

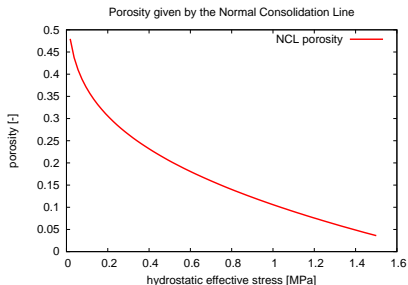
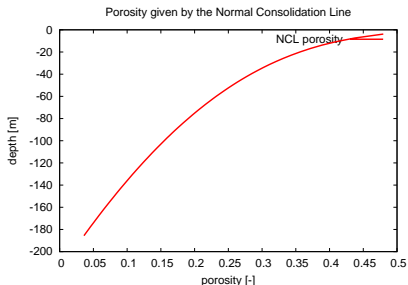
Some examples from the book “Physical principals of sedimentary basin analysis”

Magnus Wangen

January 4, 2009

Normal Consolidation Line

See section 4.6 “Gravitational compaction of a hydrostatic clay layer” in “Physical principals of sedimentary basin analysis”.

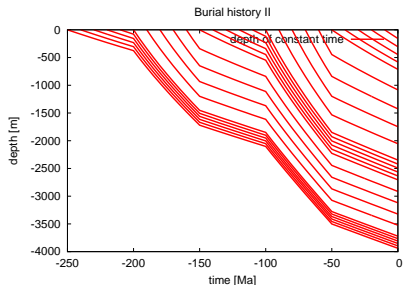
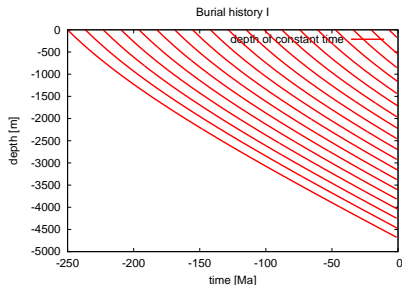


m/make_hydrostatic_NCL.m

gnuplot plot/plot-hydrostatic-NCL.gp
figure: figs/fig-hydrostatic-NCL.eps
figure: figs/fig-hydrostatic-NCL-ii.eps

Burial histories

See section 5.1 “Porosity as a function of net sediment thickness” in “Physical principals of sedimentary basin analysis”.

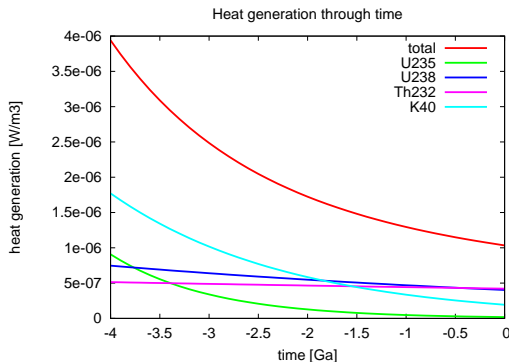


m/make_burial_hist1.m
m/make_burial_hist2.m

gnuplot plot/plot-hydrostatic-NCL.gp
figure: figs/fig-burial-hist1.eps
figure: figs/fig-burial-hist2.eps

Heat generation in an average continental crust

See section 6.3 “Heat generation” in “Physical principals of sedimentary basin analysis”.

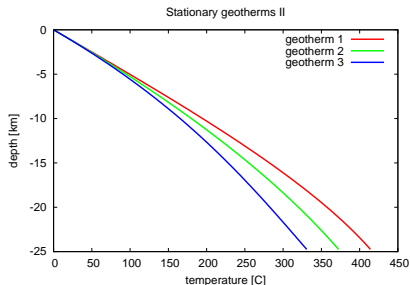
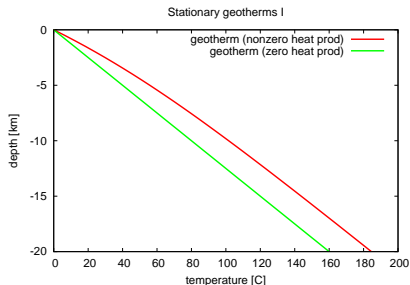


m/make_heat_gen.m

gnuplot plot/plot-make-heat-gen.gp
figure: figs/fig-heat-gen.eps

Stationary 1D temperature solutions

See section 6.4 “Stationary 1D temperature solutions with heat generation” in “Physical principals of sedimentary basin analysis”.

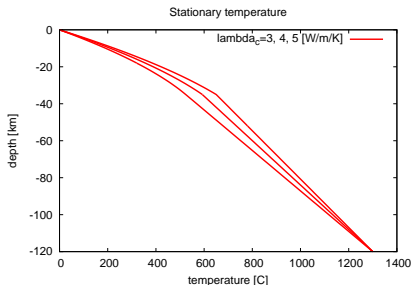
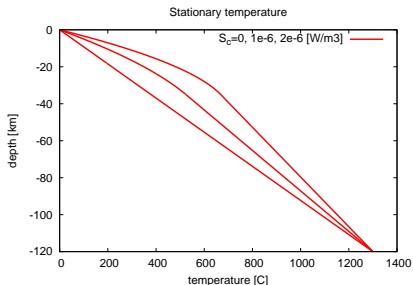


m/make_geotherms0.m
m/make_geotherms123.m

gnuplot plot/plot-geotherms.gp
figure: figs/fig-geotherms0.eps
figure: figs/fig-geotherms123.eps

Stationary 1D temperature solutions (cont.)

