

Table of Contents

Preface	7
Introduction	8
How are rates of geological processes measured and expressed?	10
Crustal movements	11
Sudden seismic displacements	11
Long-term tectonic movements along seismically active faults	14
Glacio-isostatic movements	18
Recent crustal movements (other than glacio-isostatic)	23
Older and long-term movements of the Earth's crust	28
The rate of movement of diapirs	39
Movements related to plate tectonics	40
The rate of geological deformation	51
Movements due to human activity	52
Convection currents in the crust and mantle	55
Conclusion	55
Plutonic and volcanic processes	58
Plutonic processes	58
Volcanic processes	61
The rate of crystallization	69
The rate of weathering	73
The rate of soil genesis	78
The formation of duricrust	80
Desert varnish	81
Obsidian hydration	81
Submarine weathering	82
Transportation velocity and the rate of abrasion of clasts	83
Transportation velocity	83
Reduction in weight and size of particles during transport	87
The rate of rounding	90
The origin of ventifacts	92
Conclusion	93
The rate of sedimentation	94
Recent sediments	94
The rate of ancient sedimentation	122
Conclusion	132
Postsedimentation processes (diagenesis)	136
The lithification of limestones	136
Mineralogical changes	138
The growth of concretions and diagenetic migration	140
Changes in arenaceous sediments	140
Changes in clayey sediments	141
Gypsum	141
Glauconite and other authigenic minerals	141
Ice	142
Conclusion	142

The rate of erosion	143
The erosion mechanism	144
The rate of global erosion	145
Erosion of continents	145
Smaller territories	147
The vertical erosion of river channels	149
Glacial erosion	151
The rate of deflation and eolian abrasion	152
The erosion of limestones and dolomites	153
Lateral erosion	155
Retrogressive erosion	158
Slope degradation	159
Erosion due to catastrophic and extreme events	159
Soil erosion	162
Factors affecting the rate of erosion	166
The relation of mechanical to chemical erosion	169
The rate of ancient erosion	170
Conclusion	170
The rate of biological erosion and bioturbation	173
The rate of coastal changes	176
The rate of cliff erosion	176
The rate of erosion and removal of unconsolidated coastal deposits	178
The rate of mass gravity movements	180
Mass movements on land	180
Sub-aqueous mass movements	186
Movements of glaciers	187
Sea level changes, transgression and regression	189
The rate of transgressions and regressions	191
Movement of waters	193
The rate of ore genesis	195
The rate of generation of oil and natural gas	199
Variations of the Earth's magnetic field	201
Geological processes on the Moon and planets	204
The rate of lava production	204
The rate of cratering	204
Sedimentation	205
Erosion	206
The lunar regolith	206
The rate of cooling of glasses and meteorites	206
The rate of geological cycles	208
Astronomical cycles	208
Geological cycles	212
Events and catastrophic cycles	219
The rate of change of the Earth's surface	222
Orogenesis	222
Volcanism	223
The rate of erosion and peneplanation of relief	223
The rate of sedimentation	224
The rate of evolution of lakes	224
Deserts, arid and semi-arid phenomena	224
Glaciers	225
Periglacial phenomena	227
Karstification	227
Coastal and littoral changes	228
Conclusion	230
References	231
Index	259