Bibliography

[1] Abboud, H., Girault, V., and Sayah, T. A second order accuracy for a full discretized time-dependent Navier–Stokes equations by a two-grid scheme. *Numerische Mathematik*, 114(2):189–231, 2009.

[2] Adams, R. A. Sobolev spaces, Academic Press, New York, 1975.

[3] Adams, R. A. and Fournier, J. J. F. *Sobolev Spaces (Pure and applied mathematics; v. 140).* Elsevier, 2003.

[4] Agranovich, Y. Y. and Sobolevskii, P. E. Investigation of viscoelastic fluid mathematical model. *RAC. Ukranian SSR. Ser. A*, 10:71–74, 1989.

[5] Arnold, D. N. An interior penalty finite element method with discontinuous elements. *SIAM Journal on Numerical Analysis*, 19(4):742–760, 1982.

[6] Arnold, D. N., Brezzi, F., Cockburn, B., and Marini, L. D. Unified analysis of discontinuous Galerkin methods for elliptic problems. *SIAM Journal on Numerical Analysis*, 39(5):1749–1779, 2002.

[7] Babuška, I. The finite element method with penalty. *Mathematics of Computation*, 27(122):221–228, 1973.

[8] Babuška, I. and Zlámal, M. Nonconforming elements in the finite element method with penalty. *SIAM Journal on Numerical Analysis*, 10(5):863–875, 1973.

[9] Badia, S., Codina, R., Gudi, T., and Guzmán, J. Error analysis of discontinuous Galerkin methods for the Stokes problem under minimal regularity. *IMA Journal of Numerical Analysis*, 34(2):800–819, 2014.

[10] Bajpai, S. *Finite Element Galerkin Methods for Equations of Motion Arising in the Kelvin-Voigt Model.* PhD thesis, Ph. D. Dissertation, Department of Mathematics, IIT Bombay, 2012.

[11] Bajpai, S. and Nataraj, N. On a two-grid finite element scheme combined with Crank–Nicolson method for the equations of motion arising in the Kelvin–Voigt model. *Computers & Mathematics with Applications*, 68(12):2277–2291, 2014.

[12] Bajpai, S. and Pani, A. K. On three steps two-grid finite element methods for the 2D-transient Navier-Stokes equations. *Journal of Numerical Mathematics*, 25(4):199–228, 2017.

[13] Bajpai, S. and Pany, A. K. A priori error estimates of fully discrete finite element Galerkin method for Kelvin–Voigt viscoelastic fluid flow model. *Computers & Mathematics with Applications*, 78(12):3872–3895, 2019.

[14] Bajpai, S., Nataraj, N., and Pani, A. K. On fully discrete finite element schemes for equations of motion of Kelvin-Voigt fluids. *International Journal of Numerical Analysis & Modeling*, 10(2):481–507, 2013.

[15] Bajpai, S., Nataraj, N., Pani, A. K., Damazio, P., and Yuan, J. Y. Semidiscrete Galerkin method for equations of motion arising in Kelvin-Voigt model of viscoelastic fluid flow. *Numerical Methods for Partial Differential Equations*, 29(3): 857–883, 2013.

[16] Bajpai, S., Nataraj, N., and Pani, A. K. On a two-grid finite element scheme for the equations of motion arising in Kelvin-Voigt model. *Advances in Computational Mathematics*, 40:1043–1071, 2014.

[17] Bajpai, S., Goswami, D., and Ray, K. Fully discrete finite element error analysis of a discontinuous Galerkin method for the Kelvin-Voigt viscoelastic fluid model. *Computers & Mathematics with Applications*, 130:69–97, 2023.

[18] Bajpai, S., Goswami, D., and Ray, K. A priori error estimates of a discontinuous Galerkin method for the Navier-Stokes equations. *Numerical Algorithms*, 94: 937–1002, 2023.

[19] Baker, G. A. Finite element methods for elliptic equations using nonconforming elements. *Mathematics of Computation*, 31(137):45–59, 1977.

[20] Baker, G. A., Jureidini, W. N., and Karakashian, O. A. Piecewise solenoidal vector fields and the Stokes problem. *SIAM Journal on Numerical Analysis*, 27 (6):1466–1485, 1990.

[21] Bi, C. and Ginting, V. Two-grid discontinuous Galerkin method for quasi-linear elliptic problems. *Journal of Scientific Computing*, 49(3):311–331, 2011.

[22] Bi, C., Wang, C., and Lin, Y. Pointwise error estimates and two-grid algorithms of discontinuous Galerkin method for strongly nonlinear elliptic problems. *Journal of Scientific Computing*, 67:153–175, 2016.

