Appendix A
Fundamental Stresses and Fluid Velocities

This appendix lists the components of the stress tensors $\boldsymbol{\sigma}^{\mathrm{pe},\cdot}$ and fluid velocities $v_f^{\cdot}$ to the dimensionless fundamental solutions.

For three–dimensional domains, these are given by

$$\begin{aligned}
&\boldsymbol{\sigma}_{kl}^{\mathrm{pe,Si}}(x,t)\\
&=\frac{C_1}{2\pi\,\|x\|^3}\Bigg[\left(\delta_{kl}-\frac{3x_kx_l}{\|x\|^2}\right)\left(\operatorname{erf}\left(\frac{\|x\|}{\sqrt{4C_2t}}\right)-\frac{2}{\sqrt{\pi}}\frac{\|x\|}{\sqrt{4C_2t}}\exp\left(-\frac{\|x\|^2}{4C_2t}\right)\right)\\
&\qquad+\frac{4}{\sqrt{\pi}}\left(\delta_{kl}+\frac{x_kx_l}{\|x\|^2}\right)\frac{\|x\|^3}{\sqrt{4C_2t^3}}\exp\left(-\frac{\|x\|^2}{4C_2t}\right)\Bigg],
\end{aligned}\tag{A.1a}$$

$$\begin{aligned}
&\boldsymbol{\sigma}_{jkl}^{\mathrm{pe,fi}}(x,t)\\
&=-\frac{C_1^2}{2\pi\,\|x\|^5}\Bigg[\left(x_j\delta_{lk}+x_k\delta_{jl}+x_l\delta_{jk}-\frac{5x_jx_kx_l}{\|x\|^2}\right)\\
&\qquad\times\left(3\operatorname{erf}\left(\frac{\|x\|}{\sqrt{4C_2t}}\right)-\frac{2}{\sqrt{\pi}}\left(3+\frac{\|x\|^2}{2C_2t}\right)\frac{\|x\|}{\sqrt{4C_2t}}\exp\left(-\frac{\|x\|^2}{4C_2t}\right)\right)\\
&\qquad+\frac{8}{\sqrt{\pi}}\left(x_j\delta_{kl}-\frac{x_jx_kx_l}{\|x\|^2}\right)\frac{\|x\|^5}{\sqrt{4C_2t^5}}\exp\left(-\frac{\|x\|^2}{4C_2t}\right)\Bigg],
\end{aligned}\tag{A.1b}$$

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$$
\begin{aligned}
&\boldsymbol{\sigma}_{jkl}^{\mathrm{pe,CN}}(x) \\
&= \frac{-(2c_0\lambda + \alpha^2)}{c_0(\lambda + 2\mu) + \alpha^2} \frac{x_j}{4\pi \left\|x\right\|^3} \delta_{kl} \\
&\quad - \frac{C_3}{4\pi \left\|x\right\|^3} \left[(1 - C_4)(x_k\delta_{jl} + x_l\delta_{jk}) - 2C_4 x_j \delta_{kl} + 4C_4 \frac{x_j x_k x_l}{\left\|x\right\|^2} \right] ,
\end{aligned} \tag{A.1c}
$$

$$
v_{f,k}^{\mathrm{Si}}(x,t) = \frac{2C_2}{\sqrt{\pi}^3} \frac{x_k}{\sqrt{4C_2 t}^5} \exp\left(-\frac{\left\|x\right\|^2}{4C_2 t} \right) , \tag{A.2a}
$$

$$
v_{f,jk}^{\mathrm{fi}}(x,t) = \frac{2C_1 C_2}{\sqrt{\pi}^3} \left(\delta_{jk} - \frac{x_j x_k}{2C_2 t} \right) \frac{1}{\sqrt{4C_2 t}^5} \exp\left(-\frac{\left\|x\right\|^2}{4C_2 t} \right) , \tag{A.2b}
$$

$$
v_{f,jk}^{\mathrm{CN}}(x) = \frac{C_1}{4\pi \left\|x\right\|^3} \left(-\delta_{jk} + \frac{3x_j x_k}{\left\|x\right\|^2} \right) . \tag{A.2c}
$$

For two–dimensional domains, we have

$$
\begin{aligned}
&\boldsymbol{\sigma}_{kl}^{\mathrm{pe,Si}}(x,t) \\
&= \frac{C_1}{\pi \left\|x\right\|^2} \left[\left(\delta_{kl} - \frac{2x_k x_l}{\left\|x\right\|^2} \right) \left(1 - \exp\left(-\frac{\left\|x\right\|^2}{4C_2 t} \right) \right) \right. \\
&\qquad \left. + \left(-\delta_{kl} + \frac{x_k x_l}{\left\|x\right\|^2} \right) \frac{2\left\|x\right\|^2}{4C_2 t} \exp\left(-\frac{\left\|x\right\|^2}{4C_2 t} \right) \right] ,
\end{aligned} \tag{A.3a}
$$

$$
\begin{aligned}
&\boldsymbol{\sigma}_{jkl}^{\mathrm{pe,fi}}(x,t) \\
&= \frac{2C_1^2}{\pi \left\|x\right\|^4} \left[\left(x_j\delta_{kl} + x_k\delta_{jl} + x_l\delta_{jk} - \frac{4x_j x_k x_l}{\left\|x\right\|^2} \right) \right. \\
&\qquad \times \left(\left(1 + \frac{\left\|x\right\|^2}{4C_2 t} \right) \exp\left(-\frac{\left\|x\right\|^2}{4C_2 t} \right) - 1 \right) \\
&\qquad \left. + \left(x_j\delta_{kl} - \frac{x_j x_k x_l}{\left\|x\right\|^2} \right) \frac{2\left\|x\right\|^4}{(4C_2 t)^2} \exp\left(-\frac{\left\|x\right\|^2}{4C_2 t} \right) \right] ,
\end{aligned} \tag{A.3b}
$$

$$
\begin{aligned}
&\boldsymbol{\sigma}_{jkl}^{\mathrm{pe,CN}}(x) \\
&= \frac{-(2c_0\lambda + \alpha^2)}{c_0(\lambda + 2\mu) + \alpha^2} \frac{x_j}{2\pi \left\|x\right\|^2} \delta_{kl} \\
&\quad - \frac{C_3}{2\pi \left\|x\right\|^2} \left[(1 - C_4)(x_k\delta_{jl} + x_l\delta_{jk}) - 2C_4 x_j\delta_{kl} + 4C_4 \frac{x_j x_k x_l}{\left\|x\right\|^2} \right] ,
\end{aligned} \tag{A.3c}
$$

$$
v_{f,k}^{\mathrm{Si}}(x,t) = \frac{2C_2}{\pi} \frac{x_k}{(4C_2t)^2} \exp\left(-\frac{\left\|x\right\|^2}{4C_2t} \right) , \tag{A.4a}
$$

$$
v_{f,jk}^{\mathrm{fi}}(x,t) = \frac{2C_1C_2}{\pi} \left(\delta_{jk} - \frac{x_j x_k}{2C_2t} \right) \frac{1}{(4C_2t)^2} \exp\left(-\frac{\left\|x\right\|^2}{4C_2t} \right) , \tag{A.4b}
$$

$$
v_{f,jk}^{\mathrm{CN}}(x) = \frac{C_1}{2\pi \left\|x\right\|^2} \left(-\delta_{jk} + \frac{2x_j x_k}{\left\|x\right\|^2} \right) . \tag{A.4c}
$$

