U. S. DEPARTMENT OF THE INTERIOR

U. S. GEOLOGICAL SURVEY

A bibliography of some geophysical computer programs, data bases, and maps from the U.S. Geological Survey, 1971-1994

by Viki Bankey[1] and Walter L. Anderson[2]

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[1] Denver, CO

[2] formerly USGS, Denver, CO

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INTRODUCTION

Scientists of the U.S. Geological Survey (USGS) have written an extensive amount of computer source codes in order to process and interpret geophysical data including gravity, magnetics, radiometrics, electrical and electromagnetics, remote sensing, spectroscopy, borehole geophysics, and some shallow seismic processing. In addition, compiled data in the form of maps or data bases are available for gravity, magnetics, and aeroradiometrics. This report lists some source codes, data bases, and map compilations that are currently available. Although the papers referenced here are authored by USGS employees, many are published by cooperating agencies, such as state geological surveys.

The bibliography is based on the publications of working groups in the USGS known to the authors, and does not include all geophysical source codes published by the USGS (notable omissions include seismology and geomagnetism). Entries were included that reflect the disciplines of these working groups. Some source code that was determined to be superceded or obsolete is not included in this report.

The USGS publishes a free monthly periodical, "New Publications of the U.S. Geological Survey," and all future USGS publications will be listed there (address for subscription is found at the end of this report). Addresses for sources of data, publications, and other information are listed at the end of this report. Any use of trade, product, or company names in this report is for descriptive purposes only and does not imply endorsement by the U.S. Government.

GRAVITY, MAGNETIC, AND RADIOMETRIC DATA COMPILATIONS AND MAPS

The USGS has flown or contracted many aeromagnetic surveys. Following is a list of open-file reports that reference these surveys:

Hill, P.L., 1991a, Bibliographies and location maps of aeromagnetic and aeroradiometric publications for the states west of approximately 104° longitude (exclusive of Alaska and Hawaii): U.S. Geological Survey Open-File Report 91-370-A, 173 p.

Hill, P.L., 1991b, Bibliographies and location maps of aeromagnetic and aeroradiometric publications of the states west of the Mississippi River and east of approximately 104° longitude: U.S. Geological Survey Open-File Report 91-370-B, 72 p.

Hill, P.L., 1991c, Bibliographies and location maps of aeromagnetic and aeroradiometric publications for the states east of the Mississippi River and north of the Ohio and Potomac Rivers: U.S. Geological Survey Open-File Report 91-370-C, 105 p.

Hill, P.L., 1991d, Bibliographies and location maps of aeromagnetic and aeroradiometric publications for the states east of the Mississippi River and south of the Ohio and Potomac Rivers: U.S. Geological Survey Open-File Report 91-370-D, 68 p.

Hill, P.L., 1991e, Bibliographies and location maps of aeromagnetic and aeroradiometric publications for Alaska and Hawaii: U.S. Geological Survey Open-File Report 91-370-E, 36 p.

Hill, P.L., 1991f, Bibliographies and location maps of aeromagnetic and aeroradiometric publications for Puerto Rico and large areas of the conterminous United States: U.S. Geological Survey Open-File Report 91-370-F, 36 p.

Sikora, R.F., Ponce, D.A., and Oliver, H.W., 1993, Status of aeromagnetic survey coverage of southwestern Nevada and southeastern California: U.S. Geological Survey Open-File Report 93-44, 18 p.

Publicly available geophysical data for the United States include original gravity, aeromagnetic, and radiometric data, as well as computer-generated map and data-base compilations of these data. Two such cooperative products are the gravity and magnetic gridded data that were used to compile the Geological Society of America's 1988 gravity and magnetic anomaly maps of North America, available from the National Geophysical Data Center (NGDC). A CD-ROM of magnetic data gridded at 2 km (extracted from the DNAG set), gravity data gridded at 4 km (Simpson and others, 1987), and topographic data for the conterminous U.S. and additional software is listed below (Phillips and others).

Gravity, magnetic, and radiometric maps are divided below into two sections. The first section includes maps that cover more than one state. The second section includes maps that primarily cover one state. Numerous compilations have been published that cover areas smaller than a complete state, and those reports are not listed here.

GRAVITY, MAGNETIC, AND RADIOMETRIC DATA COMPILATIONS AND MAPS
MULTI-STATE REGIONS

Bankey, Viki, 1992, Complete Bouguer gravity, isostatic residual gravity, and related geophysical maps centered on the Idaho batholith and Challis volcanic field, lat. 42°-47°, lon. 110°-118°: U.S. Geological Survey Geophysical Investigations Map GP-995, scale 1:1,000,000.

Bond, K.R., and Zietz, Isidore, 1987, Composite magnetic anomaly map of the conterminous United States west of 96° longitude: U.S. Geological Survey Geophysical Investigations Map GP-977, scale 1:2,500,000.

Cady, J.W., 1992, Digital topographic map centered on the Idaho batholith and Challis volcanic field, lat. 42°-47°, lon. 110°-118°: U.S. Geological Survey Geophysical Investigations Map GP-996, scale 1:1,000,000.

Cordell, Lindrith, Keller, G.R., and Hildenbrand, T.G., 1982, Complete Bouguer gravity anomaly map of the Rio Grande Rift, Colorado, New Mexico, Texas: U.S. Geological Survey Geophysical Investigations Map GP-949, scale 1:1,000,000.

Duval, J.S., Jones, W.J., Riggle, F.R., and Pitkin, J.A., 1989, Equivalent uranium map of the conterminous United States: U.S. Geological Survey Open-File Report 89-478, scale 1:2,500,000.

Duval, J.S., Jones, W.J., Riggle, F.R., and Pitkin, J.A., 1990, Potassium and thorium maps of the conterminous United States: U.S. Geological Survey Open-File Report 90-338, scale 1:2,500,000.

Duval, J.S., Riggle, F.E., Pitkin, J.A., and Jones, W.J., 1995, Potassium, uranium, and thorium maps of the conterminous United States: U.S. Geological Survey Geophysical Investigations Map GP-1010, scale 1:2,500,000.

Finn, C.A., Williams, D.L., Couch, R.W., Danes, Z.F., Pitts, G.S., Phillips, W.M., 1986, Gravity anomaly and terrain maps of the Cascade Range, California, Oregon, Washington, and British Columbia: U.S. Geological Survey Geophysical Investigations Map GP-972, scale 1:2,500,000.

Godson, R.H., compiler, 1982, Composite magnetic anomaly map of the United States, part B--Alaska and Hawaii: U.S. Geological Survey Geophysical Investigations Map GP-954-B, scale 1:2,500,000, 9 p.

Godson, R.H., 1986a, Description of magnetic tape containing Alaska magnetic data in a gridded format: National Technical Information Service Report PB86-197399, 5 p., magnetic tape.

Godson, R.H., 1986b, Description of magnetic tape containing conterminous United States magnetic data in a gridded format: National Technical Information Service Report PB86-197423, 5 p., magnetic tape.

Godson, R.H., and Schiebe, D.M., 1982, Description of magnetic tape containing conterminous United States gravity data in gridded format: National Technical Information Service Report PB82-254798, 5 p., magnetic tape. [4-km grid, as opposed to NGDC's more recent 6-km grid]

Hildenbrand, T.G., Kucks, R.P., and Johnson, R.W., Jr., 1981, Aeromagnetic map of east-central United States: U.S. Geological Survey Geophysical Investigations Map GP-948, scale 1:1,000,000.

Hildenbrand, T.G., Kucks, R.P., and Sweeney, R.E., 1983, Digital magnetic-anomaly map of central United States--Description of major features: U.S. Geological Survey Geophysical Investigations Map GP-955, scale 1:2,500,000.

Hildenbrand, T.G., Simpson, R.W., Godson, R.H., and Kane, M.F., 1982, Digital colored residual and regional Bouguer gravity maps of the conterminous United States with cut-off wavelengths of 250 km and 1000 km: U.S. Geological Survey Geophysical Investigations Map GP-953-A, scale 1:7,500,000.

Jachens, R.C., Simpson, R.W., Saltus, R.W., and Blakely, R.J., 1985, Isostatic residual gravity anomaly map of the United States (exclusive of Alaska and Hawaii): National Oceanic and Atmospheric Administration, Geophysical Data Center Map, scale 1:2,500,000.

McCafferty, A.E., 1992, Aeromagnetic maps and terrace-magnetization map centered on the Idaho batholith and Challis volcanic field, lat. 42°-47°, lon. 110°-118°: U.S. Geological Survey Geophysical Investigations Map GP-994, scale 1:1,000,000.

Phillips, J.D., Duval, J.S., and Ambroziak, R.A., 1993, National geophysical data grids--gamma-ray, gravity, magnetic, and topographic data for the conterminous United States: U.S. Geological Survey Digital Data Series DDS-9, 1 CD-ROM disk.

Saltus, R.W., and Jachens, R.C., 1995, Gravity and basin-depth maps for the Basin and Range province, western United States: U.S. Geological Survey Geophysical Investigations Map GP-1012, scale 1:2,500,000.

Simpson, R.W., Hildenbrand, T.G., Godson, R.H., and Kane, M.F., 1987, Digital colored Bouguer gravity, free-air gravity, station location, and terrain maps for the conterminous United States: U.S. Geological Survey Geophysical Investigations Map GP-953-B, scale 1:7,500,000.

