CAMBRIDGE

Cambridge University Press
978-1-107-04234-6 — A Concise Guide to Geopressure
Peter B. Flemings
Index
More Information

Index

Auger field, 167

Bulk compressibility, 13
Bullwinkle field, 9, 14

Calculation of hydrostatic pressure, 9
Calculation of overpressure, 11
Capillary pressure, 17
  capillary rise, 21
  capillary tube radius, 21
  capillary/gravity equilibrium, 27
  cohesion energy, 19
  conformance correction, 24
  contact angle, 20
  converting mercury-air to oil-water, 26
  displacement pressure, 26
  effect of compaction, 199
  extrapolated displacement pressure, 26
  free water level, 28, 29
  gas-water from mercury-air, 197
  interfacial tension, 20
  maximum trapped column, 196
  mercury-air capillary pressure curve, 23
  migration pressure, 26
  oil-water from mercury-air, 197
  surface tension, 17
  Thomeer's method, 26
  three phase capillary/gravity equilibrium, 30
  threshold pressure, 26
Capillary seal, 196
  effect of compaction, 199
  estimation from mercury injection capillary pressure, 197
  fish tank example, 196
  height of gas and oil column in three phase reservoir, 198
  impact of clay-silt fraction, 200
  impact of seal heterogeneity, 202
  impact of water phase pressure, 201
  maximum trapped column, 196
  three phase systems, 198
  waste rock, 202
Centroid. *See* Flow focusing
Centroid depth, 219
  estimation, 222
  impact of mudrock permeability, 224
  impact of reservoir geometry, 223
Clay dehydration, 85
CO_2 sequestration, 4
Coefficient of consolidation, 74
Column height, 29, 196
Compaction, 35
  effect of clay composition, 37
  effect of silt fraction, 39
  for characteristic stress states, 59
  liquid limit, 37
  modified Cam clay model, 56
  preconsolidation stress, 41, 128
  reservoir compaction due to flow focusing, 229
  surface area dependence, 37
Compression index, 36
Consolidation, 71
Consolidation equation, 74
Converting mercury-air to oil-water capillary curve, 26, 197
Creep
  pressure prediction, 141
  secondary compression, 47
  viscoplastic behavior, 47
  viscous compaction, 99

Darcy's law, 72
Deepwater Horizon, 1
Differential stress, 93, 159
Displacement pressure, 26
Dix velocity, 142
Drainage, 23
Drained compression, 70

Effective stress, 13, 66
  pore pressure coefficient, 13
Elastoplastic behavior, 42
  preconsolidation stress, 41

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-1-107-04234-6 — A Concise Guide to Geopressure
Peter B. Flemings
Index
More Information

Equivalent mean stress, 160
Equivalent mud weight, 14
Estimation of overburden stress, 12, 167
Eugene Island 330 field, 105, 125, 170
Expansion index, 42, 124
Extrapolating pressure within reservoir, 11

Flow focusing, 211
  analytical model, 212
  Bullwinkle basin, 217
  casing depth, 247
  centroid, 220, 223
  centroid depth, 220
  effect of geometry, 223
  estimating centroid depth, 222, 227
  field example, 217
  flow capture, 213
  flow focusing ratio, 213
  impact of mudrock permeability, 224
  impact of reservoir hydrocarbons, 228, 230
  map-based centroid estimation, 223, 225
  mechanical seal failure, 233
  mud volcano, 237
  numerical model, 216
  physical example, 211
  reservoir compaction, 229
  reservoir vs. mudrock pressure, 217, 221, 229
  shallow water flow, 243
  slope instability, 243
  submarine landslides, 243
  Z parameter, 219
Formation breakdown pressure. *See* Formation pressure integrity test
Formation pressure integrity test, 177, 184
  formation breakdown pressure, 179
  fracture closure pressure, 181
  fracture initiation pressure, 182
  fracture propagation pressure, 180
  instantaneous shut-in pressure, 181
  leak-off pressure, 181
  least principal stress, 175
  shear failure, 180
Fracture closure pressure. *See* Formation pressure integrity test
Fracture initiation pressure, 175
  model, 187
Free oil level, 31, 199
Free water level, 28
Friction angle
  lithology dependence, 46
  measurement, 45

Height above free water level, 196
Hydromechanical properties, 76

Imbibition, 23
Instantaneous shut-in pressure. *See* Formation pressure integrity test

Leak-off pressure. *See* Formation pressure integrity test
Leak point
  least principal stress, 236
  sandstone injection, 246
Least principal stress, 175. *See* Formation pressure integrity test
  Macondo, 188
  model, 184
Liquid Limit, 37
Lost circulation, 182
LOT. *See* Formation pressure integrity test

Macondo Well, 1, 137, 191
Mad Dog field, 163, 202
Mean effective stress, 46, 93, 159
Mean stress, 46, 93, 159
Mean stress-induced pressure, 45, 93
Mechanical seal, 203
  CO_2, 208
  Frade field, 208
  impact of friction angle, 207
  limit by hydraulic fracturing of caprock, 204
  limit by shear failure, 205
Mercury injection capillary pressure curve, 23, 197
Migration pressure, 26, 194
Mohr circle, 49, 52
Mudrock
  compaction, 35
  compression, 35
  creep, 47, 141, 187
  definition, 34
  elastoplastic behavior, 39
  surface area, 37
  viscoplastic behavior, 47