See section 6.4 “Stationary 1D temperature solutions with heat generation” in “Physical principals of sedimentary basin analysis”.

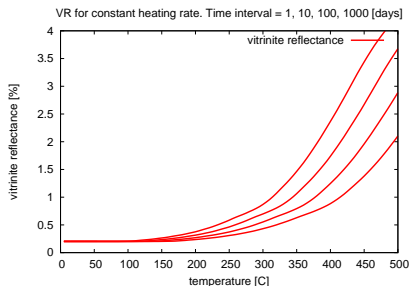
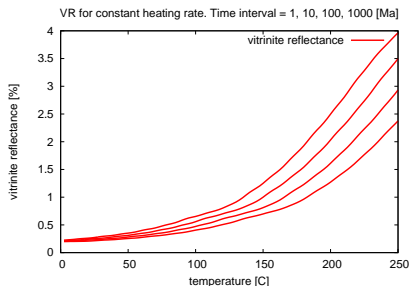


m/make_temp_stationary.m

gnuplot plot/plot-temp-stationary.gp
figure: figs/fig-temp-stationary-a.eps
figure: figs/fig-temp-stationary-b.eps

Vitrinite reflectance

See section 6.7 “Sediment maturity and vitrinite reflectance” in “Physical principals of sedimentary basin analysis”.

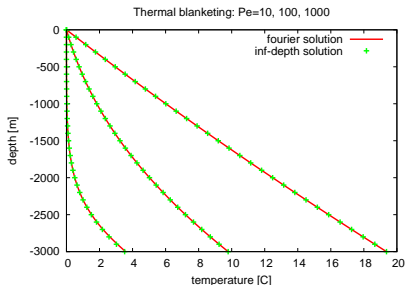
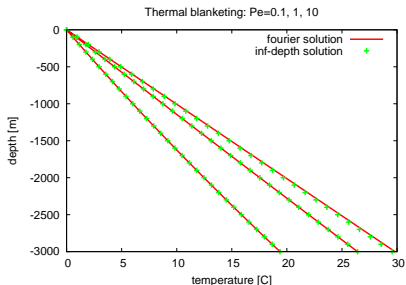


src/vr.c

gnuplot plot/plot-easy-ro-rate.gp
figure: figs/fig-easy-ro-rate1.eps
figure: figs/fig-easy-ro-rate2.eps

Temperature transients from sediment deposition

See note 6.14 “Fourier series solution” in “Physical principals of sedimentary basin analysis”.

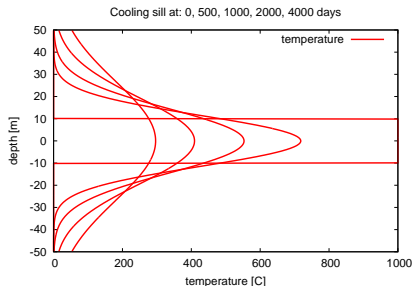
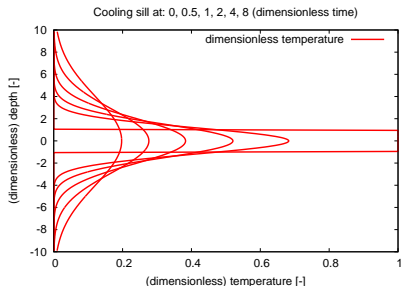


m/make_sed_temp_fourier.m
m/make_sed_temp_inf_depth.m

gnuplot plot/plot-sed-temp.gp
figure: figs/fig-sed-temp1.eps
figure: figs/fig-sed-temp2.eps

Cooling sill

See section 6.15 “Cooling sills and dikes” in “Physical principals of sedimentary basin analysis” .

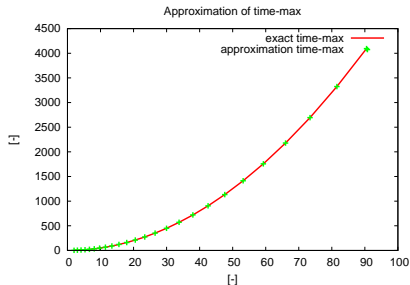
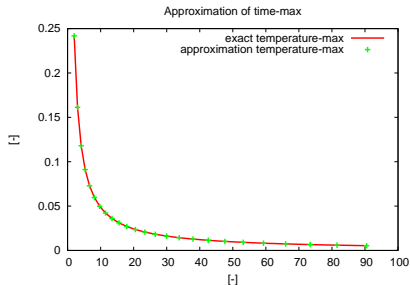


m/make_cooling_sill1.m
m/make_cooling_sill2.m

gnuplot plot/plot-cooling-sill1.gp
gnuplot plot/plot-cooling-sill2.gp
figure: figs/fig-cooling-sill1.eps
figure: figs/fig-cooling-sill2.eps

Cooling sills: Approximations of t_{Max} and T_{Max}

See section 6.15 “Cooling sills and dikes” in “Physical principals of sedimentary basin analysis”.