Simpson, R.W., Jachens, R.C., Saltus, R.W., and Blakely, R.J., 1986, Isostatic residual gravity, topographic, and first-vertical derivative gravity maps of the conterminous United States: U.S. Geological Survey Geophysical Investigations Map GP-975, scale 1:750,000.

U.S. Geological Survey, 1986, Gravity anomaly map of the United States; Part A, Conterminous United States: U.S. Geological Survey Geophysical Investigations Map GP-964, scale 1:2,500,000.

Zeitz, Isidore, compiler, 1982, Composite magnetic anomaly map of the United States, part A--Conterminous United States: U.S. Geological Survey Geophysical Investigations Map GP-954-A, scale 1:2,500,000, 59 p.

GRAVITY, MAGNETIC, AND RADIOMETRIC DATA COMPILATIONS AND MAPS
INDIVIDUAL STATES

Gravity, magnetic, and radiometric data are being compiled for various states. A complete state folio typically consists of (1) black-and-white contour gravity, aeromagnetic, and radiometric maps printed at the scale of the state geologic map (which varies depending on the state but is usually 1:500,000, 1:750,000, or 1:1,000,000); (2) color maps at a reduced scale for the three geophysical data sets and additional derivative products; and (3) a magnetic tape of data and grids. The maps are published through the state geological survey or through the USGS. Entries without publication dates have not been published but are nearly finished at the time of this report and are included to aid the reader.

The following data tapes are available through the EROS Data Center:

> Idaho: Gravity data
> Idaho batholith: Gravity, aeromagnetic, derivative, and topographic gridded data
> Ohio: Gravity, aeromagnetic, and radiometric data
> Nevada: Gravity, aeromagnetic, and radiometric data
> Lake Superior aeromagnetic grid

Abrams, G.A., 1993, Complete Bouguer gravity anomaly map of the state of Colorado: U.S. Geological Survey Miscellaneous Field Studies Map MF-2236, scale 1:500,000.

Abrams, G.A., and Knepper, D.H., 1994, Complete Bouguer gravity anomaly, isostatic-residual gravity, horizontal gradient, and terrain maps of Colorado: U.S. Geological Survey Geophysical Investigations Map GP-1009, scale 1:1,000,000.

Bankey, Viki, and Kleinkopf, M.D., 1988, Bouguer gravity anomaly map and four derivative maps of Idaho: U.S. Geological Survey Geophysical Investigations Map GP-978, scale 1:1,000,000.

Bankey, Viki, Webring, Michael, Mabey, D.R., Kleinkopf, M.D., and Bennett, E.H., 1985, Complete Bouguer gravity anomaly map of Idaho: U.S. Geological Survey Miscellaneous Field Studies Map MF-1773, scale 1:500,000.

Bond, K. R., 1993, Complete Bouguer gravity anomaly map of Maine and vicinity: Maine Geological Survey Department of Conservation Map, scale 1:500,000.

Bond, K.R., and Duval, J.S., 199_, Aerial gamma-ray maps of the regional surficial concentrations of potassium, uranium, and thorium in West Virginia: U.S. Geological Survey Geophysical Investigations Map I-2364-I (in press).

Bond, K.R., and Duval, J.S., 199_, Aerial gamma-ray maps of the regional surficial concentrations of potassium, uranium, and thorium in Illinois: U.S. Geological Survey Geophysical Investigations Map GP-1013.

Bond, K.R., and Duval, J.S., 199_, Aerial gamma-ray maps of the regional surficial concentrations of potassium, uranium, and thorium in Utah: U.S. Geological Survey Geophysical Investigations Map GP-____, in press.

Bothner, W.A., and Kucks, R.P., 1993, Bouguer gravity anomaly maps and four derivative maps of New Hampshire, Vermont, and vicinity: U.S. Geological Survey Geophysical Investigations Map GP-1005, scale 1:250,000 and 1:500,000.

Cady, J.W., 1991, Aeromagnetic map of Alaska from lat. 65°-68°N., lon. 141°-162°W.--Color-shaded relief: U.S. Geological Survey Geophysical Investigations Map GP-992, scale 1:500,000.

Cook, K.L., Bankey, Viki, Mabey, D.R., and DePangher, Michael, 1989, Complete Bouguer gravity anomaly map of Utah: Utah Geological and Mineral Survey Map 122, scale 1:500,000.

Cordell, Lindrith, 1983, Geothermal resources of New Mexico--composite residual total intensity aeromagnetic map of New Mexico: New Mexico Energy Institute Map, clear overlay, scale 1:500,000.

Duval, J.S., 1985, Aerial radiometric contour maps of surface concentrations of uranium, potassium, and thorium in Ohio: U.S. Geological Survey Geophysical Investigations Map GP-968, scale 1:500,000.

Duval, J.S., 1987, Aerial radiometric color contour maps and composite color map of regional surface concentrations of uranium, potassium, and thorium in Ohio: U.S. Geological Survey Geophysical Investigations Map GP-966, scale 1:1,000,000.

Duval, J.S., 1988, Aerial gamma-ray contour maps of regional surface concentrations of potassium, uranium, and thorium in Nevada: U.S. Geological Survey Geophysical Investigations Map GP-982, scale 1:750,000.

Duval, J.S., 1989, Aerial gamma-ray contour maps of regional surface concentrations of uranium, potassium, and thorium, and composite-color maps of U, K, Th, and their ratios in New Mexico: U.S. Geological Survey Geophysical Investigations Map GP-980, scale 1:1,000,000.

Duval, J.S., 1989, Aerial gamma-ray color contour maps of regional surface concentrations of potassium, uranium, and thorium in New Mexico: U.S. Geological Survey Geophysical Investigations Map GP-979, scale 1:750,000.

Finn, C.A., 1984, Description of magnetic tape containing Washington state gravity anomaly data: National Technological Information Service Report USGS-GD-85-001, magnetic tape.

Finn, C.A., Phillips, W.M., and Williams, D.L., 1984, Gravity maps of the state of Washington and adjacent areas: U.S. Geological Survey Open-File Report 84-416, scale 1:250,000.

Finn, Carol, Phillips, W.M, and Williams, D.L., 1991, Gravity anomaly and terrain maps of Washington: U.S. Geological Survey Geophysical Investigations Map GP-988, scale 1:1,000,000 and 1:500,000.

Godson, R.H., Zablocki, C.J., Pierce, H.A., Frayser, J.B., Mitchell, C.M., and Sneddon, R.A., 1981, Aeromagnetic map of the Island of Hawaii: U.S. Geological Survey Geophysical Investigations Map GP-946, scale 1:250,000.

Heigold, P.C., McGinnis, L.D., Ervin, C.P., and Kucks, R.P., 1993, Simple Bouguer gravity anomaly map of Illinois: Illinois State Geological Survey Map 1, scale 1:500,000.

Hildenbrand, T.G., 1984, Complete Bouguer gravity anomaly map of Ohio: U.S. Geological Survey Geophysical Investigations Map GP-962, scale 1:500,000.

Hildenbrand, T.G., 1986, Gravity anomaly maps of Ohio: U.S. Geological Survey Geophysical Investigations Map GP-963, scale 1:1,000,000.

Hildenbrand, T.G., 1987, Filtered magnetic anomaly maps of Ohio: U.S. Geological Survey Geophysical Investigations Map GP-967, scale 1:1,000,000.

Hildenbrand, T.G., and Kucks, R.P., 1984, Residual total intensity magnetic map of Ohio: U.S. Geological Survey Geophysical Investigations Map GP-961, scale 1:500,000.

Hildenbrand, T.G., and Kucks, R.P., 1988a, Total intensity magnetic anomaly map of Nevada: Nevada Bureau of Mines and Geology Map 93A, scale 1:750,000.

Hildenbrand, T.G., and Kucks, R.P., 1988b, Filtered magnetic anomaly maps of Nevada: Nevada Bureau of Mines and Geology Map 93B, scale 1:1,000,000.

Hildenbrand, T.G., and Kucks, R.P., 1992, Filtered magnetic anomaly maps of Illinois: U.S. Geological Survey Geophysical Investigations Map GP-999, scale 1:1,000,000.

Hildenbrand, T.G., and Kucks, R.P., 1992, Filtered magnetic anomaly maps of Missouri: U.S. Geological Survey Geophysical Investigations Map GP-1000, scale 1:1,000,000.

Hildenbrand, T.G., Kucks, R.P., and Heigold, P.C., 1993, Total intensity magnetic anomaly map of Illinois, Illinois State Geological Survey Map 2, scale 1:500,000.

Jachens, R.C., and Moring, B.C., 1990, Maps of the thickness of Cenozoic deposits and the isostatic residual gravity over basement for Nevada: U.S. Geological Survey Open-File Report 90-404, scale 1:1,000,000.

Keller, G.R., and Cordell, Lindrith, 1983, Geothermal resources of New Mexico- -Bouguer gravity anomaly map of New Mexico: New Mexico Energy Institute Map, clear overlay, scale 1:500,000.