Nankai accretionary prism, 97, 138
Normal compaction trend, 59, 104, 106, 115
  determination within overpressure, 112

Overburden, 167
  calculation, 167
  impact of bathymetry, 172
  impact of salt, 172
  overburden gradient, 168
  problems with water-based muds, 170
  shallow section, 170
  variation with depth, 167
  vs. vertical stress, 168
Overpressure, 1, 11
Overpressure during sedimentation, 79
  Boston Blue clay, 83

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-1-107-04234-6 — A Concise Guide to Geopressure
Peter B. Flemings
Index
More Information

Overpressure during sedimentation (cont.)
effect of stratigraphic evolution, 87
Gibson solution, 79
Gulf of Mexico mudrock, 83
IODP Site U1324, 80
pressure retention depth, 85
time factor, 79
uniaxial basin models, 82
unloading, 85

Popeye field, 168, 169, 234
Pore pressure coefficient, 13, 67
Pore pressure dissipation, 74
average degree of consolidation, 75
dependence on thickness and time, 75
hydromechanical properties, 76
Terzaghi spring model, 65
time factor, 74
Pore pressure in complex stress states, 92, 138
full effective stress method, 92, 138, 157
mean-induced pressure, 93
Nankai accretionary prism, 138, 163
non uniaxial strain, 92
pressure prediction, 138, 159
salt diapir, 95
seismic, 157
shear-induced pressure, 92
thrust belt/accretionary prism, 95
Porosity, 36, 103
from velocity, 106
Preconsolidation stress, 41, 125, 128
Pressure
average density, 13
Bullwinkle J3 sand, 15
equivalent mud weight, 14
Hydrostatic pressure, 9
Macondo well, 1, 137
overpressure, 11
overpressure ratio, 17
pore pressure, 9
pressure plots, 13
Pressure induced by mean stress, 46, 92, 138
Pressure induced by shear stress, 46, 92, 138
Pressure prediction
Bowers method, 117
Bowers unloading model, 127
Eaton method, 116, 118, 152
EI-330 field, 105, 125, 128
framework weakening, 132
from full stress tensor, 138, 157
from seismic, 151
Hubbert method, 103
log vs. seismic resolution, 153
Macondo, 135, 137
Nankai accretionary prism, 138
normal compaction trend, 103, 106
picking appropriate lithology, 110
smectite-illite, 128, 132
unloading, 123
Pressure prediction from seismic, 142
full effective stress method, 157
Mad Dog, 153
vertical effective stress method, 151
Pressure retention depth, 85
Pressure sources
biogenic, 86
hydrocarbon buoyancy, 17, 24
sediment loading, 79
smectite-illite diagenesis, 85, 133
tectonics, 92, 138
thermal expansion, 85
thermogenic, 86
viscous compaction, 99
Protected trap, 233
leak point, 237, 240
mechanical seal failure, 237
Popeye-Genesis minibasin, 233
seafloor amplitude, 236
seafloor vent, 236

Reflection tomography, 149

Salt density, 172
Seismic velocity, 142
calibration, 147
Dix equation, 145
impact of lateral velocity variation, 149
incident travel time, 144
interval velocity, 145
normal moveout velocity, 145
reflection tomography, 149
root mean square velocity, 144
travel time, 143
velocity to density transform, 151
Shear stress, 44, 51, 93, 159
Shear-induced pressure, 45, 93, 138
Smectite-illite diagenesis, 85, 133
Solid compressibility, 13, 67
Stress
Earth stress states, 51
estimation of overburden stress, 12, 167
hydrostatic effective stress, 107
preconsolidation stress, 41, 124, 128
representation, 49
vertical effective stress, 12, 68
vertical stress, 12, 167
Stress anisotropy, 187, 188
Stress ratio, 42, 184
Coulomb failure, 185
Eaton, 186
friction angle, 185
Stress ratio under uniaxial strain, 42, 184
dependence on clay composition, 43
dependence on silt fraction, 43

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-1-107-04234-6 — A Concise Guide to Geopressure
Peter B. Flemings
Index
More Information

K_0, 42, 184
poroelastic solution, 184
stress dependence, 43, 187

Three Phase Capillary/Gravity Equilibrium, 30, 199
Threshold pressure, 26, 197
Trap integrity, 194. *See* Mechanical seal, Capillary seal
capillary seal, 194
CO_2, 199
mechanical seal, 203
three phase system, 198, 209

Undrained loading, 68
common B values, 68
common C values, 68
loading efficiency, 68
Skempton's B value, 68
tidal loading example, 69
Uniaxial basin model, 82
Unloading, 41, 123
preconsolidation stress, 41, 128

Velocity anisotropy, 146
Thomsen delta, 147
vertically transverse isotropic, 147
Viscous compaction, 99
Void ratio, 36, 72, 115

© in this web service Cambridge University Press www.cambridge.org