

Table of Contents

Geologic Time

- 1.1 Chronostratigraphic Stages of the Last 2.7 Ma
- 1.2 Major Geochronologic and Chronostratigraphic Units
- 1.3 International Commission on Stratigraphy Time Scale
- 1.4 Geomagnetic Polarity Timescale from Marine Magnetic Anomalies
- 1.5 Geologic Time and the Biosphere
- 1.6 Major Fossil Groups Used for Dating and Correlation of Phanerozoic Strata in North America
- 1.7 Geologic Time and Human Evolution

Solid Earth

- 2.1 Earth's Lithospheric Plates
- 2.2 Age of the Oceanic Lithosphere
- 2.3 The World Magnetic Model 2015-2020
- 2.4 The Geoid
- 2.5 The Geoid in North America
- 2.6 Major Divisions of the Earth
- 2.7 Profile and Properties of Oceanic and Continental Crust
- 2.8 Earth's Seismic Profile (PREM Model) and Composition
- 2.9 Distribution of Radioactive Heating
- 2.10 Physical Data about the Earth

Geologic Mapping

- 3.1 General Standards for Geologic Maps
- 3.2 Geologic Map Symbols
- 3.3 Lithologic Patterns for Stratigraphic Columns and Cross Sections
- 3.4 U.S. Public Land Survey Grid

Safety in the Field

- 4.1 Before You Leave
- 4.2 Field Research Safety Plan
- 4.3 Environmental Hazards and Diseases

Mineralogy

- 5.1 Mineral Hardness
- 5.2 The 7 Crystal Systems
- 5.3 The 14 Bravais Lattices
- 5.4 Macroscopic Identification of Common Minerals and Selected Optical Properties
- 5.5 Data Pertaining to Important Non-Silicate Minerals
- 5.6 The Role of the Microscope and Related Techniques
- 5.7 Routine Mineral Determination in Plane- and Cross-Polarized Light
- 5.8 Selected Mineral Properties in Thin Section
- 5.9 Michel-Levy Birefringence Chart
- 5.10 Selected Minerals under the Microscope
- 5.11 Identification of Peaks in the EDX Spectrum
- 5.12 Selected Crystals under the Scanning Electron Microscope (SEM)
- 5.13 Imaging Spectroscopy of Common Rock-forming Minerals
- 5.14 Geologic Materials and Human Health

Igneous Rocks

- 6.1 Tectonic Settings that Generate Magma
- 6.2 Phase Equilibria Diagrams for Mineralogy and Petrology
- 6.3 Bowen's Reaction Series
- 6.4 Igneous Rocks: Components and Composition
- 6.5 Textures of Igneous Rocks
- 6.6 Thin Sections of Selected Igneous Rocks
- 6.7 Estimating Percentage Composition
- 6.8 IUGS Classifications of Plutonic and Volcanic Rocks
- 6.9 Chemical Classification of Igneous Rocks
- 6.10 Pyroclastic Sediments and Rocks
- 6.11 Characteristics of Fallout Tephra

Metamorphic Rocks

- 7.1 Metamorphic Environments
- 7.2 Pressure-Temperature-Time (P-T-t) Paths: Continental Collision
- 7.3 Metamorphic Facies
- 7.4 Classification of Metamorphic Rocks in the Field
- 7.5 Descriptive Classification of Metamorphic Rocks
- 7.6 Selected Textural Terms for Metamorphic Rocks
- 7.7 Common Metamorphic Rocks in Thin Section
- 7.8 Chemographic Diagrams: ACF, AKF, and AFM
- 7.9 Petrogenetic Grids for Metapelites
- 7.10 Stress and Strain Analysis
- 7.11 Conditions for Shock Metamorphism