[23] Bir, B. and Goswami, D. On a three step two-grid finite element method for the Oldroyd model of order one. *ZAMM-Journal of Applied Mathematics and Mechanics/Zeitschrift für Angewandte Mathematik und Mechanik*, 101(11): e202000373, 2021.

[24] Bir, B., Goswami, D., and Pani, A. K. Backward Euler method for the equations of motion arising in Oldroyd model of order one with nonsmooth initial data. *IMA Journal of Numerical Analysis*, 42(4):3529–3570, 2022.

[25] Bir, B., Goswami, D., and Pani, A. K. Finite element penalty method for the Oldroyd model of order one with non-smooth initial data. *Computational Methods in Applied Mathematics*, 22(2):297–325, 2022.

[26] Brezis, H. *Functional analysis, Sobolev spaces and partial differential equations*, volume 2. Springer, 2011.

[27] Cai, M., Mu, M., and Xu, J. Numerical solution to a mixed Navier–Stokes/Darcy model by the two-grid approach. *SIAM Journal on Numerical Analysis*, 47(5): 3325–3338, 2009.

[28] Cai, M., Huang, P., and Mu, M. Some multilevel decoupled algorithms for a mixed Navier-Stokes/Darcy model. *Advances in Computational Mathematics*, 44:115–145, 2018.

[29] Cao, L., He, Y., Li, J., and Yang, D. Decoupled modified characteristic FEMs for fully evolutionary Navier–Stokes–Darcy model with the Beavers–Joseph interface condition. *Journal of Computational and Applied Mathematics*, 383:113128, 2021.

[30] Caussignac, P. and Touzan, R. Solution of three-dimensional boundary layer equations by a discontinuous finite element method, part I: Numerical analysis of a linear model problem. *Computer Methods in Applied Mechanics and Engineering*, 78(3):249–271, 1990.

[31] Caussignac, P. and Touzani, R. Solution of three-dimensional boundary layer equations by a discontinuous finite element method, part ii: Implementation and numerical results. *Computer Methods in Applied Mechanics and Engineering*, 79 (1):1–20, 1990.

[32] Cesmelioglu, A. and Rhebergen, S. A hybridizable discontinuous Galerkin method for the coupled Navier–Stokes and Darcy problem. *Journal of Computational and Applied Mathematics*, 422:114923, 2023.

[33] Çeşmelioğlu, A. and Riviere, B. Analysis of time-dependent Navier–Stokes flow coupled with Darcy flow. *Journal of Numerical Mathematics*, 16:249–280, 2008.

[34] Çeşmelioğlu, A. and Rivière, B. Primal discontinuous Galerkin methods for time-dependent coupled surface and subsurface flow. *Journal of Scientific Computing*, 40(1):115–140, 2009.

[35] Cesmelioglu, A., Girault, V., and Riviere, B. Time-dependent coupling of Navier–Stokes and Darcy flows. *ESAIM: Mathematical Modelling and Numerical Analysis*, 47(2):539–554, 2013.

[36] Cesmelioglu, A., Cockburn, B., and Qiu, W. Analysis of a hybridizable discontinuous Galerkin method for the steady-state incompressible Navier-Stokes equations. *Mathematics of Computation*, 86(306):1643–1670, 2017.

[37] Cesmelioglu, A., Lee, J. J., and Rhebergen, S. A strongly conservative hybridizable discontinuous Galerkin method for the coupled time-dependent Navier-Stokes and Darcy problem. *arXiv preprint arXiv:2303.09882*, 2023.

[38] Chaabane, N., Girault, V., Puelz, C., and Riviere, B. Convergence of IPDG for coupled time-dependent Navier–Stokes and Darcy equations. *Journal of Computational and Applied Mathematics*, 324:25–48, 2017.

[39] Chavent, G. and Cockburn, B. The local projection-discontinuous-Galerkin finite element method for scalar conservation laws. *ESAIM: Mathematical Modelling and Numerical Analysis*, 23(4):565–592, 1989.

[40] Chavent, G. and Salzano, G. A finite-element method for the 1-D water flooding problem with gravity. *Journal of Computational Physics*, 45(3):307–344, 1982.

[41] Chen, X., Li, Y., Drapaca, C., and Cimbala, J. A unified framework of continuous and discontinuous Galerkin methods for solving the incompressible Navier–Stokes equation. *Journal of Computational Physics*, 422:109799, 2020.

[42] Chen, Y., Zhao, X., and Huang, Y. Mortar element method for the time dependent coupling of Stokes and Darcy flows. *Journal of Scientific Computing*, 80 (2):1310–1329, 2019.

[43] Chidyagwai, P. and Rivière, B. On the solution of the coupled Navier–Stokes and Darcy equations. *Computer Methods in Applied Mechanics and Engineering*, 198(47-48):3806–3820, 2009.

