge of the age to depth relationships in sedimentary cores.

The consequences of these age uncertainties for sedimentary cores are explored using a simple statistical model. Ages of magnetization samples from cores are commonly inferred by dated tie points from complementary data, such as oxygen isotope records, and by assuming a constant sedimentation rate between tie points. In reality, imprecisely known or misidentified tie points and naturally varying sedimentation rates give rise to discrepancies between the inferred and the true ages. Our model treats the true, but in practice unknown, ages of tie points and equally spaced core samples as random variables. For errors in the ages of tie points, we draw the true age from a normal distribution. For errors due to variable sedimentation rate, the true ages are generated by summing samples of a uniform distribution. The perturbation in sedimentation rate resulting from this model is consistent with a zero-mean uniform random variable. In each case, our analysis yields closed form expressions for the expected value and variance of resulting errors. We show that age errors across a paleomagnetic record due to misdated tie points are of the same order as the tie point discrepancies, while those due to sedimentation rate variations of as much as 10% of the mean rate are on the order of only a few years. Further, the effects of tie point errors on the spectral content of the inferred signal is severe. For example, modest tie point discrepancies of 5 kyr at the beginning and end of a 100 kyr record increase the minimum coherent period, when compared with the original signal, from 1 kyr to 10 kyr.

GP51A-0283 0830h POSTER

The Origin of the Earth's Magnetic Field and the Cause for its Reversals

Jozsef Garai (305-225-1083; jozsef_garai@hotmail.com)

, 1550 SW 104th Path 110, Miami, FL 33174, United States

The destabilization of San Carlos olivine in the presence of carbon produces a carbonate melt. This melt could separate through geological times and become trapped in higher concentration at the bottom of the lithosphere and perhaps at the bottom of the 660 km boundary, as suggested by seismic wave attenuation. Carbonate melt could reduce the viscosity of the olivine rich solid mantle by more than ten orders of magnitude. This low viscosity would allow the development of a significant differential rotation within the mantle at the 660 km boundary, thereby decoupling the lower mantle from the upper.

The increasing temperature with depth in the mantle reduces the electron retaining capacity of its atoms resulting in an overall positive charge in the lower mantle and an overall negative charge in the upper mantle and the lithosphere. The differential rotation of these two oppositely charged layers will generate a dipole magnetic field. The direction of the dipole field depends on the relative angular velocities of the two sections of the mantle. If the 660 km outer shell is the faster, then the field is normal with its dipole moment pointing north.

The last two R-N reversals coincided with major impacts, suggesting that the impacts triggered a process which slowed the rotation of the lower mantle or sped up the rotation of the 660 km outer shell or both. The rotation of the 660 km outer shell could be speeded up by global cooling, triggered by impacts. This would occur if glaciation reduces the moment of inertia of the outer shell by shifting ocean water from the equator to ice at the poles. If only this glaciation process was active at the time of the last reversal then a 140 m reduction of the global sea level would have been needed to reverse the sign of the differential rotation and generate the observed normal field. Alternatively, the rotation of the lower mantle could have been slowed down if the projectile reached the lower mantle, thereby increasing its moment of inertia. The existence of plateau basalt formations at the impact sites coinciding in age with the last R-N reversal gives credibility to this scenario.

Assuming that the differential rotation between the inner and outer shells is equal to the observed westward movement of the dipole field, and using a simplified spherical model, it can be shown that a $7x10^{-7}$ C/cm^3 uniform charge of the outer shell is required to generate the contemporary dipole field. This uniform charge falls within the range of the friction generated charges, therefore it is reasonable. The proposed model is consistent with all the features of both the contemporary field and, within reasonable uncertainty, the paleomagnetic field. It also explains:

-the correlation between the gravitational and magnetic field,

-the correlation determined between the length of the day (LOD) and the strength of the magnetic field,

-the inverse correlation between the westward drift of the field and LOD,

-the lunar secular variation of the field,

-the preferred longitudes of the virtual geomagnetic poles for N-R and R-N reversals,

-the correlation between climate and magnetic field,

-the inverse correlation between the frequency of the magnetic reversals and plume and volcanic activity and

-the stronger geomagnetic field for the superchrons.

GP51A-0284 0830h POSTER

An Integratted Paleomagnetic Study of Rio Grande Santiago Volcanic Succession (Trans Mexican Volcanic Belt): Revisited

Avto Gogichaishvili[1] (52 56224230; avto@tonatiuh.igeofcu.unam.mx); Luis Alva-Valdivia[1] (5 6224237; lalva@tonatiuh.igeofcu.unam.mx); Jose Rosas-Elguera[2] (jrosas@quantum.ucting.udg.mx); Jaime Urrutia-Fucugauchi[1] (juf@tonatiuh.igeofcu.unam.mx); Antonio Gonzalez[1] (avto@tonatiuh.igeofcu.unam.mx); Juan Morales[1] (jmorales@tonatiuh.igeofcu.unam.mx)

[1] Instituto de Geofisica, Lab. de Paleomagnetismo y Geofisica Nuclear, UNAM, Ciudad Universitaria s/n, Mexico DF, DF 04510, Mexico

[2] Centro de Ciencias de la Tierra, Universidad de Guadalajara, Calzada Olmpica y Blvd. Marcelino Garcia Barragn, Guadalajara, Jal 44840, Mexico