Kitchen, N.E, Langenheim, V.E., Rambo, W.L., and Griscom, Andrew, 1991, Bouguer gravity maps, rock property data, and principal facts for gravity data compiled for the island of Puerto Rico and vicinity: U.S. Geological Survey Open-File Report 91-633A-B, 21 p., diskette.

Meyers, J.F., and Saltus, R.W., 1994, Merged aeromagnetic map of interior Alaska: U.S. Geological Survey Geophysical Investigations Map GP-xxx, scale 1:500,000.

Oliver, H.W., Chapman, R.H., Biehler, Shawn, Robbins, S.L., Hanna, W.F., Griscom, Andrew, Beyer, L.A., and Silver, E.A., 1980, Gravity map of California and its continental margin: California Department of Conservation, Division of Mines and Geology Map 3, scale 1:750,000.

Roberts, C.W., and Jachens, R.C., 19__, Aeromagnetic map of California: in press.

Roberts, C.W., Jachens, R.C., and Oliver, H.W., 1990, Isostatic residual gravity map of California and offshore southern California: California Department of Conservation, Division of Mines and Geology Map 7, scale 1:750,000.

Saltus, R.W., 1988, Bouguer gravity anomaly map of Nevada: Nevada Bureau of Mines and Geology Map 94A, scale 1:750,000.

Saltus, R.W., 1989, Regional, residual, and derivative gravity maps of Nevada: Nevada Bureau of Mines and Geology Map 94B, scale 1:1,000,000.

Snyder, S.L., 1992, Aeromagnetic gridded data for New Jersey: U.S. Geological Survey Open-File Report 92-700 A-B, 11 p., 3 diskettes.

Snyder, S.L., 19__, Aeromagnetic anomaly map of New Jersey and parts of adjacent states: New Jersey Geologic Map Series 9X-X, scale 1:100,000.

SOFTWARE AVAILABLE BY ELECTRONIC COMMUNICATION

The current release of potential-field software (Phillips and others) is available by file transfer protocol (ftp) on the Internet by connecting to **musette.cr.usgs.gov** (or **136.177.80.144**).

Log in as anonymous. Change directories (cd) to **pub** (an area containing published source codes) or to **tmp** (to get source code or data you have previously arranged with a scientist to receive). Within the pub directory are several subdirectories of interest. Change directory to **pf** to access PF211.EXE (or the latest version). This file is a self-extracting archive containing source code, data, and directory structure of the potential-field software for the Microsoft DOS operating system for IBM-compatable personal computers. There is a

README file in the pf directory with further details.

The directory, pub/saltus , contains a UNIX tar (tape archive) file (hyperkit.tar) that contains the source code and documentation for HYPERMAG (Saltus and Blakely, 1993, potential fields source code, below). HYPERMAG is a UNIX-based program, and the files within hyperkit.tar file can be listed on an UNIX system by using the command "tar tvf hyperkit.tar".

The directory, pub/anderson , contains source code for W.L. Anderson's programs INVDP and INVTCI (see references for Anderson in section on electrical and electromagnetic source code).

The directory, pub/mwebring, contains source code for SAKI and MINC (see references for Webring in potential fields source code section), as well as Webring's other current publicly available software.

POTENTIAL FIELDS (GRAVITY AND MAGNETICS) SOURCE CODE

Three recent reports (Cordell and others, Grauch and others, and Phillips and others) contain numerous data reduction and data interpretation programs for either IBM-PC compatible computers or DEC VAX computers and are available on diskettes or by using anonymous ftp.

Recent source codes are commonly available on IBM-compatable diskettes within the Open-File (usually as parts B and higher of the open-file report, with part A containing written documentation). Earlier reports contain only a listing of source code. If a program is not available on diskette, a version may be available from the program's author, to whom inquiries should be directed (see listings at end of this report).

Blakely, R.J., 1977, Documentation for subroutine REDUC3, and algorithm for the linear filtering of gridded magnetic data: U.S. Geological Survey Open-File Report 77-784, 14 p.

Blakely, R.J., 1981, A program for rapidly computing the magnetic anomaly over digital topography: U.S. Geological Survey Open-File Report 81-298, 46 p. [program PFMAG3D]

Blakely, R.J., 1990, MEPDEP--A program to estimate depth to source along magnetic profiles: U.S. Geological Survey Open-File Report 90-66, 15 p.

Blakely, R.J., 1994, Potential theory in gravity and magnetic applications: Cambridge, England, Cambridge University Press, 441 p. [Appendix B contains 29 subroutines]

Bracken, R.E., 1992, AEROBMG--a base magnetometer program incorporating a method for tying aeromagnetic surveys to an established datum, in Roberts, C.A., ed.: Proceedings of Geotech '92, August 29-September 1, 1992, Denver, CO, p. 119-129.

Campbell, D.L., 1983, BASIC programs to calculate gravity and magnetic anomalies for 2 1/2-dimensional prismatic bodies: U.S. Geological Survey Open-File Report 83-154, 37 p.

Chuchel, B.A., 1985, POLYGON--An interactive program for constructing and editing the geometries of polygons using a color graphics terminal: U.S. Geological Survey Open-File Report 85-233 A-B, 91 p., 1 diskette.

Cordell, Lindrith, Phillips, J.D., and Godson, R.H., 1992, USGS potential-fields geophysics software, version 2.0: U.S. Geological Survey Open-File Report 92-18 A-G, 18 p., 6 diskettes.

Godson, R.H., 1983a, GRAVPOLY--A modification of a three-dimensional gravity modeling program: U.S. Geological Survey Open-File Report 83-346, 53 p.

Godson, R.H., 1983b, MAGPOLY--A modification of a three-dimensional magnetic modeling program: U.S. Geological Survey Open-File Report 83-345, 62 p.

Godson, R.H., Bracken, R.E., and Webring, M.W., 1988, PCCONTUR version 1.0, a microcomputer general purpose contouring program: U.S. Geological Survey Open-File Report 88-593, A--Documentation paper copy, 30 p.; B--Executable code and test data disk; C--Source code disk; D--Plot system source code and library disk.

Godson, R.H, and Mall, M.R., 1989, Potential-field geophysical programs for IBM compatible microcomputers, version 1.0: U.S. Geological Survey Open-File Report 89-197-A-F, 23 p., 5 diskettes. [almost all programs superceded by Cordell and others, above).

Godson, R.H., and Plouff, Donald, 1988, BOUGUER, version 1.0--A microcomputer gravity-terrain-correction program: U.S. Geological Survey Open-File Report 88-644-A-B, 13 p., 1 diskette.

Godson, R.H., and Webring, M.W., 1982, CONTOUR--A modification of G.I. Evendon's general purpose contouring program: U.S. Geological Survey Open-File Report 82-797, 73 p.

Grauch, V.J.S., 1984, TAYLOR--A Fortran program using Taylor series expansion for level-surface or surface-level continuation of potential-field data: U.S. Geological Survey Open-File Report 84-501, 31 p.

Grauch, V.J.S., 1986, VARMAG--A Fortran program to implement the variable-magnetization terrain-correction method for aeromagnetic data: U.S. Geological Survey Open-File Report 86-268, 52 p.

Grauch, V.J.S., Phillips, J.D., Hoover, D.B., Pitkin, J.A., Livo, K.E., and McCafferty, A.E., 1993, Materials provided at the workshop *Geophysical map interpretation on the PC*, convened April 21-22, 1993: U.S. Geological Survey Open-File Report 93-560 A-D, 238 p., 14 diskettes. [contains numerous software programs for gravity, magnetic, radiometric, and remote sensing program REMAPP version 1.03 (see LIVO, K.E.)]

Hildenbrand, T.G., 1983, FFTFIL--A filtering program based on two-dimensional Fourier analysis: U.S. Geological Survey Open-File Report 83-237, 61 p.

Jachens, R.C., and Roberts, C.W., 1981, Documentation for a Fortran program, ISOCOMP, for computing isostatic residual gravity: U.S. Geological Survey Open-File Report 81-574, 26 p.

Phillips, J.D., 1979, ADEPT--A program to estimate depth to magnetic basement from sampled magnetic profiles: U.S. Geological Survey Open-File Report 79-367, 37 p.

Phillips, J.D., 1992, TERRACE--a terracing procedure for gridded data, with FORTRAN programs and VAX command procedure, Unix C-shell, and DOS batch file implementations: U.S. Geological Survey Open-File Report 92-5 A-B, 20 p., 1 diskette.

Phillips, J.D., Duval, J.S., and Ambroziak, R.A., 1993, National geophysical data grids--gamma-ray, gravity, magnetic, and topographic data for the conterminous United States: U.S. Geological Survey Digital Data Series DDS-9, 1 CD-ROM disk. [includes potential-field software version 2.1]

Plouff, Donald, 1977, Preliminary documentation for a Fortran program to compute gravity terrain corrections based on topography digitized on a geographic grid: U.S. Geological Survey Open-File Report 77-535, 43 p.

Plouff, Donald, 1993, User documentation for GVOUTERTC/1.001, Technical Contact, Donald Plouff--Report prepared for Yucca Mountain Program Software Configuration Management System: U.S. Geological Survey Administrative Report, 18 p., 1 diskette.

Simpson, R.W., Jachens, R.C., and Blakely, R.J., 1983, AIRYROOT--A Fortran program for calculating the gravitational attraction of an Airy isostatic root out to 166.7 km: U.S. Geological Survey Open-File Report 83-883, 66 p.

