

# Literaturverzeichnis

- A. Adam. Geothermal effects in the formation of electrically conducting zones and temperature distribution in the earth. *Physics of the Earth and Planetary Interiors*, 17:P21–P28, 1978.
- A. Adam. Are there two types of conductivity anomaly (CA) caused by fluid in the crust? *Physics of the Earth and Planetary Interiors*, 45:209–215, 1987.
- E. Aharonov, J. a. Whitehead, P. Kelemen, and M. Spiegelman. Channeling instability of upwelling melt in the mantle. *Journal of Geophysical Research*, 100:20433–20450, 1995.
- E. Aharonov, D. G. Rothman, and A. H. Thompson. Transport properties and diagenesis of sedimentary rocks: The role of micro-scale geometry. *Geology*, 25:547–550, 1997a.
- E. Aharonov, M. Spiegelman, and P. Kelemen. Three-dimensional flow and reaction in porous media: implications for the Earth's mantle and sedimentary basins. *Journal of Geophysical Research*, 102: 14821–14834, 1997b.
- A. S. Alekseev, A. V. Egorkin, and N. I. Pavlenkova. Shear waves in lithosphere studies on the territory of the U.S.S.R. *Tectonophysics*, 154:227–239, 1988.
- P. W. Atkins. *Physical Chemistry*. Oxford University Press, 1986.
- K. Bahr. Interpretation of the magnetotelluric impedance tensor: Regional induction and local telluric distortion. *jofg*, 62:119–127, 1988.
- R. C. Bailey. The trapping of fluids in the deep crust. *Geophysical Research Letters*, 17:1129–1132, 1990.
- N. P. Balling. Geothermal Models of the Crust and Uppermost Mantle of the Fennoscandian Shield in South Norway and the Danish Embayment. *Journal of Geophysics*, pages 237–256, 1976.
- H. L. Barnes. Solubilities of ore minerals. In H. L. Barnes, editor, *Geochemistry of Hydrothermal Ore Deposits*, pages 405–460. Wiley, 1978.
- R. Barret, M. Berry, T. Chan, J. Demmel, J. Donato, J. Dongarra, V. Eijkhout, R. Pozo, C. Romine, and H. van der Vorst. *Templates for the Solution of Linear Systems: Building Blocks for Iterative Methods*. SIAM, 1994.
- J. Bear. *Dynamics of Fluids in Porous Media*. Elsevier, 1972.
- J. Bear and Y. Bachmat. Transport phenomena in porous media - basic equations. In J. Bear and M. Y. Corapcioglu, editors, *Fundamentals of Transport Phenomena in Porous Media, NATO Adv.St.Inst. Ser. E: Applied Science - No. 82*, pages 3–62. Martinus Nijhoff, 1984.
- J. Bear and Y. Bachmat. Deletion of nondominant effects in modeling transport in porous media. In J. Bear and M. Y. Corapcioglu, editors, *Transport Phenomena in Porous Media, NATO Adv.St.Inst. Ser. E: Applied Science - No. 202*, pages 3–62. Martinus Nijhoff, 1991.
- J. Bear and A. Veruijt. *Modelling Groundwater Flow and Pollution*. Reidel, 1987.

- H.-J. Behr and J. Gerler. Inclusions of sedimentary brines in post-variscan mineralizations in the FRG. *Chemical Geology*, 61:265–277, 1987.
- H.-J. Behr, E. E. Horn, K. Frentzel-Beyme, and Chr. Reutel. Fluid inclusion characteristics of the variscan and post-variscan mineralizing fluids in the FRG. *Chemical Geology*, 61:273–285, 1987.
- J. H. Behrmann. A study of white mica microstructure and microchemistry in a low grade mylonite zone. *Journal of Structural Geology*, 2:283–292, 1984.
- S. Békri, J. F. Thovert, and P. M. Adler. Dissolution of porous media. *Chemical Engineering Science*, 50:2765–2791, 1995.
- A. Bellin and Y. Rubin. HYDRO\_GEN: A new random number generator for correlated properties. *Stochastic Hydrology and Hydraulics*, 10:1–8, 1996.
- J. G. Berryman. Mixture theory for rock properties. In T. J. Ahrens, editor, *AGU Handbook of Physical Constants*, pages 205–228. Elsevier, 1995.
- C. M. Bethke. Hydrologic constraints on the genesis of the upper Mississippi Valley mineral district from Illinois Basin brines. *Economic Geology*, 81:223–249, 1986.
- C. M. Bethke and S. Marshak. Brine migrations across North America – the up-plate tectonics of groundwater. *Annual Review of Earth and Planetary Sciences*, 18:287–315, 1990.
- J. J. Bikerman. Ionentheorie der Elektroosmose, Strömungsströme und der Oberflächenleitfähigkeit. *Zeitschrift für Physikalische Chemie. Serie A*, 163:378–394, 1933.
- J. J. Bikerman. Die Oberflächenleitfähigkeit und ihre Bedeutung. *Kolloid-Zeitschrift*, 72:100–108, 1942.
- J. J. Bikerman. *Physical Surfaces*. Academic Press, 1970.
- G. Bird, J. Boon, and T. Stone. Silica transport during steam injection into oil sands. 1. dissolution and precipitation kinetics of quartz: New results and review of existing data. *Chemical Geology*, 54:69–80, 1986.
- BIRPS and ECORS. Deep seismic reflection studies profiling between England, France, and Ireland. *Journal of the Geological Society of London*, 143:45–52, 1986.
- J. L. Bischoff and R. J. Rosenbauer. An empirical equation of state for hydrothermal seawater (3.2 percent NaCl). *American Journal of Science*, 285:725–763, 1985.
- K. Bjørlykke. Fluid-flow processes in sedimentary basins. *Surveys in Geophysics*, 86, 1993.
- K. Bjørlykke. Fluid-flow processes and diagenesis in sedimentary basins. In J. Parnell, editor, *Geofluids: Origin, Migration, and Evolution of Fluids in Sedimentary basins*. Geological Society Special Publication No. 78, volume 95 of AMD. Geological Society, 1994.
- K. Bjørlykke and P. K. Egeberg. Quartz cementation in sedimentary basins. *American Association of Petroleum Geologists Bulletin*, 77, 1993.
- R. J. Bodnar and J. K. Costain. Effect of varying fluid composition on mass and energy transport in the crust. *Geophysical Research Letters*, 18:983–9986, 1991.
- D. E. Boerner, R. D. Kurtz, and J. A. Craven. Electrical conductivity and paleo-proterozoic foredeeps. *Journal of Geophysical Research*, 101(B6):13775–13792, June 1996.
- E. W. Bolton, A. C. Lasaga, and D. M. Rye. A model for the kinetic control of quartz dissolution and precipitation in porous media flow with spatially variable permeability: Formulation and examples of thermal convection. *Journal of Geophysical Research*, 101:22157–22187, 1996.

- E. W. Bolton, A. C. Lasaga, and D. M. Rye. Dissolution and precipitation via forced flux injection in a porous medium with spatially variable permeability: Kinetic control in two dimensions. *Journal of Geophysical Research*, 102:1257–22187, 1997.
- E. W. Bolton, A. C. Lasaga, and D. M. Rye. Long-term flow/chemistry feedback in a porous medium with heterogeneous permeability: Kinetic control of dissolution and precipitation. *in preparation*, ???:??–?, 1998.
- D. C. Booth and S. Crampin. Shear-wave polarisations on a curved wavefront at the free surface of an anisotropic halfspace. *Geophysical Journal of the Royal Astronomical Society*, 83:31–45, 1985.
- T. S. Bowers and H. C. Helgeson. Calculation of the thermodynamic and Geochemical consequences of nonideal mixing in the system  $H_2O - CO_2 - NaCl$  on phase relations in Geologic systems: Equation of state for  $H_2O - CO_2 - NaCl$  fluids at high pressures and temperatures. *Chemical Geology*, 11: 203–213, 1983a.
- T. S. Bowers and H. C. Helgeson. Calculation of the thermodynamic and Geochemical consequences of nonideal mixing in the system  $H_2O - CO_2 - NaCl$  on phase relations in Geologic systems: Metamorphic equilibria at high pressures and temperatures. *American Mineralogist*, 68:1059–1075, 1983b.
- T. S. Bowers and H. C. Helgeson. FORTRAN programs for generating fluid inclusion isochores and fugacity coefficients for the system  $H_2O - CO_2 - NaCl$  at high pressures and temperatures. *Chemical Geology*, 11:203–213, 1985.
- W. F. Brace. Resistivity of saturated crustal rocks to 40 km based on laboratory measurements. In J. G. Heacock, editor, *The Structure and Physical Properties of the Earth's Crust. AGU Geophysical Monograph*. 14. American Geophysical Union, 1971.
- W. F. Brace. Pore pressure in Geophysics. In H. C Heard, I. Y. Borg, N. L. Carter, and C. B. Raleigh, editors, *Flow and Fracture of Rocks. AGU Geophysical Monograph*. 16, pages 265–274. American Geophysical Union, 1972.
- W. F. Brace. Permeability of crystalline rocks: New in situ measurements. *Journal of Geophysical Research*, 89:4327–4330, 1984.
- W. F. Brace, A. S. Orange, and T. B. Madden. The effect of pressure on the electrical resistivity of water-saturated crystalline rocks. *Journal of Geophysical Research*, 70:5669–5678, 1965.
- D. R. Brehm. *Entwicklung, Validierung und Anwendung eines dreidimensionalen, strömungsgekoppelten Finite Differenzen Wärmetransportmodells*. PhD thesis, Justus-Liebig-Universität GieSSen. Fachbereich Geowissenschaften, 1989.
- J. M. Brenan and E. B. Watson. Fluids in the lithosphere. 2. experimental constraints on  $CO_2$  transport in dunite and quartzite at elevated P-T conditions with implications for mantle and crustal decarbonation processes. *Earth and Planetary Science Letters*, 91:141–158, 1988.
- G. H. Brimhall and D. A. Crerar. Ore fluids: Magmatic to supergene. In I. S. E. Carmichael and H. P. Eugster, editors, *Thermodynamic Modeling of Geological Materials: Minerals, Fluids and Melts. Reviews in Mineralogy* 17. Mineralogical Society of America, 1986.
- F. Börner. *Untersuchungen zur komplexen elektrischen Leitfähigkeit von Gesteinen im Frequenzbereich von 1 mHz bis 10 kHz*. PhD thesis, Bergakademie Freiberg. Fakultät für Mathematik und Naturwissenschaften, 1991.
- A. N. Brooks and T. J. R. Hughes. Streamline-Upwind/Petrov-Galerkin formulations for convection dominated flows with particular emphasis on the compressible Euler equations. *Computer Methods in Applied Mechanics and Engineering*, pages 199–259, 1982.
- D. H. Brownell, Jr., S. K. Garg, and J. W. Pritchett. Governing equations for Geothermal reservoirs. *Water Resources Research*, 13:929–934, 1977.

