Subject Index

A

Advanced sensor systems, for investigating surficial deposits for surface mining operations, 133, 136

Aerial photography, 1

- characteristics of, for remote sensing, 72-73
- for construction and postconstruction monitoring in pipeline investigations, 13-14
- cost-effectiveness of, 70
- for the detection of solution features, 108, 110
- Aerial Photo Summary Record System (APSRS), 82
- Agricultural Stabilization and Conservation Service, 241

Airborne Goodyear electronic mapping system/synthetic-aperture radar, comparison of, with satellite-borne Seasat/ synthetic-aperture radar imagery, 163-182

- Airborne imagery, for monitoring river crossings and bank stability, 14
- Airborne sensing, application of, to soil moisture studies, 18
- Airborne thermography, 3
- Alluvial dolines, 103
- American National Standards Institute (ANSI), 230
- American Society for Photogrammetry and Remote Sensing, 258
- Archived imagery, costs of, 2
- Archived multipled data sets, value of, 163-182
- Argos satellite system, 207-209, 218-219
- ASTM Committee D-18, 1, 4
- Australia, Bowen Basin, evaluation of geotechnical parameters in, 123-124, 129
- Automation of interface between remote-sensing data and computer-assisted design, 179, 225

B

- Bank stability, assessment of, in pipeline investigations, 14
- Base maps, characteristics of, for remote sensing, 77
- Basement-block hypothesis, in lineament analysis, 55, 67
- Bowen Basin (Queensland, Australia)
 - evaluation of geotechnical parameters in geological background, 123-124 structural lineaments, 124, 129
- tertiary deposits, 129
- Box gullies, 19
- Bureau of Land Management (BLM), 245

С

- Canada
 - application of remote sensing data to geotechnical investigations in Ontario, 9-42

sources of remote sensing data in, 257-258 Carbonate rock

geotechnical significance of soluble forms of metastable forms of solution features, 103-104

forms of solution features, 100

geotechnical problems, 104-105

- locating potential ground subsidence in, 99-118
- China, estimation of reservoir submerging losses using CIR aerial photographs at Ertan hydropower station, 89-98
- Co-estimation, 141
- Co-kriging, 2
 - application of, to analyzing multiple remote sensing data sets, 138-150
- Collapse dolines, 104
- Color-infrared (CIR) film (see also Spring color-infrared photography)
 - estimation of reservoir submerging losses using, 89-98

use of, for aerial photography, 72-73 uses of, 71

Computer-assisted design, automation of interface between remote sensing data and, 179, 225

Copper cable, long-term stability of, near nuclear waste, 217

Cross-correlation voltage, 153

D

Data set procurement and merging, 82-84

Data transmission (see also Remote data transmission systems)

in geotechnical applications, 214

- use of meteorburst radio technology, 220
- use of microwave systems for, 220

use of satellites for, 218-220

use of telephone for, 218-219

Defense Meteorological Satellite Program (DMSP), 245

Detectability, 73

Digital data processing, 1

- Digital elevation model (DEM), 194
- Digital image processing system (DIPS) in data analysis, 193

to update land-use and land-cover data of GIS with, 196

Digital simulation models, in lineament analysis, 61, 63

Digitized data, for computerized evaluations and processing, 225

Dolines, 100

types of, 103-104

Е

- Edge-enhancement of images, in recognizing fracture systems, 11
- Electromechanical scanner system imagery, for historic waste-site use and characterization, 73, 77
- Enhanced Landsat multispectral scanner (MSS), for pipeline investigation, 11
- Enhancement techniques, 1

for preliminary cross-country pipeline routing studies, 11

- Environmental Monitoring Systems Laboratory (EMSL), 81-82
 - characterizations and historic compilations, 83
- EROS Data Center (EDC), as source of remote sensing data, 79, 82, 245-246
- Ertan hydropower station (China), estimation of reservoir submerging losses using CIR aerial photographs at, 89-98