References

1. Abeyratne, M.K., Freeden, W., Mayer, C.: Multiscale deformation analysis by Cauchy-Navier wavelets. J. Appl. Math. **12**, 605–645 (2003)
2. Abousleiman, Y., Cheng, A.H.D., Cui, L., Detournay, E., Roegiers, J.C.: Mandel's problem revisited. Géotechnique **46**, 187–195 (1996)
3. Adams, R.: Sobolev Spaces. Academic, New York (1975)
4. Aleksidze, M.A.: On approximation solutions of a certain mixed boundary value problem in the theory of harmonic functions. Differ. Equ. **2**, 515–518 (1966)
5. Allis, R., Bromley, C., Currie, S.: Update on subsidence at the Wairakei-Tauhara geothermal system, New Zealand. Geothermics **38**, 169–180 (2009)
6. Allis, R.G., Zhan, X.: Predicting subsidence at Wairakei and Ohaaki geothermal fields, New Zealand. Geothermics **29**, 479–497 (2000)
7. Altay, C.A., Dökmeci, M.C.: A uniqueness theorem in Biot's poroelasticity theory. J. Appl. Math. Phys. **49**, 838–846 (1998)
8. Alves, C.J.S.: On the choice of source points in the method of fundamental solutions. Eng. Anal. Bound. Elem. **33**, 1348–1361 (2009)
9. Alves, C.J.S., Antunes, P.R.S.: The method of fundamental solutions applied to the calculation of eigensolutions for 2D plates. Int. J. Numer. Method. Eng. **77**, 177–194 (2009)
10. Alves, C.J.S., Silvestre, A.L.: Density results using Stokeslets and a method of fundamental solutions for the Stokes equations. Eng. Anal. Bound. Elem. **28**, 1245–1252 (2004)
11. Ansorge, R., Sonar, T.: Mathematical Models of Fluid Dynamics. Wiley, Weinheim (2009)
12. António, J., Tadeu, A., Godinho, L.: A Three-dimensional acoustics model using the method of fundamental solutions. Eng. Anal. Bound. Elem. **32**, 525–531 (2008)
13. Augustin, M.: Mathematical aspects of stress field simulations in deep geothermal reservoirs. Schr. Funkt.Anal. Geomath. **50**, 1–26 (2011)
14. Augustin, M.: On the role of poroelasticity for modeling of stress fields in geothermal reservoirs. Int. J. Geomath. **3**, 67–93 (2012)
15. Augustin, M., Bauer, M., Blick, C., Eberle, S., Freeden, W., Gerhards, C., Ilyasov, M., Kahnt, R., Klug, M., Michel, I., Möhringer, S., Neu, T., Nutz, H., I., Punzi, A.: Modeling deep geothermal reservoirs: recent advances and future perspectives. In: W. Freeden, Z. Nashed, T. Sonar (eds.) Handbook of Geomathematics, 2nd edn. Springer, New York (2015). Accepted for publication
16. Augustin, M., Caiazzo, A., Fiebach, A., Fuhrmann, J., John, V., Linske, A., Umla, R.: An assesment of discretizations for convection-dominated convection-diffusion equations. Comput. Method. Appl. Mech. Eng. **200**, 3395–3409 (2011)

M.A. Augustin, *A Method of Fundamental Solutions in Poroelasticity to Model the Stress Field in Geothermal Reservoirs*, Lecture Notes in Geosystems Mathematics and Computing, DOI 10.1007/978-3-319-17079-4

17. Augustin, M., Freeden, W., Gerhards, C., Möhringer, S., Ostermann, I.: Mathematische Methoden in der Geothermie. Math. Semesterber. **59**, 1–28 (2012)
18. Auriault, J.L.: Contribution à l'étude de la Consolidation des Sols. Ph.D. thesis, L'Université Scientifique et Médicale de Grenoble (1973)
19. Auriault, J.L., Sanchez-Palencia, E.: Étude du Comportement Macroscopique d'un Milieu Poreux Saturé déformable. J. Mec. **16**, 575–603 (1977)
20. Badmus, T., Cheng, A.H.D., Grilli, S.: A Laplace-transform-based three-dimensional BEM for poroelasticity. Int. J. Numer. Method. Eng. **36**, 67–85 (1993)
21. Baisch, S., Carbon, D., Dannwolf, U., Delacou, B., Delvaux, M., Dunand, F., Jung, R., Koller, M., Martin, C., Sartori, M., Secanell, R., Vorös, R.: Deep heat mining Basel – seismic risk analysis. SERIANEX. Tech. rep., study prepared for the Departement für Wirtschaft, Soziales und Umwelt des Kantons Basel-Stadt, Amt für Umwelt und Energie (2009)
22. Balakrishnan, K., Ramachandran, P.A.: The method of fundamental solutions for linear diffusion-reaction equations. Math. Comput. Model. **31**, 221–237 (2000)
23. Barbier, E.: Geothermal energy technology and current status: an overview. Renew. Sustain. Energy Rev. **6**, 3–65 (2002)
24. Barnett, A.H., Betcke, T.: Stability and convergence of the method of fundamental solutions for Helmholtz problems on analytic domains. J. Comput. Phys. **227**, 7003–7026 (2008)
25. Barucq, H., Madaune-Tort, M., Saint-Macary, P.: Theoretical aspects of wave propagation for Biot's consolidation problem. Monogr. Semin. Mat. García de Galdeano **31**, 449–458 (2004)
26. Barucq, H., Madaune-Tort, M., Saint-Macary, P.: On nonlinear Biot's consolidation models. Nonlinear Anal. **63**, e985–e995 (2005)
27. Barucq, H., Madaune-Tort, M., Saint-Macary, P.: Some existence-uniqueness results for a class of one-dimensional nonlinear Biot models. Nonlinear Anal. **61**, 591–612 (2005)
28. Barucq, H., Madaune-Tort, M., Saint-Macary, P.: Asymptotic Biot models in porous media. Adv. Differ. Equ. **11**, 61–90 (2006)
29. Bauer, F., Gutting, M., Lukas, M.A.: Evaluation of parameter choice methods for regularization of ill-posed problems in geomathematics. In: W. Freeden, Z. Nashed, T. Sonar (eds.) Handbook of Geomathematics, 2nd edn. Springer, New York (2015). Accepted for publication
30. Bauer, F., Lukas, M.A.: Comparingparameter [sic] choice methods for regularization of ill-posed problems. Math. Comput. Simul. **81**, 1795–1841 (2011)
31. Bear, J.: Dynamics of Fluids in Porous Media. Dover, Mineola (1988)
32. Berryman, J.G.: Comparison of upscaling methods in poroelasticity and its generalizations. J. Eng. Mech. **131**, 928–936 (2005)
33. Bertani, R.: Geothermal power generation in the world 2005–2010 update report. Geothermics **41**, 1–29 (2012)
34. Biot, M.A.: Le Problème de la Consolidation des Matières Argileuses sous une Charge. Ann. Soc. Sci. Brux. **B55**, 110–113 (1935)
35. Biot, M.A.: General theory of three-dimensional consolidation. J. Appl. Phys. **12**, 151–164 (1941)
36. Biot, M.A.: Theory of elasticity and consolidation for a porous anisotropic solid. J. Appl. Phys. **26**, 182–185 (1955)
37. Biot, M.A.: General solutions of the equations of elasticity and consolidation for a porous material. J. Appl. Mech. **78**, 91–96 (1956)
38. Biot, M.A.: Mechanics of deformation and acoustic propagation in porous media. J. Appl. Phys. **33**, 1482–1498 (1962)
39. de Boer, R.: Theoretical poroelasticity – a new approach. Chaos Solitons Fractals **25**, 861–878 (2005)
40. Bogomolny, A.: Fundamental solutions method for elliptic boundary value problems. SIAM J. Numer. Anal. **22**, 644–669 (1985)
41. Browder, F.E.: Approximation by solutions of partial differential equations. Am. J. Math. **84**, 134–160 (1962)