- C. J. Bruton and H. C. Helgeson. Calculation of the chemical and thermodynamic consequences of differences between fluid and Geostatic pressure in hydrothermal systems. *American Journal of Science*, A283:540–588, 1983.
- C. W. Burnham, J. R. Holloway, and N. F. Davis. *Thermodynamic properties of water to 1000°C and 10,000 bars*, volume 12 of *Special Papers*. Geological Society of America, 1969.
- P. R. Buseck and Bo-Jun Huang. Conversion of carbonaceous material to graphite during metamorphism. *Geochimica et Cosmochimica Acta*, 49:2003–2016, 1985.
- M. E. Cantekin and J. J. Westerink. Non-diffusive N+2 degree Petrov-Galerkin methods for two-dimensional transient transport computations. *International Journal for Numerical Methods in Engineering*, 30:397–418, 1990.
- G. F. Carey and K. Sepehrnoori. Gershgorin theory for stiffness and stability of evolution systems and convection-diffusion. *Computer Methods in Applied Mechanics and Engineering*, 22:23–48, 1984.
- H. S. Carslaw and J. C. Jaeger. *Conduction of Heat in Solids*. Oxford University Press, 1959.
- N. L. Carter and M. C. Tsenn. Flow properties of continental lithosphere. *Tectonophysics*, 136:27–63, 1987.
- L. M. Cathles. Scales and effects of fluid flow in the upper crust. *Science*, 248:323–329, 1990.
- L. M. Cathles, A. J. H. Erendi, and T. Barrie. How long can a hydrothermal system be sustained by a single intrusive event? *Economic Geology*, 92:766–771, 1997.
- L. M. Cathles III. Thermal aspects of ore formation. In H. L. Barnes, editor, *Geochemistry of Hydrothermal Ore Deposits. Third Edition*, pages 191–227. Wiley, 1997.
- D. S. Chapman. Thermal gradients in the continental crust. In J. B. Dawson, D. A. Carswell, J. Hall, and K. H. Wedepohl, editors, *The Nature of The Lower Continental Crust. Geological Society Special Publicationa No. 24*. Blackwell, 1986.
- D. S. Chapman and K. P. Furlong. The thermal state of the continental crust. In D. M. Fountain, R. Arculus, and Kay R. W., editors, *Continental Lower Crust*, volume 23 of *Developments in Geotectonics*, pages 179–199. Elsevier, 1992.
- T. L. Chelidse and Y. Gueguen. Electric spectroscopy of porous rocks: a review - I. theoretical results. *Geophysical Journal International*, 137:1–15, 1999.
- T. L. Chelidse, Y. Gueguen, and C. Ruffet. Electric spectroscopy of porous rocks: a review - II. experimental results and interpretation. *Geophysical Journal International*, 137:16–34, 1999.
- A. S. M. Cherkaoui and W. S. D. Wilcock. Characteristics of high Rayleigh number twodimensional convection in an open-top porous layer heated from below. *Journal of Fluid Mechanics (submitted)*, 1999.
- M. Chigira and M. Watanabe. Silica precipitation behaviour in a flow field with negative temperature gradients. *Journal of Geophysical Research*, 99:15539–15548, 1994.
- N. I. Christensen. Pore pressure and oceanic crustal seismic structure. *Geophysical Journal of the Royal Astronomical Society*, 79:411–423, 1984.
- I. Christie, D. F. Griffiths, A. R. Mitchell, and O. C. Zienkiewicz. Finite element methods for second order differential equations with significant first derivatives. *International Journal for Numerical Methods in Engineering*, 10:1389–1396, 1976.
- C. Clauser. Permeabilität kristalliner Gesteine - Vergleich von Mittelwerten im Maßstab von  $10^{-1}$  bis  $10^4$  m . Technical Report 107 776, NLfB-GGA Hannover, 1991.
- C. Clauser and E. Huenges. Thermal conductivity of rocks and minerals. In T. J. Ahrens, editor, *AGU Handbook of Physical Constants*. AGU, New York, 1995.

- C. Clauser and St. Kiessner. A conservative, unconditionally stable, second-order three-point differencing scheme for the diffusion-convection equation. *Geophysical Journal of the Royal Astronomical Society*, 91:557–568, 1987.
- C. Clauser and H. J. Neugebauer. Thermisch relevante Tiefenwasserzirkulation in der Oberkruste unter dem Oberrheingraben? Eingrenzungen mit Hilfe hydrothermischer Modellrechnungen. *Geologisches Jahrbuch*, E 48:185–217, 1991.
- M. Combarnous. Natural convection in porous media and Geothermal systems. Proceedings of the 6<sup>th</sup> Int. Heat Transfer Conference, Toronto, Vol. 6, 1978.
- J. A. D. Connolly. Devolatilization-generated fluid pressure and deformation-propagated fluid flow during prograde regional metamorphism. *Contributions to Mineralogy and Petrology*, 102:347–366, 1997a.
- J. A. D. Connolly. Mid-crustal focused fluid movement: thermal consequences and silica transport. In B. Jamtveit and B. W. D. Yardley, editors, *Fluid flow and transport in rocks. Mechanisms and effects*, pages 235–250. Chapman & Hall, 1997b.
- J. A. D. Connolly and A. B. Thompson. Fluid and enthalpy production during regional metamorphism. *Contributions to Mineralogy and Petrology*, 102:347–366, 1989.
- R. L. Cooley. Some new procedures for numerical solutions of variably saturated flow problems. *Water Resources Research*, 19:1271–1285, 1983.
- S. Crampin. Seismic-wave propagation through a cracked solid: Polarisation as a possible dilatancy diagnostic. *Geophysical Journal of the Royal Astronomical Society*, 53:467–496, 1978.
- S. Crampin. An introduction to wave propagation in anisotropic media. *Geophysical Journal of the Royal Astronomical Society*, 76:17–28, 1984.
- S. Crampin. Evaluation of anisotropy by shear-wave splitting. *Geophysics*, 50:142–152, 1985a.
- S. Crampin. Evidence for aligned cracks in the earth's crust. *First Break*, 3(3):12–15, 1985b.
- S. Crampin. Suggestions for a consistent terminology for seismic anisotropy. *Geophysical Prospecting*, 37:753–770, 1989.
- S. Crampin and B. K. Atkinson. Microcracs in the earth's crust. *First Break*, 3(3):16–20, 1985.
- S. Crampin, E. M. Chesnokov, and R. G. Hipkin. Seismic anisotropy - the state of the art: II. *Geophysical Journal of the Royal Astronomical Society*, 76:1–16, 1984a.
- S. Crampin, R. Evans, and B. K. Atkinson. Earthquake prediction: a new physical basis. *Geophysical Journal of the Royal Astronomical Society*, 76:147–156, 1984b.
- M. L. Crawford and L. S. Hollister. Metamorphic fluids: The evidence from fluid inclusions. In B. J. Wood and J. V. Walther, editors, *Water-Rock Interactions During Metamorphism. Advances in Physical Geochemistry 5*, pages 109–131. Springer, 1986.
- D. Crerar, S. Wood, S. Brantley, and A. Bocarsly. Chemical controls on solubility of ore-forming minerals in hydrothermal solutions. *Canadian Mineralogist*, 23:333–352, 1985.
- R. D. da Cunha and T. Hopkins. *PIM 2.1. The Parallel Iterative Methods package for systems of linear equations*. Mathematics institute and National Supercomputing Centre, Universidadt Federal do Rio Grande do Sul, Brasil and Computing Laboratory, University of Kent, Canterbury, UK, 1995.
- C. David, T.-F. Wong, W. Zhu, and J. Zhang. Laboratory measurements of compaction induced permeability change in porous rocks: implications for the generation and maintenance of pore pressure excess in the crust. *Pure and Applied Geophysics*, 143:425–456, 1994.
- S. H. Davis, S. Rosenblat, J. R. Wood, and T. A. Hewett. Convective fluid flow and diagenetic patterns in domed sheets. *American Journal of Science*, 285:207–223, 1985.

- P. de Caritat. Persistence of quartz disequilibrium in groundwater flows. *Terra Nova*, 2:53–59, 1990.
- E. de St. Q. Isaacson and M. de St. Q. Isaacson. *Dimensional Methods in Engineering and Physics*. Edward Arnold, 1975.
- DEKORP Research Team. Results of the DECORP 1 BELCORP-DEKORP deep seismic reflection studies in the western part of the Rhenish Massif. *Geophysical Journal International*, 106:203–227, 1991.
- C. V. Deutsch and A. G. Journel. *GSLIB. Geostatistical software library and user's guide*. Oxford University Press, 1998.
- J. F. Dewey. Diversity in the lower continental crust. In J. B. Dawson, D. A. Carswell, J. Hall, and K. H. Wedepohl, editors, *The Nature of The Lower Continental Crust. Geological Society Special Publications No. 24*. Blackwell, 1986.
- G. M. Dipple and J. M. Ferry. The effect of thermal history on the development off mineral assemblages during infiltration-driven contact metamorphism. *Contributions to Mineralogy and Petrology*, 124: 333–345, 1996.
- R. A. Dobbins, K. Mohamed, and D. A. Sullivan. Pressure and density series equations of state for steam as derived from the Haar-Gallagher-Kell-formulation. *Journal of Physical and Chemical Reference Data*, 17:1–8, 1988.
- P. A. Domenico and F. W. Schwartz. *Physical and Chemical Hydrogeology*. Wiley, 1990.
- I. G. Donaldson. Temperature gradients in the upper layers of the Earth's crust due to convective water flow. *Journal of Geophysical Research*, 67:3449–3459, 1962.
- J. Donea, S. Giuliani, H. Laval, and L. Quartapelle. Time-accurate solution of advection-diffusion problems by finite elements. *Computer Methods in Applied Mechanics and Engineering*, 45:123–145, 1984.
- J. Douglas Jr. and T. F. Russel. Numerical methos for convection-dominated diffusion problems based on combining the method of characteristics with finite element or finite difference procedures. *SIAM Journal of Numerical Analysis*, 19:871–885, 1982.
- P. M. Dove and J. D. Rimstidt. Silica-water reactions. In P. J. Heaney, C. T. Prewitt, and G. V. Gibbs, editors, *Silica: Physical Behavior, Geochemistry, and Materials Applications*, volume 29 of *Reviews in Mineralogy*. Mineralogical Society of America, 1994.
- M. J. Drury. Electrical resistivity sounding as a technique for studying crustal dilatancy prior to earthquakes. *Canadian Journal of Earth Sciences*, 16:205–214, 1979.
- M. J. Drury. The heat flow-heat generation relationship: implications for the nature of continental crust. *Tectonophysics*, 164:93–106, 1989.
- A. G. Duba, E. Huenges, G. Nover, G. Will, and H. Jödicke. Impedance of black shale from Münsterland I borehole: an anomalously good conductor? *Geophysical Journal International*, 94:413–419, 1988.
- A. G. Duba and T. J. Shankland. Free carbon and electrical conductivity in the earth's mantle. *Geophysical Research Letters*, 9:1271–1274, 1982.
- S. S. Dukhin and B. V. Derjaguin. Electrokinetic phenomena. In E. Matijevic, editor, *Surface and Colloid Science*, volume 7, pages 1–356. Wiley-Interscience, 1974.
- B. Dutrow and D. Norton. Evolution of fluid pressure and fracture popagation during contact metamorphism. *Journal of Metamorphic Geology*, 13:677–686, 1995.
- N. C. Dutta. Shale compaction, burial diagenesis, and Geopressures: A dynamic model, solution and some results. In J. Burrus, editor, *Thermal Modelling of Sedimentary Basins*, pages 149–172. Editions Technip, 1986.

- M. Eisel. *Interpretation magnetotellurischer Messungen im Umfeld der Kontinentalen Tiefbohrung unter besonderer Berücksichtigung lateral anisotroper Leitfähigkeitsstrukturen*. PhD thesis, Freie Universität Berlin, 1994.
- J. W. Elder. Physical processes in geothermal areas. In W. H. K. Lee, editor, *Terrestrial Heat Flow*, volume 8 of *AGU Monograph*, pages 211–239. AGU, 1965.
- J. W. Elder. Steady free convection in a porous medium heated from below. *Journal of Structural Fluid Mechanics*, 27:29–48, 1967.
- ELEKTB group. KTB and the electrical conductivity of the crust. *Journal of Geophysical Research*, 102:18289–18306, 1997.
- ELEKTB-Gruppe. Untersuchungen zur elektrischen Leitfähigkeit in der kontinentalen Tiefbohrung und ihrem Umfeld – was bringen sie uns Neues ? *DGG Mitteilungen*, 4:2–40, 1994.
- P. C. England and S. W. Richardson. The influence of erosion upon mineral facies of rocks from different metamorphic environments. *Journal of the Geological Society of London*, 134:201–213, 1977.
- P. C. England and A. B. Thompson. Pressure-temperature-time paths of regional metamorphism I. heat transfer during the evolution of regions of thickened continental crust. *Journal of Petrology*, 25:894–928, 1984.
- M. A. Etheridge, V. J. Wall, S. F. Cox, and R. H. Vernon. High fluid pressures during regional metamorphism and deformation. *Journal of Geophysical Research*, 89:4344–4358, 1984.
- M. A. Etheridge, V. J. Wall, and R. H. Vernon. The role of the fluid phase during regional metamorphism and deformation. *Journal of Metamorphic Geology*, 1:205–226, 1983.
- D. G. Evans and J. P. Raffensperger. On the stream function for variable density groundwater flow. *Water Resources Research*, 28:927–930, 1992.
- R. Evans. Anisotropy: a pervasive feature of fault zones ? *Geophysical Journal of the Royal Astronomical Society*, 76:157–163, 1984a.
- R. Evans. Effects of the free surface on shear wave trains. *Geophysical Journal of the Royal Astronomical Society*, 76:165–172, 1984b.
- U. Fehn and L. M. Cathles. Hydrothermal convection at slow-spreading mid-ocean ridges. *Tectonophysics*, 55:239–260, 1979.
- U. Fehn, K. E. Green, R. P. Von Herzen, and L. M. Cathles. Numerical models for the hydrothermal field at the Galapagos spreading center. *Journal of Geophysical Research*, 88:1033–1048, 1983.
- Y. Fei and S. K. Saxena. An equation for the heat capacity of solids. *Geochimica et Cosmochimica Acta*, 51:251–254, 1987.
- I. S. Feldman. On the nature of conductive layers in the earth's crust and upper mantle. In A. Adam, editor, *Geoelectric and Geothermal Studies*, pages 721–730. Akademiai Kiado Budapest, 1976.
- J. M. Ferry. A case study of the amount and distribution of heat and fluid during metamorphism. *Contributions to Mineralogy and Petrology*, 71:373–385, 1980.
- J. M. Ferry. Regional metamorphism in the Vassalboro formation, south-central Maine, USA: A case study of the role of fluid in metamorphic petrogenesis. *Journal of the Geological Society of London*, 140:551–576, 1983.
- J. M. Ferry. Reaction progress: A monitor of fluid rock interaction during metamorphic and hydrothermal events. In B. J. Wood and J. V. Walther, editors, *Water-Rock Interactions During Metamorphism. Advances in Physical Geochemistry 5*, pages 61–88. Springer, 1986.