F

Federal Geographic Exchange Format, 229

- Federal Interagency Committee for Digital Cartography (FICDC), 229
- Fiber-optic cable, use of, in geotechnical monitoring, 217
- Fourier optical transform, 3
- Fractures

detection of near-surface in pipeline investigations, 12

effect of permeability and leakage on flow in aquifer systems, 46

G

- General Services Administration, 257
- Geographic information system (GIS) land use and land cover data in, 192-196 and need for up-to-date data base, 2
- Geological applications, field evaluation of satellite remote sensing systems for, 197-200
- Geological conditions, effect of, on effectiveness of remote sensing, 115-116
- Geosat Committee's 1979–1984 Joint NASA/ Geosat Test Case Project, 1, 197
- Geostationary Environmental Operational Satellite (GOES), 4, 210, 218-220
- Geostationary meteorological satellite (GMS), 209

Geotechnical applications, 4

- automation of instruments in, 214-215 criteria for selecting remote data telemetry
- methods for, 213-222
- optical Fourier analysis of surface features of interest in, 151-162
- of remote sensing data, in Ontario, Canada, 9-42
- selection of sampling sites, in pipeline investigations, 12-13
- of U.S. government remote sensing programs, 183-191

Glaciofluvial sediments, subdivision of, 17-18

- GOES satellite system, 4, 210, 218-220
- Grid coding, in image subtraction, 152, 154, 155
- Ground subsidence, locating potential, in carbonate rock, 99-118
- Ground-water flow system, analysis of regional, 61, 63

H

Higher spatial resolution, 1

Historic waste-site use and geotechnical characterization

- characteristics of remote sensor data, 72 aerial photography, 72-73
 - available map products, 78
 - base maps, 77
 - electromechanical scanner system imagery, 73, 77
- characterization capabilities of remote sensor data, 70
- conclusions of, 84, 88
- data requirements for site characterization, 70-71
- data set procurement and merging, 82-83 guidelines for, 83-84
- limitation of remote sensor data, 71-72
- need for, 69-70
- presentation of data, 84
- sources and characteristics of available and historic data
 - NASA photography and imagery, 79, 81
 - U.S. Army Corps of Engineers, 82
 - U.S. Department of Agriculture aerial photography, 79
 - U.S. Environmental Protection Agency, 81-82
 - U.S. Geological Survey aerial photography, 78-79
- Hydrogeological information, 3
- Hydrological data analysis, in lineament analysis, 55, 59

I

- Image enhancement techniques, 1, 11
- Image processing, during geographic information system (GIS) updating, 194
- Image subtraction (IS), 2, 151, 152–153 capabilities of, 3
 - in geotechnical applications, 161-162
 - input images in, 162
- Infrared aerial photography, for pipeline investigations, 10
- Instrument automation, in geotechnical applications, 214-215
- International Organization for Standardization (ISO), 230

J

Jet Propulsion Laboratory (JPL) (Pasadena, CA), 197 Joint NASA/Geosat Test Case Project, 197-200 Joint-transform correlation (JTC), 2, 151, 153, 155, 160-161

function of, 3

input images in, 162

method of, 153 usefulness for geotechnical applications, 162

K

Kriging estimate, 141

L

- Landsat-based land cover mapping, for pipeline investigation, 11-12
- Landsat data, digital analysis of, 3
- Landsat Ground Station Operator's Working Group (LGSOWG), 228-229
- Landsat imagery, for lineament mapping, 63, 66
- Landsat/multispectral scanner (MSS) system, 1
 - advantages of, 77
- use of, to examine solution features, 110
- Landsat thematic mapper (TM), for investigating surficial deposits for surface mining operations, 133, 136
- Land use and land cover data, in a geographic information system (GIS), 192-196
- Lineament mapping
 - for igneous intrusions, 22, 31
 - Landsat imagery for, 66
 - Skylab photography for, 63, 66
 - usefulness of, in geologic and hydrologic investigations, 46
 - use of thermal IR line scanning for, 113-114
- Lineaments
 - analysis of regional ground-water flow system, 61, 63
 - continuity of, 54, 66
 - criteria for defining significant, 48, 51
 - determination of structural, from satellite photography, 124, 129
 - distribution of frequency, 54-55
 - effect of, on ground-water systems, 46-47
 - frequency of, 54
 - geological and hydrological perspective, 63
 - hydrological data analysis of, 55, 59
 - methods of analyzing, 48, 51
 - relationship of, to basement tectonics, 47-48
 - seismic data analysis of, 59, 61
 - use of basement-block hypothesis in analyzing, 55, 67
 - use of Landsat imagery and skylab photography in analysis, 47
- Lithological mapping, for igneous intrusions, 22

