independent of a priori assumptions about Z and can be interpreted in terms of three-dimensional conductivity structures. Through SVD, the impedance is represented by two characteristic states. These states consist of two pairs (E and H) of complex vectors and two corresponding, real, singular values which together describe the extremal properties of Z. The singular values are the maximum and minimum [E]/[H] ration possible at the observation site and therefore yield the true maximum and minimum apparent resistivities.

We use a variation of SVD analysis by incorporating phases in the singular values, which are then called characteristic values. These phases reflect the delay (caused by the earth's conductivity) of the electric fields relative to their associated magnetic field. In this analysis of Z, the characteristic values contain four parameters, two singular values and two phases. The characteristic vectors contain the remaining four parameters, two principal axis directions and two ellipticities. The principal axis directions for the E and H vectors need not be at right angles as in biorthogonal analysis. The deviation of these axes from orthogonality is called the "skew angle" S. From a model by Park, we have found S to be closely related to distortions in the telluric current system caused by current gathering due to a good conductor. From the same model, we have found to a good conductor. From the same model, we have found to a good conductor. From the same model, we have found to a good conductor. From the same model, we have found to a good conductor. From the same model, we have found to a good conductor. From the same model, we have found to a good conductor. From the same model, we have found S to be closely related to distortions in the telluric current distortion and at the shorter periods. Consequently, we speculate that the ellipticity parameters are associated with local induction.

Polymetallic Sulfide Exploration on the Deep Sea Floor: The Feasibility of the MINI-MOSES Experiment

P. A. Wolfgram (Department of Physics, University of Toronto, Toronto, Ont., Canada M58 [A7]
R. N. Edwards (same as Wolfgram)
L. K. Law (Pacific Geoscience Centre, Geological Survey of Canada, Sidney, B.C., Canada V8L 482)
M. N. Bone (same as Law)

GEOPHYSICS, VOL. 51, NO. 9

The recent discoveries of polymetallic sulfide deposits on the deep sea floor have created an interest in geophysical techniques for mapping them. A Magnetometric resistivity method (MINI-MOSES) has been developed for detecting the distribution of sub-sea-floor electrical resistivity. A vertical, long-wire bipole feeds electric current into the ocean. Some of the current enters the sea floor, and its magnetic field is measured at various distances by a low-frequency induction coil magnetometer. The method is sensitive to conductive and resistive zones at depth, and information about three-dimensional resistivity structures can be obtained.

The small load resistance of an electric transmitter grounded in the ocean allows high current to be driven by a battery-powered instrument. The induction coil receiver is more sensitive and less noisy than conventional flux-gate magnetometers over the selected frequency band. This receiver is therefore well-adapted to the almost noise-free deep sea-floor environment. Both the transmitter and the receiver are completely self-contained, recording averaged transmitted and received signals in random access memory.

The technique was tested near a sulfide deposit at 47957 N, 12906 W on the axis of the Juan de Puca Ridge. The deep submersible ALVIN positioned and moved the instruments about on the sea floor. Just enough data were obtained to demonstrate the viability of the technique for this kind of geologic mapping and mineral exploration. The electrical resistivity of 14 2m obtained for a uniform half-space model is consistent with Deep Sea Drilling Project (DSDP) results for the seawater-saturated basalt.

GEOPHYSICS, VOL. 51, NO. 9 The recent discoveries of polymetallic sulfide

Geomagnetism and Paleomagnetism

1525 Peleomagnetism applied to tectonics PALEOMAGNETISM OF CRETACEOUS AND ECCENE STRATA, SAN MIGUEL ISLAND, CALIFORNIA BORDERLAND AND THE NORTHWARD TRANSLATION OF BAJA CALIFORNIA

4. 39.7A.

OF BAJA CALIFORNIA
D. E. Chempion (U.S. Geological Survey, Henlo Park, CA 94025)
D. G. Howell, Honte Harshall
The history of poleward motion of the Baja California peninsula is a subject of continuing geologic investigations, including paleomagnetic studies during the past decade. Geologic correlations mean not to necessitate northward movement, while paleomagnetic data suggest movement not to necessitate northward movement, while paleomagnetic data suggest movement of 1000 km or more. We have made paleomagnetic measurements on Cretaceous and Eccene sedimentary rocks of San Miguel Island, California, which are western lithofacies of rocks cropping out on the Baja peninsula. A total of 97 drill corestaken from Upper Cretaceous turbidites, though weakly magnetized, were found to clean beet in response to thermal demagnetization. This direction is 19° shellower and rotated 50° clockwise from shallower and rotated 50° clockwise from the expected direction for the present site position, and corresponds to a peleolatitude of 26° M. A total of 11° drill cores of middle Ecceme rocks revealed characteristic magnetizations in response to either alternating field or thermal desagnatizations. A mean direction of magnetization can be derived from the intersection of planes fitted to the paths of desagnatization. This direction is 24° shallower and rotated 79° clockwise from the expected Ecceme direction for this site, and corresponds to a latitude of 17° M. These peleomagnetic