- J. M. Ferry. A historical review of metamorphic fluid flow. *Journal of Geophysical Research*, 99: 15487–15498, 1994a.
- J. M. Ferry. Role of fluid flow in contact metamorphism of siliceous dolomitic limestones. *Applied Geochemistry*, 79:719–736, 1994b.
- J. M. Ferry and L. Baumgartner. Thermodynamic models of molecular fluids at the elevated pressures and temperatures of crustal metamorphism. In I. S. E. Carmichael and H. P. Eugster, editors, *Thermodynamic Modeling of Geological Materials: Minerals, Fluids and Melts. Reviews in Mineralogy* 17. Mineralogical Society of America, 1986.
- C. A. J. Fletcher. *Computational Galerkin Methods*. Springer, 1984.
- C. A. J. Fletcher. *Computational Techniques for Fluid Dynamics. Volume I.: Fundamental and General Techniques*. Springer, 1988.
- G. C. Flowers. Computation of the thermodynamic properties of reactions involving minerals and aqueous solutions with the aid of the PC. *Computers & Geosciences*, 12:361–379, 1986.
- D. M. Fountain and M. H. Salisbury. Exposed cross-sections through the continental crust; implications for crustal structure, petrology, and evolution. *Earth and Planetary Science Letters*, 56:263–277, 1981.
- R. O. Fournier. A method of calculating quartz solubilities in aqueous sodium chloride solutions. *Geochimica et Cosmochimica Acta*, 47:579–586, 1983.
- R. O. Fournier and W. L. Marshall. Calculation of amorphous silica solubility at 25°C to 300°C and apparent cation hydration numbers in aqueous salt solutions using the concept of effective density of water. *Geochimica et Cosmochimica Acta*, 47:587–586, 1983.
- R. O. Fournier and R. W. Potter. An equation correlating the solubility of quartz in water from 25° to 900°C at pressures up to 10000 bars. *Geochimica et Cosmochimica Acta*, 46:1969–1973, 1982.
- S. K. Frape, P. Fritz, and R. H. McNutt. Water-rock interaction and chemistry of groundwaters from the Canadian Shield. *Geochimica et Cosmochimica Acta*, 48:1617–1627, 1984.
- E. O. Frind and M. J. Verge. Three-dimensional modelling of groundwater flow systems. *Water Resources Research*, 14:844–856, 1978.
- P. Fritz and S. K. Frape. Saline groundwaters on the Canadian Shield - A first overview. *Chemical Geology*, 36:179–190, 1982.
- B. R. Frost and K. Bucher. Is water responsible for geophysical anomalies in the deep continental crust? A petrological perspective. *Tectonophysics*, 231:293–309, 1994.
- B. R. Frost, W. S. Fyfe, K. Tazaki, and T. Chan. Grain-boundary graphite in rocks from the Laramie Anorthosite Complex : Implications for lower crustal conductivity. accepted by Nature, 1987.
- K. Fuchs. On the properties of deep crustal reflectors. *Journal of Geophysics*, 35:133–149, 1969.
- D. J. Furbish. *Fluid Physics in Geology. An Introduction to Fluid Motions on the Earth's Surface and within its Crust*. Oxford University Press, 1997.
- K. P. Furlong and D. S. Chapman. Crustal heterogeneities and the thermal structure of the continental crust. *Geophysical Research Letters*, 14:314–317, 1987.
- W. S. Fyfe. Dehydration reactions. *AAPG Bulletin*, 57:190–197, 1973a.
- W. S. Fyfe. Low-grade metamorphism: Some thoughts on the present situation. *Canadian Mineralogist*, 12:439–444, 1973b.
- W. S. Fyfe. Fluids in deep continental crust. In M. Baranzangi and L. Brown, editors, *Reflection Seismics: The Continental Crust. AGU Geodynamics Series 14*. American Geophysical Union, 1986.

- W. S. Fyfe, N. J. Price, and A. B. Thompson. *Fluids in the Earth's Crust*. Elsevier, 1978.
- S. K. Garg and D. R. Kassoy. Convective heat and mass transfer in hydrothermal systems. In L. Rybach and L. J. P. Muffler, editors, *Geothermal Systems. Principles and Case Histories*. Wiley, 1981.
- G. Garven. The role of regional fluid flow in the genesis of the Pine Point Deposit, Western Canada Sedimentary Basin. *Economic Geology*, 80:307–327, 1985.
- G. Garven and R. A. Freeze. Theoretical analysis of the role of groundwater flow in the genesis of stratabound ore deposits. 1. mathematical and numerical model. *American Journal of Science*, 284: 1085–1124, 1984a.
- G. Garven and R. A. Freeze. Theoretical analysis of the role of groundwater flow in the genesis of stratabound ore deposits. 2. quantitative results. *American Journal of Science*, 284:1125–1174, 1984b.
- G. Garven, S. Ge, M. A. Person, and D. A. Sjervensky. Genesis of stratabound ore deposits in the midcontinent basins of North America: 1. the role of regional groundwater flow. *American Journal of Science*, 293:497–568, 1993.
- G. Garven and J. P. Raffensperger. Hydrogeology and geochemistry of ore genesis in sedimentary basins. In H. L. Barnes, editor, *Geochemistry of Hydrothermal Ore Deposits. Third Edition*, pages 125–189. Wiley, 1997.
- P. Gavrilenko and Y. Gueguen. Percolation in the crust. *Terra Nova*, 1:63–68, 1989.
- S. Ge and G. Garven. Hydromechanical modeling of tectonically-driven groundwater flow with application to the Arkoma foreland basin. *Journal of Geophysical Research*, 97:9119–9144, 1992.
- S. Ge and G. Garven. A theoretical model for thrust-induced deep groundwater flow with application to the Canadian Rocky Mountains. *Journal of Geophysical Research*, 99:13851–13868, 1994.
- B. S. Gibson and A. R. Levander. Lower crustal reflectivity patterns in wide-angle seismic recordings. *Geophysical Research Letters*, 15:617–620, 1988a.
- B. S. Gibson and A. R. Levander. Modeling and processing of scattered waves in seismic reflection surveys. *Geophysics*, 53:466–478, 1988b.
- W. Glassley. Fluid evolution and graphite genesis in the deep continental crust. *Nature*, 295:229–231, 1982a.
- W. Glassley. The role of  $CO_2$  in the chemical modification of deep continental crust. *Nature*, 295: 229–231, 1982b.
- P. W. J. Glover and F. J. Vine. Electrical conductivity of carbon bearing granulite at raised temperatures and pressures. *Nature*, 360:723–726, 1994a.
- P. W. J. Glover and F. J. Vine. Electrical conductivity of the continental crust. *Geophysical Research Letters*, 21:2357–2360, 1994b.
- P. W. J. Glover and F. J. Vine. Beyond KTB - electrical conductivity of the deep continental crust. *Surveys in Geophysics*, 16:5–36, 1995.
- T. Gold and St. Soter. Fluid ascent through the solid lithosphere and its relation to earthquakes. *Pure and Applied Geophysics*, 122:492–530, 1984.
- G. H. Golub and C. F. Van Loan. *Matrix Computations*. John Hopkins University Press, 1989.
- E. B. Goodwin and G. A. Thompson. The seismically reflective crust beneath highly extended terranes. *Geological Society of America Bulletin*, 100:1616–1626, 1988.
- D. I. Gough. Electromagnetic Geophysics and global tectonics. *JGR*, 88:3367–3377, 1983.

- D. I. Gough. Seismic reflectors, conductivity, water and stress in the continental crust. *Nature*, 323: 143–144, 1986.
- W. G. Gray. Comparison of finite difference and finite element methods. In J. Bear and M. Y. Corapcioglu, editors, *Fundamentals of Transport Phenomena in Porous Media, NATO Adv.Sc.Inst. Ser. E: Applied Sciences - No. 82*, pages 899–952. Martinus Nijhoff, 1984.
- J. P. Greenhouse and R. C. Bailey. A review of Geomagnetic variation measurements in the eastern United States: Implications for continental tectonics. *Canadian Journal of Earth Sciences*, 18:1268–1289, 1981.
- P. M. Gresho and S. T. Chan. Solving the incompressible Navier-Stokes equations using consistent mass and a pressure Poisson equation. In T. J. R. Hughes and T. Tezduyar, editors, *Recent Developments in Computational Fluid Dynamics*, volume 95 of *AMD*. ASME, 1979.
- P. M. Gresho, R. L. Lee, and R. L. Sani. Advection dominated flows with emphasis on the consequences of mass lumping. In R. H. Gallagher, O. C. Zienkiewicz, J. T. Oden, M. M. Cecchi, and C. Taylor, editors, *Finite Elements in Fluids*, volume 3, pages 335–350. Wiley, 1978.
- E. S. Grew. Carbonaceous material in some metamorphic rocks of New England and other areas. *Journal of Geology*, 82:50–73, 1974.
- Y. Gueguen and J. Dienes. Transport properties of rocks from statistics and percolation. *Mathematical Geology*, 21:1–13, 1989.
- Y. Gueguen, P. Gavrilenko, and M. Le Ravellec. Scales of rock permeability. *Surveys in Geophysics*, 17:245–263, 1996.
- Y. Gueguen and V. Palciauskas. *Introduction to the Physics of Rocks*. Princeton University Press, 1994.
- V. Haak and R. Hutton. Electrical conductivity in the lower crust. In J. B. Dawson, D. A. Carswell, J. Hall, and K. H. Wedepohl, editors, *The Nature of The Lower Continental Crust. Geological Society Special Publicationa No. 24*. Blackwell, 1986.
- L. Haar, J. S. Gallagher, and G. S. Kell. *NBS/NRC Wasserdampftafeln. Thermodynamische und Transportgrößen mit Computerprogrammen für Dampf und Wasser in SI-Einheiten*. Springer, 1988.
- W. Hackbusch. *Iterative Lösung großer schwach besetzter Gleichungssysteme*. Teubner, 1991.
- S. E. Haggerty. Mineralogical constraints on Curie isotherms in deep crustal anomalies. *Geophysical Research Letters*, 5:105–108, 1978.
- S. E. Haggerty. The aeromagnetic mineralogy of igneous rocks. *Canadian Journal of Earth Sciences*, 76:1281–1293, 1979.
- R. Halbach and N. D. Chatterjee. An empirical Redlich-Kwong-type equation of state for water to 1000° and 200 kbar. *Contributions to Mineralogy and Petrology*, 79:337–345, 1982.
- H. H. Haldorsen. Simulator parameter assignment and the problem of scale in reservoir engineering. In L. W. Lake and H. B. Carroll, editors, *Reservoir Characterization*, pages 293–340. Academic Press, 1986.
- R. B. Hanson. The hydrodynamics of contact metamorphism. *Geological Society of America Bulletin*, 107:595–611, 1995.
- R. B. Hanson and M. D. Barton. Thermal development of low-pressure metamorphic belts: Results from two-dimensional numerical models. *Journal of Geophysical Research*, 94:10363–10377, 1989.
- S. J. Hay, J. Hall, G. Simmons, and M. J. Russel. Sealed microcracks in the Lewisian of NW Scotland: a record of 2 billion years old fluid circulation. *Journal of the Geological Society of London*, 145: 819–830, 1988.