Sedimentology

- 8.1 Total Sediment Thickness of the World's Oceans and Marginal Seas
- 8.2 Sedimentary Basin Types and Subsidence Mechanisms
- 8.3 Global Crustal Volume and Mass of Sedimentary Rocks
- 8.4 Depositional Environments and Sedimentary Characteristics
- 8.5 Recognizing Sequence Boundaries and Other Key Sequence-Stratigraphic Surfaces in Siliciclastic Rocks
- 8.6 Lithofacies Classification Codes
- 8.7 Descriptions of Selected Sedimentary Structures
- 8.8 Core Examination and Stratigraphic Logs
- 8.9 Classification of Sedimentary Rocks
- 8.10 Selected Sedimentary Rocks in Thin Section
- 8.11 Grain-Size Scales and Data
- 8.12 Graphic for Determining the Size of Sedimentary Particles
- 8.13 Chart for Estimating the Roundness and Sphericity of Particles
- 8.14 Chart for Estimating the Sorting of Clastic Sediments

Structural Geology

- 9.1 Using a Brunton® Compass
- 9.2 Collecting Field Data Using Mobile Devices
- 9.3 Criteria for Determining Top and Bottom of Beds
- 9.4 Folds
- 9.5 Characterizing the Shapes of Folded Surfaces
- 9.6 Use of Mohr's Circle in Geology
- 9.7 Joints and Faults
- 9.8 Orientation Data and Discontinuities
- 9.9 Projection Nets
- 9.10 Correction for True and Apparent Dip
- 9.11 Physical Engineering Properties of Rocks
- 9.12 Physical Properties of Building Stones

Geochemistry

- 10.1 Periodic Table of Elements
- 10.2 Abundance of Chemical Elements in Earth's Crust, Mantle, and Core
- 10.3 Isotopic Variations in Mantle Materials
- 10.4 Commonly Studied Stable Isotopes and Applications
- 10.5 Geochemical Analysis of Igneous, Sedimentary, and Metamorphic Rocks
- 10.6 Chemical Weathering of Silicate Minerals in Igneous Rocks
- 10.7 Characterization of Solutions by pH and Eh
- 10.8 Organic and Inorganic Carbon: Reservoirs, Production, and Preservation
- 10.9 Organic and Inorganic Compounds, and Biogenic and Non-Biogenic Materials
- 10.10 Geochronological Methods
- 10.11 Instrumental Techniques Common To Analytical Mineralogy, Petrology, and Solid-Earth Geochemistry
- 10.12 Geochemistry Equations

Geophysics

- 11.1 Application of Geophysical Methods: Studying Earth's Crust Using Seismic Reflection
- 11.2 Studying Earth's Interior Using Seismic Tomography
- 11.3 Hydraulic Fracturing
- 11.4 Surface Methods
- 11.5 Geophysical Well Logging Techniques
- 11.6 Elements of Borehole Logging for Hydrocarbon Assessment
- 11.7 Summary of Geophysical Methods Applicable to Exploration and Geoenvironmental Studies
- 11.8 Geophysical Properties of Selected Materials

Energy Resources

- 12.1 Global Distribution of Major Oil and Gas Fields
- 12.2 Selected Geologic Characteristics of Major Oil Fields
- 12.3 Global Distribution of Proved Reserves in Oil, Natural Gas, and Coal
- 12.4 Shale Gas and Shale Oil Global Reserves
- 12.5 Major Trade Movements of Oil and Natural Gas
- 12.6 Reserves to Production (R/P) Ratios for Global Oil and Natural Gas
- 12.7 U.S. Energy Production, Trade, and Consumption 1950–2014
- 12.8 U.S. Petroleum Fuel Stocks by Type 1950–2014
- 12.9 Shale Gas Plays in the Lower 48 States
- 12.10 U.S. Production from Unconventional Gas Reservoirs
- 12.11 U.S. Coal Distribution and Production
- 12.12 Geothermal Heat Flow Map of the Conterminous United States
- 12.13 Production Costs for Petroleum and Alternative Fuel Resources
- 12.14 Crude Oil: Refinement, Products, and Consumption
- 12.15 Physical Properties of Crude Oil
- 12.16 Laboratory Analysis of Petroleum: Brent Crude Assay Example
- 12.17 Comparison of Selected Properties of Gasoline to Alternative Fuels
- 12.18 Energy Conversion Tables