42. Buhmann, M.D.: Radial basis functions: theory and implementations. In: Cambridge Monographs on Applied and Computational Mathematics, vol. 12. Cambridge University Press, Cambridge (2003)
43. Chantasiriwan, S.: Methods of fundamental solutions for time-dependent heat conduction problems. Int. J. Numer. Method. Eng. **66**, 147–165 (2006)
44. Chantasiriwan, S., Johansson, B.T., Lesnic, D.: The method of fundamental solutions for free surface Stefan problems. Eng. Anal. Bound. Elem. **33**, 529–538 (2009)
45. Chen, C.S., Karageorghis, A., Smyrlis, Y.S. (eds.): The method of fundamental solutions – a meshless method. Dynamic Publishers, Atlanta (2008)
46. Chen, C.S., Rashed, Y.F., Golberg, M.A.: A Mesh-Free Method for Linear Diffusion Equations. Numer. Heat Transf. B **33**, 469–486 (1998)
47. Chen, C.W., Young, D.L., Tsai, C.C., Murugesan, K.: The method of fundamental solutions for inverse 2D Stokes problems. Comput. Mech. **37**, 2–14 (2005)
48. Chen, J.: Time domain fundamental solution to Biot's complete equations of dynamic poroelasticity. Part I: two-dimensional solution. Int. J. Solid. Struct. **31**, 1447–1490 (1994)
49. Chen, J.: Time domain fundamental solution to Biot's complete equations of dynamic poroelasticity. Part II: three-dimensional solution. Int. J. Solid. Struct. **31**, 169–202 (1994)
50. Chen, J.T., Wu, C.S., Lee, Y.T., Chen, K.H.: On the equivalence of the Trefftz method and method of fundamental solutions for Laplace and biharmonic equations. Comput. Math. Appl. **53**, 851–879 (2007)
51. Cheng, A.H.D., Detournay, E.: A direct boundary element method for plane strain poroelasticity. Int. J. Numer. Anal. Method. Geomech. **12**, 551–572 (1988)
52. Cheng, A.H.D., Detournay, E.: On singular integral equations and fundamental solutions of poroelasticity. Int. J. Solid. Struct. **35**, 4521–4555 (1998)
53. Cheng, A.H.D., Liggett, J.A.: Boundary integral equation method for linear porous-elasticity with applications to soil consolidation. Int. J. Numer. Method. Eng. **20**, 255–278 (1984)
54. Cheng, A.H.D., Predeleanu, M.: Transient boundary element formulation for linear poroelasticity. Appl. Math. Model. **11**, 285–290 (1987)
55. Ciarlet, P.G.: The Finite Element Method for Elliptic Problems. North-Holland, Amsterdam (1978)
56. Ciarlet, P.G.: Mathematical Elasticity: Volume I: Three-Dimensional Elasticity. Studies in Mathematics and Its Applications. North-Holland, Amsterdam (1994)
57. Costabel, M.: Boundary integral operators for the heat equation. Integral Equ. Operat. Theory **13**, 498–552 (1990)
58. Costabel, M.: Time-dependent problems with the boundary integral equation method. In: E. Stein, R. de Borst, T.J.R. Hughes (eds.) Encyclopedia of Computational Mechanics, chap. 25. Wiley, Chichester (2004)
59. Courant, R., Friedrichs, K., Lewy, H.: Über die partiellen Differenzengleichungen der mathematischen Physik. Math. Ann. **100**, 32–74 (1928)
60. Courant, R., Friedrichs, K., Lewy, H.: On partial difference equations of mathematical physics. IBM J. Res. Dev. **11**, 215–234 (1967). Translated from German by Phyllis Fox
61. Cui, L., Abousleiman, Y.: Time-dependent poromechanical response of saturated cylinders. J. Eng. Mech. **127**, 391–398 (2001)
62. Dafermos, C.M.: On the existence and the asymptotic stability of solutions to the equations of linear thermoelasticity. Arch. Ration. Mech. Anal. **29**, 1521–1536 (1968)
63. Darcy, H.P.G.: Les Fontaines Publiques de la Ville de Dijon. Victor Dalmont, Paris (1856)
64. Dargush, G.F., Banerjee, P.K.: A time domain boundary element method for poroelasticity. Int. J. Numer. Method. Eng. **28**, 2423–2449 (1989)
65. Detournay, E., Cheng, A.H.D.: Fundamentals of poroelasticity. In: C. Fairhurst (ed.) Comprehensive Rock Engineering: Principles, Practice and Projects. Analysis and Design Method, vol. II, chap. 5, pp. 113–171. Pergamon Press, Oxford (1993)
66. Dickson, M.H., Fanelli, M.: Geothermal Energy. Earthscan, New York (2003)
67. Eberhart-Phillips, D., Oppenheimer, D.H.: Induced seismicity in The Geysers geothermal area, California. J. Geophys. Res. **89**, 1191–1207 (1984)

68. Edwards, H.M.: Advanced calculus: a differential forms approach. Birkhäuser, Boston (1994)
69. Ehrenpreis, L.: On the theory of kernels of Schwartz. Proc. Am. Math. Soc. **7**, 713–718 (1955)
70. Engel, K.J., Nagel, R.: A Short Course in Operator Semigroups. Universitext. Springer, New York (2006)
71. Evans, K.F., Cornet, F.H., Hashida, T., Hayashi, K., Ito, T., Matsuki, K., Wallroth, T.: Stress and rock mechanics issues of relevance to HDR/HWR engineered geothermal systems: review of developments during the past 15 years. Geothermics **28**, 455–474 (1999)
72. Evans, L.: Partial Differential Equations. Graduate Studies in Mathematics, vol. 19. American Mathematical Society, Providence (1998)
73. Expertengruppe "Seismisches Risiko bei hydrothermaler Geothermie": Das seismische Ereignis bei Landau vom 15. August 2009, Abschlussbericht. Tech. rep., on behalf of the Ministerium für Umwelt, Landwirtschaft, Ernährung, Weinbau und Forsten des Landes Rheinland-Pfalz (2010)
74. Fairweather, G., Karageorghis, A.: The method of fundamental solutions for elliptic boundary value problems. Adv. Comput. Math. **9**, 69–95 (1998)
75. Fairweather, G., Karageorghis, A., Martin, P.A.: The method of fundamental solutions for scattering and radiation problems. Eng. Anal. Bound. Elem. **27**, 759–769 (2003)
76. Fam, G.S.A., Rashed, Y.F.: The method of fundamental solutions applied to 3d structures with body forces using particular solutions. Comput. Mech. **36**, 245–254 (2005)
77. Fasshauer, G.E.: Solving partial differential equations by collocation with radial basis functions. In: A. Le Méhauté, C. Rabut, L.L. Schumaker (eds.) Surface Fitting and Multiresolution Methods, pp. 131–138. Vanderbilt University Press, Nashville (1997)
78. Fialko, Y., Simons, M.: Deformation and seismicity in the Coso geothermal area, Inyo County, California: observations and modeling using satellite radar interferometry. J. Geophys. Res. **105**, 21,781–21,793 (2000)
79. Freeden, W.: On the approximation of external gravitational potential with closed systems of (trial) functions. Bull. Géod. **54**, 1–20 (1980)
80. Freeden, W.: Least squares approximation by linear combination of (multi-)poles. Report 344, The Ohio State University, Departement of Geodetic Science and Surveying, Columbus (1983)
81. Freeden, W.: Multiscale Modelling of Spaceborne Geodata. Teubner, Stuttgart (1999)
82. Freeden, W.: Metaharmonic Lattice Point Theory. CRC Press/Taylor & Francis, Boca Raton (2011)
83. Freeden, W., Blick, C.: Signal decorrelation by means of multiscale methods. World Min. Surf. Undergr. **65**, 304–317 (2013)
84. Freeden, W., Gerhards, C.: Poloidal and toroidal field modeling in terms of locally supported vector wavelets. Math. Geosci. **42**, 817–838 (2010)
85. Freeden, W., Gerhards, C.: Geomathematically Oriented Potential Theory. Chapman & Hall/CRC Press, Boca Raton (2013)
86. Freeden, W., Gervens, T., Schreiner, M.: Constructive Approximation on the Sphere (With Applications to Geomathematics). Oxford Science Publications, Oxford (1998)
87. Freeden, W., Groten, E., Schreiner, M., Söhne, W., Tücks, M.: Deformation analysis using Navier spline interpolation (with an application to the Lake Blåsjø area). Allg. Vermess.-Nachr. **3**, 120–146 (1996)
88. Freeden, W., Gutting, M.: Special Functions of Mathematical (Geo-)Physics. Birkhäuser, Basel (2013)
89. Freeden, W., Kersten, H.: A constructive approximation theorem for the oblique derivative problem in potential theory. Math. Method. Appl. Sci. **3**, 104–114 (1981)
90. Freeden, W., Mayer, C., Schreiner, M.: Tree algorithms in wavelet approximations by Helmholtz potential operators. Numer. Funct. Anal. Optim. **24**, 747–782 (2003)
91. Freeden, W., Michel, V.: Multiscale Potential Theory with Applications to Geoscience. Applied and Numerical Harmonic Analysis. Birkhäuser, Boston (2004)
92. Freeden, W., Michel, V.: Wavelet deformation analysis for spherical bodies. Int. J. Wavelets, Multiresolut. Inf. Process. **3**, 523–558 (2005)