M

- Mathematical simulation modeling, use of, in lineament analysis, 61
- Meteorburst communication system, 4, 203-205
- Meteorburst radio technology, use of, for data transmission, 220
- Microwave radiometry, for the detection of solution features, 115
- Microwave systems, data transmission over, 220
- Mineral aggregates and other surface deposits, mapping of, 15, 17
- Mine roof instability, use of remote sensing data for evaluating potential for, 37, 40
- Mining operations
 - remote sensing applications in, 226
 - satellite-based investigation of the significance of surficial deposits for surface, 122-136
- Multiple-band information registration, 193
- Multiple-date information registration, 193
- Multiple remote sensing data sets, application of spatial statistics to analyzing, 138-150
- Multiple-source spatial information registration, 193
- Multispectral image analysis limitations of, 77
- in remote sensing, 199-200
- Multispectral scanners, for the detection of solution features, 110

Ν

- National Aeronautics and Space Administration, 257
 - photography and imagery, characteristics of, 79, 81
 - Shuttle Imaging Radar (SIR) Program, 1
- National Archives and Records Service, 257
- National Cartographic Information Center (NCIC)
 - as source of remote sensing data, 79, 246-255
- National Committee for Digital Cartographic Data Standards (NCDCDS), 229
- National High Altitude Photography Program (NHAP) Data, geotechnical applications of, 1, 184-185
- National Map Accuracy Standards, 78, 81
- National Oceanic and Atmospheric Administration, 242-243
 - advanced very-high-resolution radiometer (AVHRR) imagery, 124

to determine lineament distribution, 124 resolution of sensor, 132

- uses of sensor, 124
- availability of historic climatological data from, 242-243
- National Park Service (NPS), 256
- Natural color films, use of, for aerial photography, 73
- Northern Louisiana Salt Dome area, terrain and image characteristics of, 165-166, 168, 172, 176, 178

0

- Ontario, Canada, application of remote sensing data to geotechnical investigations, 9-42
- Optical diffraction analysis (ODA), 2 basic methods of, 2-3, 151 technique of, 151-152
- Optical Fourier analysis of surface features of interest in geotechnical engineering, 151-162
- Orthophotomapping, use of, to estimate reservoir submerging losses at Ertan Hydropower Station (China), 95

P

- Panchromatic films, use of, for aerial photography, 72 Pipeline investigation conclusions and recommendations for, 15 construction and postconstruction monitoring, 13-14 detection of high water table, 13 detection of near-surface fractures, 12 detection of subsurface drainage tiles, 13 effects of soil compaction, 15 enhanced Landsat multispectral scanner (MSS) data, 11 Landsat-based land cover mapping, 11-12 preconstruction mapping and regional route selection, 10-11 river crossings and bank stability, 14 route selection with spring airborne imagery, 12 Seasat SAR radar data, 11 selection of geotechnical sampling sites, 12-13 thematic mapper (TM) data, 11 usefulness of remote sensing data in, 10-15
- Platform terminal transmitters (PTT), functions of, 208-209