Mineral Resources

- 13.1 Classification of Mineral Deposit Models by Litho-Tectonic Environment
- 13.2 World and U.S. Production, Imports, and Exports of Selected Non-Fuel Mineral Commodities
- 13.3 U.S. Net Import Reliance of Selected Non-Fuel Mineral Commodities
- 13.4 Major Metal and Industrial Mineral Producing Areas of the United States
- 13.5 The Rare Earth Elements
- 13.6 Minerals Found in Rare Earth Elements Deposits
- 13.7 Global Distribution of Rare Earth Elements
- 13.8 Classification of Deposits Containing Rare Earth Elements
- 13.9 Global Mine Production and Reserves of Rare Earth Elements

Earthquakes

- 14.1 Selected Major and Notable Earthquakes
- 14.2 Global Seismic Hazard Map
- 14.3 Global Seismographic Network
- 14.4 U.S. National Seismic Hazard Map
- 14.5 ShakeMap — A Tool for Earthquake Response
- 14.6 Earthquake Hazards Mitigation: PAGER from USGS
- 14.7 Geologic Study of Earthquake Effects
- 14.8 Fault-plane Solutions of Earthquakes
- 14.9 Checklist for Earthquake Effects

Volcanology

- 15.1 Remote Sensing Applications: Volcanic Eruptions
- 15.2 Monitoring Ground Deformation from Space Using InSAR
- 15.3 Global Distribution of Volcanoes
- 15.4 Global Distribution of Large Igneous Provinces
- 15.5 Volcanism, Large Igneous Provinces, and Mass Extinctions
- 15.6 Volcanic and Plutonic Regions in North and Central America
- 15.7 Morphologic Types of Volcanoes
- 15.8 Classification and Characteristics of Volcanic Eruptions
- 15.9 Selected Data Pertaining to Volcanic Activity
- 15.10 The Volcanic Explosivity Index
- 15.11 Volcano Monitoring by United States Volcano Observatories
- 15.12 Historic Volcanic Eruptions

Oceans

- 16.1 Selected Ocean Data
- 16.2 Global Histogram and Hypsographic Curve of Earth's Surface
- 16.3 Global Heat Transfer by the Oceans and Atmosphere
- 16.4 Global Map of M2 Tide
- 16.5 Sea Surface Temperature (SST)
- 16.6 Annual Salinity of the Ocean Surface
- 16.7 Ocean Temperature, Density and Nutrients at Depth
- 16.8 Physical Properties of Atlantic Water at Depth
- 16.9 Ocean Circulation: A Southern Hemisphere Perspective
- 16.10 El Niño and La Niña Southern Oscillation Events
- 16.11 Marine Carbon Production
- 16.12 Concentrations and Residence Times of Solutes in Seawater
- 16.13 Marine Carbonate Production and Buffering
- 16.14 Calcite and Aragonite Seas

Atmosphere

- 17.1 Sea-Level Pressure and Global Winds
- 17.2 Seasonal Radiation and the Redistribution of Heat
- 17.3 Composition of Air in Earth's Troposphere
- 17.4 Natural and Anthropogenic Sources of a Selection of Trace Gases
- 17.5 Variation of Temperature, Pressure, and Composition with Altitude
- 17.6 Absorptivity of Selected Gases of the Atmosphere
- 17.7 Radiative Forcings from 1750-2010
- 17.8 Lapse Rates
- 17.9 The Radiosonde in Meteorology
- 17.10 Interpretation of Doppler Radar Imagery
- 17.11 The Saffir-Simpson Hurricane Wind Scale
- 17.12 The Fujita Tornado Damage Scale
- 17.13 The Beaufort Wind Scale
- 17.14 Action in Extreme Weather
- 17.15 Weather Symbols Used in Meteorology