93. Freeden, W., Nutz, H.: Satellite gravity gradiometry as tensorial inverse problem. Int. J. Geomath. **2**, 123–146 (2011)
94. Freeden, W., Nutz, H.: Mathematische Methoden. In: M. Bauer, W. Freeden, H. Jacobi, T. Neu (eds.) Handbuch Tiefe Geothermie. Springer, Berlin (2014)
95. Freeden, W., Ostermann, I., Augustin, M.: Mathematik als Schlüsseltechnologie in der Geothermie. Geotherm. Energ. **70**, 20–24 (2011)
96. Freeden, W., Reuter, R.: A constructive method for solving the displacement boundary-value problem of elastostatics by use of global basis systems. Math. Method. Appl. Sci. **12**, 105–128 (1990)
97. Freeden, W., Schreiner, M.: Spherical Functions of Mathematical Geosciences – A Scalar, Vectorial, and Tensorial Setup. Advances in Geophysical and Environmental Mechanics and Mathematics, 1st edn. Springer, Berlin (2009)
98. Frenkel, J.: On the theory of seismic and seismoelectric phenomena in a moist soil. J. Eng. Mech. **131**, 879–887 (2005). Originally published in J. Phys. **3**, 230–241 (1944)
99. Fridleifsson, I.B., Freeston, D.H.: Geothermal energy research and developement. Geothermics **23**, 175–214 (1992)
100. Friedleifsson, I., Ragnarsson, Á.: Survey of Energy Resources, chap. 11. Geothermal Energy, pp. 427–477. World Energy Council, London (2007)
101. Friedman, A.: Partial Differential Equations of Parabolic Type. Prentice-Hall, Englewood Cliffs (1964)
102. Friedrichs, K.O.: On the boundary-value problems of the theory of elasticity and Korn's inequality. Ann. Math. **48**, 441–471 (1947)
103. Gehringer, M., Loksha, V.: Geothermal Handbook: Planning and Financing Power Generation. The International Bank for Reconstruction and Development, The World Bank Group (2012). Energy Sector Management Assistance Program (ESMAP)
104. Gerhards, C.: Spherical decompositions in a global and local framework: theory and an application to geomagnetic modeling. Int. J. Geomath. **1**, 205–256 (2011)
105. Gerhards, C.: Spherical multiscale methods in terms of locally supported wavelets: theory and application to geomagnetic modeling. Ph.D. thesis, University of Kaiserslautern, Geomathematics Group (2011)
106. Gerhards, C.: Locally supported wavelets for the separation of spherical vector fields with respect to their sources. Int. J. Wavelets Multires. Inf. Process. **10**, 1250034:1–1250034:26 (2012)
107. Gerhards, C.: A multiscale power spectrum for the analysis of the lithospheric magnetic field. Int. J. Geomath. **5**, 63–79 (2014)
108. Gerhards, C.: Multiscale modeling of the geomagnetic field and ionospheric currents. In: W. Freeden, Z. Nashed, T. Sonar (eds.) Handbook of Geomathematics, 2nd edn. Springer, New York (2015). Accepted for publication
109. Ghassemi, A.: A review of some rock mechanics issues in geothermal reservoir developement. Geotechn. Geol. Eng. **30**, 647–664 (2012)
110. Ghassemi, A., Cheng, A.H.D., Diek, A., Roegiers, J.C.: A complete plane strain fictitious stress boundary element method for poroelastic media. Eng. Anal. Bound. Elem. **25**, 41–48 (2001)
111. Ghassemi, A., Tarasovs, S.: Three-dimensional modeling of injection induced thermal stresses with an example from Coso. In: Proceedings Twenty-Ninth Workshop on Geothermal Reservoir Engineering, Stanford (2004)
112. Ghassemi, A., Tarasovs, S.: Fracture slip and opening in response to fluid injection into a geothermal reservoir. In: Proceedings Thirty-First Workshop on Geothermal Reservoir Engineering, Stanford (2006)
113. Giusti, E.: Direct Methods in the Calculus of Variations. World Scientific, New Jersey (2003)
114. Glowacka, E., Sarychikhina, O., Nava, F.A.: Subsidence and stress changes in the Cerro Pietro geothermal field, B. C., Mexico. Pure Appl. Geophys. **162**, 2095–2110 (2005)
115. Golberg, M.A.: The method of fundamental solutions for Poisson's equation. Eng. Anal. Bound. Elem. **16**, 205–213 (1995)

116. Golberg, M.A., Chen, C.S.: The method of fundamental solutions for potential, Helmholtz and diffusion problems. In: M.A. Golberg (ed.) Boundary Integral Methods – Numerical and Mathematical Aspects, chap. 4, pp. 103–176. WIT Press, Southampton (1998)
117. Goldemberg, J. (ed.): World energy assesment: energy and the challenge of sustainability. United Nations Development Programme, United Nations Department of Economic and Social Affairs, World Energy Council (2000)
118. Goldemberg, J., Johansson, T.B. (eds.): World energy assesment: overview 2004 update. United Nations Development Programme, United Nations Department of Economic and Social Affairs, World Energy Council (2004)
119. Golub, G.H., Reinsch, C.: Singular value decomposition and least squares solutions. Numer. Math. **14**, 403–420 (1970)
120. Gorzelańczyk, P., Kołodziej, J.A.: Some remarks concerning the shape of the source contour with application of the method of fundamental solutions to elastic torsion of prismatic rods. Eng. Anal. Bound. Elem. **32**, 64–75 (2008)
121. Grothaus, M., Raskop, T.: Limit formulae and jump relations of potential theory in Sobolev spaces. Int. J. Geomath. **1**, 51–100 (2010)
122. Gu, M.H., Fan, C.M., Young, D.L.: The method of fundamental solutions for the multi-dimensional wave equations. J. Mar. Sci. Technol. **19**, 586–595 (2011)
123. Gudmundsson, A., Fjeldskaar, I., Brenner, S.L.: Propagation pathways and fluid transport of hydrofractures in jointed and layered rocks in geothermal fields. J. Volcanol. Geotherm. Res. **116**, 257–278 (2002)
124. Guimaraes, S., Telles, J.C.F.: The method of fundamental solutions for fracture mechanics – Reissner's plate application. Eng. Anal. Bound. Elem. **33**, 1152–1160 (2009)
125. Gunasekera, R.C., Foulger, G.R., Julian, B.R.: Reservoir depletion at The Geysers geothermal area, California, shown by four-dimensional seismic tomography. J. Geophys. Res: Solid Earth **108**, 2156–2202 (2003)
126. Haenel, R., Rybach, L., Stegana, L.: Fundamentals of geothermics. In: R. Haenel, L. Rybach, L. Stegana (eds.) Handbook of Terrestrial Heat-Flow Density Determination, pp. 9–57. Kluwer Academics, Dordrecht (1988)
127. Han, D., Dai, H.H., Qi, L.: Conditions for strong ellipticity of anisotropic elastic materials. J. Elast. **97**, 1–13 (2009)
128. Hazewinkel, M. (ed.): Encyclopedia of Mathematics. Kluwer Academic, Dordrecht (2002)
129. Herrera, I.: Trefftz method: a general theory. Numer. Method. Partial Differ. Equ. **16**, 561–580 (2000)
130. Hicks, T.W., Pine, R.J., Willis-Richards, J., Xu, S., Jupe, A.J., Rodrigues, N.E.V.: A hydro-thermo-mechanical numerical model for HDR geothermal reservoir evaluation. Int. J. Rock Mech. Min. Sci. Geomech. Abstr. **33**, 499–511 (1996)
131. Hon, Y.C., Li, M.: A discrepancy principle for the source points location in using the MFS for solving the BHCP. Int. J. Comput. Method. **6**, 181–197 (2009)
132. Hörmander, L.: The Analysis of Linear Partial Differential Operators I. Die Grundlehren der mathematischen Wissenschaften in Einzeldarstellungen, vol. 256. Springer, Berlin (1983)
133. Hu, S.P., Fan, C.M., Chen, C.W., Young, D.L.: Method of fundamental solutions for Stokes' first and second problems. J. Mech. **21**, 25–31 (2005)
134. Ilyasov, M.: A tree algorithm for Helmholtz potential wavelets on non-smooth surfaces: theoretical background and application to seismic data postprocessing. Ph.D. thesis, University of Kaiserslautern, Geomathematics Group (2011)
135. Ingber, M.S., Chen, C.S., Tanski, J.A.: A mesh free approach using radial basis functions and parallel domain decomposition for solving three-dimensional diffusion equations. Int. J. Numer. Method. Eng. **60**, 2183–2201 (2004)
136. Ionescu-Casimir, V.: Problem of linear coupled thermoelasticity. I. Theorems on reciprocity for the dynamic problem of coupled thermoelasticity. Bull. Acad. Pol. Sci., Sér. Sci. Tech. **12**, 473–488 (1964)
137. Jackson, J.D.: Classical Electrodynamics, 3rd edn. Wiley, New York (1998)