- D. O. Hayba and S. E. Ingebritsen. Multiphase groundwater flow near cooling plutons. *Journal of Geophysical Research*, 102:12233–12252, 1997.
- C. L. Hearn, J. P. Hobson, and M. L. Fowler. Reservoir characterization for simulation, Hartzog Draw Field, Wyoming. In L. W. Lake and H. B. Carroll, editors, *Reservoir Characterization*, pages 141–372. Academic Press, 1986.
- J. C. Heinrich, P. S. Huyakorn, O. C. Zienkiewicz, and A. R. Mitchell. An upwind finite element method for two dimensional convective transport equations. *International Journal for Numerical Methods in Engineering*, 11:131–144, 1977.
- H. C. Helgeson and D. H. Kirkham. Theoretical prediction of the thermodynamic behavior of aqueous electrolytes at high pressures and temperatures: I. Summary of the thermodynamic/electrostatic properties of the solvent. *American Journal of Science*, 274:1089–1198, 1974a.
- H. C. Helgeson and D. H. Kirkham. Theoretical prediction of the thermodynamic behavior of aqueous electrolytes at high pressures and temperatures: II. Debye-Hueckel parameters for activity coefficients and relative partial molal properties. *American Journal of Science*, 274:1199–1261, 1974b.
- H. C. Helgeson and P. C. Lichtner. Fluid flow and mineral reactions at high temperature and pressures. *Journal of the Geological Society of London*, 144:313–326, 1987.
- D. Henderson. Recent developments in the theory of electrified interfaces. In A. F. Silva, editor, *Trends in Interfacial Electrochemistry*, pages 473–521. Reidel, 1986.
- R. W. Henley and A. J. Ellis. Geothermal systems ancient and modern: A Geochemical review. *Earth-Science Reviews*, 19:1–50, 1983.
- T. A. Hewett. Porosity and mineral alteration by fluid flow through a temperature field. In L. W. Lake and H. B. Carroll, editors, *Reservoir Characterization*, pages 83–140. Academic Press, 1986.
- D. K. Higley, M. P. Pantea, and R. M. Slatt. 3-D reservoir characterization of the House Creek oil field, Powder River Basin, Wyoming, V1.00. U.S. Geological Survey DDS-33, [http://greenwood.cr.usgs.gov/pub/dds-033/USGS\\_3D/homepage.htm](http://greenwood.cr.usgs.gov/pub/dds-033/USGS_3D/homepage.htm), 1997.
- S. E. Hjelt. Regional EM studies in the 80's. *Surveys in Geophysics*, 9:349–487, 1988.
- J. Hoefs. Ein Beitrag zur Geochemie des Kohlenstoffs in magmatischen und metamorphen Gesteinen. *Geochimica et Cosmochimica Acta*, 29:399–428, 1965.
- J. Hoefs. *Stable Isotope Geochemistry*. Springer, 1996.
- W. S. Holbrook, D. Gajewski, A. Kramer, and C. Prodehl. An interpretation of wide-angle compressional and shear wave data in southwest Germany: Poisson's ratio and petrological implications. *Journal of Geophysical Research*, 93:12081–12106, 1988.
- W. S. Holbrook, W. D. Mooney, and N. I. Christensen. The seismic velocity structure of the lower continental crust. In D. M. Fountain, R. Arculus, and Kay R. W., editors, *Continental Lower Crust*, volume 23 of *Developments in Geotectonics*, pages 1–43. Elsevier, 1996.
- J. R. Holloway. Fugacity and activity of molecular species. In D. G. Fraser, editor, *Thermodynamics in Geology*. Reidel, 1977.
- J. R. Holloway. Compositions and volumes of supercritical fluids in the earth's crust. In L. S. Hollister and M. L. Crawford, editors, *Fluid inclusions: applications to petrology. Short Course Handbook*, volume 6. Mineralogical Society of Canada, 1981.
- M. B. Holness. Equilibrium dihedral angle in the system  $Quartz - CO_2 - H_2O - NaCl$  at  $800^\circ C$  and  $1 - 15kb$ : the effects of pressure and fluid composition on the permeability of quartzites. *Earth and Planetary Science Letters*, 114:171–184, 1992.

- M. B. Holness. Temperature and pressure dependence of quartz-aqueous fluid dihedral angles: the control of adsorbed  $H_2O$  on the permeability of quartzites. *Earth and Planetary Science Letters*, 117:363–377, 1993.
- H. Honarmand. *Bohrlochsonden zur Bestimmung der Wärmeleitfähigkeit in größeren Tiefen*. PhD thesis, Technische Universität Berlin. Fachbereich Bergbau und Geowissenschaften, 1993.
- U. Hornung and W. Messing. *Poröse Medien – Methoden und Simulation*. Beiträge zur Hydrologie, 1984.
- C. W. Horton and F. T. Rogers. Convection currents in a porous medium. *Journal of Applied Physics*, 16:367–370, 1945.
- T. J. R. Hughes. *The Finite Element Method. Linear Static and Dynamic Finite Element Analysis*. Prentice-Hall, 1987.
- T. J. R. Hughes and A. N. Brooks. A theoretical framework for Petrov-Galerkin methods with discontinuous weighting functions: Application to the Streamline-Upwind procedure. In R. H. Gallagher, D. H. Norrie, J. T. Oden, and O. C. Zienkiewicz, editors, *Finite Elements in Fluids*, volume 4, pages 47–65. Wiley, 1982.
- T. J. R. Hughes, L. P. Franca, and M. Mallet. A new Finite Element formulation for computational fluid dynamics: I. symmetric forms of the compressible Euler and Navier-Stokes equations and the Second Law of thermodynamics. *Computer Methods in Applied Mechanics and Engineering*, 54: 223–234, 1986a.
- T. J. R. Hughes and M. Mallet. A new Finite Element formulation for computational fluid dynamics: III. the generalized streamline operator for multidimensional advective-diffusive systems. *Computer Methods in Applied Mechanics and Engineering*, 54:305–328, 1986a.
- T. J. R. Hughes and M. Mallet. A new Finite Element formulation for computational fluid dynamics: IV. A discontinuity capturing operator for multidimensional advective-diffusive systems. *Computer Methods in Applied Mechanics and Engineering*, 54:329–336, 1986b.
- T. J. R. Hughes, M. Mallet, and A. Mizukami. A new Finite Element formulation for computational fluid dynamics: II. beyond SUPG. *Computer Methods in Applied Mechanics and Engineering*, 54: 341–355, 1986b.
- T. J. R. Hughes, M. Mallet, Y. Yaki, T. Tezduyar, and R. Zanutta. A one-dimensional shock capturing Finite Element method and multidimensional generalisations. In F. Angrand, A. Dewrviewxe, J. A. Desideri, and R. Glowinski, editors, *Numerical Methods for the Euler Equations of Fluid Dynamics*, pages 371–408. SIAM, 1985.
- T. J. R. Hughes and T. E. Tezduyar. Finite Element methods for first-order hyperbolic systems with particular emphasis on the compressible Euler equations. *Computer Methods in Applied Mechanics and Engineering*, pages 217–284, 1984.
- T. J. R. Hughes, T. E. Tezduyar, and A. N. Brooks. A Petrov-Galerkin Finite Element formulation for systems of conservation laws with special reference to the compressible Euler equation. In K. EW. Morton and M. J. Baines, editors, *Numerical Methods for Fluid Dynamics*, pages 97–126. Academic Press, 1982.
- P. S. Huyakorn and G. F. Pinder. A pressure-enthalpy finite element model for simulating hydrothermal reservoirs. In R. Vichnevetsky, editor, *Advances in Computer Methods for Partial Differential Equations II*. IMACS (AICA), 1977.
- P. S. Huyakorn and G. F. Pinder. *Computational Methods in Subsurface Flow*. Academic Press, 1983.
- R. D. Hyndman. Dipping seismic reflectors and electrically conductive zones: Metamorphic reactions and free water beneath a subduction zone. *Journal of Geophysical Research*, 93:13391–13405, 1988.

- R. D. Hyndman and D. W. Hyndman. Water saturation and high electrical conductivity in the lower continental crust. *Earth and Planetary Science Letters*, 4:427–432, 1968.
- R. D. Hyndman and S. L. Klemperer. Lower crustal porosity from electrical measurements and interferences on composition from seismic velocities. *Geophysical Research Letters*, 16:255–258, 1989.
- R. D. Hyndman and P. M. Shearer. Water in the lower continental crust: Modeling magnetotelluric and seismic reflection results. *Geophysical Journal International*, 1989.
- T. Ikeda. *Maximum Principle in Finite Element Models for Convection-Diffusion Phenomena*, volume 4 of *Lecture Notes in Numerical and Applied Analysis*. North Holland/Kinokuniya, 1977.
- T. Itaya. Carbonaceous material in pelitic schists of the sanbagawa metamorphic belt in central Shikoku, Japan. *Lithos*, 14:215–224, 1981.
- G. K. Jacobs and D. M. Kerrick. APL and FORTRAN programs for a new equation of state for  $H_2O$ ,  $CO_2$ , and their mixtures at supercritical conditions. *Computers & Geosciences*, 7:131–143, 1981.
- I. Javandel, C. Doughty, and C. F. Tsang. *Groundwater Transport: Handbook of Mathematical Models*, volume 10 of *Water Resources Monograph*. AGU, 1984.
- H. Jödicke. *Zonen hoher elektrischer Leitfähigkeit im Rhenoherzynikum und seinem nördlichen Vorland*. PhD thesis, Universität Münster, 1990.
- H. Jödicke. Water and graphite in the earth's crust - an approach to interpretation of conductivity models. *Surveys in Geophysics*, 13:381–407, 1992.
- H. Jödicke, J. Untiedt, W. Olgemann, and M. Schulte. Electrical conductivity structure of the crust and upper mantle beneath the Rhenish Massif. In K. Fuchs, K. von Gehlen, H. Mälzer, H. Murawski, and A. Semmel, editors, *Plateau Uplift. The Rhenish Shield*, pages 288–302. Springer, 1983.
- Bo-nan Jiang. *The Least-Squares Finite Element Method*. Springer, Berlin, 1998.
- V. V. Jikov, S. M. Kozlov, and O. A. Oleinik. *Homogenization of differential operators and integral functionals*. Springer, 1994.
- C. Johnson. *Numerical Solution of Partial Differential equations by the Finite Element Methods*. Cambridge University Press, 1987.
- A. G. Jones. MT and reflection - an essential combination. *Geophysical Journal of the Royal Astronomical Society*, 89:7–18, 1987.
- A. G. Jones. Electrical properties of the lower continental crust. In D. M. Fountain, R. Arculus, and Kay R. W., editors, *Continental Lower Crust*, volume 23 of *Developments in Geotectonics*, pages 81–143. Elsevier, 1992.
- A. G. Jones. Electromagnetic images od modern and ancient subduction zones. *Tectonophysics*, pages 29–45, 1993.
- A.G. Jones. Waves of the future: Superior inferences from collocated seismic and electromagnetic experiments. *Tectonophysics*, 286:273–298, 1998.
- A.G. Jones, I. Ferguson, G. McNeice, R. Evans, and A. Chave. Electromagnetic studies of the Slave Craton: preliminary results and ongoing experiments. Lithoprobe Publication, 1997a.
- A.G. Jones, T. J. Katsebe, and P. Schwann. The longest conductivity anomaly in the world explained: sulphides in fold hinges causing very high electrical anisotropy. *J. Geomagn. Geoelectr.*, 49:1619–1629, 1997b.
- T. D. Jones and A. Nur. The nature of seismic reflections from deep crustal fault zones. *Journal of Geophysical Research*, 89:3135–3171, 1984.

- O. Kappelmeyer and R. Haenel. *Geothermics with Special Reference to Application*. Borntraeger, 1974.
- T. J. Katsumi and M. Mareschal. Petrophysical model of deep electrical conductors: Graphite lining as a source and its disconnection due to uplift. *Journal of Geophysical Research*, 98:8019–8030, 1993.
- M. B. Katz. Graphite deposits of Sri Lanka: A consequence of granulite facies metamorphism. *Mineralia Deposita*, 22:18–25, 1987.
- R. W. Kay and S. M. Kay. The nature of the lower continental crust: Inferences from Geophysics, surface Geology, and crustal xenoliths. *Reviews of Geophysics and Space Physics*, 19:271–297, 1981.
- J. H. Keenan, F. G. Keyes, P. G. Hill, and J. G. Moore. *Steam Tables. Thermodynamic properties of water including vapor, liquid and solid phases*. Wiley, 1969.
- G. V. Keller. Electrical studies of the crust and upper mantle. In J. G. Heacock, editor, *The Structure and Physical Properties of the Earth's Crust. AGU Geophysical Monograph*. 14, pages 107–121. American Geophysical Union, 1971.
- G. V. Keller. Electrical structure of the crust and upper mantle beneath the United States. Part 2: survey of data. Unpublished manuscript, 1986a.
- G. V. Keller. Electrical structure of the crust and upper mantle beneath the United States. Part 1: methods for determining the conductivity profile. Unpublished manuscript, 1986b.
- R. L. Kellett, M. Mareschal, and R. D. Kurtz. A model of lower crustal electrical anisotropy for the Pontiac subprovince of the Canadian Shield. *Geophysical Journal International*, 111:141–150, 1992.
- W. C. Kelly, R. O. Rye, and A. Livnat. Saline minewaters of the Keweenaw Peninsula, Northern Michigan: Their nature, origin, and relation to similar deep waters in precambrian rocks of the Canadian Shield. *American Journal of Science*, 286:281–308, 1986.
- H. Kern and V. Schenk. A model of velocity structure beneath Calabria, southern Italy, based on laboratory data. *Earth and Planetary Science Letters*, 87:325–337, 1988.
- R. Kerrich. Fluid infiltration into fault zones: Chemical, isotopic, and mechanical effects. *Pure and Applied Geophysics*, 124:225–268, 1986a.
- R. Kerrich. Fluid transport in lineaments. *Philosophical Transactions of the Royal Society, London, A* 317:219–251, 1986b.
- R. Kerrich, T. E. La Tour, and L. Willmore. Fluid participation in deep fault zones: Evidence from Geological, Geochemical and  $^{18}\text{O}/^{16}\text{O}$  relations. *Journal of Geophysical Research*, 89:4331–4343, 1984.
- J. Kestin, H. E. Khalifa, and R. Correira. Tables of the dynamic and kinematic viscosity of aqueous  $\text{NaCl}$  solutions in the temperature range 20 – 150°C. *Journal of Physical and Chemical Reference Data*, 10:71–87, 1981.
- J. Kestin and J. Sengers. New international formulations for the thermodynamic properties of light and heavy water. *Journal of Physical and Chemical Reference Data*, 15:305–320, 1986.
- J. Kestin, J. V. Sengers, B. Kamgar-Parsi, and J. M. H. Levelt Sengers. Thermophysical properties of fluid  $\text{H}_2\text{O}$ . *Journal of Physical and Chemical Reference Data*, 13:175–183, 1984.
- K. L. Kipp. *HST3D: A Computer Code for Simulation of Heat and Solute Transport in Three-dimensional Ground-water Flow Systems*, 1987.
- C. Kittel. *Introduction to Solid State Physics*. Wiley, 1967.
- S. Klemperer. A relation between continental heat flow and the seismic reflectivity of the lower crust. *Journal of Geophysics*, 61:1–11, 1987.