Environmental Change

- 18.1 Common References to Time Periods in the Climate Literature
- 18.2 Changes in Global Glacial Mass Balance
- 18.3 Global Mean Sea-Level from Altimetry from 2005 to 2012
- 18.4 Monthly Sea Ice Extent Anomalies
- 18.5 Holocene Environmental Change
- 18.6 Processes that Remove Carbon Dioxide from the Atmosphere
- 18.7 Millennial Scale Climate Change in Greenland and West Antarctic over the last 90,000 years BP
- 18.8 Global Chronostratigraphic Correlation for the last 2.7 Ma
- 18.9 Late Pleistocene Sea Level and $\delta^{18}\text{O}$ from 150 ka to Present
- 18.10 9 Million Year Climate Record from Foraminiferal $\delta^{18}\text{O}$ Curves
- 18.11 Earth's 65 Million Year Atmospheric CO_2 History by Proxy
- 18.12 Estimated Record of Global Sea-Level for the Past 100 Million Years
- 18.13 Paleoclimate Proxies

Hydrology

- 19.1 Remote Sensing in Hydrology using GRACE
- 19.2 Global Hydrology
- 19.3 Hydraulic Characteristics of Groundwater Regions in the United States
- 19.4 Principal Aquifers of the United States
- 19.5 Hydrological Network Design: Station Density by Physiographic Region
- 19.6 Network Design: Data Requirements for Water Management
- 19.7 Metadata Fields for Recording Catchment Data
- 19.8 Recommended Accuracy of Hydrological Measurements
- 19.9 Hydrogeology Equations and Calculations
- 19.10 Groundwater Flow into a Well
- 19.11 Symbols, Units, and Conversion Factors
- 19.12 Modeling and Statistics in Hydrology
- 19.13 Commonly Used Frequency Distributions
- 19.14 An Overview of MODFLOW
- 19.15 USGS Water Resources Software
- 19.16 Selected Hydrologic Properties of Soil and Rock
- 19.17 Permeability Conversion Chart
- 19.18 National Primary Drinking Water Regulations

Geomorphology

- 20.1 Structure from Motion (SfM) Photogrammetry vs Terrestrial Laser Scanning
- 20.2 Geophysical Methods in Geomorphology
- 20.3 A Hierarchical Classification of Terrestrial Geomorphological Features by Scale
- 20.4 A Systems Approach to Geomorphology
- 20.5 Physiographic Regions of the United States
- 20.6 Uplift and Denudation
- 20.7 Chemical Weathering
- 20.8 Measuring Rock Hardness in the Field
- 20.9 Selected Characteristics of Fluvial Systems
- 20.10 Characterization of Alluvial Fans and Facies
- 20.11 Major Types of Landslide
- 20.12 Historic Landslide Hazards
- 20.13 Classification of Glacigenic Deposits
- 20.14 Selected Features of Desert Environments
- 20.15 Selected Characteristics of Coastal Environments
- 20.16 Types of Beaches

Soils

- 21.1 Soil Taxonomy
- 21.2 Checklist for Field Descriptions of Soils
- 21.3 Unified Soil Classification System
- 21.4 National Soils Map Dominant Orders and Suborders

Astronomy

- 22.1 Hertzsprung-Russell (H-R) Diagram and Pulsating Variable Stars
- 22.2 Compositions of the Sun, Chondrites, the Moon, and Continental Crust
- 22.3 Condensation of Materials from the Solar Nebula
- 22.4 Selected Stars Visible from Earth
- 22.5 Locations of Stars with Exoplanets
- 22.6 Properties of the Sun
- 22.7 Selected Properties of the Planets
- 22.8 Fraunhofer Lines and Solar Spectra
- 22.9 Magnetic Fields: Solar and Terrestrial
- 22.10 Sun Spots
- 22.11 Near Earth Objects
- 22.12 Space Weather