138. Jaeger, J.C., Cook, N.G.W., Zimmerman, R.W.: Fundamentals of Rock Mechanics, 4th edn. Blackwell, Malden (2007)
139. Jing, L., Hudson, J.A.: Numerical methods in rock mechanics. Int. J. Rock Mech. Min. Sci. **39**, 409–427 (2002)
140. Johansson, B.T., Lesnic, D.: A method of fundamental solutions for transient heat conduction. Eng. Anal. Bound. Elem. **32**, 697–703 (2008)
141. Johansson, B.T., Lesnic, D.: A method of fundamental solutions for transient heat conduction in layered material. Eng. Anal. Bound. Elem. **33**, 1362–1367 (2009)
142. Johansson, B.T., Lesnic, D., Reeve, T.: A method of fundamental solutions for the one-dimensional inverse Stefan problem. Appl. Math. Model. **35**, 4367–4378 (2011)
143. Johansson, B.T., Lesnic, D., Reeve, T.: A method of fundamental solutions for two-dimensional heat conduction. Int. J. Comput. Math. **88**, 1697–1713 (2011)
144. Johnson, R.: A priori estimates and unique continuation theorems for second order parabolic equations. Trans. Am. Math. Soc. **158**, 167–177 (1971)
145. Johnston, R.L., Fairweather, G.: The method of fundamental solutions for problems in potential flow. Appl. Math. Model. **8**, 265–270 (1984)
146. Jung, R.: Stand und Aussichten der Tiefengeothermie in Deutschland. Erdöl, Erdgas, Kohle **123**, 1–7 (2007)
147. Karageorghis, A., Fairweather, G.: The method of fundamental solutions for the numerical solution of the biharmonic equation. J. Comput. Phys. **69**, 434–459 (1987)
148. Karageorghis, A., Fairweather, G.: The method of fundamental solutions for axisymmetric elasticity problems. Comput. Mech. **25**, 524–532 (2000)
149. Karageorghis, A., Poullikkas, A., Berger, J.R.: Stress intensity factor computation using the method of fundamental solutions. Comput. Mech. **37**, 445–454 (2006)
150. Karageorghis, A., Smyrlis, Y.S., Tsangaris, T.: A matrix decomposition MFS algorithm for certain linear elasticity problems. Numer. Algorithm. **43**, 123–149 (2006)
151. Katsurada, M.: A mathematical study of the charge simulation method II. J. Fac. Sci. Univ. Tokyo Sect. IA Math. **36**, 135–162 (1989)
152. Katsurada, M.: Asymptotic error analysis of the charge simulation method in a Jordan region with analytic boundary. J. Fac. Sci. Univ. Tokyo Sect. IA Math. **37**, 635–657 (1990)
153. Katsurada, M.: Charge simulation method using exterior mapping functions. Jpn. J. Ind. Appl. Math. **11**, 47–61 (1994)
154. Katsurada, M., Okamoto, H.: A mathematical study of the charge simulation method I. J. Fac. Sci. Univ. Tokyo Sect. IA Math. **35**, 507–518 (1988)
155. Katsurada, M., Okamoto, H.: The collocation points of the fundamental solution method for the potential problem. Comput. Math. Appl. **31**, 123–137 (1996)
156. Kaynia, A.M., Banerjee, P.K.: Fundamental solutions of Biot's equations of dynamic poroelasticity. Int. J. Eng. Sci. **31**, 817–830 (1993)
157. Kincaid, D., Cheney, W.: Numerical Analysis – Mathematics of Scientific Computing. Brooks/Cole, Pacific Grove (1991)
158. Kita, E., Kamiya, N.: Trefftz method: an overview. Adv. Eng. Softw. **24**, 3–12 (1995)
159. Kitagawa, T.: On the numerical stability of the method of fundamental solution applied to the Dirichlet problem. Jpn. J. Appl. Math. **5**, 123–133 (1988)
160. Kitagawa, T.: Asymptotic stability of the fundamental solution method. J. Comput. Appl. Math. **38**, 263–269 (1991)
161. Kohl, T., Brenni, R., Eugster, W.: System performance of a deep borehole heat exchanger. Geothermics **31**, 687–708 (2002)
162. Kondapalli, P.S., Shippy, D.J., Fairweather, G.: Analysis of acoustic scattering in fluids and solids by the method of fundamental solutions. J. Acoust. Soc. Am. **91**, 1844–1854 (1992)
163. Kupradze, V.D.: A method for the approximate solution of limiting problems in mathematical physics. USSR Comput. Math. Math. Phys. **4**, 199–205 (1964)
164. Kupradze, V.D.: Potential Methods in the Theory of Elasticity, Translated from the Russian by H. Gutfreund, Translation edited by I. Meroz. Israel Program for Scientific Translations, Jerusalem (1965)