m/make_sill_max_temp_max_time_approx.m

gnuplot

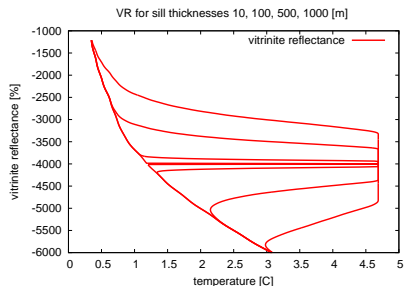
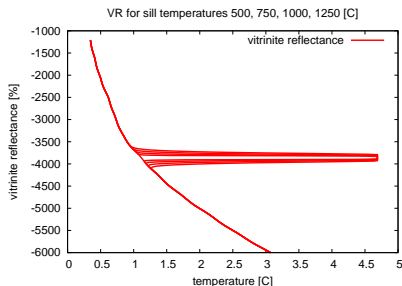
plot/plot-sill-max-temp-max-time.gp

figure: figs/fig-approx-temp-max.eps

figure: figs/fig-approx-time-max.eps

Vitrinite reflectance from sills

See section 6.15 “Cooling sills and dikes” in “Physical principals of sedimentary basin analysis”.

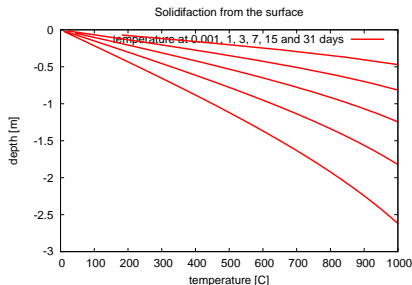
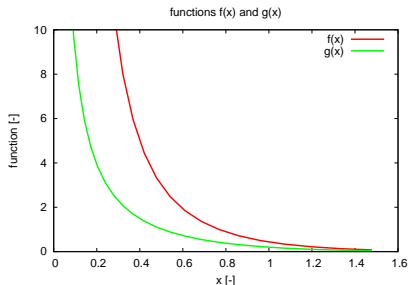


src/vr.c

gnuplot plot/plot-vr-sill.gp
figure: figs/fig-vr-sill-100m.eps
figure: figs/fig-vr-sill-thickness.eps

Solidification and latent heat of fusion

See section 6.16 “Solidification and latent heat of fusion” in “Physical principals of sedimentary basin analysis”.

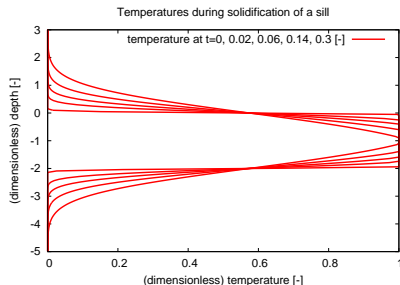
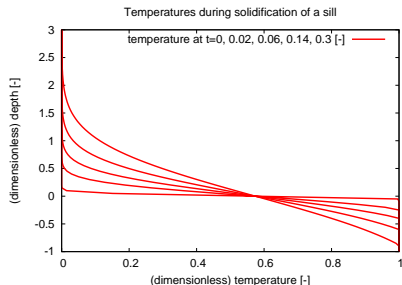


m/make_solid_from_surface.m

gnuplot plot/plot-solid-from-surface.gp
figure: figs/fig-functions-f-and-g.eps
figure: figs/fig-solid-from-surface.eps

Solidification of sills

See section 6.17 “Solidification of sills and dikes” in “Physical principals of sedimentary basin analysis”.

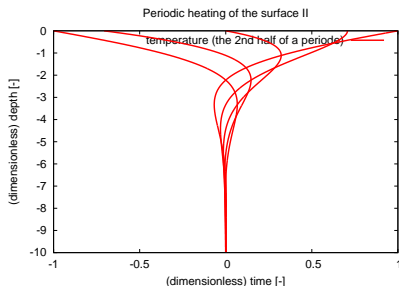
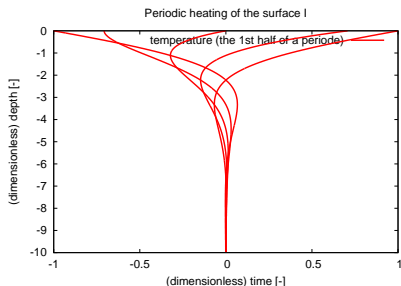


m/make_solidified_sill.m

gnuplot plot/plot-solid-sill.gp
figure: figs/fig-solid-sill-half.eps
figure: figs/fig-solid-sill-full.eps

Periodic heating of the surface

See section 6.18 “Periodic heating of the surface” in “Physical principals of sedimentary basin analysis”.

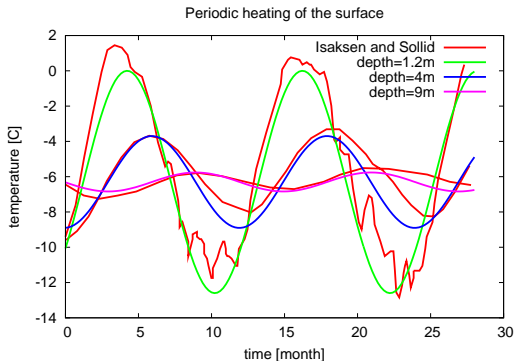


m/make_temp_periodic.m

gnuplot plot/plot-temp-periodic.gp
figure: figs/fig-temp-periodic1.eps
figure: figs/fig-temp-periodic2.eps

Periodic heating of the surface

See section 6.18 “Periodic heating of the surface” in “Physical principals of sedimentary basin analysis”.