Q

Quaternary geology, investigations of, 17

R

- Radar imaging, geomechanical potential for, 133 Reconnaissance tools, value of SLAR and SAR as. 178 Remote data transmission systems, 4, 203, 215 Argos system, 207-209 criteria for selecting, for geotechnical applications, 213-222 description of, 184-189 geostationary meteorological satellite systems, 209-211 and local data transmission, 215, 217-218 meteorburst, 203-205 overview of, 203-212 potential for geotechnical applications of, 1 and remote data transmission, 218-220 satellite systems, 205-207 Remote sensing abbreviations and acronyms used in, 263-265 application of data, to geotechnical investigations in Ontario, Canada, 9-42 application of spatial statistics to analyzing multiple data sets, 138-150 automation of interface between computerassisted design and, 179, 225 case history in the use of, for studying effects of lineaments. 46-68 characteristics of, 70, 72-73, 77-78 comparison of airborne GEMS/SAR with satellite-borne Seasat/SAR radar imagery, 163-179 cost-effectiveness of, 99-100 defining quality of, 226-227 descriptions of data, 184-189 to estimate reservoir submerging losses at Ertan Hydropower Station (China), 89-98 for evaluating mine roof instability, 37, 40 factors influencing effectiveness of conditions during data acquisition, 117 geological conditions, 115-116 image interpretation, 118 image processing, 117 resolution of sensor, 116-117 field evaluation of satellite system for geological applications, 197-200 future developments in, 231-232 geotechnical application of, 3-4, 225-226
- historic waste-site use and geotechnical characterization, 69-98 limitations of data, 71-72 location of potential ground subsidence and collapse features in soluble carbonate rock by, 99-118 optical Fourier analysis of surface features of interest in geotechnical engineering, 151-162 potential for geotechnical applications of, 1 satellite-based investigation of surficial deposits for surface mining operations, 122-137 selection criteria for data, 227 sources of data Agricultural Stabilization and Conservation Service, 241 American Society for Photogrammetry and Remote Sensing, 258 Bureau of Land Management (BLM), 245 in Canada, 257-258 Defense Meterological Satellite Program (DMSP), 245 General Services Administration. 257 National Aeronautics and Space Administration, 257 National Archives and Records Service, 257 National Oceanic and Atmospheric Administration, 242-243 National Park Service (NPS), 256 Soil Conservation Service (SCS), 242 Tennessee Valley Authority, 257 U.S. Army Corps of Engineers, 243-245 U.S. Department of Agriculture, 241-242 U.S. Department of Commerce, 242-243 U.S. Department of Defense, 243-245 U.S. Department of the Interior, 245-255 U.S. Environmental Protection Agency, 256-257 U.S. Forest Service (USFS), 241-242 U.S. Geological Survey (USGS), 245-255 Wallops Flight Center, 257 standardization of collection and transmission of data, 228-230 technological advances in the field of, 225-226 updating of data base for geographic information system, 194, 196 use of satellites for, 123-136 Remote sensing specialist, responsibilities of, 181-182 Reservoir submerging losses, estimation of,
 - using CIR aerial photographs, 89–98

Ridgway Dam project, case history of, 221

- River crossings, assessment of, in pipeline investigations, 14
- Root-mean-square (rms) method, use of, to determine land-use map accuracy at the Ertan. Hydropower Station (China), 96-97
 - S

San Justa Dam and Dike, case history of, 221

- Satellite-based investigation of the significance of surficial deposits for surface mining operations, 122-136
- Satellite-borne Seasat/SAR radar imagery, comparison of airborne GEMS/SAR with, 163-182
- Satellite imagery, 1
- use of, for pipeline investigations, 11-15
- Satellite remote sensing systems, field evaluation of, for geological applications, 197-200
- Satellite, use of, for data transmission, 218-220
- Seasat SAR (synthetic-aperture radar) data, 2 interpretation of, 3
 - for pipeline investigation, 11
- Seismic data analysis, use of, in lineament analysis, 59, 61
- Sensor resolution, effect of, on effectiveness of remote sensing, 116-117
- Shortwave infrared (IR) thematic mapper (TM) spectral bands, 1
- Shuttle imaging radar
 - geotechnical applications of, 188-189
 - for investigating surficial deposits for surface mining operations, 132-133
- Shuttle Imaging Radar (SIR) Program, 1 Side-looking airborne radar, 1
- geotechnical applications of, 185, 188 value of, as a reconnaissance tool, 178
- Skylab photography, for lineament mapping,
- 63, 66 Snow-telemetry (SNOTEL) system, 203, 204-
- 205, 220
- Soil compaction, effects of, in pipeline investigations, 15
- Soil Conservation Service (SCS), 242
- Soil moisture studies, application of airborne sensing to, 18
- Solution dolines, 103
- Solution features
 - development of metastable forms of, 103-104
 - distinct forms of, 100
 - methods of locating, 105, 108