Sadek, H.S., Rashad, S.M., and Blank, H.R., 1984, Spectral analysis of aeromagnetic profiles for depth estimation principles, software and practical application: U.S. Geological Survey Open-File Report 84-849, 56 p.

Saltus, R.W., and Blakely, R.J., 1993, HYPERMAG--An interactive, 2- and 2 1/2-dimensional gravity and magnetic modeling program, Version 3.5: U.S. Geological Survey Open-File Report 93-287, 39 p., 1 diskette. (also available using anonymous ftp)

Spielman, J.B., and Ponce, D.A., HANDTC, a FORTRAN program to calculate inner-zone terrain corrections: U.S. Geological Survey Open-File Report 84-777, 20 p.

Sweeney, R.E., 1990, IGRFGRID--A program for creation of a total magnetic field (International Geomagnetic Reference Field) grid representing the earth's main magnetic field: U.S. Geological Survey Open-File Report 90-45A-B.

U.S. Geological Survey, 1989, Potential-field geophysical programs for VAX 7xx computers: U.S. Geological Survey Open-File Report 89-115 A-D, 21 p., 3 diskettes. [all but a few of these programs have been updated in Cordell and others].

Wagini, Alexander, 1985, An automatic program for the interpretation of two-dimensional gravity and magnetic anomalies: U.S. Geological Survey Open-File Report 85-377, 68 p.

Webring, M.W., 1981, MINC--A gridding program based on minimum curvature: U.S. Geological Survey Open-File Report 81-1224, 41 p.

Webring, M.W., 1985, SAKI--A Fortran program for generalized linear inversion of gravity and magnetic profiles: U.S. Geological Survey Open-File Report 85-122, 104 p.

REMOTE SENSING SOURCE CODES AND PROCEDURES

The REMAPP (remote sensing array processing procedures) system is a series of programs for processing satellite and aircraft imagery, such as Landsat Multi-Spectral Scanner (MSS) and Thematic Mapper (TM), SPOT, NOAA, or other GIS (Geographical Information System) data. TM and MSS data are available from EOSAT (Earth Observation Satellite Company), NCIC (National Cartographic Information Center), or EROS Data Center (addresses at the end of this report). SPOT data are available from SPOT Image Corporation. NOAA operational polar-orbiting satellite data, such as AVHRR (Advanced Very High Resolution Radiometer) are available from the Satellite Data Services Division. Image processing routines include mathematical operations, image statistics, contrast and edge enhancements, spatial and color coordinate transformations, band ratioing, and masking. Processed imagery can be output to film, paper, or magnetic media.

Duval, J.S., 1984, Computer program useful for quality control of an image-processing laboratory: U.S. Geological Survey Open-File Report 84-218, 18 p.

Duval, J.S., 1985, Data processing programs for aerial gamma-ray data: U.S. Geological Survey Open-File Report 85-359, 83 p.

Duval, J.S., 1982, Image processing equipment and procedures: U.S. Geological Survey Open-File Report 82-534, 14 p.

Grauch, V.J.S., Phillips, J.D., Hoover, D.B., Pitkin, J.A., Livo, K.E., and McCafferty, A.E., 1993, Materials provided at the workshop *Geophysical map interpretation on the PC*, convened April 21-22, 1993: U.S. Geological Survey Open-File Report 93-560 A-D, 238 p., 14 diskettes. [contains numerous software programs for gravity, magnetic, radiometric, and remote sensing program REMAPP version 1.03.]

Hummer-Miller, Susanne, 1989, A digital mosaicking algorithm allowing for an irregular join "line": Photogrammetric Engineering and Remote Sensing, v. 55, no. 1, p. 43-47.

Hummer-Miller, Susanne, 1990, Noise removal and registration of TIMS remote sensing aircraft data: Photogrammetric Engineering and Remote Sensing, v. 56, no. 1, p. 49-53.

Livo, K.E., 1990, REMAPP PC Remote Sensing Image Processing software for MS-DOS personal computers, version 1.00: U.S. Geological Survey Open-File Report 90-88 A-E, 4 diskettes. [compatable with potential fields data]

Livo, K.E., and Gallagher, A.J., 1991, REMAPP - PC Remote Sensing Image Processing software for MS-DOS personal computers, version 2.00: U.S. Geological Survey Open-File Report 91-449 A-G, 83 p. [new data format, incompatable with potential-fields data]

Sawatzky, D.L., 1985, Programmer's guide to REMAPP, REMote sensing Array Processing Procedures: U.S. Geological Survey Open-File Report 85-231, 21 p.

Sawatsky, D.L., and Simpson, S.L., 1994, Procedure for image mosaics: National Technical Information Service Report M94-890, 10 p. and microfiche.

Simpson, S.L., 1986, Selected geological and geophysical remote sensing publications by U.S. Geological Survey authors, 1961-1984: U.S. Geological Survey Open-File Report 86-41, 60 p.

Watson, Kenneth, 1971, A computer program of thermal modeling for interpretation of infrared images: National Technical Information Service Report PB-203-578.

Watson, Kenneth, 1981, Topographic slope correction for analysis of thermal infrared images: National Technical Information Service Report PB81-211781, 14 p.

Watson, Kenneth, 1982, Radiative transfer from a homogeneous half-space, a fast algorithm solution: U.S. Geological Survey Open-File Report 82-986, 7 p.

Watson, Kenneth, 1992, A 2D FFT program for image processing with examples: U.S. Geological Survey Open-File Report 92-265, 74 p.

SHALLOW SEISMIC AND BOREHOLE GEOPHYSICAL SOURCE CODES

This report includes some shallow seismic processing programs. Programs by Ackermann and others (1982, 1983) can be obtained through Jackie Williams (address at end of this report). Coal-seismic programs are available through Bill Hasbrouck (address at the end of this report), who can help with unpublished modifications to his programs.

Ackermann, H.D., 1985, Shallow geological investigations with personal computers: Geocompuphysics, v. 36, no. 5, p. 1569-1605.

Ackermann, H.D., Pankratz, L.W., and Dansereau, D.A., 1982, A comprehensive system for interpreting seismic-refraction arrival-time data using interactive computer methods: U.S. Geological Survey Open-File Report 82-1065, 268 p.

Ackermann, H.D., Pankratz, L.W., and Dansereau, D.A., 1983, Computer program modifications of Open-File Report 82-1065; a comprehensive system for interpreting seismic-refraction arrival-time data using interactive computer methods: U.S. Geological Survey Open-File Report 83-604, 2 p. [updated for DEC PDP11-34A]

Chuchel, B.A., 1989, TURBOSEIS - An interactive program for constructing and editing models of seismic refraction traveltime data using a color-graphics terminal : U.S. Geological Survey Open-File Report 89-567 A-B, 82 p, 1 diskette.

Hasbrouck, W.P., 1979, Coal-seismic computer programs in BASIC; Part 1, Store, plot, and edit array data: U.S. Geological Survey Open-File Report 79-242, 35 p.

Hasbrouck, W.P., 1980a, Coal-seismic, desktop computer programs in BASIC; Part 2, Enter, compute, edit, and store results of downhole, inhole, and crosshole investigations: U.S. Geological Survey Open-File Report 80-669, 89 p.

Hasbrouck, W.P., 1980b, Coal-seismic, desktop computer programs in BASIC; Part 3, Compute, tabulate, and plot normal moveout time: U.S. Geological Survey Open-File Report 80-670, 21 p.

Hasbrouck, W.P., 1980c, Coal-seismic, desktop computer programs in BASIC; Part 4, Transfer, edit, and display observed data: U.S. Geological Survey Open-File Report 80-668, 46 p.

Hasbrouck, W.P., 1983a, Coal-seismic, desktop computer programs in BASIC; Part 5, Perform X-square/T-square analyses and plot normal moveout lines on a seismogram overlay: U.S. Geological Survey Open-File Report 83-350, 21 p.

Hasbrouck, W.P., 1983b, Coal-seismic, desktop computer programs in BASIC; Part 6, Develop rms velocity functions and apply mute and normal moveout: U.S. Geological Survey Open-File Report 83-341, 29 p.

Hasbrouck, W.P., 1983c, Coal-seismic, desktop computer programs in BASIC; Part 7, Display and compute shear-pair seismograms: U.S. Geological Survey Open-File Report 83-348, 41 p.

Hasbrouck, W.P., 1984a, Coal-seismic, desktop computer programs in BASIC; Part 8, Pick first arrivals and align events on screen: U.S. Geological Survey Open-File Report 84-175, 23 p.

Hasbrouck, W.P., 1984b, Coal-seismic, desktop computer programs in BASIC; Part 9, Compute static corrections using an ABC method applied to six-fold, two-way field data: U.S. Geological Survey Open-File Report 84-334, 44 p.

Hasbrouck, W.P., 1985, Coal-seismic, desktop computer programs in BASIC; part 10, Construct and apply one-dimensional synthetic seismograms: U.S. Geological Survey Open-File Report, 85-226, 99 p.

Hasbrouck, W.P., 1990a, A two-layer, multiple-coverage seismic refraction method with computer programs in BASIC to expedite its application: U.S. Geological Survey Open-File Report 90-266, 86 p.