Comparison of Magnetic Field Structures in Quasi-Parallel Interplanetary Shocks: Observations Versus M. E. Mandt, J. R. Kan, and C. T. Russell 8981 Simulations (Paper 5A8268) Possible Effects of Solar Flares on the Ionosphere of Venus From Pioneer Venus Orbiter Measurements (Paper 5A8119)

J. Kar, K. K. Mahajan, M. V. Srilakshmi, and R. Kohli M. A. Moreno and D. D. Barbosa Mass and Energy Balance of the Cold Io Torus (Paper 5A8349) Some Molecular Nitrogen Emission From Titan-Solar EUV Interaction (Paper 4A8278)

Earth's Compressional Foreshock Boundary Revisited: Observations by the ISEE 1 Magnetometer (Paper 6A8377) S. A. Haider 8998 E. W. Greenstadt and L. W. Baum 9001 (Paper 5A8249) Simultaneous Measurements of Polar Cap Electron Distributions in Opposite Hemispheres Paul F. Mizera and Dave S. Evans An Empirical Relationship Between Kp and the Tail Lobe Magnetic Field (Paper 5A8315) Paul L. Rothwell 9012 Thermal Coupling of Conjugate Ionospheres and the Tilt of the Earth's Magnetic Field (Paper 5A8326) P. G. Richards and D. G. Torr 9017 Correction to "Quiet Ionospheric Currents of the Northern Hemisphere Derived From Geomagnetic Field Records" (Paper 6A8501) Wallace H. Campbell an Correction to "Chaos and Nonlinear Dynamics of Single-Particle Orbits in a Magnetotaillike Magnetic Wallace H. Campbell and Edward R. Schiffmacher J. Chen and P. J. Palmadesso Field" (Paper 6A8529)

Journal of Geophysical Research

Volume 91 Number D8 July 20, 1986

Helen E. Coffey

9026

Air Chemistry Over the Tropical Forest of Guyana (Paper 6D0233)

G. L. Gregory, R. C. Harriss, R. W. Talbot, R. A. Rasmussen, M. Garstang, M. O. Andreae, R. R. Hinton, E. V. Browell, S. M. Beck, D. I. Sebacher, M. A. K. Khalil, R. J. Ferek, and S. V. Harriss

Transport of Ozone Between Boundary Layer and Cloud Layer by Cumulus Clouds (Paper 6D0222) Gary K. Greenhut Chemistry of Marine Aerosol Over the Tropical and Equatorial Pacific (Paper 6D0135)

Hans Raemdonck, Willy Maenhaut, and Meinrat O. Andreae Climate Record in Varved Sediments of the Eocene Green River Formation (Paper 6D0249) Kevin D. Crowley, Claude E. Duchon, and Jaeyoung Rhi

A Nonisothermal Emissivity and Absorptivity Formulation for Water Vapor (Paper 6D0216) V. Ram Upper Stratospheric (30-50 km) Lidar Observations of the Ozone Vertical Distribution (Paper 6D0201) V. Ramanathan and P. Downey

J. Pelon, S. Godin, and G. Méaie 8667 The Mg 280-nm Doublet as a Monitor of Changes in Solar Ultraviolet Irradiance (Paper 6D0187) Donald F. Heath and Barry M. Schlesinger

Some Kinetic and Thermochemical Aspects of Sodium in the Stratosphere (Paper 5D0906) John J. Lamb and Sidney W. Benson Evolution of Lightning Flash Density and Reflectivity Structure in a Multicell Thunderstorm (Paper 6D0226)

Vladislav Mazur, W. David Rust, and John C. Gerlach Sferics Rate in Relation to Thunderstorm Dimensions (Paper 6D0220) E. V. Cherna and E. J. Stansbury

Temperature Dependence of the NO₃ Cross Section in the 662-nm Region (Paper 6D0251)

A. R. Ravishankara and R. L. Mauldin III 8709

data in combination with recently pub-lished data for the Baja peninsula and Peninsular Ranges of southern California, Peninsular Ranges of southern California, indicate action trajectories that mimic the North American craton for the period Cretaceous to late Eccene time. During the Oligocene the Baja peninsula and adjoining regions to the west moved northward relative to the craton arriving at a pre-Gulf of California position not later than earliest Miccene time. A comparison of the northward motion of the Baja peninsula with thet of the Santa Lucis-Orocopia allochthon shows that both area underwent rapid poleward translations, but these motions occurred at different times.