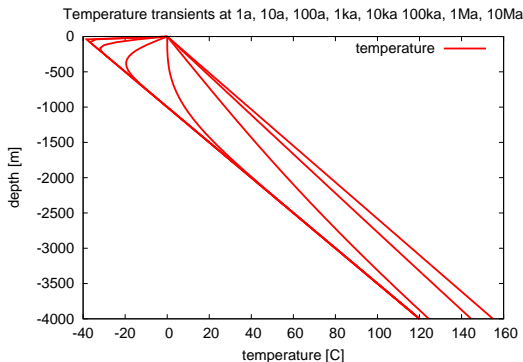


m/make_modelled_IS.m

gnuplot plot/plot-modelled-IS.gp
figure: figs/fig-modelled-IS.eps

Instantaneous deposition

See section 6.20 “Temperature transients from sediment deposition or erosion” in “Physical principals of sedimentary basin analysis”.

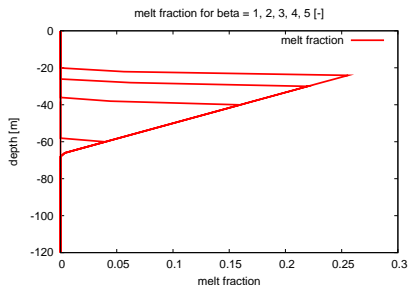
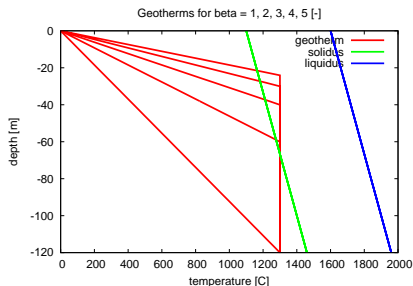


m/make_depos_temp_trans.m

gnuplot plot/plot-depos-temp-trans.gp
figure: figs/fig-depos-temp-trans.eps

Melt generation from lithospheric extension

See section 7.12 “Lithospheric extension and decompression melting” in “Physical principals of sedimentary basin analysis”.

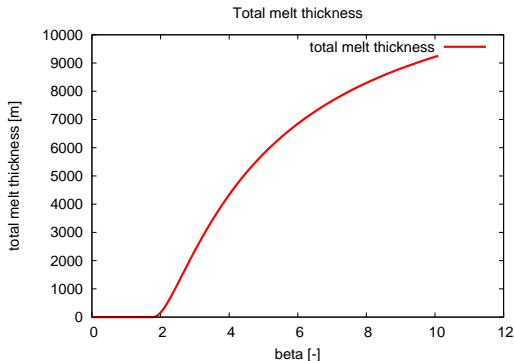


m/make_linear_melt_data.m

gnuplot plot/plot-linear-melt-data.gp
figure: figs/fig-linear-melt-geotherms.eps
figure: figs/fig-linear-melt-fraction.eps

Melt generation from lithospheric extension (cont.)

See section 7.12 “Lithospheric extension and decompression melting” in “Physical principals of sedimentary basin analysis”.



m/make_linear_melt_total_thickness.m

gnuplot

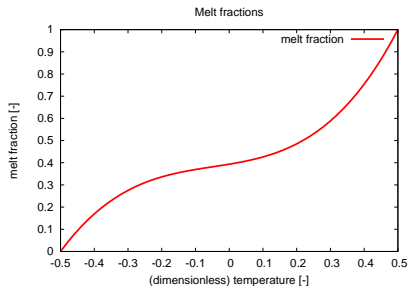
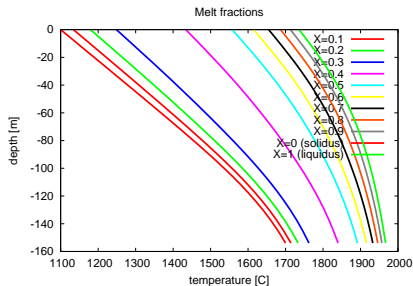
plot/plot-linear-melt-total-thickness.gp

figure:

figs/fig-linear-melt-total-thickness.eps

McKenzie and Bickle melt model

See section 7.12 “Lithospheric extension and decompression melting” in “Physical principals of sedimentary basin analysis”.



m/make_McKenzie_Bickle_melt_data.m

gnuplot

plot/plot-McKenzie-Bickle-melt-data.gp

figure:

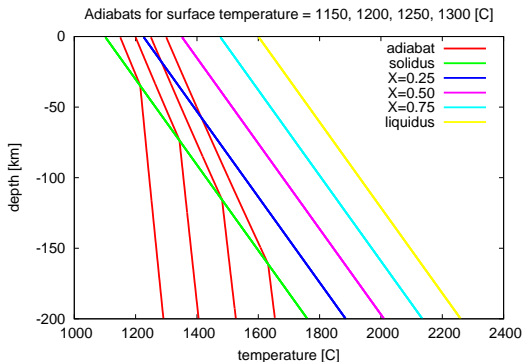
figs/fig-McKenzie-Bickle-melt-data.eps

figure:

figs/fig-McKenzie-Bickle-melt-data-II.eps

Adiabats and melt fractions

See section 7.12 “Lithospheric extension and decompression melting” in “Physical principals of sedimentary basin analysis”.