We carried out a detailed paleomagnetic, rock-magnetic and paleoinetsnity study of Miocene volcanic succession from the Trans-Mexican Volcanic Belt north of Guadalajara. A total of 37 consecutive basaltic lava flows (326 oriented standard paleomagnetic core) were collected at Lazo locality. Several rock-magnetic experiments were carried out in order to identify the magnetic carriers and to obtain information about their paleomagnetic stability. These experiments combined with microscopy study shows that the main magnetic mineral is Ti-poor titanomagnetite associated with exsoluted ilmenite. Two geomagnetic reversals were observed in the 300m thick composite section. According to the dispersion of virtual geomagnetic pole directions, paleosecular variation was lower than the one observed in general during Miocene. Considering our paleomagnetic results altogether with available radiometric data, it seems that the volcanic units have been emplaced during a relatively short time span of about 1 My. The mean paleomagnetic directions obtained from this study do not differ significantly from that expected for the Middle Miocene. The mean paleomagnetic direction calculated from all data is I = 31.1°, D = 354.6°, k = 124 and a95 = 2.1°, N=37, which corresponds to the mean paleomagnetic pole position Plat=84°, Plong=129.8°, K=29, A95=4.4°. Seventy two samples with apparently preserved primary magnetic mineralogy and without secondary magnetization, mostly belonging to reverse polarity zone were preselected for Thellier paleointensity determination. The flow-mean paleointensity values are ranging from 22.4 +/- 3.4 to 53.8 +/- 6.0 mT and the corresponding Virtual Dipole Moments are ranging from 5.4 +/- 0.8 to 12.0 +/- 1.4 (1022 Am2). This correspond to mean value of 7.98 +/- 2.21 x 1022 Am2, which is close to present day geomagnetic field strength. Altogether, our data suggest the existence of relatively high geomagnetic field strength undergoing low fluctuations.

GP51A-0285 0830h POSTER

Paleointensities of the Auckland Excursion from Volcanic Rocks in New Zealand

Nobutatsu Mochizuki[1] (81-3-5734-2717; nmochi@geo.titech.ac.jp)

Hideo Tsunakawa[1] (htsuna@geo.titech.ac.jp)

Hidetoshi Shibuya[2] (shibuya@sci.kumamoto-u.ac.jp)

John Cassidy[3] (j.cassidy@auckland.ac.nz)

Ian E.M. Smith[3] (ie.smith@auckland.ac.nz)

[1] Department of Earth and Planetary Sciences, Tokyo Institute of Technology, 2-12-1, Ookayama, Meguro, Tokyo 152-8551, Japan

[2] Department of Earth Sciences, Kumamoto University, 2-39-1, Kurokami, Kumamoto 860-8555, Japan

[3] Department of Geology, University of Auckland, PO Box 92019, Auckland 92019, New Zealand

Shibuya et al. (1992) reported the Auckland excursion from several basaltic lava flows of monogenetic volcanic centers (<50 ka) in the Auckland Volcanic Field, New Zealand. The Auckland excursion was recorded in five centers in three intermediate direction groups of north-down, west and south. We carried out paleointensity and rock-magnetic studies in order to obtain the absolute paleointensities associated with three intermediate geomagnetic fields.

Thermomagnetic analyses indicated typical Curie temperatures of 150-200, 450-500 and/or 550-580°C. The Day plot (Day et al., 1977) showed a linear trend in the pseudo-single-domain range of magnetic carriers. Those results, combined with the reflection microscope observations, identified the magnetic carriers as titanomagnetites with wide variation in titanium content and grain size.

First, the Coe's version of the Thellier method (Coe, 1967) was applied to the samples. Several samples seemed to give paleointensities ranging from 3.2 to 6.4 μT (Shibuya and Cassidy, 1995 AGU fall meeting), but they were often affected by thermal alteration in the furnace even from fairly low temperature steps like 200°C. We were forced to introduce correction for thermal alterations in laboratory heating, using low temperature part of the Arai plot. We, therefore, applied the double heating technique (DHT) of Shaw method (Tsunakawa and Shaw, 1994), which was capable of detecting inappropriate results by the ARM correction, to the samples. The low temperature demagnetization (LTD) was combined with DHT (Yamamoto et al., submitted) before AF demagnetization and samples were heated in a vacuum of 10-100 Pa.

Sixty-one samples from the five lava flows were subjected to the LTD-DHT Shaw method. Twenty-three of these samples yielded successful results passing the selection criteria. Five out of six paleointensities from the Crater Hill lava were consistent with each other. A mean paleointensity was given to be 10.9± 1.9 μT (N=5) for the Crater Hill lava. Five out of seven paleointensities from the Wiri lava, were consistent and a mean was 10.8± 1.2 μT (N=5). Three samples from the Puketutu lava gave a mean paleointensity of 11.4± 0.8 μT (N=3). These three lava flows, Crater Hill, Wiri and Puketutu lava, all recorded the north-down paleodirection and gave almost the same paleointensities of $\sim 11\mu$T. This concordance of paleointensities and paleodirections supports the reliability of the paleointensity determination.

Four paleointensities were obtained from the Hampton Park lava of the west paleodirection, and gave a mean paleointensity of 10.1± 1.1 μT (N=4). The field strength was comparable to that of the north-down group. Three samples from the McLennan Hills lava of the south paleodirection gave quite low paleointensities, a mean of which was calculated to be 2.4± 0.6 μT (N=3).

These five paleointensities from the Auckland excursion are no more than one-fifth of the present-field intensity. The corresponding VDMs range from 0.6×10^{22} to 2.3×10^{22}Am^2, which are similar to those of about 45ka excursion; $1.2\times10^{22} \sim 2.3 \times 10^{22}$Am^2 from France (Roperch et al., 1988; Chauvin et al., 1989) and 1.1×10^{22}Am^2 from Iceland (Marshall et al., 1988; Levi et al., 1990).

GP51A-0286 0830h POSTER

Geomagnetic Paleointensity Variations as a Cheap, High-Resolution Geochronometer for Recent Mid-Ocean Ridge Processes

Jerome DYMENT[1] (jerome@univ-brest.fr)

Christophe HEMOND[1] (chhemond@univ-brest.fr)