165. Kupradze, V.D.: On the approximate solution of problems in mathematical physics. Russ. Math. Surv. **22**, 58–108 (1967)
166. Kupradze, V.D., Aleksidze, M.A.: An approximate method of solving certain boundary-value problems. Soobŝ. Akad. Nauk Gruz. SSR (Bull. Acad. Sci. Georgian SSR) **30**, 529–536 (1963). In Russian
167. Kupradze, V.D., Aleksidze, M.A.: The method of functional equations for the approximate solution of certain boundary value problems. USSR Comput. Math. Math. Phys. **4**, 82–126 (1964)
168. Kurashige, M., Sato, K., Imai, K.: Mandel and Cryer problems of fluid-saturated foam with negative Poisson's ratio. Acta Mech. **175**, 25–43 (2005)
169. Lai, M., Krempl, E., Ruben, D.: Introduction to Continuum Mechanics, 4th edn. Butterworth-Heinemann, Oxford (2010)
170. Landau, L.D., Pitaevskii, L.P., Lifshitz, E.M., Kosevich, A.M.: Theory of Elasticity. Theoretical Physics, vol. 7, 3rd edn. Butterworth-Heinemann, Oxford (1986)
171. LeVeque, R.J.: Lectures in mathematics, ETH Zürich. In: O.E. Lanford (ed.) Numerical Methods for Conversation Laws, 2nd edn. Birkhäuser, Basel (1992)
172. Li, X.: On convergence of the method of fundamental solutions for solving the Dirichlet problem of Poisson's equation. Adv. Comput. Math. **23**, 265–277 (2005)
173. Li, X.: Convergence of the method of fundamental solutions for Poisson's equation on the unit sphere. Adv. Comput. Math. **28**, 269–282 (2008)
174. Li, X.: Rate of convergence of the method of fundamental solutions and hyperinterpolation for modified Helmholtz equations on the unit ball. Adv. Comput. Math. **29**, 393–413 (2008)
175. Lions, J.L.: Equations Differentielles Operationelles et Problèmes aux Limites. Die Grundlehren der mathematischen Wissenschaften in Einzeldarstellungen, vol. 111. Springer, Berlin (1961)
176. Liu, G., Xie, K., Zheng, R.: Model of nonlinear coupled thermo-hydro-elastodynamics response for a saturated poroelastic medium. Sci. China, Ser. E: Technol. Sci. **52**, 2373–2383 (2009)
177. Lopatnikov, S.L., Gillespie, J.W., Jr.: Poroelasticity-I: governing equations of the mechanics of fluid-saturated porous material. Transp. Porous Media **84**, 471–492 (2010)
178. Lopatnikov, S.L., Gillespie, J.W., Jr.: Poroelasticity-II: on the equilibrium state of the fluid-filled penetrable poroelastic body. Transp. Porous Media **89**, 475–486 (2011)
179. Lopatnikov, S.L., Gillespie, J.W., Jr.: Poroelasticity-III: conditions on the interface. Transp. Porous Media **93**, 597–607 (2012)
180. Lowitzsch, S.: Error estimates for matrix-valued radial basis function interpolation. J. Approx. Theory **137**, 238–249 (2005)
181. Lowitzsch, S.: Matrix-valued radial basis functions: stability estimates and applications. Adv. Comput. Math. **23**, 299–315 (2005)
182. Luchko, Y., Punzi, A.: Modeling anomalous heat transport in geothermal reservoirs via fractional diffusion equations. Int. J. Geomath. **1**, 257–276 (2011)
183. Lund, J.W.: Direct utilization of geothermal energy. Energies **3**, 1443–1471 (2010)
184. Malgrange, B.: Éxistence et Approximation des Solutions des Équations aus Dérivées Partielles et des Équations de Convolution. Ann. Inst. Fourier **6**, 271–355 (1956)
185. Mandel, J.: Consolidation de Sols (Étude Mathématique). Géotechnique **3**, 287–299 (1953)
186. Manolis, G.D., Beskos, D.E.: Integral formulation and fundamental solutions of dynamic poroelasticity and thermoelasticity. Acta Mech. **76**, 89–104 (1989)
187. Marin, L.: An alternating iterative MFS algorithm for the Cauchy problem for the modified Helmholtz equation. Comput. Mech. **45**, 665–677 (2010)
188. Marsden, J.E., Hughes, T.J.R.: Mathematical Foundations of Elasticity. Dover, Mineola (1994)
189. Mathon, R., Johnston, R.L.: The approximate solution of elliptic boundary-value problems by fundamental solutions. SIAM J. Numer. Anal. **14**, 638–650 (1977)
190. Matlab: version R2013a. The MathWorks (2013)

191. Mayer, C.: A wavelet approach to the Stokes problem. Habilitation Thesis, University of Kaiserslautern, Geomathematics Group (2007)
192. Mayer, C., Freeden, W.: Stokes problem, layer potentials and regularizations, multiscale applications. In: W. Freeden, Z. Nashed, T. Sonar (eds.) Handbook of Geomathematics, 2nd edn. Springer, New York (2015). Accepted for publication
193. Mazzucato, A.L., Nistor, V.: Well-posedness and regularity for the elasticity equation with mixed boundary conditions on polyhedral domains and domains with cracks. Arch. Ration. Mech. Anal. **195**, 25–73 (2010)
194. McLean, W.: Strongly Elliptic Systems and Boundary Integral Equations. Cambridge University Press, Cambridge (2000)
195. Cirne de Mederios, G., Partridge, P.W.: The method of fundamental solutions with dual reciprocity for thermoelasticity. In: International Workshop on Meshfree Methods, Lisbon (2003)
196. Cirne de Mederios, G., Partridge, P.W., Bandão, J.O.: The method of fundamental solutions with dual reciprocity for some problems in elasticity. Eng. Anal. Bound. Elem. **28**, 453–461 (2004)
197. Menéndez, C., Nieto, P.J.G., Ortega, F.A., Bello, A.: Mathematical modelling and study of the consolidation of an elastic saturated soil with an incompressible fluid by FEM. Math. Comput. Model. **49**, 2002–2018 (2009)
198. Miehe, C., Méndez Diez, J., Göktepe, S., Schänzel, L.M.: Coupled thermoviscoplasticity of glassy polymers in the logarithmic strain space based on the free volume theory. Int. J. Solid. Struct. **48**, 1799–1817 (2010)
199. Mikhailov, V.P.: Partial Differential Equations. MIR Publishers, Moscow (1978)
200. Mikhlin, S.G.: Mathematical Physics, an Advanced Course. North-Holland, Amsterdam (1970)
201. Möhringer, S.: Decorrelation of gravimetric data. Ph.D. thesis, University of Kaiserslautern, Geomathematics Group (2014)
202. Moldovan, I.D., Teixera de Freitas, J.A.: Hybrid-trefftz stress and displacement elements for dynamic analysis of bounded and unbounded saturated porous media. Comput. Assist. Mech. Eng. Sci. **15**, 289–303 (2008)
203. Moler, C.: Cleve's corner: professsor SVD. The MathWorks News & Notes (2006). Downloaded from http://www.mathworks.de/company/newsletters/articles/professor-svd.html. On 28 Feb 2014
204. Mosconi, M.: A variational approach to porous elastic bodies. Z. Angew. Math. Phys. ZAMP **56**, 548–558 (2005)
205. Mossop, A., Segall, P.: Subsidence at The Geysers geothermal field, N. California from a comparison of GPS and leveling surveys. Geophys. Res. Lett. **24**, 1839–1842 (1997)
206. Müller, C., Kersten, H.: Zwei Klassen vollständiger Funktionensysteme zur Behandlung der Randwertaufgaben der Schwingungsgleichung $\Delta U + k^2 U = 0$. Math. Method. Appl. Sci. **2**, 48–67 (1980)
207. Nakao, S., Ishido, T.: Pressure-transient behavior during cold water injection into geothermal wells. Geothermics **27**, 401–413 (1998)
208. Nardini, D., Brebbia, C.A.: A new approach for free vibration analysis using boundary elements. In: C.A. Brebbia (ed.) Boundary Element Methods in Engineering: Proceedings of the Fourth International Seminar, Southhampton, Sept 1982, pp. 312–326. Springer, Berlin (1982)
209. Naumovich, A.: Efficient numerical methods for the Biot poroelasticity system in multilayered domains. Ph.D. thesis, University of Kaiserslautern, Department of Mathematics (2007)
210. Navarro, C.B., Quintanilla, R.: On existence and uniqueness in incremental thermoelasticity. J. Appl. Math. Phys. **35**, 206–215 (1984)
211. Nennig, P., Perrey-Debain, E., Chazot, J.D.: The method of fundamental solutions for acoustic wave scattering by a single and a periodic array of poroelastic scatterers. Eng. Anal. Bound. Elem. **35**, 1019–1028 (2011)