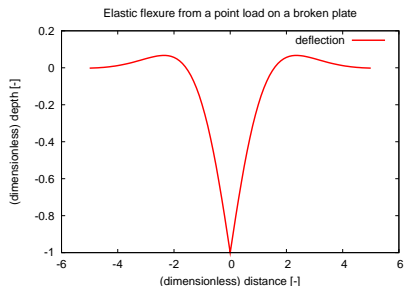
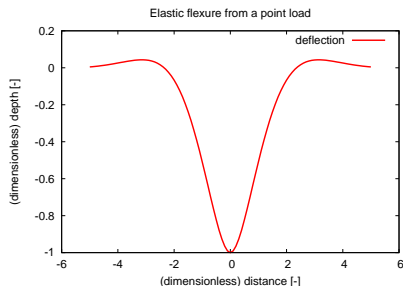


m/make_adiabat_melt.m

gnuplot plot/plot-adiabat-melt.m
figure: figs/fig-adiabat-melt.eps

Elastic flexure of a plate

See section 9.2 “Flexure from a point load” and section 9.3 “Flexure from a point load on a broken plate” in “Physical principals of sedimentary basin analysis”.



m/make_point_load_flexure.m

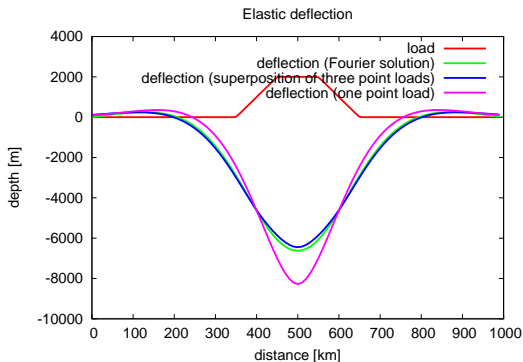
gnuplot plot/plot-point-load-flexure.gp

figure: figs/fig-point-load-flexure.eps

figure: figs/fig-point-load-flexure-broken.eps

Elastic flexure of a plate (cont.)

See Note 9.3 “Semi-numerical solution” and note 9.5 “Fourier series solution” in “Physical principals of sedimentary basin analysis”.

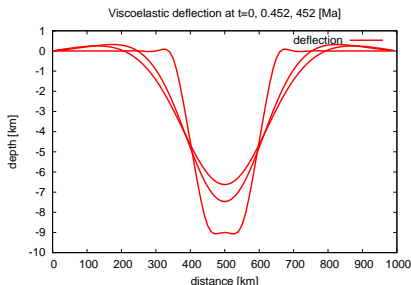
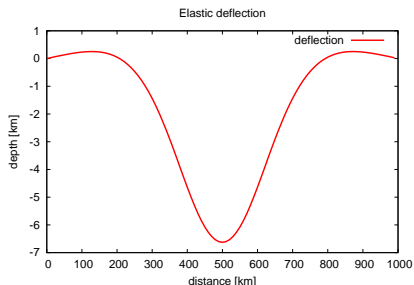


src/flexure.c

gnuplot plot/plot-rectangle-fourier-II.gp
figure: figs/fig-rectangle-fourier-II.eps

Visoelastic deflection of a plate

See section 9.9 “Flexure of a viscoelastic plate” in “Physical principals of sedimentary basin analysis”.

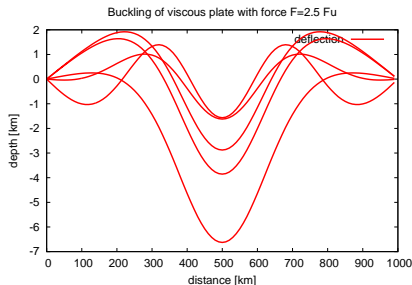
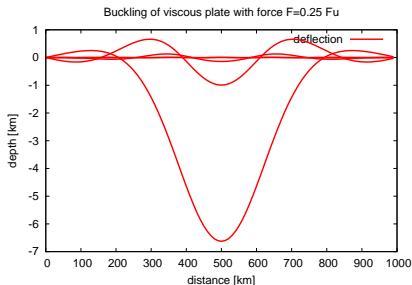


src/flexure.c # See file MakeAll.sh for the load.

gnuplot plot/plot-rectangle-fourier.gp
figure: figs/fig-rectangle-fourier.eps
figure: figs/fig-rectangle-fourier-VE.eps

Buckling of a viscous plate

See section 9.10 “Buckling of a viscous plate” in “Physical principals of sedimentary basin analysis”.

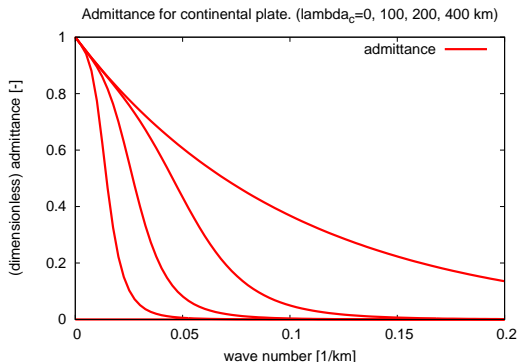


src/flexure.c # See file MakeAll.sh for the load.

gnuplot plot/plot-visc-deflex.gp
figure: figs/fig-visc-deflex-A.eps
figure: figs/fig-visc-deflex-B.eps

Admittance function for continents

See section 10.14 “Gravity and isostasy over continents” in “Physical principals of sedimentary basin analysis”.

