

the use of magnetic isochrons for the implicit dating of ocean floor remains of primeval importance, the use of magnetic measurements to better understand the fundamental processes of mid-ocean ridge accretion is becoming more and more important. With the increased data density, the higher precision of the observations, both in positioning and sensitivity, as well as the availability of data at different scales and different altitudes relative to the ocean floor, an entire new spectrum of applications of marine magnetic anomalies is opening up. In this contribution, we compare recent observations of Ravilly et al. (JGR, 1998), along the axis of the mid-Atlantic Ridge, with those made many years ago off axis in the Cretaceous magnetic quiet zone (85 - 118 Ma). Ravilly et al. observed that along segments of the mid-Atlantic Ridge, between 20 and 40 N, the axial magnetic anomaly is higher by a factor of about 2 near the segment ends as compared to the segment centres. The preferred explanation is that both variations in the Fe-Ti content resulting from shallow magma fractionation and serpentinisation of shallow mantle rocks near the segment ends are responsible for this variation. One question is then if this signature persists as the crust generating the axial magnetic anomaly becomes older and moves away from the spreading axis by seafloor spreading. The best region to look for such a signature off axis is the Cretaceous magnetic quiet zone, because there the signal is not contaminated by large reversals in the Earth's magnetic field. Collette et al. (1984) observed such an increase in effective magnetization near the ends of segments, which expresses itself as distinctly positive anomalies over the fossil fracture zone valleys, when the magnetic anomalies are reduced to the pole. Hence, we conclude that both observations are consistent and that the processes responsible for the amplitude variations are restricted to the axial region. Hydrothermal processes off axis may be responsible for additional changes in the total magnetic structure of the oceanic crust, but the fundamental 'magnetic' segmentation is preserved.

GP21A-0036 0830h POSTER

Interpretation of the new CHAMP crustal field anomaly maps using a GIS technique

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Reliable global crustal field anomaly maps produced from magnetic data of the first three years of the CHAMP satellite mission now allow for quantitative geological studies of crustal structure and composition. Here, we have developed a GIS based forward modeling technique to infer crustal structure overlain by younger cover. Modeling takes the geologic and tectonic maps of the world as the input and, depending upon the known rock types in each region, an average susceptibility value is computed for every geological unit. Next, the vertically integrated susceptibility (VIS) is generated by multiplying the average susceptibility with the seismic crustal thickness, as given by global models of 3SMAC and CRUST2.1. Starting with this initial VIS model, the vertical field anomaly is computed at an altitude of 400 km and compared with the corresponding CHAMP vertical field anomaly map. Significant geological inferences are made from the agreement and the discrepancies between our initial map and the observed anomaly map. In a subsequent modeling step the poorly known boundaries of buried crustal units are modified until the recomputed map fits the observed magnetic map. By this simple procedure a remarkably good fit to the magnetic anomaly map is achieved. We conclude that the lateral extent of Archean units in the lower crust can thus be inferred from satellite magnetic anomaly maps.

GP21B MCC: Level 1 Tuesday 0830h

High-Resolution Description of the Earth's Magnetic Field Time Variations Using Paleomagnetism and Archeomagnetism I Posters

Presiding: Y Gallet, Institut de Physique du Globe de Paris; M Korte, GeoForschungsZentrum Potsdam

GP21B-0037 0830h POSTER

Constraining the geomagnetic field intensity in Western Europe during the 17-19th centuries from French faience shards

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We obtained new archeointensity results for France from the analysis of seven groups of potsheds precisely dated from the beginning of the 17th century to the 19th century. These earthenware shards were found during excavations in Nevers which was an important production center of faience in France during the 17-18th centuries. For our intensity determinations, we used a new variant of the Thellier and Thellier (1959) method. This procedure ("IZZI" method; Tauxe et al., 2003) involves the alternation of pair of heatings in field-zero field ("IZ" steps) and pair of heatings in zero field-in field ("ZI" steps), and was specially designed to detect biased intensity results due to multi-domain magnetic grains. The raw intensity values were corrected for TRM anisotropy and cooling rate effects. Our preliminary results do not show strong intensity variations during the 17-19th centuries. In particular they do not exhibit a rapid intensity decrease during the 17th century as predicted in Western Europe from the global geomagnetic models of Jackson et al. (2000). To constrain their models during the 1590-1840 period, during which directional but no intensity geomagnetic measurements are available, these authors used a backward extrapolation made on the basis of the linear decay of the dipole moment observed since 1840. Our study challenges the validity of this extrapolation and contributes to our knowledge on the recent variation of the dipole moment of the geomagnetic field.