Hasbrouck, W.P., 1990b, A computer program in BASIC for construction of two-layer, seismic refraction forward models within elevation and thickness of the upper layer change and velocities vary laterally within both layers: U.S. Geological Survey Open-File Report 90-320, 49 p.

Hasbrouck, W.P., 1990c, Computer programs in HP-9845 BASIC for modeling and interpreting multiple-layer, plane-interface shallow refraction seismics: U.S. Geological Survey Open-File Report 90-473, 56 p.

Hasbrouck, W.P., and Bailey, L.F., 1984, The Lanczos-preconditioned, folded (sinx)/x interpolator--Discussion and desktop-computer program in BASIC: U.S. Geological Survey Open-File Report 84-226, 17 p.

Haeni, F.P., Granthan, D.G., and Ellefsen, Karl, 1987, Microcomputer-based version of SIPT; a program for the interpretaion of seismic-refraction data: U.S. Geological Survey Open-File Report 87-103 A-B, 135 p., 2 diskettes.

Muller, D.C., 1985, Computer method to detect and correct cycle skipping on sonic logs, in 26th Annual Logging Symposium, Transactions: Society of Professional Well Log Analysts, Paper R, v. 1, p. 1-18.

Nelson, P.H., Clutsom, F.G., Stoddard, C.E., Kibler, J.E., and Mikesell, J.L, 1992, Branch of Geophysics well-logging system, operating manual: U.S. Geological Survey Administrative Report, 105 p.

Scott, J.H., 1977, SIPT--A seismic refraction inverse modeling program for timeshare terminal computer systems: U.S. Geological Survey Open-File Report 77-365, 108 p.

Scott, J.H., 1977, SIPB--A seismic refraction inverse modeling program for batch computer systems: U.S. Geological Survey Open-File Report 77-366, 108 p.

Scott, J.H., 1978, A computer program for borehole compensation of dual-detector density well logs: U.S. Geological Survey Open-File Report 78-515, 7 p.

Scott, J.H., 1978, A FORTRAN algorithm for correcting normal resistivity logs for borehole diameter and mud resistivity: U.S. Geological Survey Open-File Report 78-669, 12 p.

ELECTRICAL AND ELECTROMAGNETIC SOURCE CODES

The USGS has many programs for reduction of electrical and electromagnetic data collected using various methods, including Schlumberger, Slingram, magnetotellurics (MT), audiomagnetotellurics (AMT), very low frequency (VLF), time-domain electromagnetics (TDEM), and other methods. Data interpretation programs use forward and inverse modeling, digital filtering, and mathematical transforms. Also see separate listing in Appendix A.

Anderson, W.L., 1971, Application of bicubic spline functions to two-dimensional gridded data: National Technical Information Service No. PB 203 579.

Anderson, W.L, 1974, Electromagnetic fields about a finite electric wire source: National Technical Information Service report PB 238-199/4WC, 205 p.

Anderson, W.L, 1975, Improved digital filters for evaluating Fourier and Hankel transform integrals: U.S. Geological Survey Report USGS GD-75-012 available as National Technical Information Service report PB-242-800/1WC, 223 p.

Anderson, W.L, 1976a, An optimal method for evaluating a class of convolution integrals with related kernels: National Technical Information Service report, PB-251-156/6WC, 15 p.

Anderson, W.L, 1976b, Electromagnetic scattering by multiple conductors in the earth due to a plane wave source: National Technical Information Service report PB-261-183/AS, 75 p.

Anderson, W.L, 1977, Marquardt inversion of vertical magnetic field measurements from a grounded wire source, National Technical Information Service report, PB-263-924/AS, 76 p.

Anderson, W.L, 1979a, Numerical integration of related Hankel transforms of orders 0 and 1 by adaptive digital filtering: Geophysics, v. 44, no. 7, p. 1287-1305.

Anderson, W.L, 1979b, Program IMSLPW: Marquardt inversion of plane-wave frequency soundings: U.S. Geological Survey Open-File Report 79-586, 37 p.

Anderson, W.L, 1979c, Program MARQDCLAG: Marquardt inversion of DC Schlumberger soundings by lagged-convolution: U.S. Geological Survey Open-File Report 79-1432, 58 p.

Anderson, W.L, 1979d, Program MARQLOOPS: Marquardt inversion of loop-loop frequency soundings: U.S. Geological Survey Open-File Report 79-240, 75 p.

Anderson, W.L, 1979e, Programs TRANS-HCLOOP and TRANS-HZWIRE: Calculation of transient horizontal coplanar loop soundings and transient wire-loop soundings: U.S. Geological Survey Open-File Report 79-590, 46 p.

Anderson, W.L, 1980a, Program IMSLEXY: Marquardt inversion of Ex and Ey frequency soundings from a grounded wire source: U.S. Geological Survey Open-File Report 80-1073, 87 p.

Anderson, W.L, 1980b, Program MARQHXY: Marquardt inversion of Hx and Hy frequency soundings from a grounded wire source: U.S. Geological Survey Open-File Report 80-901, 111 p.

Anderson, W.L, 1981, Calculation of transient soundings for a central induction loop system (Program TCILOOP): U.S. Geological Survey Open-File Report 81-1309, 80 p.

Anderson, W.L, 1982a, Adaptive nonlinear least-squares solution for constrained or unconstrained minimization problems (Subprogram NLSOL): U.S. Geological Survey Open-File Report 82-68, 65 p.

Anderson, W.L, 1982b, Calculation of transient soundings for a coincident loop system (Program TCOLOOP): U.S. Geological Survey Open-File Report 82-378, 77 p.

Anderson, W.L, 1982c, Fast evaluation of squared-Hankel transforms of order-1 by linear digital filtering (Subprogram SQJ1): U.S. Geological Survey Open-File Report 82-224, 13 p.

Anderson, W.L, 1982d, Fast Hankel transforms using related and lagged convolutions: Association for Computing Machinery Transactions on Mathematical Software, v. 8, no. 4, p. 344-368.

Anderson, W.L, 1982e, Nonlinear least-squares inversion of transient soundings for a central induction loop system (Program NLSTCI): U.S. Geological Survey Open-File Report 82-1129, 85 p.

Anderson, W.L, 1982f, Nonlinear least-squares inversion of transient soundings for a coincident loop system (Program NLSTCO): U.S. Geological Survey Open-File Report 82-1064, 81 p.

Anderson, W.L, 1983, Fourier cosine and sine transforms using lagged convolutions in double-precision (Subprograms DLAGFO/DLAGF1): U.S. Geological Survey Open-File Report 83-320, 38 p.

Anderson, W.L, 1984a, A general interface for producing forward solution programs (Subprogram FWDSOL): U.S. Geological Survey Open-File Report 84-348, 43 p.

Anderson, W.L, 1984b, Computation of Green's tensor integrals for three-dimensional electromagnetic problems using fast Hankel transforms: Geophysics, v. 49, no. 10, p. 1754-1759.

Anderson, W.L, 1984c, Fast evaluation of Hr and Hz field soundings near a rectangular loop source on a layered earth (Program HRZRECT): U.S. Geological Survey Open-File Report 84-257, 80 p.

Anderson, W.L, 1985a, Computation of transient soundings for the time-derivative of Hz near a rectangular loop source on a layered earth (Program FWDTHZ): U.S. Geological Survey Open-File Report 85-270, 44 p.

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Anderson, W.L, 1989, A hybrid fast Hankel transform algorithm for electromagnetic modeling: Geophysics, v. 54, no. 2, p. 263-266.

Anderson, W.L, 1989, Nonlinear least-squares inversion of infinite line source data (program NLSINF): U.S. Geological Survey Open-File Report 89-555, 30 p.

Anderson, W.L, 1992, Inversion of plane-wave electromagnetic data for layered earth models using a graphical user interface: U.S. Geological Survey Open-File Report 92-518 A-B, 28 p., 1 diskette.

Anderson, W.L, 1992, Interactive inversion of dipole loop-loop electromagnetic data for layered earth models using numerical integrating and complex image theory: U.S. Geological Survey Open-File Report 92-553 A-B, 42 p., 1 diskette. [available as INVDP on anonymous ftp]

Anderson, W.L, 1993, Interactive inversion of transient electromagnetic data for a central-induction loop over layered earth models: U.S. Geological Survey Open-File Report 93-234 A-B, 33 p., 1 diskette. [available as INVTCI on anonymous ftp]

Anderson, W.L., and Kauahikaua, J., 1979, Program MARQ-TRANS-HCLOOP: Marquardt inversion of transient horizontal coplanar loop soundings: U.S. Geological Survey Open-File Report 79-773, 75 p.

Anderson, W.L., and Smith, B.D., 1984, Nonlinear least-squares inversion of transient induced polarization data (Program NLSTIP): U.S. Geological Survey Open-File Report 84-514, 63 p.

Anderson, W.L., and Smith, B.D., 1986, Nonlinear least-squares inversion of frequency-domain induced polarization data (Program NLSIP): U.S. Geological Survey Open-File Report 86-280, 33 p.

Bisdorf, R.J., 1980, Hewlett-Packard 9845 computer programs to compute Hankel transforms by convolution: U.S. Geological Survey Open-File Report 80-806, 26 p.