- S. Klemperer and BIRPS-Group. Reflectivity of the crystalline crust: Hypotheses & tests. *Geophysical Journal of the Royal Astronomical Society*, 89:217–222, 1987.
- N. Klever. *Stationäre Konvektion in Porösen Medien - numerische Untersuchungen an unterschiedlichen Fragestellungen aus der Hydrothermik und der Schneemetamorphose*. PhD thesis, Freie Universität Berlin. Fachbereich Geowissenschaften, 1984.
- R. B. Knapp. Spatial and temporal scales of local equilibrium in dynamic fluid-rock systems. *Geochimica et Cosmochimica Acta*, 53:1955–1964, 1989.
- S. Ko, D. L. Olgaard, and T. Wong. Generation and maintenance of pore pressure excess in a dehydrating system. 1. experimental and microstructural observations. *Journal of Geophysical Research*, 102:825–839, 1997.
- O. Kolditz. *Strömung, Stoff- und Wärmetransport im Kluftgestein*. Bornträger, Berlin, 1997.
- A. Kontny, G. Friedrich, H. J. Behr, H. de Wall, E. E. Horn, P. Möller, and G. Zulauf. Formation of ore minerals in metamorphic rock of the German deep drilling site (KTB). *Journal of Geophysical Research*, 102:18323–18336, 1997.
- R. D. Kurtz, J. A. Craven, E. R. Niblett, and R. A. Stevens. The conductivity of the crust and mantle beneath the Kapuskasing Uplift: electrical anisotropy in the upper mantle. *Geophysical Journal International*, 113:483–498, 1993.
- G. T. Kuster and M. N. Töksöz. Velocity and attenuation of seismic waves in two-phase media: Part I. Theoretical formulations. *Geophysics*, 39:587–607, 1973a.
- G. T. Kuster and M. N. Töksöz. Velocity and attenuation of seismic waves in two-phase media: Part II. Experimental results. *Geophysics*, 39:608–618, 1973b.
- N. J. Kuznir and R. J. Park. Continental lithosphere strength: The critical role of lower crustal deformation. In J. B. Dawson, D. A. Carswell, J. Hall, and K. H. Wedepohl, editors, *The Nature of The Lower Continental Crust. Geological Society Special Publications No. 24*. Blackwell, 1986.
- A. H. Lachenbruch. Crustal temperature and heat production: implications of the linear heat-flow relation. *Journal of Geophysical Research*, 75:3291–3300, 1970.
- A. H. Lachenbruch. Vertical gradients of heat production in the continental crust: Theoretical detectability from near surface measurements. *Journal of Geophysical Research*, 76:3842–3857, 1971.
- A. H. Lachenbruch and J. H. Sass. Heat flow in the United States and the thermal regime of the crust. In J. G. Heacock, editor, *The earth's crust. AGU Geophysical Monograph*. 20, pages 626–675. American Geophysical Union, 1977.
- W. M. Lamb and J. W. Valley. C-O-H fluid calculations and granulite genesis. In A. C. Tobi and J. L. R. Touret, editors, *The Deep Proterozoic Crust in the North Atlantic Provinces*, pages 119–131. Reidel, 1985.
- L. S. Land. Evidence for vertical movement of fluids, Gulf Coast sedimentary basin. *Geophysical Research Letters*, 18:919–922, 1991.
- L. S. Land and R. S. Fisher. Wilcox sandstone diagenesis, Texas Gulf Coast: a regional isotopic trend within the Frio formation. In J. D. Marshall, editor, *Diagenesis of Sedimentary Sequences*, volume 36 of *Spec. Publ.*, pages 219–235. Geol. Soc. London, 1987.
- L. S. Land, K. L. Milliken, and E. McBride. Diagenetic evolution of cenozoic sandstones, Gulf of Mexico sedimentary basin. *Surveys in Geophysics*, 50:195–225, 1987.
- C. A. Landis. Graphitisation of dispersed carbonaceous material in metamorphic rocks. *Contributions to Mineralogy and Petrology*, 30:34–45, 1971.
- E. R. Lapwood. Convection of a fluid in a porous medium. *Proc. Camb. Phil. Soc.*, 44:508, 1948.

- A. C. Lasaga. Metamorphic reaction rate laws and development of isograds. *Mineralogical Magazine*, 50:359–373, 1986.
- R. J. Le Veque. *Numerical Methods for Conservation Laws*. Birkhäuser, 1990.
- P. C. Leary, S. Crampin, and T. V. McEvilly. Seismic fracture anisotropy in the earth's crust: An overview. *Journal of Geophysical Research*, 95:11105–11115, 1990.
- T. S. Lebedev. Elastizität und elektrische Eigenschaften von Gesteinen bei hohen Temperaturen und Drücken. *Gerlands Beiträge zur Geophysik*, 90:21–32, 1981.
- M.-K. Lee and C. M. Bethke. Groundwater flow, late cementation, and petroleum accumulation in the permian Lyons Sandstone, Denver Basin. *American Association of Petroleum Geologists Bulletin*, 78:217–237, 1994.
- A. Leger, E. A. Mathez, A. Duba, F. Pineau, and S. Ginsberg. Carbonaceous material in metamorphosed carbonate rocks from the Waits River formation, NE Vermont, and its effect on electrical conductivity. *Journal of Geophysical Research*, 101:22203–22214, 1996.
- B. P. Leonard and H. S. Niknafs. Sharp monotonic resolution of discontinuities without clipping of narrow extrema. *Computational Fluid Dynamics*, 19:141–154, 1991.
- C. W. Li. Least-squares characteristics and finite elements for advection-dispersion simulation. *International Journal for Numerical Methods in Engineering*, 29:1343–1358, 1990.
- P. C. Lichtner. Continuum model for simultaneous chemical reactions and mass transport in hydrothermal systems. *Geochimica et Cosmochimica Acta*, 49:779–800, 1985.
- P. C. Lichtner. The quasi-stationary state approximation to coupled mass transport and fluid-rock interaction in a porous medium. *Geochimica et Cosmochimica Acta*, 52:143–165, 1988.
- J. A. Ligget. *Fluid Mechanics*. McGraw-Hill, 1994.
- J. C. S. Long, P. Gilmour, and P. A. Witherspoon. A model for steady state fluid flow in random, three-dimensional networks of disk-shaped fractures. *Water Resources Research*, 21:1105–1115, 1985.
- J. C. S. Long, J. S. Remer, C. R. Wilson, and P. A. Witherspoon. Porous media equivalents for networks of discontinuous fractures. *Water Resources Research*, 18:645–658, 1982.
- S. Losh. Fluid-rock interaction in an evolving ductile shear zone across the brittle-ductile transition. *American Journal of Science*, 289:600–648, 1989.
- L. Luckner and W. M. Schestakow. *Migrationsprozesse im Boden- und Grundwasserbereich*. VEB Verlag für Grundstoffindustrie, 1986.
- A. H. Macdonald and W. S. Fyfe. Rate of serpentinization in seafloor environments. *Tectonophysics*, 116:123–135, 1985.
- C. E. Manning. The solubility of quartz in  $H_2O$  in the lower crust and upper mantle. *Geochimica et Cosmochimica Acta*, 58:4831–4839, 1994.
- C. E. Manning and S. E. Ingebritsen. Permeability of the continental crust: implications of geothermal data and metamorphic systems. *Reviews of Geophysics*, 37:127–150, 1999.
- G. Marquis and R. D. Hyndman. Geophysical support for aqueous fluids in the deep crust: seismic and electrical relationships. *Geophysical Journal International*, 110:91–105, 1992.
- R. S. Martinsen. Summary of published literature on anomalous pressures: implications for the study of pressure compartments. In P. J. Ortoleva, editor, *Basin compartments and seals*, volume 25, pages 27–38. AAPG, 1994.

- E. A. Mathez and J. R. Delaney. The nature and distribution of carbon in submarine basalts and peridotite nodules. *Earth and Planetary Science Letters*, 56:217–232, 1981.
- E. A. Mathez, V. J. Dietrich, J. R. Holloway, and A. E Boudreau. Carbon distribution in the stillwater complex and evolution of vapor during crystallisation of Stillwater and Bushveld magmas. *Journal of Petrology*, 30:153–173, 1989.
- E. A. Mathez, A. G. Duba, C. L. Peach, A. Leger, T. J. Shankland, and G. Plafker. Electrical conductivity and carbon in metamorphic rock of the Yukon–Tanana terrane, Alaska. *Journal of Geophysical Research*, 100:10187–10196, 1995.
- D. H. Matthews. Seismic reflections from the lower crust around britain. In J. B. Dawson, D. A. Carswell, J. Hall, and K. H. Wedepohl, editors, *The Nature of The Lower Continental Crust. Geological Society Special Publications No. 24*. Blackwell, 1986.
- G. Mavko, T. Mukerji, and J. Dvorkin. *The Rock Physics Handbook. Tools for Seismic Modelling of Porous Media*. Cambridge University Press, 1998.
- E. F. McBride. Quartz cement in sandstones: A review. *Earth-Science Reviews*, 26:69–112, 1989.
- A. M. McCaig. Deformation and fluid-rock interaction in metasomatic dilatant shear bands. *Tectonophysics*, 135:121–132, 1987.
- J. McCarthy and G. A. Thompson. Seismic imaging of extended crust with emphasis on the western United States. *Geological Society of America Bulletin*, 100:1361–1374, 1988.
- D. McKenzie. The generation and compaction of partially molten rock. *Journal of Petrology*, 25: 713–765, 1984.
- D. McKenzie. The compaction of igneous and sedimentary rocks. *Journal of the Geological Society of London*, 144:299–307, 1987.
- R. Meissner. Viscosity and creep processes in the lithosphere. In N.-A. Moerner, editor, *Earth Rheology, Isostasy and Eustasy*. Wiley, 1980.
- R. Meissner. *The Continental Crust. A Geophysical Approach*. International Geophysics Series Vol. 34. Academic Press, 1986.
- J. W. Mercer, C. R. Faust, J. W. Miller, and F. J. Pearson Jr. Review of simulation technique for Aquifer Thermal Energy Storage (ATES). *Advances in Hydroscience*, 13:1–129, 1982.
- J. W. Mercer, G. F. Pinder, and I. G. Donaldson. A Galerkin-Finite Element analysis of the hydro-thermal system at Wairakei, New Zealand. *Journal of Geophysical Research*, 80:2608–2621, 1975.
- J. B. Moody. An experimental study of the serpentinization of iron-bearing olivines. *Canadian Mineralogist*, 14:462–478, 1976a.
- J. B. Moody. Serpentinization: a review. *Lithos*, 9:125–138, 1976b.
- W. D. Mooney and T. M. Brocher. Coincident seismic reflection/refraction studies of the continental lithosphere: A global review. *Reviews of Geophysics*, 25:723–742, 1987.
- W. D. Mooney and R. Meissner. Multi-genetic origin of crustal reflectivity: A review of seismic reflection profiling of the continental lower crust and Moho. In D. M. Fountain, R. Arculus, and Kay R. W., editors, *Continental Lower Crust*, volume 23 of *Developments in Geotectonics*, pages 45–79. Elsevier, 1992.
- E. M. Moores and F. J. Vine. Alpine serpentinites, ultramafic magmas, and ocean-basin evolution: The ideas of H. H. Hess. *Geological Society of America Bulletin*, 100:1205–1212, 1988.
- F. D. Morgan, E. R. Williams, and T. M. Madden. Streaming potential of Westerly Granite with applications. *Journal of Geophysical Research*, 94:12449–12461, 1989.