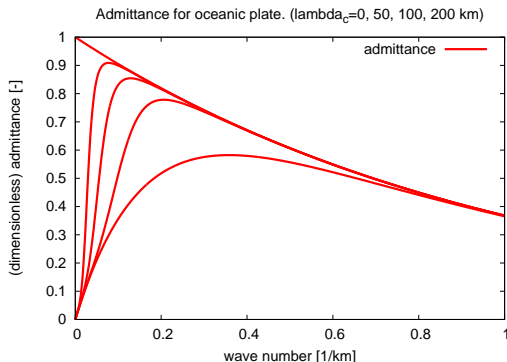


m/make_admittance_continental.m

gnuplot plot-admittance-II.gp
figure: figs/fig-admittance-continent.eps

Admittance function for oceans

See section 10.15 “Gravity and sea bed topography” in “Physical principals of sedimentary basin analysis”.

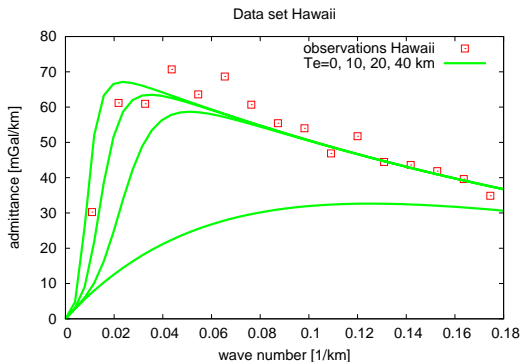


m/make_admittance_ocean.m

gnuplot plot-admittance-II.gp
figure: figs/fig-admittance-ocean.eps

Admittance Hawaii

See section 10.15 “Gravity and seabed topography” in “Physical principals of sedimentary basin analysis”.

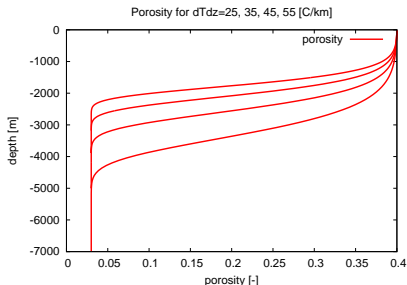
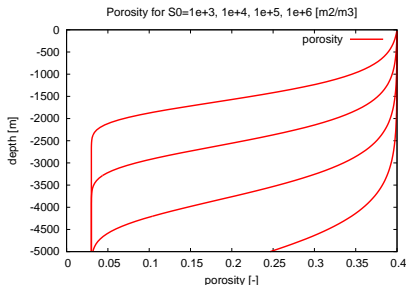


m/make_admittance_for_Te.m
m/make_admittance_hawaii.m

gnuplot plot/plot-admittance.gp
figure: figs/fig-admittance-hawaii.eps

Quartz cementation of sandstones

See section 11.6 “Cementation during constant burial” in “Physical principals of sedimentary basin analysis”.

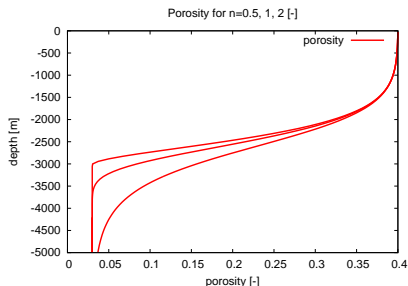
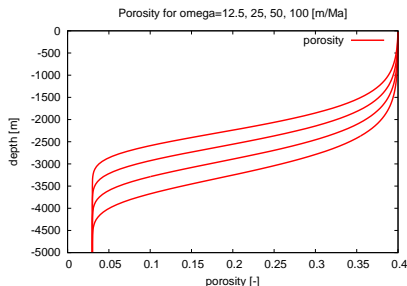


m/make_porosity_burial.m

gnuplot plot/plot-porosity1.gp
figure: figs/fig-porosity-burial-S0.eps
figure: figs/fig-porosity-burial-dTdz.eps

Quartz cementation of sandstones (cont.)

See section 11.6 “Cementation during constant burial” in “Physical principals of sedimentary basin analysis”.

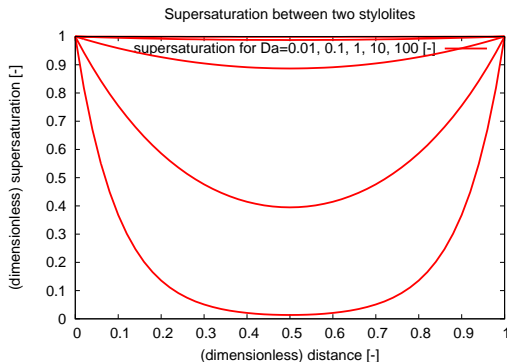


m/make_porosity_burial.m

gnuplot plot/plot-porosity2.gp
figure: figs/fig-porosity-burial-omega.eps
figure: figs/fig-porosity-burial-n.eps

The silica concentration between stylolites

See section 11.10 “The silica concentration between stylolites” in “Physical principals of sedimentary basin analysis”.