GP21B-0038 0830h POSTER

Archeomagnetism of some pre-Columbian mural paintings in Central Mexico

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This work investigates the magnetic remanence associated with the mural paintings at three archeological sites in Central Mexico dated between 200 AD and 1450 AD (Cholula, Cacaxtla and Templo Mayor). The remanence of the murals is shown, using X-ray analyses and rock-magnetic measurements, to be carried by both magnetite and hematite. In most specimens, a characteristic magnetization is successfully isolated by alternating field demagnetization. The mean site directions are consistent with the available master curve for Mesoamerica. This work shows that murals from Central Mexico can retain their remanent magnetization for centuries and demonstrates the viability in principle of pictorial remanence as an archeomagnetic tool.

GP21B-0039 0830h POSTER

Absolute Paleointensities From 21-84 ka Ontake Volcanic Rocks, Japan - Evidence For Excursion At 80 ka

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Tanaka and Kobayashi (2003) reported a paleosecular variation in directions from 21-84 ka volcanic rocks of the Ontake Volcano, Japan. They found two low latitude VGPs from 48 ka (41.9N, 196.2E) and 80 ka (15.9N, 183.3E) lavas, indicating existence of excursions in Japan during the latest Pleistocene. Following this study, we have tried absolute paleointensity measurements on the Ontake volcanic rocks including samples with these two low latitude VGPs. From various rock magnetic experiments, main remanence carrier was judged to be titanomagnetite with minor Ti content. Hysteresis properties suggested that most of the paleomagnetic cores had PSD characteristics, though ratios of Hcr/Hc were beyond the value of PSD-MD threshold (Hcr/Hc=4) for some cores. These evidences indicated that the present samples had ordinary rock magnetic properties for absolute paleointensity measurements. Therefore, we have performed two different methods of the measurements; Coe's version of the Thellier method (Coe, 1967), and double heating technique of the Shaw method combined with low temperature demagnetization (LTD-DHT Shaw method; Tsunakawa et al., 1997; Yamamoto et al., 2003). Until now, the former method has been applied to 71 specimens while the latter to 126 specimens. Each method gave 30 and 54 successful results. Especially, the latter method seemed to be effective for the MD-pronounced specimens. These results ranged from about 10 to 60 ZAM2 in VADM except one site at 84 ka (110 ZAM2). Striking point in these results is that samples from the 80 ka lava with low latitude VGP yielded consistent low paleointensities for both methods: 4.9±0.4 μT for the Thellier method (N=4); 5.9±0.2 μT for the LTD-DHT Shaw method (N=3). These samples were collected from two outcrops which are 20 m apart across a gully. Since corresponding VDM and VADM is about 12% of the present value, typical for the geomagnetic excursions, the existence of 80 ka excursion is confirmed not only from the paleodirectional evidence but also from the absolute paleointensity data.

GP21C MCC: Level 1 Tuesday 0830h

Extraterrestrial Paleomagnetism: Role of Impact Related Shock I Posters (joint with P)

Presiding: B Lin, University of California, Berkeley; D Mitchell, University of California, Berkeley; M Fuller, HIGP-SOEST, University of Hawaii

GP21C-0040 0830h POSTER

Pyrrhotite in Extraterrestrial Materials: Paleomagnetic Implications of its High-Pressure Transition

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In mineralogical and rock magnetic studies of meteorites, pyrrhotite has been somewhat underdiscussed due to misidentification with troilite and to the poor knowledge of its magnetic properties until the nineties. In the common case of pyrrhotite-magnetite (or metal) mixtures, remanence may be mainly carried by pyrrhotite while thermomagnetic curves point toward metal or magnetite. We have now studied 20 (among a total of 28) independent martian meteorites (SNCs) and found that among the 18 strongly magnetic ones (Mrs more than 10 A/m), 9 have their magnetic remanence carried by pyrrhotite. Among the chondrites, rumurites (R) contain only pyrrhotite, while a number