- S. A. F. Murrell. The role of deformation, heat and thermal processes in the formation of the lower crust. In J. B. Dawson, D. A. Carswell, J. Hall, and K. H. Wedepohl, editors, *The Nature of The Lower Continental Crust. Geological Society Special Publications No. 24*. Blackwell, 1986.
- S. Nakazawa, J. F. T Pittman, and O. C. Zienkiewicz. Numerical solution of flow and heat transfer in polymer melts. In R. H. Gallagher, D. H. Norrie, J. T. Oden, and O. C. Zienkiewicz, editors, *Finite Elements in Fluids*, volume 4, pages 251–283. Wiley, 1982.
- G. B. Naumov. Endogenic fluid regime and its role in hydrothermal ore formation. In *Proceedings of the 27th International Geological Congress, Volume 11, Geochemistry and Cosmochemistry*, pages 537–557, Moskau, 1984. VNU Science Press.
- S. P. Neuman. A Eulerian-Lagrangian numerical scheme for the dispersion- convection equation using conjugate space-time grids. *Journal of Computational Physics*, 41:270–294, 1981.
- V. V. Nguyen, W. G. Gray, G. F. Pinder, J. F. Botha, and D. A. Crerar. A theoretical investigation on the transport of chemicals in reactive porous media. *Water Resources Research*, 18:1149–1156, 1982.
- J. Nicholls and M. L. Crawford. FORTRAN programmes for calculation of fluid properties from micro- thermometric data on fluid inclusions. *Chemical Geology*, 11:619–654, 1985.
- D. A. Nield and A. Bejan. *Convection in Porous Media*. Springer, 1992.
- S. B. Nielsen. Steady state heat flow in a random medium and the linear heat flow – heat production relationship. *Geophysical Research Letters*, 14:318–321, 1987.
- J. Noorishad, C. F. Tsang, P. Perrochet, and A. Musy. A perspective on numerical solution of convection-dominated transport problems: A price to pay for the easy way out. *Water Resources Research*, 28:661–561, 1992.
- G. T. Norrell, A. Teixell, and G. D. Harper. Microstructure of serpentinite mylonites from the Josephine ophiolite and serpentinitisation in retrogressive shear zones, California. *Geological Society of America Bulletin*, 101:673–682, 1989.
- D. Norton and R. Knapp. Transport phenomena in hydrothermal systems: The nature of porosity. *American Journal of Science*, 277:913–936, 1977.
- D. Norton and J. Knight. Transport phenomena in hydrothermal systems: Cooling plutons. *American Journal of Science*, 277:937–981, 1977.
- A. Nur and J. Walder. Hydraulic pulses in the earth's crust. In B. Evans and T.-F. Wong, editors, *Fault mechanics and transport properties of rocks*. Academic Press, 1992.
- E. H. Oelkers. Physical and chemical properties of rocks and fluids for chemical mass transport calculations. In P. C. Lichtner, C. I. Steefel, and E. H. Oelkers, editors, *Reactive Transport in Porous Media*, volume 34 of *Reviews in Mineralogy*, pages 131–192. Mineralogical Society of America, Wahington DC, 1996.
- G. R. Olhoeft. Electrical properties of granite with implications for the lower crust. *Journal of Geophysical Research*, 86:931–936, 1981a.
- G. R. Olhoeft. Electrical properties of rocks. In Y. S. Touloukian, W. R. Judd, and R. F. Roy, editors, *Physical Properties of Rocks and Minerals*. McGraw-Hill, 1981b.
- G. R. Olhoeft. Electrical properties of rocks and minerals. Short Course Notes, 1982.
- G. R. Olhoeft. Electrical conductivity. In *8<sup>th</sup> Workshop on Electromagnetic Induction in the Earth and Moon, Neuchatel, Switzerland, 24-31 August 1986. Review Papers.*, pages 2.1–2.13. Working Group 1-3 International Association of Geomagnetism and Aeronomy, 1986.

- R. Ondrak, U. Bayer, and O. Kahle. Characteristics and evolution of artificial anisotropic rocks. In J. Kruhl, editor, *Fractals and dynamic systems in geoscience*, pages 355–367. Springer, 1994.
- K. O'Neill. Highly efficient, oscillation free solutions of the transport equation over long times and large spaces. *Water Resources Research*, 17:1665–1675, 1981.
- T. C. Oppe, W. D. Joubert, and D. R. Kincaid. *NSPCG User's Guide Version 1.0 . A Package for Solving Large Sparse Linear System by Various Iterative Methods*. Center for Numerical Analysis. The University of Texas at Austin, April 1988.
- P. Ortoleva, Z. Al-Shaieb, and J. Puckette. Genesis and dynamics of basin compartments and seals. *American Journal of Science*, 295:345–427, 1995.
- P. Ortoleva, E. Merino, C. Moore, and J. Chadam. Geochemical self-organisation I: Reaction-transport feedbacks and modeling approach. *American Journal of Science*, 287:979–1007, 1987.
- P. J. Ortoleva. Basin compartmentation: definitions and mechanisms. In P. J. Ortoleva, editor, *Basin compartments and seals*, volume 25, pages 39–51. AAPG, 1994a.
- P. J. Ortoleva, editor. *Basin compartments and seals*. AAPG, 1994b.
- P. J. Ortoleva. *Geochemical Self-Organization*. Oxford University Press, 1994c.
- A. M. Osella and P. Martinelli. Magnetotelluric response of anisotropic 2-D structures. *Geophysical Journal International*, 115:819–828, 1993.
- E. R. Oxburgh and R. K. O'Nions. Helium, volatile flux and the development of continental crust. *Earth and Planetary Science Letters*, 90:331–347, 1988.
- E. Palm. Rayleigh convection, mass transport, and change in porosity in layers of sandstone. *Journal of Geophysical Research*, 95:8675–8679, 1990.
- H. Pape, C. Clauser, and J. Bartels. Bestimmung von Porosität und Permeabilität aus Bohrlochmessungen der induzierten Polarisierung (IP) oder nuklearmagnetischen Resonanz(NMR) auf der Grundlage einer fraktalen Porenraumgeometrie – Teil I: Porositäts-Permeabilitätsbeziehung und NMR- Anwendungsbeispiel. In A. Junge and K. Bahr, editors, *17. Kolloquium Elektromagnetische Tiefenforschung: Neustadt an der Weinstraße, 9.03. - 13.03.1998*, pages 351–362, 1998a.
- H. Pape, C. Clauser, and J. Iffland. Permeability prediction for reservoir sandstones and basement rocks based on fractal pore space geometry. Extended abstract of paper to be presented at 1998 SEG, New Orleans, 1998b.
- H. Pape and J. R. Schopper. Interlayer conductivity of rocks – A fractal model of interface irregularities for calculating interlayer conductivity of natural porous mineral systems. *Colloids and Surfaces*, 27: 97–122, 1987.
- E. I. Parkhomenko. Electrical resistivity of minerals and rocks at high temperature and pressure. *Reviews of Geophysics and Space Physics*, 20:193–218, 1982.
- T. Pedersen, M. Wangen, and H. Johansen. Flow along fractures in sedimentary basins. In B. Jamtveit and B. W. D. Yardley, editors, *Fluid flow and transport in rocks. Mechanisms and effects*, pages 213–233. Chapman & Hall, 1997.
- J. Pek. 2-D numerical modelling of magnetotelluric fields in anisotropic structures - an FD algorithm. In K. Bahr and A. Junge, editors, *15. Kolloquium Elektromagnetische Tiefenforschung: Höchst im Odenwald, 28.03. - 31.03.1994*, pages 27–39, 1994.
- J. Pek and T. Verner. Finite difference modelling of magnetotelluric fields in 2-D anisotropic media. *Geophysical Journal International*, 128:505–521, 1997.
- M. Person, J. P. Raffensperger, Ge S., and G. Garven. Basin-scale hydrogeologic modeling. *Reviews of Geophysics*, 34:61–87, 1996.

- O. M. Phillips. Flow-controlled reactions in rock fabrics. *Water Resources Research*, 12:105–107, 1976.
- O. M. Phillips. *Flow and Reaction in Permeable Rocks*. Cambridge University Press, 1991.
- S. L. Phillips, A. Igbene, J. A. Fair, H. Ozbek, and M. Tavana. A technical data book for geothermal energy utilization. Technical Report DE81-029868, NTIS, 1981.
- S. L. Phillips, H. Ozbek, and L. F. Sylvester. Density of sodium chloride solutions at high temperatures and pressures. Technical Report DE84-004883, NTIS, 1983.
- A. R. Philpotts. *Principles of Igneous and Metamorphic Petrology*. Prentice-Hall, 1990.
- R. A. Phinney and D. M. Jurdy. Seismic imaging of deep crust. *Geophysics*, 44:1637–1660, 1979.
- G. F. Pinder and W. G. Gray. Is there a difference in the Finite Element method. *Water Resources Research*, 12:105–107, 1976.
- S. Pissanetzky. *Sparse Matrix Technology*. Academic Press, 1984.
- K. S. Pitzer and R. T. Pabalan. Thermodynamics of *NaCl* in steam. *Geochimica et Cosmochimica Acta*, 50:1445–1454, 1986.
- R. W. Potter II and D. L. Brown. The volumetric properties of aqueous sodium chloride solutions from 0° to 500°C at pressures up to 2000 bar based on a regression of available data in the literature. U. S. Geological Survey Bulletin 1421-C, 1976.
- D. E. Powley. Pressures and hydrogeology in petroleum basins. *Earth-Science Reviews*, 29:215–226, 1990.
- W. H. Press, B. P. Flannery, S. A. Teukolsky, and W. T. Vetterling. *Numerical Recipes. The Art of Scientific Computing*. Cambridge University Press, 1986.
- A. S. Quist and A. L. Marshall. Electrical conductances of aqueous sodium chloride solutions from 0 to 800° and at pressures to 4000 bars. *Journal of Physical Chemistry*, 72:684–703, 1968.
- M. Rabinowicz, J.-L. Dandurand, M. Jakubowski, J. Schott, and J.-P. Cassan. Convection in a North Sea oil reservoir: Inferences on diagenesis and hydrocarbon migration. *Earth and Planetary Science Letters*, 74:387–404, 1985.
- J. P. Raffensperger. Numerical simulation of basin-scale hydrochemical processes. In M. Y. Corapcioglu, editor, *Advances in Porous Media*, volume 3, pages 185–305. Elsevier, 1996.
- J. P. Raffensperger. The formation of unconformity-type Uranium ore deposits 1. coupled groundwater flow and heat transport modeling. *American Journal of Science*, 295:581–636, 1995a.
- J. P. Raffensperger. Fully coupled numerical modeling of diagenetic cementation in sandstones by free and mixed convection. *Geological Society of America Bulletin*, Abstracts with Programs 27: A259–A260, 1995b.
- J. P. Raffensperger. Numerical modeling of coupled groundwater flow, heat transport, and reactive mass transport with application to diagenetic cementation by free convection. Keynote address: Goldschmidt Conference, State College, PA, May 24–26, 1995, 1995c.
- J. P. Raffensperger and G. Garven. The formation of unconformity-type Uranium ore deposits 2. coupled hydrochemical modeling. *American Journal of Science*, 295:639–696, 1995.
- G. Ranalli. *Rheology of the Earth*. Allen & Unwin, 1987.
- G. Ranalli and D. C. Murphy. Rheological stratification of the crust. *Tectonophysics*, 132:281–295, 1987.
- T. M. Rasmussen. Magnetotellurics in Southeastern Sweden: Evidence for electrical anisotropy in the lower crust ? *Journal of Geophysical Research*, 93:7897–7907, 1988a.