212. Neumaier, A.: Solving ill-conditioned and singular linear systems: a tutorial on regularization. SIAM Rev. **40**, 636–666 (1998)
213. Nowacki, W.: Thermoelasticity. Aeronautics and Astronautics. Pergamon Press, Oxford (1986)
214. Ostermann, I.: A mathematical model for 3D heat transport in hydrothermal systems. World Min. Surf. Undergr. **63**, 280–289 (2011)
215. Ostermann, I.: Modeling heat transport in deep geothermal systems by radial basis functions. Ph.D. thesis, University of Kaiserslautern, Geomathematics Group (2011)
216. Ostermann, I.: Three-dimensional modeling of heat transport in deep hydrothermal reservoirs. Int. J. Geomath. **2**, 37–68 (2011)
217. Owczarek, S.: A Galerkin method for Biot consolidation model. Math. Mech. Solid. **15**, 42–56 (2010)
218. Pan, E.: Green's functions in layered poro-elastic half-spaces. Int. J. Numer. Anal. Method. Geomech. **23**, 1631–1653 (1999)
219. Partridge, P.W., Sensale, B.: The method of fundamental solutions with dual reciprocity for diffusion and diffusion-convection using subdomains. Eng. Anal. Bound. Elem. **24**, 633–641 (2000)
220. Paschen, H., Oertel, D., Grünwald, R.: Möglichkeiten geothermischer Stromerzeugung in Deutschland. TAB Arbeitsbericht 84, Deutscher Bundestag, Ausschuss für Bildung, Forschung und Technikfolgeabschätzung (2003)
221. Phillips, P.J.: Finite element method in linear poroelasticity: theoretical and computational results. Ph.D. thesis, University of Texas, Austin (2005)
222. Phillips, P.J., Wheeler, M.F.: A coupling of mixed and continuous Galerkin finite-element methods for poroelasticity I: the continuous in time case. Comput. Geosci. **11**, 131–144 (2007)
223. Phillips, P.J., Wheeler, M.F.: A coupling of mixed and continuous Galerkin finite-element methods for poroelasticity II: the discrete-in-time case. Comput. Geosci. **11**, 145–158 (2007)
224. Phillips, P.J., Wheeler, M.F.: A coupling of mixed and discontinuous Galerkin finite-element methods for poroelasticity. Comput. Geosci. **12**, 417–435 (2008)
225. Phillips, P.J., Wheeler, M.F.: Overcoming the problem of locking in linear elasticity and poroelasticity: an heuristic approach. Comput. Geosci. **13**, 5–12 (2009)
226. Poullikkas, A., Karageorghis, A., Georgiou, G.: The numerical solution of three-dimensional Signorini problems with the method of fundamental solutions. Eng. Anal. Bound. Elem. **25**, 221–227 (2001)
227. Predeleanu, M.: Reciprocal theorem in the consolidation theory of porous media. An. Univ. Bucur. Ser. Ştiinţ. Nat. Mat.-Mec. **17**, 75–79 (1968)
228. Press, W.H., Teukolsky, S.A., Vetterling, W.T., Flannery, B.P.: Fortran Numerical Recipes, 2nd edn. Cambridge University Press, Cambridge (2001)
229. Prudnikov, A.P., Brychkov, Y.A., Marichev, O.I.: Direct Laplace Transforms. Integrals and Series, vol. 4. Gordeon and Breach Science Publishers, Amsterdam (1992)
230. Prudnikov, A.P., Brychkov, Y.A., Marichev, O.I.: Inverse Laplace Transforms. Integrals and Series, vol. 5. Gordeon and Breach Science Publishers, Amsterdam (1992)
231. Quintanilla, R.: Spatial stability for the quasi-static problem of thermoelasticity. J. Elast. **76**, 93–105 (2004)
232. Raskop, T.: The analysis of oblique boundary problems and limit formulae motivated by problems from geomathematics. Ph.D. thesis, University of Kaiserslautern, Functional Analysis and Stochastic Analysis Group (2009)
233. Redekop, D.: Fundamental solutions for the collation [sic] method in planar elastostatics. Appl. Math. Model. **6**, 390–393 (1982)
234. Renardy, M., Rogers, R.C.: An Introduction to Partial Differential Equations. Texts in Applied Mathematics. Springer, New York (1993)
235. Reutskiy, S.Y.: The method of approximate fundamental solutions (MAFS) for Stefan problems. Eng. Anal. Bound. Elem. **36**, 281–292 (2012)

236. Ritz, W.: Über eine neue Methode zur Lösung gewisser Variationsprobleme der mathematischen Physik. J. rein. angew. Math. **135**, 1–6 (1909)
237. Rose, N.J. (ed.): Mathematical Maxims and Minims. Rome Press, Raleigh (1988). Illustrated by J. de Pillis
238. Rudin, W.: Functional Analysis. McGraw-Hill, New York (1973)
239. Runge, C.: Zur Theorie der eindeutigen analytischen Functionen. Acta Math. **6**, 229–234 (1885)
240. Rutqvist, J., Stephansson, O.: The role of hydromechanical coupling in fractured rock engineering. Hydrogeol. J. **11**, 7–40 (2003)
241. Saemundsson, K., Axelsson, G., Steingrimsson, B.: Geothermal systems in global perspectives. In: Short Course V on Conceptual Modelling of Geothermal Systems. United Nations University Geothermal Training Programme, La Geo, Santa Tecla, El Salvador (2013)
242. Saint-Macary, P.: Analyse Mathématique de Modèles de Diffusion en Milieu Poreux élastique. Ph.D. thesis, L'Université de Pau et des Pays de l'Adour (2004)
243. Sanyal, S.K.: Classification of geothermal systems – a possible scheme. In: Proceedings of the Thirtieth Workshop on Geothermal Reservoir Engineering, Stanford University, Stanford (2005)
244. Saut, J.C., Scheurer, B.: Unique continuation for some evolution equations. J. Differ. Equ. **66**, 118–139 (1987)
245. Sauter, M., Wieners, C.: Robust estimates for the approximation of the dynamic consolidation problem. IMA J. Numer. Anal. **30**, 832–856 (2010)
246. Schaback, R.: Adaptive numerical solution of MFS systems. In: C.S. Chen, A. Karageorghis, Y.S. Smyrlis (eds.) The Method of Fundamental Solutions – A Meshless Method, pp. 1–27. Dynamic Publishers, Atlanta (2008)
247. Schanz, M.: Application of 3D time domain boundary element formulation to wave propagation in poroelastic solids. Eng. Anal. Bound. Elem. **25**, 363–376 (2001)
248. Schanz, M., Pryl, D.: Dynamic fundamental solutions for compressible and incompressible modeled poroelastic continua. Int. J. Solid. Struct. **41**, 4047–4073 (2004)
249. Schellschmidt, R., Sanner, B., Pester, S., Schulz, R.: Geothermal energy use in Germany. In: Proceedings World Geothermal Congress, Bali (2010)
250. Schulz, R.: Aufbau eines geothermischen Informationssystems für Deutschland. Tech. Rep., Leibniz-Institut für Angewandte Geophysik, Hannover (2009)
251. Selvadurai, A.P.S.: The analytical method in geomechanics. Appl. Mech. Rev. **60**, 87–106 (2007)
252. Sensale-Rodriguez, B., Sensale, B., Leitão, V.M.A., Peixeiro, C.: Microstrip antenna analysis using the method of fundamental solutions. Int. J. Numer. Model.: Electron. Net. Device. Field. **21**, 563–581 (2008)
253. Showalter, R.E.: Monotone Operators in Banach Space and Nonlinear Partial Differential Equations. Mathematical Surveys and Monographs, vol. 49. American Mathematical Society, Providence (1996)
254. Showalter, R.E.: Diffusion in poro-elastic media. J. Math. Anal. Appl. **251**, 310–340 (2000)
255. Showalter, R.E.: Diffusion in deformable media. In: J. Chadam, A. Cunningham, R.E. Ewing, P. Ortoleva, M.F. Wheeler (eds.) Resource Recovery, Confinement and Remedation of Environmental Hazards. The IMA Volumes in Mathematics and its Applications, vol. 131. Springer, New York (2002)
256. Showalter, R.E., Momken, B.: Single-phase flow in composite poroelastic media. Math. Method. Appl. Sci. **25**, 115–139 (2002)
257. Showalter, R.E., Stefanelli, U.: Diffusion in poro-plastic media. Math. Method. Appl. Sci. **27**, 2131–2151 (2004)
258. Showalter, R.E., Su, N.: Partially saturated flow in a poro-elastic medium. Discret. Contin. Dyn. Syst. Ser. B **1**, 403–420 (2001)
259. Showalter, R.E., Su, N.: Partially saturated flow in a composite poroelastic medium. In: J.L. Auriault, C. Geindreau, P. Royer, J.F. Bloch (eds.) Poromechanics II, Proceedings of the Second Biot Conference on Poromechanics, pp. 549–554. Balkema, Grenoble (2002)