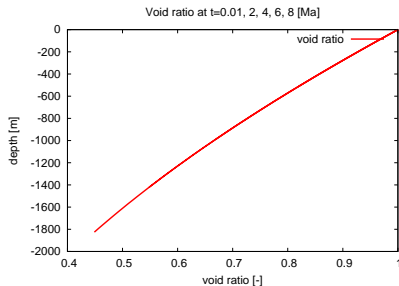
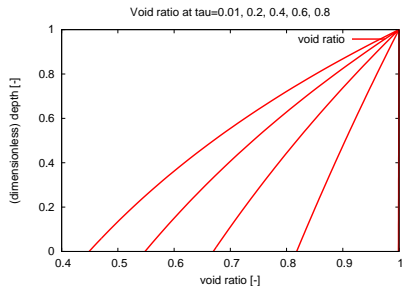


m/make_supersat_data.m

gnuplot plot/plot-supersat-data.gp
figure: figs/fig-supersat-data.eps

Void ratio as a function of depth

See section 12.4 “A simple model for overpressure build-up” in “Physical principals of sedimentary basin analysis”.



m/make_pres_for_phi_of_zeta.m

gnuplot

plot/plot-void-ratio-for-phi-of-zeta.gp

figure:

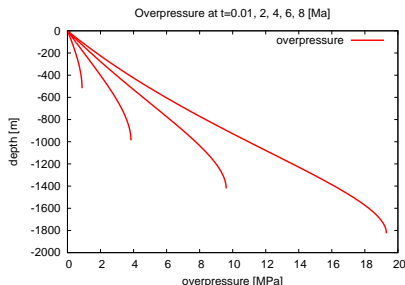
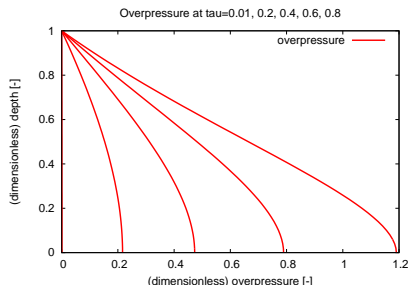
figs/fig-void-ratio-for-phi-of-zeta1.eps

figure:

figs/fig-void-ratio-for-phi-of-zeta2.eps

Overpressure (porosity as a function of depth)

See section 12.4 “A simple model for overpressure build-up” in “Physical principals of sedimentary basin analysis”.

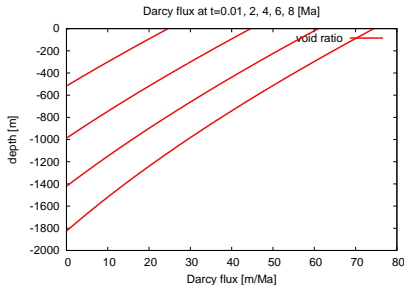
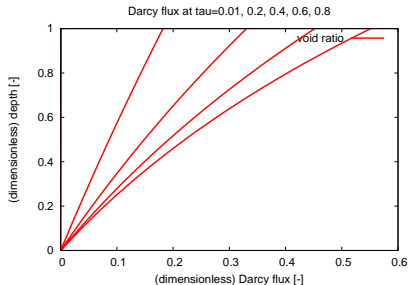


m/make_pres_for_phi_of_zeta.m

gnuplot plot/plot-pres-for-phi-of-zeta.gp
figure: figs/fig-pres-for-phi-of-zeta1.eps
figure: figs/fig-pres-for-phi-of-zeta2.eps

Darcy velocity (porosity as a function of depth)

See section 12.4 “A simple model for overpressure build-up” in “Physical principals of sedimentary basin analysis”.



m/make_pres_for_phi_of_zeta.m

gnuplot

plot/plot-Darcy-flux-for-phi-of-zeta.gp

figure:

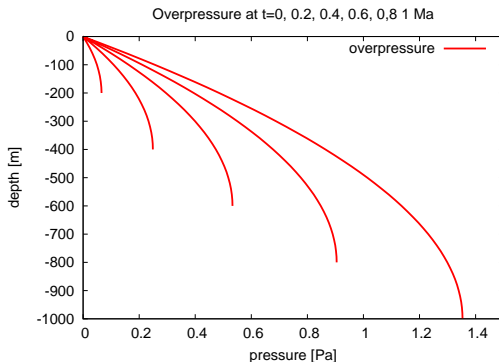
figs/fig-Darcy-flux-for-phi-of-zeta1.eps

figure:

figs/fig-Darcy-flux-for-phi-of-zeta2.eps

Gibson's solution for overpressure

See section 12.6 “Gibson’s solution for overpressure” in “Physical principals of sedimentary basin analysis”.