- T. M. Rasmussen. Magnetotellurics in Southeastern Sweden: Evidence for electrical anisotropy in the lower crust ? *Journal of Geophysical Research*, 93:7897–7907, 1988b.
- V. Rath and V. Haak. Ideas concerning the nature of crustal high-conductivity zones. Poster, presented at the 8th IAGA Workshop on Electromagnetic Induction in the Earth and Moon, Neuchatel, 1986.
- A. Rauen and M. Lastovickova. Investigation of electrical anisotropy in the Deep Borehole KTB. *Surveys in Geophysics*, 16:37–46, 1995.
- Lord Rayleigh. On convection currents in a horizontal layer of fluid when the higher temperature is on the under side. *Phil. Mag., Ser. 6*, 32:199–222, 1916.
- B. A. Raynaud. Statistical modelling of lower-crustal reflections. *Geophysical Journal International*, 95:111–121, 1988.
- J. N. Reddy. *An Introduction to the Finite Element Method*. McGraw-Hill, 1984.
- R. J. Ribando and K. E. Torrance. Natural convection in a porous medium: Effects of confinement, variable permeability, and thermal boundary conditions. *JHT*, pages 42–48, 1976.
- P. H. Rieger. *Electrochemistry*. Prentice-Hall, 1987.
- J. D. Rimstidt and H. L. Barnes. The kinetics of silica-water reactions. *Geochimica et Cosmochimica Acta*, 44:1683–1699, 1980.
- O. Ritter, V. Haak, V. Rath, E. Stein, and M. Stiller. Very high electrical conductivity beneath the Münschberg Gneiss area in Southern Germany: Implications for horizontal transport along shear planes. *Geophys. J. Int.*, 139:161–170, 1999.
- P. J. Roache. *Computational Fluid Dynamics*. Hermosa Publishers, 1978.
- J. J. Roberts, A. G. Duba, E. A. Mathez, T. J. Shankland, and R. Kinzler. Carbon-enhanced electrical conductivity during fracture of rocks. *Journal of Geophysical Research*, 104:737–747, 1999.
- E. Roedder. *Fluid Inclusions. Reviews in Mineralogy 12*. Mineralogical Society of America, 1984.
- D. C. Rubie. The catalysis of mineral reactions by water and restrictions on the presence of aqueous fluid during metamorphism. *Mineralogical Magazine*, 50:399–415, 1986.
- R. L. Rudnick and S. R. Taylor. The composition and petrogenesis of the lower crust: A xenolith study. *Journal of Geophysical Research*, 92:13981–14005, 1987.
- M. Ruffet, C. Darot, and Y. Guéguen. Surface conductivity in rocks: a review. *Surveys in Geophysics*, 16:83–105, 1995.
- D. Rumble III and F. S. Spear. Oxygen-isotope equilibration and permeability enhancement during regional metamorphism. *Journal of the Geological Society of London*, 140:619–628, 1983.
- E. H. Rutter and K. T. Brodie. The permeation of water into hydrating shear zones. In A. B. Thompson and D. C. Rubie, editors, *Advances in Physical Geochemistry 4*. Springer, 1985.
- L. Rybach. Geothermal Systems. Conductive Heat Flow, Geothermal anomalies. In L. Rybach and L. J. P. Muffler, editors, *Geothermal Systems. Principles and Case Histories*. Wiley, 1981.
- Y. Saad. SPARSKIT: A basic toolkit for sparse matrix computations. Documentation, 1990.
- Y. Saad. ILUT: A dual threshold incomplete ILU factorization. Technical Report 92-38, Minnesota Supercomputer Institute, University of Minnesota, Minneapolis, 1992.
- Y. Saad and M. H. Schultz. GMRES: a generalized minimal residual algorithm for solving nonsymmetric linear systems. *SIAM J. Sci. Statist. Comput.*, 44:417–424, 1986.
- M. Sahimi. *Flow and Transport in Porous Media and Fractured Rock*. Verlag Chemie, 1995.

- M. H. Salisbury and D. M. Fountain, editors. *Exposed cross-sections of the continental crust*, 1990. Kluwer.
- I. S. Sanders. Exhumed lower crust in NW Ireland, and a model for crustal conductivity. *Journal of the Geological Society of London*, 148:131–135, 1991a.
- I. S. Sanders. Exhumed lower crust in NW Ireland, and a model for crustal conductivity. *Journal of the Geological Society of London*, 148:131–135, 1991b.
- H. Sato and Y. Ida. Low frequency electrical impedance of partially molten gabbro: The effect of melt geometry on electrical properties. *Tectonophysics*, 107:105–134, 1984.
- A. Saul and W. Wagner. A fundamental equation for water covering the range from the melting line to 1273 K at pressures up to 25000 MPa. *Journal of Physical and Chemical Reference Data*, 18: 1537–1564, 1989.
- S. K. Saxena and Y. Fei. Fluids at crustal pressures and temperatures. I. pure species. *Contributions to Mineralogy and Petrology*, 95:370–375, 1987.
- H. Schmeling. *Numerische Modelle über den Einfluß partieller Schmelze auf elastische, anelastiche und elektrische Eigenschaften von Gesteinen mit Anwendung auf Labordaten und die Asthenosphäre*. PhD thesis, Universität Frankfurt/Main. Institut für Meteorologie und Geophysik, 1983.
- H. Schmeling. Numerical models on the influence of partial melt on elastic, anelastic and electrical properties of rocks. Part I: Elasticity and anelasticity. *Physics of the Earth and Planetary Interiors*, 41:34–57, 1985.
- H. Schmeling. Numerical models on the influence of partial melt on elastic, anelastic and electrical properties of rocks. Part II: Electrical conductivity. *Physics of the Earth and Planetary Interiors*, 43:123–136, 1986.
- U. Schmucker and B. Tezkan. 20 Jahre elektromagnetische Tiefenforschung im Rheingraben - eine Zusammenfassung mit Ausblick auf neuere Ergebnisse. In V. Haak and J. Homilius, editors, *Protokoll über das 12. Kolloquium Elektromagnetische Tiefenforschung Königstein/Taunus, 1.3.-3.3.1988*, pages 17–34. Niedersächsisches Landesamt für Bodenforschung, 1988.
- J. Schön. *Petrophysik. Physikalische Eigenschaften von Gesteinen und Mineralen*. Enke, 1983.
- J. R. Schopper. Personal Communication, 1983.
- J. R. Schopper, H. Pape, A. Fülop, L. Riepe, and R. Wehr. Permeability estimation from logs based on a new petrophysical model. In *KTB-REPORT 88-10. Beiträge zum 1. KTB-Kolloquium in Giessen, 28. - 29.1.1988*, volume 15, pages 71–76, 1988.
- A. Schultz and H. Elderfield. Controls on the physics and chemistry of seafloor hydrothermal circulation. *Phil. Trans. Royal Soc. London*, 335:387–4 untersucht 25, 1997.
- H. G. Schuster. *Deterministic Chaos*. Verlag Chemie, 1987.
- H. R. Schwarz. *Die Methode der Finiten Elemente*. Teubner, 1984.
- H. R. Schwarz. *FORTRAN-Programme zur Methode der Finiten Elemente*. Teubner, 1988.
- M. Seager. A SLAP for the masses. Lawrence Livermore National Laboratory. UCRL 100195, 1988.
- J. V. Sengers and J. T. R. Watson. Improved international formulations for the viscosity and thermal conductivity of water substance. *Journal of Physical and Chemical Reference Data*, 15:1291–1314, 1986.
- T. J. Shankland and M. E. Ander. Electrical conductivity, temperatures and fluids in the lower crust. *Journal of Geophysical Research*, 88:9475–9484, 1983.

- T. J. Shankland, A. G. Duba, E. A. Mathez, and C. L. Peach. Increase of electrical conductivity with pressure as an indicator of conduction through a solid phase in midcrustal rocks. *Journal of Geophysical Research*, 102:14741–14750, 1997.
- P. M. Shearer. Cracked media, Poisson's ratio and the structure of the upper oceanic crust. *Geophysical Journal International*, 88:357–362, 1988.
- T. J. Sheperd. Geological link between fluid inclusiona, dilatant microcracks, and palaeostress field. *Journal of Geophysical Research*, 95:11115–11120, 1990.
- P. N. Shive and D. M. Fountain. Magnetic mineralogy in an archaean crustal cross sections. *Journal of Geophysical Research*, 93:12177–12186, 1988.
- P. N. Shive, B. R. Frost, and A. Peretti. The magnetic properties of metaperidotitic rocks as a function of metamorphic grade. *Journal of Geophysical Research*, 93:12187–12195, 1988.
- R. H. Sibson . Crustal stress, faulting and fluid flow. In J. Parnell, editor, *Geofluids: Origin, Migration, and Evolution of Fluids in Sedimentary basins* . Geological Society Special Publication No. 78, volume 95 of AMD. Geological Society, 1994.
- R. H. Sibson. Fault zone models, heat flow, and depth distribution of earthquakes in the continental crust of the United States. *Geological Society of America Bulletin*, 72:151–163, 1982.
- R. H. Sibson. Earthquake rupturing as a mineralizing agent in hydrothermal systems. *Geology*, 15: 701–704, 1987.
- R. H. Sibson. High-angle reverse faults, fluid pressure cycling, and mesothermal gold-quartz deposits. *Geology*, 16:551–555, 1988.
- W. Skrotzki and I. Strackenbrock. Untersuchungen der Graphitisierung während der Metamorphose mittels hochauflösender TEM. In *Beiträge zum 1. KTB-Kolloquium Giessen, 28.-29.1.1988. KTB-Report 88-10*, 1988.
- L. Smith and D. S. Chapman. On the thermal effect of groundwater flow. 1. regional scale systems. *Journal of Geophysical Research*, 88:593–608, 1983.
- K. Soman, R. V. Lobzova, and K. M. Sivadas. Geology, genetic types, and origin of graphite in South Kerala, India. *Economic Geology*, 81:997–1002, 1986.
- M. L. Sorey. Numerical modeling of liquid Geothermal systems. USGS Professional Paper 1044-D, Washington, 1978.
- F. S Spear and S. M. Peacock. *Metamorphic Pressure-Temperature-Time Paths*, volume 7 of *Short Course in Geology*. AGU, 1989.
- W. D. Stanley. Comparison of geoelectrical/tectonic models for suture zones in the western U.S.A and eastern Europe: are black shales a possible source of high conductivities ? *Physics of the Earth and Planetary Interiors*, 53:228–238, 1989.
- D. Stauffer and A. Aharoni. *Perkolationstheorie. Eine Einführung*. VCH, 1995.
- C. I. Steefel and A. C. Lasaga. Evolution of dissolution patterns: Permeability change due to coupled flow and reaction. In D. C. Melchior and R. L. Basset, editors, *Chemical Modelling of Aquaeous Systems II*, volume 416 of *ACS Symp. Ser.*, pages 212–225. American Chemical Society, 1990.
- C. I. Steefel and A. C. Lasaga. A coupled model for transport of multiple chemical species and kinetic precipitation/dissolution reactions with application to reactive flow in single phase hydrothermal systems. *American Journal of Science*, 294:529–592, 1994.
- R. M. Stesky and W. F. Brace. Electrical conductivity of serpentinized rocks to 6 kbars. *Journal of Geophysical Research*, 78:7614–7621, 1973.

- J. M. Strauss and G. Schubert. Thermal convection of water in a porous medium: Effect of temperature- and pressure-dependent thermodynamic and transport properties. *Journal of Geophysical Research*, 82:325–333, 1977.
- E. A. Sudicky. The Laplace Transform Galerkin Technique: A time-continuous finite element theory and application to mass transport in groundwater. *Water Resources Research*, 25:1833–1846, 1989.
- A. Szepessy. *Convergence of the Streamline Diffusion Finite Element Method for Conservation Laws*. PhD thesis, Chalmers University of Technology – University of Göteborg, 1989.
- J. C. Tanger IV and H. C. Helgeson. Calculation of the thermodynamic and transport properties of aqueous species at high pressures and temperatures: Revised equations of state for the standard partial molal properties of ions and electrolytes. *American Journal of Science*, 288:19–98, 1988.
- S. Tauber. Die Leitfähigkeitsverteilung der nördlichen Varisziden untersucht mit der Methode der Magnetotellurik und der geomagnetischen Tiefensondierung auf einem profil vom Oberpfälzer Wald ins Vogtland. Diplomarbeit, Institut für Geophysik, FU-Berlin, 1993.
- K. Tödheide. Hydrothermal solutions. *Ber. Bunsenges. Phys. Chem.*, 86:1005–1016, 1982.
- T. E. Tezduyar and D. K. Ganjoo. Petrov-Galerkin formulations with weighting functions dependent upon spatial and temporal diskretisation: Applications to transient convection-diffusion problems. *Computer Methods in Applied Mechanics and Engineering*, 59:49–71, 1986.
- T. E. Tezduyar and Y. J. Park. Discontinuity-capturing Finite Element formulations for nonlinear convection-diffusion-reaction equations. *Computer Methods in Applied Mechanics and Engineering*, 59:307–325, 1986.
- B. Tezkan. Ein Interpretationsversuch zur Erklärung der konträren Phasenverläufe der E- und B-Polarisation am Ostrand der Hessischen Senke mit 2-D Leitfähigkeitsmodellen. In V. Haak and J. Homilius, editors, *Protokoll über das 12. Kolloquium Elektromagnetische Tiefenforschung Königstein/Taunus, 1.3.-3.3.1988*, pages 35–54. Niedersächsisches Landesamt für Bodenforschung, 1988.
- B. Tezkan, V. Červ, and J. Pek. Resolving anisotropic and shielded high conductive layers using 2D electromagnetic modelling in the Rhine Graben and in the Black Forest. *Physics of the Earth and Planetary Interiors*, 000:000–000, submitted.
- F. Thomasset. *Implementation of Finite Element Methods for Navier-Stokes Equations*. Springer, 1981.
- A. B. Thompson. Metamorphism and fluids. In G. C. Brown, C. J. Hawkesworth, and R. C. L. Wilson, editors, *Understanding the Earth*, volume 25, pages 222–248. Cambridge University Press, 1993.
- A. B. Thompson and J. A. D. Connolly. Metamorphic fluids and anomalous porosities in the lower crust. *Tectonophysics*, 182:47–55, 1990.
- A. B. Thompson and P. C. England. Pressure-temperature-time paths of regional metamorphism II. their inference and interpretation using mineral assemblages in metamorphic rocks. *Journal of Petrology*, 25:929–955, 1984.
- J. Touret. Fluid inclusions in high-grade metamorphic rocks. Short Course, Mineralogical Association of Canada Nr.6, 1981.
- J. Touret. Fluid inclusions in rocks from the lower continental crust. In J. B. Dawson, D. A. Carswell, J. Hall, and K. H. Wedepohl, editors, *The Nature of The Lower Continental Crust. Geological Society Special Publications No. 24*. Blackwell, 1986.
- H. Trappe, Th. Wever, and R. Meissner. Crustal reflectivity pattern and its relation to Geological provinces. *Geophysical Prospecting*, 36:265–281, 1988.
- V. Trommsdorff, G. Skippen, and P. Ulmer. Halite and sylvite as solid inclusion in high-grade metamorphic rocks. *Contributions to Mineralogy and Petrology*, 89:24–29, 1985.