Bisdorf, R.J., and Zohdy, A.A.R., 1990, IBM-PC programs for the automatic processing and interpretation of Wenner sounding curves in QuickBASIC 4.0: U.S. Geological Survey Open-File Report 90-211 A-B, 55 p., 1 diskette.

Bradley, Jerry, and Raab, Paul, 1983, SIROTEM II IEEE 488-1978 interface and controlling software: U.S. Geological Survey Open-File Report 83-249, 17 p.

Daniels, J.J., 1977, A computer program to calculate the resistivity and induced polarization response for a three-dimensional body in the presence of buried electrodes: U.S. Geological Survey Open-File Report 77-153, 74 p.

Fitterman, D.V., 1981, Geomagnetic data utility programs for the HP9640A: U.S. Geological Survey Open-File Report 81-360, 195 p.

Fitterman, D.V., 1982, Computer program SPDIKE for calculation of self-potential anomalies near vertical dikes: U.S. Geological Survey Open-File Report 82-470, 45 p.

Fitterman, D.V., and Anderson, W.L., 1987, Effect of transmitter turnoff time on transient soundings: Geoexploration, v. 24, p. 131-146.

Frischknecht, F.C., Muth, L., Grette, R., Buckley, T., and Kornegay, B., 1983, Geophysical methods for locating abandoned wells: U.S. Geological Survey Open-File Report 83-702, 211 p. [program CASING included]

Grantham, D.G., Ellefsen, Karl, and Haeni, F.P., 1987, Forward-modeling computer program for the inductive electromagnetic ground-conductivity method--EM34.FOR: U.S. Geological Survey Open-File Report 87-213-A, 43 p.

Grantham, D.G., Haeni, F.P., and Mazzaferro, D.L., 1986, Forward modeling computer program for the very low frequency, radio-wave, terrian-resistivity electromagnetic method--VLF.BAS: U.S. Geological Survey Open-File Report 86-407W, 31 p.

Grover, T.P., 1992, Data acquisition system for magnetotellurics: U.S. Geological Survey Open-File Report 92-569, 29 p.

Kauahikaua, J.P., 1980, Program MQLVTHXYZ--computer inversion of three-component, time-domain, magnetic-field sounding data generated using an electric wire source: U.S. Geological Survey Open-File Report 80-1159, 109 p.

Kauahikaua, J.P., and Anderson, W.L., 1977, Calculation of standard transient and frequency sounding curves for a horizontal wire source of arbitrary length: National Technical Information Service report PB-274-119/7WC.

Kauahikaua, J.P., and Anderson, W.L., 1979, Programs EMCUPL and SCHCOPL: Computation of electromagnetic coupling on a layered halfspace with complex conductivities: U.S. Geological Survey Open-File Report 79-1430, 91 p.

Kauahikaua, J.P., and Anderson, W.L., 1980, Program MQLVEMCPL--Marquardt inversion of electromagnetic coupling data for a layered halfspace model with complex conductivities: U.S. Geological Survey Open-File Report 80-1158, 86 p.

SPECTROSCOPY SOURCE CODES AND DIGITAL LIBRARIES

The USGS maintains a spectroscopy laboratory under the direction of Roger Clark. His array processing software (Clark, 1980) is geared toward processing large amounts of spectrophotometric astronomical data, but it can also be used for general one-dimensional array processing. More information, copies of the program, and a user's manual may be obtained by contacting Clark (address at the end of this report).

Clark, R.N., 1980, A large-scale interactive one-dimensional array processing system: Astronomical Society of the Pacific Publications, v. 92, p. 221-224.

Clark, R.N., 1993, SPECtrum Processing Routines User's Manual Version 3 (program SPECPR) : U.S. Geological Survey Open-File Report 93-595, 210 p.

Clark, R.N., Swayze, G.A., King, T.V.V., Gallagher, Andrea, and Calvin, W.M., 1993, The U.S. Geological Survey Spectral Library--Version 1: 0.2 and 3.0 μm: U.S. Geological Survey Open-File Report 93-592, 1,237 p.

Livo, K.E., Clark, R.N., and Knepper, D.H., Jr., 1993, SPVIEW - spectral plot program for accessing the USGS digital library database with MS-DOS personal computers--version 1.00: U.S. Geological Survey Open-File Report 93-593 A-B, 29 p., 3 diskettes.

Theisen, A.F., 1985, Computer graphics--Mini-computer results from a micro: U.S. Geological Survey Open-File Report 85-675, 9 p.

Theisen, A.F., 1989, Porting the excitation-emission-matrix 3-D plotting program from Applesoft BASIC to IBM-compatable GW-BASIC: U.S. Geological Survey Open-File Report 89-312, 23 p.

Theisen, A.F., and Hemphill, W.R., 1985, Microcomputers in the luminescence laboratory--A technique for automating spectrometers: American Laboratory, v. 17, no. 9, p. 166-171.

ADDRESSES FOR AGENCIES MENTIONED IN REPORT

New Publications of U.S. Geological Survey
582 National Center
Reston, VA 22092

U.S. Geological Survey
Open-File Services Section   MS 902
Box 25425, Federal Center
Denver, CO 80225   (303) 236-7476
            FAX: (303) 236-1972

EROS Data Center
Data Services Officer
Sioux Falls, SD 57198
Gravity and magnetic data: (605) 594-6507
Remote sensing data: (605) 594-6151

Earth Science Information Center
U. S. Geological Survey
507 National Center
Reston, VA 22092   (703) 860-6045

National Climatic Data Center
Satellite Data Services Division
Princeton Executive Square, Room 100
Washington, DC 20233 (301-763-8400)

National Geophysical Data Center
NOAA, Code E/GC4325 Broadway
Boulder, CO 80303
magnetic or gravity data:
Ronald Buhmann   (303)-497-6128

National Technical Information Service
U.S. Department of Commerce
5285 Port Royal Rd.
Springfield, VA 22161   (703) 487-4650

EOSAT (Earth Observation Satellite Company)
4300 Forbes Boulevard
Lanham, MD 20706   1-800-344-9933

SPOT Image Corporation
1897 Preston White Drive
Reston, VA 22091-4326   (703) 620-2200

U.S. Geological Survey
Branch of Geophysics
Box 25046, MS 964, Federal Center
Denver, CO 80225   (303) 236-1212

USGS Center for Environmental Geochemistry
        and Geophysics (CEGG)
Box 25046, MS 973, Denver Federal Center
Denver, CO 80225
Cathy Ager, Information Officer, 303-236-3301

ELECTRONIC-MAIL ADDRESSES FOR USGS AUTHORS (current employees only):

AUTHOR	Internet address[1]	phone (notes)
Viki Bankey:	viki@musette.cr.usgs.gov	303-236-1348
Bob Bisdorf:	rbisdorf@musette.cr.usgs.gov	
Rick Blakely:	blakely@gauss.wr.usgs.gov	
Kevin Bond	kbond@bgrdg1.er.usgs.gov	
Rob Bracken:	rbracken@musette.cr.usgs.gov	
Dave Campbell:	davec@musette.cr.usgs.gov	
Bruce Chuchel:	chuchel@mojave.wr.usgs.gov	
Roger Clark:	rclark@speclab.cr.usgs.gov	303-236-1332 spectroscopy
Joe Duval:	jduval@gaviao.cr.usgs.gov	
Karl Ellefsen:	ellefsen@musette.cr.usgs.gov	
Dave Fitterman	fitter@musette.cr.usgs.gov	
V.J.S. (Tien) Grauch:	tien@musette.cr.usgs.gov	
Bill Hasbrouck:	wph@musette.cr.usgs.gov	303-236-1327 seismic
Tom Hildenbrand:	tom@laplace.wr.usgs.gov	
Pat Hill:	pathill@musette.cr.usgs.gov	303-236-1343 potential fields general information
Bob Jachens:	jachens@fourier.wr.usgs.gov	
Eric Livo:	elivo@corona.cr.usgs.gov	303-236-1388 remote sensing
Doug Muller	dmuller@musette.cr.usgs.gov	
Jeff Phillips:	jeff@musette.cr.usgs.gov	303-236-1206 potential fields programs
Don Plouff, (retired)	plouff@mojave.wr.usgs	
Rick Saltus:	saltus@musette.cr.usgs.gov	
Bob Simpson:	simpson@gold.wr.usgs.gov	
Steve Snyder:	ssnyder@bgrdg1.er.usgs.gov	
Ron Sweeney:	rsweeney@musette.cr.usgs.gov	
Ken Watson	kwatson@corona.cr.usgs.gov	
Mike Webring:	mwebring@musette.cr.usgs.gov	
Jackie Williams:	jackie@musette.cr.usgs.gov	303-236-1203 seismic programs
Adel Zohdy	azohdy@musette.cr.usgs.gov	

[1]IP computer Internet address equivalents
musette:	136.177.80.14
corona:	136.177.80.4
speclab:	136.177.80.5
mojave:	130.118.4.68
gauss:	130.118.4.62
laplace:	130.118.4.63
fourier:	130.118.4.64
gold:	130.118.4.57

APPENDIX A : EM Program List of Walter L. Anderson

The enclosed list contains electromagnetic (EM) source codes currently available from the U.S. Geological Survey. To obtain the Fortran source code of any program(s) listed, selected files may be read over "internet" using anonymous ftp, after contacting Viki Bankey. Alternately, an MS-DOS floppy diskette can be sent, provided only a few programs are requested. (Previously, a DEC VAX/VMS generated magnetic tape could be used, but this option is no longer available.)