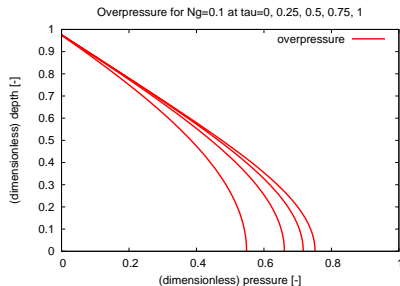
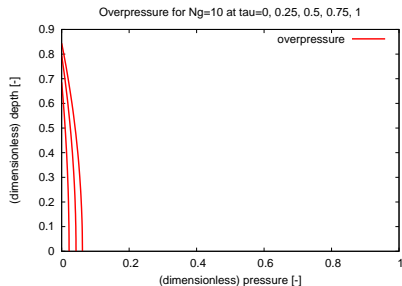


m/make_Gibson_pres.m

gnuplot plot/plot-Gibson-pres.gp
figure: figs/fig-Gibson-pres.eps

Dimensionless Gibson solution

See section 12.9 “The dimensionless Gibson solution” in “Physical principals of sedimentary basin analysis”.



m/make_dimless_Gibson_pres.m

gnuplot plot/plot-dimless-Gibson-pres.gp

figure:

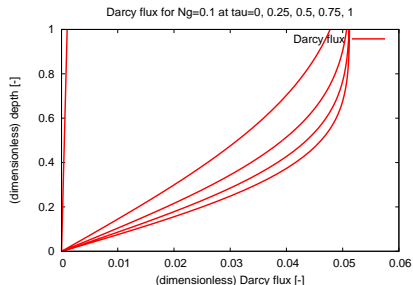
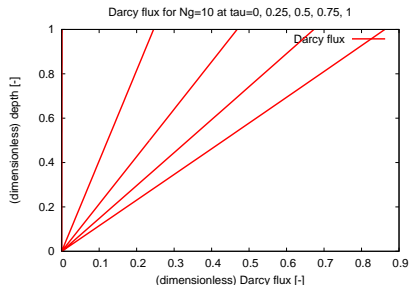
figs/fig-dimless-Gibson-pres- $Ng=10$.eps

figure:

figs/fig-dimless-Gibson-pres- $Ng=0.1$.eps

Dimensionless Gibson solution (cont.)

See section 12.9 “The dimensionless Gibson solution” in “Physical principals of sedimentary basin analysis”.



m/make_dimless_Gibson_pres.m

gnuplot plot/plot-dimless-Gibson-flux.gp

figure:

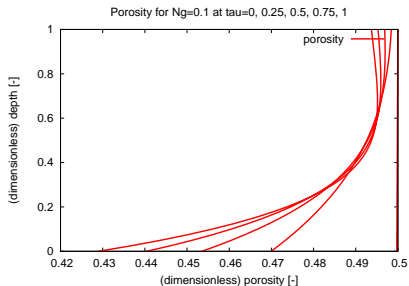
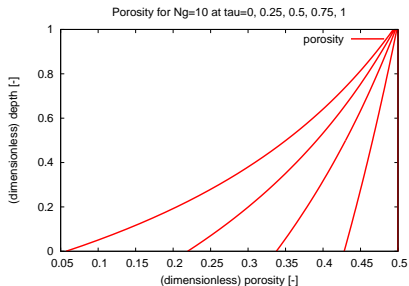
figs/fig-dimless-Gibson-flux- $Ng=10$.eps

figure:

figs/fig-dimless-Gibson-flux- $Ng=0.1$.eps

Dimensionless Gibson solution (cont.)

See section 12.9 “The dimensionless Gibson solution” in “Physical principals of sedimentary basin analysis”.



m/make_dimless_Gibson_pres.m

gnuplot plot/plot-dimless-Gibson-phi.gp

figure:

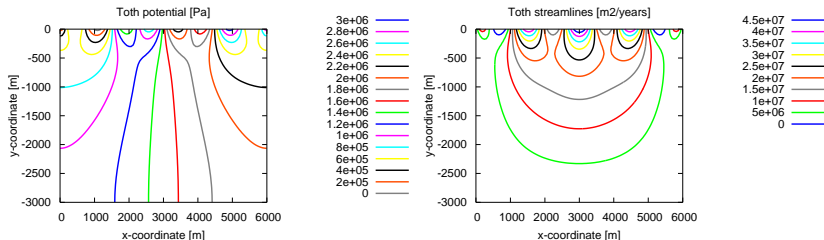
figs/fig-dimless-Gibson-phi- $N_g=10$.eps

figure:

figs/fig-dimless-Gibson-phi- $N_g=0.1$.eps

Meteoric fluid flow

See section “14.2 Meteoric fluid flow” in “Physical principals of sedimentary basin analysis”.

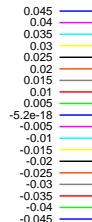
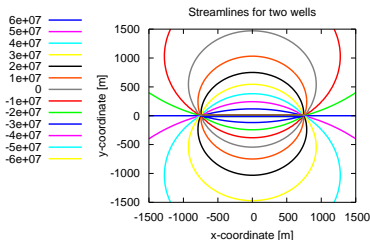
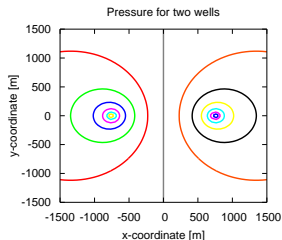


m/make_toth_flow_field.m

gnuplot plot/plot-flow-field-Toth.gp
figure: figs/fig-potential-Toth.eps
figure: figs/fig-streamlines-Toth.eps

Pressure and streamlines around wells

See section 15.1 “Stationary pressure from a well” in “Physical principals of sedimentary basin analysis”.



m/make_double_well_flow_field.m

gnuplot plot/plot-double-well-flow-field.gp
figure: figs/fig-double-well-pressure.eps
figure: figs/fig-double-well-streamlines.eps