260. Skopetskii, V.V., Marchenko, O.A.: Formulation and analysis of problems for dynamic systems of inhomogeneous two-phase media. Cybern. Syst. Anal. **41**, 865–878 (2005)
261. Smyrlis, Y.S.: The method of fundamental solutions: a weighted least-squares approach. BIT Numer. Math. **46**, 163–194 (2006)
262. Smyrlis, Y.S.: Applicability and applications of the method of fundamental solutions. Math. Comput. **78**, 1399–1434 (2009)
263. Smyrlis, Y.S.: Density results with linear combinations of translates of fundamental solutions. J. Approx. Theory **161**, 617–633 (2009)
264. Smyrlis, Y.S.: Mathematical foundation of the MFS for certain elliptic systems in linear elasticity. Numer. Math. **112**, 319–340 (2009)
265. Smyrlis, Y.S., Karageorghis, A.: Numerical analysis of the MFS for certain harmonic problems. ESAIM: Math. Model. Numer. Anal. **38**, 495–517 (2004)
266. Smyrlis, Y.S., Karageorghis, A.: Efficient implementation of the MFS: the three scenarios. J. Comput. Appl. Math. **227**, 83–92 (2009)
267. Smyrlis, Y.S., Karageorghis, A.: The under-determined version of the MFS: taking more sources than collocation points. Appl. Numer. Math. **60**, 337–357 (2010)
268. Stoer, J., Bulirsch, R.: Introduction to Numerical Analysis, 2nd edn. Springer, New York (1993). Translated from German by R. Bartels, W. Gautschi, and C. Witzgall
269. Strang, G.: Linear Algebra and Its Applications. Brooks/Cole, Toronto (1988)
270. Stynes, M.: Steady-state convection-diffusion problems. Acta Numer. **14**, 445–508 (2005)
271. von Terzaghi, K.: Die Berechnung der Durchlässigkeitsziffer des Tones aus dem Verlauf der hydrodynamischen Spannungserscheinungen. Sitz.-ber. Akad. Wiss., Wien, Math.-Nat.-wiss. Kl., Abt. IIa **132**, 105–124 (1923)
272. von Terzaghi, K.: Theoretical Soil Mechanics. Wiley, New York (1943)
273. Tester, J.W., Anderson, B.J., Batchelor, A.S., Blackwell, D.D., DiPippo, R., Drake, E.M., Garnish, J., Livesay, B., Moore, M.C., Nichols, K., Petty, S., Toksösz, M.N., Veatch Jr., R.W., Baria, R., Augustine, C., Murphy, E., Negraru, P., Richards, M.: The Future of geothermal energy. Tech. Rep., Idaho National Laboratory, copyright by Massachussetts Institute of Technology (2006)
274. Trefftz, E.: Ein Gegenstück zum Ritzschen Verfahren. In: Proceedings of the Second International Congress on Applied Mechanics, Zürich (1926)
275. Tsai, C.C.: Solutions of slow Brinkman flows using the method of fundamental solutions. Int. J. Numer. Method. Fluid. **56**, 927–940 (2008)
276. Tsai, C.C.: The method of fundamental solutions with dual reciprocity for three-dimensional thermoelasticity under arbitrary body forces. Eng. Comput. Int. J. Comput. Eng. Softw. **26**, 229–244 (2009)
277. Tsai, C.C., Hsu, T.W.: The method of fundamental solutions for oscillatory and porous buoyant flows. Comput. Fluid. **39**, 696–708 (2010)
278. Tsai, C.C., Hsu, T.W.: A meshless numerical method for solving slow mixed convections in containers with discontinuous boundary data. Int. J. Numer. Method. Fluid. **66**, 377–402 (2011)
279. Tsai, C.C., Young, D.L., Fan, C.M., Chen, C.W.: MFS with time-dependent fundamental solutions for unsteady Stokes equations. Eng. Anal. Bound. Elem. **30**, 897–908 (2006)
280. Tsangaris, T., Smyrlis, Y.S., Karageorghis, A.: Numerical analysis of the method of fundamental solutions for harmonic problems in annular domains. Numer. Method. Partial Differ. Equ. **21**, 507–539 (2005)
281. Valtchev, S.S., Roberty, N.C.: A time-marching MFS scheme for heat conduction problems. Eng. Anal. Bound. Elem. **32**, 480–493 (2008)
282. Vgenopoulou, I., Beskos, D.E.: Dynamic behavior of saturated poroviscoelastic media. Acta Mech. **95**, 185–195 (1992)
283. Visual Numerics (ed.): IMSL User Manual. Rogue Wave Software, Boulder, Colorado (2010)
284. Walsh, J.L.: The approximation of harmonic functions by harmonic polynomials and by harmonic rational functions. Bull. Am. Math. Soc. **35**, 499–544 (1929)

285. Wang, H.F.: Theory of Linear Poroelasticity with Applications to Geomechanics and Hydrogeology. Princeton University Press, Princeton (2000)
286. Wang, W., Kosakowski, G., Kolditz, O.: A parallel finite element scheme for thermo-hydro-mechanical (THM) coupled problems in porous media. Comput. Geosci. **35**, 1631–1641 (2009)
287. Weinstock, B.M.: Uniform approximation by solutions of elliptic equations. Proc. Am. Math. Soc. **41**, 513–517 (1973)
288. Wen, P.H., Liu, Y.W.: The fundamental solution of poroelastic plate saturated by fluid and its applications. Int. J. Numer. Anal. Method. Geomech. **34**, 689–709 (2010)
289. Widder, D.: The Laplace Transform. Princeton University Press, Princeton (1941)
290. Wiebe, T., Antes, H.: A time domain integral formulation of dynamic poroelasticity. Acta Mech. **90**, 125–137 (1991)
291. Wirth, B., Sobey, I.: Analytic solution during an infusion test of the linear unsteady poroelastic equations in a spherically symmetric model of the brain. Math. Med. Biol. **26**, 25–61 (2009)
292. Wloka, J.: Partial Differential Equations. Cambridge University Press, Cambridge (1992)
293. Yin, S.: Geomechanics-reservoir modeling by displacement discontinuity-finite element method. Ph.D. thesis, University of Waterloo (2008)
294. Yin, S., Rothenburg, L., Dusseault, M.B.: 3D coupled displacement discontinuity and finite element analysis of reservoir behavior during production in semi-infinite domain. Transp. Porous Media **65**, 425–441 (2006)
295. Yosida, K.: Functional Analysis. Springer, Berlin (1980)
296. Young, D.L., Chen, C.H., Fan, C.M., Shen, L.H.: The method of fundamental solutions with eigenfunctions expansion method for 3d nonhomogeneous diffusion equations. Numer. Method. Partial Differ. Equ. **25**, 195–211 (2009)
297. Young, D.L., Chen, C.W., Fan, C.M., Tsai, C.C.: The method of fundamental solutions with eigenfunction expansion method for nonhomogeneous diffusion equation. Numer. Method. Partial Differ. Equ. **22**, 1173–1196 (2006)
298. Young, D.L., Fan, C.M., Hu, S.P., Atluri, S.N.: The Eulerian-Lagrangian method of fundamental solutions for two-dimensional unsteady Burgers' equations. Eng. Anal. Bound. Elem. **32**, 395–412 (2008)
299. Young, D.L., Jane, S.J., Fan, C.M., Murugesan, K., Tsai, C.C.: The method of fundamental solutions for 2D and 3D Stokes problems. J. Comput. Phys. **211**, 1–8 (2006)
300. Young, D.L., Tsai, C.C., Murugesan, K., Fan, C.M., Chen, C.W.: Time-dependent fundamental solutions for homogeneous diffusion problems. Eng. Anal. Bound. Elem. **28**, 1463–1473 (2004)
301. Ženíšek, A.: The existence and uniqueness theorem in Biot's consolidation theory. Appl. Math. **29**, 194–211 (1984)
302. Zhou, H., Pozrikidis, C.: Adaptive singularity method for Stokes flow past particles. J. Comput. Phys. **117**, 79–89 (1995)
303. Zhou, X.X., Ghassemi, A.: Three-dimensional poroelastic simulation of hydraulic and natural fractures using the displacement discontinuity method. In: Proceedings Thirty-Fourth Workshop on Geothermal Reservoir Engineering, Stanford (2009)
304. Zubkov, V.V., Koshelev, V.F., Lin'kov, A.M.: Numerical modeling of hydraulic fracture initiation and developement. J. Min. Sci. **43**, 40–56 (2007)