These programs were mostly developed and tested on a VAX/VMS computer system (but note 3, below). Any updates to the codes since formal publication will be included in the files and noted in the form of "VAX Help Notes", if it applies to a requested VAX program. VAX Help Notes are short summaries of new parameter definitions and/or changes to the original published program. Corresponding USGS or NTIS program documentation reports may be obtained at nominal page charges by contacting the appropriate organization.

NOTATIONS & OTHER INFORMATION (*Please read before making any request*):

1. All program reference numbers ending in "v" (e.g., 004v) are later VAX-versions of the corresponding REF numbers without a suffix. The VAX-version program NAME may or may not differ from the original published program; also, the VAX-version may contain updates not included in the published non-VAX versions. All updates will be noted in a "VAX Help Note" when appropriate.

2. A forward (FWD) program series is easily obtained by interfacing any NLS-inversion program with subprogram FWDSOL (see REF 028). Thus, a stand-alone FWD-program will contain the same updates as in the current NLS-inversion program; the original *non*-FWD forward programs will not necessarily contain the latest updates as in the corresponding NLS-inversion program. See REF 028 for more information on creating FWD-programs from NLS-programs (or conversely); also, see REF 018 on the general adaptive nonlinear least-squares subprogram NLSOL2 used in all NLS-programs.

    NOTE: Most of the original *non*-FWD forward programs are now considered obsolete, but are still available if requested. Whenever any NLS-inversion program is requested, the corresponding FWD-program will also be included; hence, FWD-programs are not specified in the EM Program List along with the corresponding NLS-inversion program.

3. One HP/UNIX version program is included (REF 35). Three IBM/DOS-compatible PC programs are listed in REFs 036, 037, and 038. The DOS programs require the RPlot (TM) Scientific Graphics package, available from RSoft Inc., phone (914) 734-2665 or FAX (914) 736-9823.

REF NO.	PROGRAM NAME	TITLE/PURPOSE/SCOPE	NUMERICAL METHODS	DOCUMENTATION AVAILABLE	SOURCE-CODE:MACHINE (OPERATING SYSTEM)	PROGRAM CLASSIFICATION
001	EMFIN4	EM fields about a finite electric wire source. Computes all E,H fields for layered models in freq. or time domains.	Numerical integration by convolution or Gaussian quadrature.	NTIS Report PB-238-199 (1974) Rev. 1977	Fortran-IV:HONEYWELL- 68/80 (Multics)	Forward modeling
001v	EMFIN4	"	"	VAX Help Notes	Fortran-77:VAX-11/780 (VMS)	Forward modeling
002v	HANKEL/ FOURIER PACKAGE	Improved digital filters for evaluating Hankel and Fourier transforms.	Numerical integration by convolution and lagged convolution.	NTIS Report PB-242-800 (1975)	Fortran-77:VAX-11/780 (VMS)	Subroutine package
003	EMLOOPS	EM fields for loop-loop freq. forward solutions for layered models.	Numerical integration by related convolution.	VAX Help Notes	Fortran-77:VAX-11/780 (VMS)	Forward modeling
004	MARQHZP	Inversion of Hz- freq. soundings from a finite wire source (or electric dipole).	Nonlinear least-squares using convolution (or Gaussian quadrature).	NTIS Report PB-263-924 (1977) Rev. 1979	Fortran-IV:HONEYWELL 68/80 (Multics)	Inverse modeling
004v	NLSHZ	"	"	VAX Help Notes	Fortran-77:VAX-11/780 (VMS)	Inverse modeling
005	SCATPW2	EM scattering by multiple conductors in a halfspace for plane wave source and 2D bodies.	Integral equation approx. and numerical integration by convolution.	NTIS Report PB-261-183 (1976)	Fortran-IV:HONEYWELL- 68/80 (Multics)	Forward modeling
006	SCATLN2	EM scattering by multiple conductors in a halfspace for a line source and 2D bodies.	Integral equation approx. and numerical integration by convolution.	GEOPHYSICS, v.36,no.1, p.101-131 (Feb 1971)	Fortran-IV:HONEYWELL- 68/80 (Multics)	Forward modeling
007	MARQ- LOOPS	Inversion of loop-loop frequency soundings for 5 loop types and/or Schlumberger soundings.	Nonlinear least-squares using num. integration by related convolution.	USGS Open-File Report 79-240 (1979)	Fortran-IV:HONEYWELL- 68/80 (Multics)	Inverse modeling
007v	NLS- LOOP3	"	"	VAX Help Notes	Fortran-77:VAX-11/780 (VMS)	Inverse modeling
008	TRANS- HCLOOP/ HZWIRE	Transient horiz. coplanar loop-loop / wire-loop forward solutions for layered models.	Numerical integration by lagged convolution and cubic splines.	USGS Open-File Report 79-590 (1979)	Fortran-IV:HONEYWELL- 68/80 (Multics)	Forward modeling

REF NO.	PROGRAM NAME	TITLE/PURPOSE/SCOPE	NUMERICAL METHODS	DOCUMENTATION AVAILABLE	SOURCE-CODE:MACHINE (OPERATING SYSTEM)	PROGRAM CLASSIFICATION
008v	THCLOOP/ THZWIRE	"		VAX Help Notes	Fortran-77:VAX-11/780 (VMS)	Forward modeling
009	IMSLPW	Inversion of MT/AMT plane wave frequency soundings (1D layered models).	Nonlinear least-squares.	USGS Open-File Report 79-586 (1979)	Fortran-IV:HONEYWELL-68/80 (Multics)	Inverse modeling
009v	NLSPW	"	"	VAX Help Notes	Fortran-77:VAX-11/780 (VMS)	Inverse modeling
010	TRANS-PACKAGE	Computes transient soundings for horizontal finite wire source for all E,H fields over layered models.	Numerical integration by lagged convolution and cubic splines.	NTIS Report PB-274-119 (1977) Rev. 1979	Fortran-IV:HONEYWELL-68/80 (Multics)	Forward modeling
011	MARQ-TRANS-HCLOOP	Inversion of transient horiz. coplanar loop-loop soundings.	Nonlinear least squares using lagged convolution and cubic splines.	USGS Open-File Report 79-773 (1979)	Fortran-IV:HONEYWELL-68/80 (Multics)	Inverse modeling
011v	NLSTHC	"	"	VAX Help Notes (VMS)	Fortran-77:VAX-11/780	Inverse modeling
012	ZHANKS	Numerical integration of related Hankel transforms of orders 0 and 1 by adaptive digital filtering.	Numerical integration by convolution for related transforms.	GEOPHYSICS, v.44,no.7, p.1287-1305 (July 1979)	Fortran-IV:HONEYWELL-68/80 (Multics)	Subroutine package
012v	ZHANKS	"	"	"	Fortran-77:VAX-11/780 (VMS)	Subroutine package
013	MARQ-DCLAG	Inversion of DC schlumberger soundings by lagged convolution.	Nonlinear least-squares using lagged convolution and cubic splines.	USGS Open-File Report 79-1432 (1979)	Fortran-IV:HONEYWELL-68/80 (Multics)	Inverse modeling
013v	NLSDCLAG	"	"	VAX Help Notes	Fortran-77:VAX-11/780 (VMS)	Inverse modeling
014	EMCUPL/ SCHCOPL	EM coupling on a layered halfspace with complex conductivities (general arrays and Schlumberger).	Numerical integration by lagged convolution, adaptive quadrature, and splines.	USGS Open-File Report 79-1430 (1979) Rev. 1984 VAX Help	Fortran-77:VAX-11/780 (VMS)	Forward modeling
015	MARQHXY	Inversion of Hx and Hy frequency soundings from a finite wire source.	Nonlinear least-squares using related convolution.	USGS Open-File Report 80-901 (1980)	Fortran-IV:HONEYWELL-68/80 (Multics)	Inverse modeling