- remote sensing research concerned with the detection of, 108, 110-111, 113-115
- review of remote sensing research with the detection of, 108, 110-111, 113-115
- Solution pipes, 100
- Solution widened joints, 100
- Spatial Data Exchange Standard (SDES), 229
- Spatial resolution, 116
- Spatial statistics, application of, to analyzing multiple remote sensing data sets, 138-150
- Spectral resolution, 116-117
- inferiority of SPOT satellite to thematic mapper in, 133, 136
- Spring color-infrared photography (see also Color-infrared film)
 - for detecting high water table, 13
 - for detecting near-surface fractures, 12
 - for detecting subsurface drainage tiles, 13
 - to detect poor crop growth, 15
 - to monitor new river bank growth, 14
 - route selection for pipeline using, 12
 - for selecting geotechnical sampling sites, 12-13
- Subsidence dolines, 104
- Subsurface gravel search, use of remote sensing investigations for, 17
- Surface drainage tiles, detection of in pipeline investigations, 13
- Surficial deposits, satellite-based investigation of the significance of, for surface mining operations, 122-136
- Swallow holes, 100
- Synchronous meteorological satellites (SMS), 209
- Synthetic-aperture radar (SAR), 1
 - value of, as a reconnaissance tool, 178
- Systeme Probatoire d'Observation de la Terre (SPOT), for investigating surficial deposits for surface mining operations, 133, 136

Т

Telephone, use of, for data transmission, 218

- Tennessee Valley Authority, 257
- Thematic mapping (TM)
- capabilities of, 198
- interpretation of data, 3
- for pipeline investigation, 11
- spectral resolution of, 133, 136
- for surface mining operations, 133, 136
- Thermal contouring, as enhancement technique, 111
- Thermal infrared imagery
 - for detecting subsurface drainage tiles, 13

- for investigating surficial deposits for surface mining operations, 129, 132
- Thermal infrared line scanning
- for detection of solution features, 110-111, 113-114
- for locating potential ground subsidence in carbonate rock, 110-111, 113-114
- Thermal ratioing, as enhancement technique, 111
- Thermographic mapping conclusions regarding, 19 delineation of subsurface gravels, 18-19 delineation of surficial materials, 19 geology of the study site, 17-18
 - of mineral aggregates and other surface deposits, 15, 17

- U.S. Forest Service (USFS), 241-242
- U.S. Geological Survey aerial photography characteristics of, 78-79 National High Altitude Photography
 - (NHAP) Program, 1
 - Side-Looking Airborne Radar (SLAR) Program, 1
- U.S. Geological Survey (USGS), 245-255
- U.S. Soil Conservation
 - Snow telemetry (SNOTEL) program of, 203-205, 220
 - and the use of meteorburst, 203-205

V

W

Visible infrared and thermal data, 3

- Wallops Flight Center (Virginia), 257
- Waste disposal in igneous intrusions
 - conclusions regarding, 31
 - lineament mapping, 22, 31
 - lithological mapping, 22
 - site evaluation for, 19, 22
 - surficial materials, 31
- Water table, detection of high, in pipeline investigations, 13

U

- UHF radio, for data transmission, 217-218 U.S. Army Corps of Engineers, 243-245
- aerial photography of, 82
- U.S. Department of Agriculture, 241-242 characteristics of aerial photography of, 79
- U.S. Department of Defense, 243-245
- U.S. Department of the Interior, 245-257
- U.S. Environmental Protection Agency (EPA), 256-257
 - characteristics of, 81-82
 - National Contingency Plan requirements of, 69