Geomagnetic and Solar Data (Paper 6A0343)

Author Index

J. Geophys. Res., B, Paper 6B5917

1525 Paleomagnetism applied to tectonics STRAIN REORIENTATION OF HEMATITE AND ITS BEARING UPON REMANENT MAGNETIZATION né (CAESS, Laboratoire de Geop Université de Rennes, 35042 P. Cogné

BEARING UPON REMANENT MACRETIZATION
J. P. Cogné (CAESS, Laboratoire de Geophysique Interne, Université de Rennes, 35042 Rennes Cedex, France)
H. Perroud, M. P. Texier and N. Bonhommet
Using a computer-based numerical model, we suggest that passive reorientation of hematite planar particles induced by strain perturb significantly the remanent magnetization carried by the hematite. The evolution of its direction and dispersion in a progressively increasing strain can be correlated with the evolution of passive lines. In real rocks, the amount of reorientation can be approched by measuring one of the three following tensors: strain tensor, orientation tensor of some hematite cristallographic axes, or magnetic susceptibility tensor. From examples taken in the Maritime Alps and in Brittany, we emphasize the possible correlations between these tensors (orientation of principal axes and axial ratios). Finally, we use our best estimate of strain to correct the paleomagnetic results by the strain removal technique we have already used in the Maritime Alps (Cogné and Perroud, 1985). When applied to the preliminary paleomagnetic results obtained from Ordovician deformed redbeds of Brittany, it allows to recover a conclusive primary magne-ization direction, although the characteristic trom Ordovician deformed reduced of Brittany, it allows to recover a conclusive primary magne-tization direction, although the characteristic magnetizations appear post-folding with respect to the classical fold test. (Texture goniometry, anisotropy of the magnetic susceptibility, paleomagnetism, strain removal.)

Tectonics, Paper 6T0090 Hydrology

E05. 29 JUH 86

1830 Groundwater CHLORING-36 DATING OF VERY OLD GROUND WATER II. HILK RIVER AQUIFER, ALBERTA, CANADA Fred H. Phillips, Geoscience Department and Geophysical Research Center, New Mexico Institute of Mising and Technology, Socorto, New Mexico 87801) Harold W. Bentley, Stanley N. Davis, David Elmore,

and Gerald & Swanick
The Milk River aguifer in southern Alberta;

Canada, consists of sandstone interpedded between Canada, consists of sandstone interbedded between thick shale units. The ground-water is confined and discnarges by both upward and downward leakage through the shales. The concentration of CI increases by about 2 orders of magnitude downgradient through the aquiter. This CI increase complicates ³⁰Cl dating of the system. Climatic changes, flushing of connate water, introduction of CI from older water below the aquifer, and ion of the trom older water below the applier, and for tiltration have been proposed as possible explanations for the increase. The ³⁶Cl data show a consistent decrease of the ³⁶Cl/Cl ratio down gradient, but an increase in the ³⁶Cl concentration down gradient in certain parts of the aquifer. Dates calculated from the ³⁶Cl/Cl ratio show a reasonable distribution in light of the butternial control on the system whereas ratio show a reasonable distribution in light of the hydraulic controls on the system, whereas dates calculated from the ³⁶Cl concentration give negative ages. This suggests that ion tiltration is responsible for the Cl increase and that the ³⁶Cl/Cl dates are to be preferred. We estimate water ages to be more than 2 Myr near the distalend of the aquifer. (Groundwater, radiometric dating, ion filtration, chlorine-36.)

Water Resour. Res., Paper 6W4353

1839 Infiltration LINEARIZED UNSTEADY MULTIDIMENSIONAL INFILTRATION

J.R. Philip (CSIRO Division of Environs Mechanics, Camberra, Australia, 2601) The parameters in the linearized Mechanics, Camberra, Australia, 2001;
The parameters in the linearized
multidimensional unsteady equation for
unsaturated flow in homogeneous soils can be
chosen so that small time flow rates are
given correctly, with the quasilinear steady
solution as the large time limit, Matched
thus, the linearized equation offers insight
into the time course of multidiansional
infiltration. The Laplace transform reduces
the equation and its governing conditions
into forms similar to those for quasilinear
steady flows. The problems of unsteady
infiltration from buried spherical and
cylindrical cavities are solved. Frequently
the solutions are approximately reducible to
the product of the steady solution and a
function only of time and_radial.
coordinate. Theorems show that approximate
product solutions apply not only to these
configurations, but to multidimensional
cavities of arbitrary shape.
Nultidimensional infiltration from finite
supply surfaces involves two characteristic supply surfaces involves two characteristic times, one deriving from the capillarity-gravity interaction and the other from the gravity interaction and the determinant from the capillarity-geometry interaction. We explore the influence of these two times on the time scales of approach to steady moisture distribution near the supply surface and to steady discharge. The analysis provides explanation of the

Hater Resour. Revi. Paper 68692

relatively rapid approach to the steady state observed in three-disensional infiltration from small supply surfaces, (Unsaturated flow, subirrigation, field

Land of the South