REF NO.	PROGRAM NAME	TITLE/PURPOSE/SCOPE	NUMERICAL METHODS	DOCUMENTATION AVAILABLE	SOURCE-CODE:MACHINE (OPERATING SYSTEM)	PROGRAM CLASSIFICATION
015v	NLSHXY	"	"	VAX Help Notes	Fortran-77:VAX-11/780 (VMS)	Inverse modeling
016	IMSLEXY	Inversion of Ex and Ey frequency soundings from a finite wire source.	Nonlinear least-squares using related convolution.	USGS Open-File Report 80-1073 (1980)	Fortran-IV:HONEYWELL- 68/80 (Multics)	Inverse modeling
016v	NLSEXY	"	"	VAX Help Notes	Fortran-77:VAX-11/780 (VMS)	Inverse modeling
017	TCILOOP	Transient soundings for central-induction loop; forward solutions for layered models.	Numerical integration by lagged convolution and cubic splines.	USGS Open-File Report 81-1309 (1981)	Fortran-77:VAX-11/780 (VMS)	Forward modeling
017d	DTCILOOP	" (in double-precision)	"	VAX Help Notes	Fortran-77:VAX-11/780 (VMS)	Forward modeling
018	NLSOL2	Adaptive nonlinear least-squares for constrained, unconstrained general nonlinear minimization problems.	Adaptive Hessian approximation for general nonlinear least-squares.	USGS Open-File Report 82-68 (1982)	Fortran-77:VAX-11/780 (VMS)	Subroutine Package
019	SQJ1	Fast evaluation of squared-Hankel transforms of order-1.	Numerical integration by convolution.	USGS Open-File Report 82-224 (1982)	Fortran-77:VAX-11/780 (VMS)	Subroutine
020	TCOLOOP	Transient soundings for coincident loop system; forward solutions for layered models.	Numerical integration by lagged convolution and cubic splines.	USGS Open-File Report 82-378 (1982)	Fortran-77:VAX-11/780 (VMS)	Forward modeling
021	NLSTCO	Inversion of transient soundings using a coincident loop system for layered models.	Nonlinear least-squares using lagged convolution and cubic splines.	USGS Open-File Report 82-1064 (1982)	Fortran-77:VAX-11/780 (VMS)	Inverse modeling
022	NLSTCI	Inversion of transient soundings using a central induction loop system for layered models.	Nonlinear least-squares using lagged convolution and cubic splines.	USGS Open-File Report 82-1129 (1982)	Fortran-77:VAX-11/780 (VMS)	Inverse modeling
023	FINEGRID	2D-bicubic spline fine-grid interpolation prior to smooth contouring (with subgrid options)	Bicubic splines over rectangular data grids.	NTIS Report PB-203-579 (1971). Also VAX Help Notes	Fortran-77:VAX-11/780 (VMS)	Utility Package

REF NO.	PROGRAM NAME	TITLE/PURPOSE/SCOPE	NUMERICAL METHODS	DOCUMENTATION AVAILABLE	SOURCE-CODE:MACHINE (OPERATING SYSTEM)	PROGRAM CLASSIFICATION
024	SECDER	2nd-vertical derivative grid using FINEGRID's bicubic spline output (also gradient grid)	Bicubic splines over rectangular data grids and Laplace's eq.	NTIS Report PB-203-579 (1971). Also VAX Help Notes	Fortran-77:VAX-11/780 (VMS)	Utility Package
025	HANKEL/ DHANKL	Fast Hankel transforms using related & lagged convolutions (single/ double precision)	Numerical integration by related & lagged convolution methods	ACM Trans.Math. Software, v.8, no.4, p.344-368 (Dec 1982)	Fortran-77:VAX-11/780 (VMS)	Subroutine package
026	DLAGF0/ DLAGF1	Fourier cosine/sine transforms (in double-precision)	Numerical integration by lagged convolution	USGS Open-File Report 83-320 (1983)	Fortran-77:VAX-11/780 (VMS)	Subroutine Package
027	DTHCLOOP	Transient horiz. coplanar loop-loop forward models (double-precision THCLOOP in REF 008v)	Numerical integration by lagged convolution	VAX Help Notes	Fortran-77:VAX-11/780 (VMS)	Forward modeling
028	FWDSOL	General interface for producing forward solution programs	Uses NLSOL2 (REF 018) subprogram requirements	USGS Open-File Report 84-348 (1984)	Fortran-77:VAX-11/7S0 (VMS)	Subroutine Package
029	HRZRECT	Freq. Hr, Hz soundings near a rectangular loop on a layered earth	Numerical integration by lagged convolution and cubic splines.	USGS Open-File Report 84-257 (1984)	Fortran-77:VAX-11/780 (VMS)	Forward modeling
030	NLSTIP	Inversion of transient induced polarization data	Nonlinear least-squares using convolution and/or numerical integration.	USGS Open-File Report 84-514 (1984)	Fortran-77:VAX-11/780 (VMS)	Inverse modeling
031	FWDTHZ	Transient Hz soundings near a rectangular loop on a layered earth	Numerical integration by lagged convolution and cubic splines.	USGS Open-File Report 85-270 (1985)	Fortran-77:VAX-11/780 (VMS)	Forward modeling
032	NLSIP	Inversion of frequency induced polarization data	Nonlinear least-squares	USGS Open-File Report 86-280 (1986)	Fortran-77:VAX-11/780 (VMS)	Inverse modeling
033	NLSBPBP	Inversion of bipole-bipole direct-current data	Nonlinear least-squares using lagged convolution	USGS Open-File Report 87-95 (1987)	Fortran-77:VAX-11/780 (VMS)	Inverse modeling
034	HYBFHT/ HY2FHT (+DOC file)	Hybrid fast Hankel transform by filtering and quadrature (single/ double precision)	Numerical integration by related & lagged convolution and quadrature methods	GEOPHYSICS v.54,no.2, p.263-266 (Feb 1989)	Fortran-77:VAX-11/780 (VMS)	Subroutine package

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REF NO.	PROGRAM NAME	TITLE/PURPOSE/SCOPE	NUMERICAL METHODS	DOCUMENTATION AVAILABLE	SOURCE-CODE:MACHINE (OPERATING SYSTEM)	PROGRAM CLASSIFICATION
035	NLSINF/ FWDINF	Inversion of infinite line source data /or forward soundings for infinite line source	Numerical integration by lagged convolution	USGS Open-file Report 89-555 (1989)	Fortran-77:HP-9000 (Unix)	Inverse/Forward modeling
036	INVPW	Inversion of plane-wave EM data for 1-D models using a graphical user interface (Version 1.0)	Nonlinear least-squares.	USGS Open-file Report 92-518-A Disk: 92-518-B (1992)	Fortran-77:386 PC (MS-DOS)	Inverse and Forward modeling
037	INVDP	Interactive inversion of dipole loop-loop EM data for 1-D models. (Version 1.0)	Nonlinear least-squares using num. integration and complex image theory.	USGS Open-file Report 92-553-A Disks: 92-553-B (1992)	Fortran-77:386 PC (MS-DOS)	Inverse and Forward modeling
038	INVTCI	Interactive inversion of transient central-induction loop EM data for 1-D models (Ver 1.0)	Nonlinear least-squares using lagged convolution and cubic splines.	USGS Open-file Report 93-234-A Disk: 93-234-B (1993)	Fortran-77:386 PC (MS-DOS)	Inverse and Forward modeling

APPENDIX B: HAND-HELD CALCULATOR PROGRAMS BY D.L. CAMPBELL

Campbell, D.L., Ballantyne, E.J., Jr., Mentemeier, S., and Wiggins, R., eds., 1981, Society of Exploration Geophysicists manual of geophysical hand-calculator programs; Hewlett Packard Volume: Society of Exploration Geophysicists, Tulsa, Oklahoma.

This publication contains the following programs:

Campbell, D.L., 1981, Horizontal loop electromagnetic topographic correction: program EM 1, 7 p.

Campbell, D.L., 1981, MT inversion (Bostick's algorithm): program EM 8, 8 p.

Campbell, D.L., 1981, Bouguer reduction--regional: a portion of a package entitled GRAV 1, 6 p.

Campbell, D.L., 1981, Gravity--2-D anomaly: program GRAV 5, 5 p.

Campbell, D.L., 1981, Gravity terrain correction: program GRAV 8, 5 p.

Campbell, D.L., 1981, Susceptibility-percent magnetite: program MAG 1, 4 p.

Campbell, D.L., 1981, Magnetic profiles over dikes: program MAG 4, 7 p.

Campbell, D.L., 1981, Magnetics: 2-D anomaly: program MAG 7, 5 p.

Campbell, D.L., 1981, Digital convolution: program MISC 3, 4 p.

Campbell, D.L., 1981, Gamma-ray spectrometer data reduction: program RAD 1, 4 p.

Campbell, D.L., 1981, < 4 dipping seismic refractors: interpretation, and < 4 dipping seismic refractors--design: two programs included as program package SEIS 13 C, 15 p.

Campbell, D.L., and Findhammer, T.L.R., 1981, Geometric factors for resistivity surveys: program RIP 1, 9 p.

Zohdy, A.A.R., and Campbell, D.L., 1981, Theoretical Wenner and Schlumberger vertical electrical soundings: program RIP 4, 8 p.

Ballantyne, E.J., Jr., Campbell, D.L., Mentemeier, S., and Wiggins, R., eds., 1981, Society of Exploration Geophysicists manual of geophysical hand-calculator programs; Texas Instruments Volume: Society of Exploration Geophysicists, Tulsa, Oklahoma.

This publication contains the following programs:

Campbell, D.L., 1981, MT planewave--horizontal layers: program EM 7, 6 p.

Campbell, D.L., 1981, Bouguer reduction--regional: program GRAV 1, 9 p.

Campbell, D.L., 1981, Gravity terrain correction: program GRAV 8, 6 p.

Campbell, D.L., and Haines, D.N., 1981, Magnetic profiles over dikes: program MAG 4, 10 p.

Campbell, D.L., and Haines, D.N., 1981, Magnetics: 2-D anomaly: program MAG 7, 12 p.

Haines, D.N., and Campbell, D.L., 1981, Gravity: 2-D anomaly: program 5B, 9 p.

Haines, D.N., and Campbell, D.L., 1981, Theoretical Wenner and Schlumberger vertical electric soundings: program RIP 5, 15 p.