- D. L. Turcotte and G. Schubert. *Geodynamics: Applications of Continuum Physics to geological Problems*. Wiley, 1979.
- H. Ucok, I. Ershagi, and G. R. Olhoeft. Electrical resistivity of Geothermal brines. *Journal of Petroleum Technology*, 32:717–727, 1980.
- C. W. Ueberhuber. *Numerical Computation.*, volume 1 & 2. Springer, Berlin, 1995.
- J. W. Valley. Stable isotope geochemistry of metamorphic rocks. In J. W. Valley, H. P. Taylor, and J. R. O’Neil, editors, *Stable isotopes in high temperature geological processes. Reviews in Mineralogy* 16. Mineralogical Society of America, 1986.
- Vatnaskil Consulting Engineers. *AQUA. Groundwater Flow - and Contaminant Transport Model*, 1990.
- A. Verma and K. Pruess. Thermohydrological conditions and silica redistribution near high-level nuclear wastes emplaced in saturated Geological formations. *Journal of Geophysical Research*, 93: 1159–1173, 1988.
- M. P. Volarovich and E. I. Parkhomenko. Electrical properties of rocks at high temperatures and pressures. In A. Adam, editor, *Geoelectric and Geothermal Studies*, pages 321–369. Akademiai Kiado Budapest, 1976.
- N. von Bargen and H. S. Waff. Permeabilities, interfacial areas and curvature of partially molten systems: Results of numerical computations of equilibrium microstructures. *Journal of Geophysical Research*, 91:9261–9276, 1986.
- C. I. Voss. SUTRA - Saturated-Unsaturated TRAnsport. A finite- element simulation model for saturated-unsaturated, fluid-density- dependent ground-water flow with energy transport or chemically- reactive single species solute transport. USGS Water-Resources Investigations Report 84-4369, 1984.
- J. Walder and A. Nur. Porosity reduction and crustal pore pressure development. *Journal of Geophysical Research*, 89:11539–11548, 1984.
- O. Walderhaug. Temperatures of quartz cementation in Jurassic sandstones from the Norwegian continental shelf - evidence from fluid inclusions. *Journal of Sedimentary Research*, A 64:311–323, 1994.
- J. V. Walther and E. Althaus. Graphite deposition in tectonically mobilized fault planes in the KTB pilot drill hole. In R. Emmerman, J. Lauterjung, and T. Umsonst, editors, *KTB Report 93-2. Contributions to the 6. Annual KTB-Colloquium, Giessen 1.-2. April 1993. Geoscientific Results*, pages 493–496. KTB, 1993.
- J. V. Walther and H. C. Helgeson. Calculation of the thermodynamic properties of aqueous silica and the solubility of quartz and its polymorphs at high pressures and temperatures. *American Journal of Science*, 277:1315–1351, 1977.
- J. V. Walther and P. M. Orville. Volatile production and transport in regional metamorphism. *Contributions to Mineralogy and Petrology*, 79:252–257, 1982.
- J. V. Walther and B. J. Wood. Rate and mechanism in prograde metamorphism. *Contributions to Mineralogy and Petrology*, 88:246–259, 1984.
- J. V. Walther and B. J. Wood. Mineral-fluid reaction rates. In B. J. Wood and J. V. Walther, editors, *Water-Rock Interactions During Metamorphism. Advances in Physical Geochemistry 5*, pages 194–211. Springer, 1986.
- G. F. Wang. Carbonaceous material in the Ryoke metamorphic rocks, Kinki District, Japan. *Lithos*, 22:305–316, 1989.

- Y. Wasserman, B. Wood, and A. Davies. An equation of state for aqueous silica species at pressures from 1bar to 20kbar and temperatures from 25 °C to 900 °C based on simulated values of the dielectric constant. *Chemical Geology*, 121:3–9, 1995.
- E. B. Watson. Immobility of reduced carbon along grain boundaries in dunite. *Geophysical Research Letters*, 13:529–532, 1986.
- E. B. Watson and J. M. Brenan. Fluids in the lithosphere. 1. experimentally-determined wetting characteristics of  $CO_2 - H_2O$  fluids and their implications for fluid transport, host-rock physical properties, and fluid inclusion formation. *Earth and Planetary Science Letters*, 85:497–515, 1987.
- P. Weidelt. Three-dimensional conductivity models: implications of electrical anisotropy. In M. Oristaglio and B. Spies, editors, *International Symposium on Three-dimensional Electromagnetics. October 4-6, 1995, at Schlumberger-Doll Research, Ridgefield/Connecticut, USA*, pages 1–11, 1995.
- P. Weidelt. Three-dimensional conductivity models: implications of electrical anisotropy. In *Russian-German Seminar on Actual Problems in Deep EM Studies. Moskow, March, 11-15, 1997 (in preparation)*., 1997.
- P. L. Weis, I. Friedman, and J. P. Gleason. The origin of epigenetic graphite: Evidence from isotopes. *Geochimica et Cosmochimica Acta*, 45:2325–2332, 1981.
- P. R. A. Wells. Thermal models for the magmatic accretion and subsequent metamorphism of continental crust. *Earth and Planetary Science Letters*, 46:253–265, 1980.
- W. A. Wendt, S. Sakurai, and P. H. Nelson. Permeability prediction from well logs using multiple regression. In L. W. Lake and H. B. Carroll, editors, *Reservoir Characterization*, pages 181–221. Academic Press, 1986.
- Th. Wever, H. Trappe, and R. Meissner. Possible relations between crustal reflectivity, crustal age, heat flow, and viscosity of the continents. *Annales Geophysicae*, 5:255–266, 1987.
- S. M. Wickham and H. P. Taylor Jr. Stable isotopic evidence for large-scale seawater infiltration in a regional metamorphic terrane: The Trois Seigneurs Massif, Pyrenees, France. *Contributions to Mineralogy and Petrology*, 91:122–137, 1985.
- W. Wimmenauer. *Petrographie der magmatischen und metamorphen Gesteine*. Enke, 1985.
- H. G. F. Winkler. *Petrogenesis of Metamorphic Rocks*. Springer, 1979.
- R. P. Wintsch, A. F. O'Connell, B. L. Ransom, and M. J. Wiechman. Evidence for the influence of  $f_{CH_4}$  on the crystallinity of disseminated carbon in greenschist facies rocks, Rhode Island, USA. *Contributions to Mineralogy and Petrology*, 77:207–213, 1981.
- T. Wong, S. Ko, and D. L. Olgaard. Generation and maintenance of pore pressure excess in a dehydrating system. 2. theoretical analysis. *Journal of Geophysical Research*, 102:841–852, 1997.
- B. J. Wood and C. M. Graham. Infiltration of aqueous fluid and high fluid:rock ratios during greenschist facies metamorphism: A discussion. *Journal of Petrology*, 27:751–761, 1986.
- B. J. Wood and J. V. Walther. Fluid flow during metamorphism and its implications for fluid-rock ratios. In B. J. Wood and J. V. Walther, editors, *Water-Rock Interactions During Metamorphism. Advances in Physical Geochemistry 5*, pages 109–131. Springer, 1986.
- J. R. Wood. Thermal mass transfer in systems containing quartz and calcite. In D. L. Gautier, editor, *Roles of Organic Matter in Diagenesis*, Spec. Publ., pages 169–179. SEPM, Tulsa OK, 1986.
- J. R. Wood and T. A. Hewett. Fluid convection and mass transfer in porous sandstones: A theoretical model. *Geochimica et Cosmochimica Acta*, 46:1707–1713, 1982.
- J. R. Wood and T. A. Hewett. Reservoir diagenesis and convective fluid flow. In D. A. McDonald and R. C. Surdam, editors, *Clastic Diagenesis*, volume 37 of *AAPG Memoir*, pages 99–110. AAPG, 1984.

- J. R. Wood and T. A. Hewett. Forced fluid flow and diagenesis in porous sandstones – controls on the spatial distribution. In D. L. Gautier, editor, *Roles of Organic Matter in Diagenesis*, volume 38 of *Spec. Publ.*, pages 181–187. SEPM, Tulsa OK, 1986.
- W. L. Wood. *Practical Time-Stepping Schemes*. Special Papers. Clarendon, 1990.
- W. L. Wood and R. W. Lewis. A comparison of time marching schemes for the transient heat conduction equation. *International Journal for Numerical Methods in Engineering*, 9:679–689, 1975.
- B. W. D. Yardley. Fluid migration and veining in the Connemara Schists, Ireland. In Wood B. J. and J. V. Walther, editors, *Water-Rock Interactions During Metamorphism. Advances in Physical Geochemistry 5*, pages 109–131. Springer, 1986.
- B. W. D. Yardley and J. W. Valley. The petrologic cause for a dry lower crust. *Journal of Geophysical Research*, 102:12173–12185, 1997.
- O. C. Zienkiewicz. *Die Methode der Finiten Elemente*. Hanser, 4 edition, 1984.
- O. C. Zienkiewicz and J. C. Heinrich. The Finite Element method and convection problems in fluid dynamics. In R. H. Gallagher, O. C. Zienkiewicz, J. T. Oden, M. M. Cecchi, and C. Taylor, editors, *Finite Elements in Fluids*, volume 3, pages 1–22. Wiley, 1978.
- O. C. Zienkiewicz, R. Löhner, K. Morgan, and J. Peraire. High-speed compressible flows and other advection-dominated problems in fluid mechanics. In R. H. Gallagher, G. F. Carey, J. T. Oden, and O. C. Zienkiewicz, editors, *Finite Elements in Fluids*, volume 6, pages 41–88. Wiley, 1985.
- O. C. Zienkiewicz, K. Morgan, J. Peraire, J. Peiro, and L. Formaggia. Finite elements in fluid mechanics compressible flow, shallow water equations and transport. In T. J. R. Hughes and T. Tezduyar, editors, *Recent Developments in Computational Fluid Dynamics*, volume 95 of *AMD*. ASME, 1979.
- O. C. Zienkiewicz and R. L. Taylor. *The Finite Element Method. Basic Formulation and Linear Problems*, volume 1. McGraw-Hill, 4 edition, 1989a.
- O. C. Zienkiewicz and R. L. Taylor. *The Finite Element Method. Solid and Fluid Dynamics. Dynamics and Nonlinearity*, volume 2. McGraw-Hill, 4 edition, 1989b.
- Z. Zlatev. *Computational Methods for General Sparse Matrices*. Kluwer, 1993.
- M. L. Zoback. First- and second-order patterns of stress in the lithosphere: The World Stress Map Project. *Journal of Geophysical Research*, 97:11703–11728, 1992.
- T. A. Zoth and R. Hänel. Appendix. In R. Hänel, L. Rybach, and L. Stegenga, editors, *Handbook of Terrestrial Heat Flow Determinations*, pages 449–466. Kluwer, 1988.