[44] Chidyagwai, P. and Rivière, B. Numerical modelling of coupled surface and subsurface flow systems. *Advances in Water Resources*, 33(1):92–105, 2010.

[45] Chrysafinos, K. and Walkington, N. Discontinuous Galerkin approximations of the Stokes and Navier-Stokes equations. *Mathematics of Computation*, 79(272): 2135–2167, 2010.

[46] Ciarlet, P. G. *The Finite Element Method for Elliptic Problem.* North-Holland Publ. Comp., Amsterdam, 1978.

[47] Cockburn, B., Karniadakis, G. E., and Shu, C.-W. The development of discontinuous Galerkin methods. In *Discontinuous Galerkin methods: theory, computation and applications*, pages 3–50. Springer, 2000.

[48] Cockburn, B., Kanschat, G., and Schötzau, D. A locally conservative LDG method for the incompressible Navier-Stokes equations. *Mathematics of Computation*, 74(251):1067–1095, 2005.

[49] Cockburn, B., Kanschat, G., and Schötzau, D. A note on discontinuous Galerkin divergence-free solutions of the Navier–Stokes equations. *Journal of Scientific Computing*, 31:61–73, 2007.

[50] Cockburn, B., Kanschat, G., and Schötzau, D. An equal-order DG method for the incompressible Navier-Stokes equations. *Journal of Scientific Computing*, 40 (1-3):188–210, 2009.

[51] Congreve, S., Houston, P., and Wihler, T. P. Two-grid hp-version discontinuous Galerkin finite element methods for second-order quasilinear elliptic PDEs. *Journal of Scientific Computing*, 55(2):471–497, 2013.

[52] Dai, X. and Cheng, X. A two-grid method based on Newton iteration for the Navier–Stokes equations. *Journal of Computational and Applied Mathematics*, 220(1-2):566–573, 2008.

[53] Dawson, C., Sun, S., and Wheeler, M. F. Compatible algorithms for coupled flow and transport. *Computer Methods in Applied Mechanics and Engineering*, 193(23-26):2565–2580, 2004.

[54] de Frutos, J., García-Archilla, B., and Novo, J. Optimal error bounds for two-grid schemes applied to the Navier–Stokes equations. *Applied Mathematics and Computation*, 218(13):7034–7051, 2012.

[55] Delves, L. and Hall, C. An implicit matching principle for global element calculations. *IMA Journal of Applied Mathematics*, 23(2):223–234, 1979.

[56] Deugoué, G., Jidjou Moghomye, B., and Tachim Medjo, T. Existence and exponential behavior for the stochastic 2D Cahn–Hilliard–Oldroyd model of order one. *Journal of Mathematical Fluid Mechanics*, 24(1):1–35, 2022.

[57] Di Pietro, D. and Ern, A. Discrete functional analysis tools for discontinuous Galerkin methods with application to the incompressible Navier–Stokes equations. *Mathematics of Computation*, 79(271):1303–1330, 2010.

[58] Di Pietro, D. A. and Ern, A. *Mathematical aspects of discontinuous Galerkin methods*, volume 69. Springer Science & Business Media, 2011.

[59] Discacciati, M. Coupling free and porous-media flows: models and numerical approximation. *Simulation of Flow in Porous Media: Applications in Energy and Environment*, 12:107, 2013.

[60] Discacciati, M. and Quarteroni, A. Navier-Stokes/Darcy coupling: modeling, analysis, and numerical approximation. *Revista Matemática Complutense*, 22 (2):315–426, 2009.

[61] Discacciati, M., Miglio, E., and Quarteroni, A. Mathematical and numerical models for coupling surface and groundwater flows. *Applied Numerical Mathematics*, 43(1-2):57–74, 2002.

[62] Douglas, J. and Dupont, T. Interior penalty procedures for elliptic and parabolic Galerkin methods. In *Computing Methods in Applied Sciences: Second International Symposium December 15–19, 1975*, pages 207–216. Springer, 1976.

[63] Duan, M., Yang, Y., and Feng, M. A weak Galerkin finite element method for the Kelvin-Voigt viscoelastic fluid flow model. *Applied Numerical Mathematics*, 184:406–430, 2023.

[64] Eirich, F. *Rheology: Theory and Applications*, volume 1. Academic Press, Inc., New York, 1956.

[65] Evans, L. C. *Partial Differential Equations*, volume 19. American Mathematical Soc., 2010.

[66] Ghia, U., Ghia, K. N., and Shin, C. T. High-Re solutions for incompressible flow using the Navier-Stokes equations and a multigrid method. *Journal of Computational Physics*, 48(3):387–411, 1982.

[67] Girault, V. and Lions, J.-L. Two-grid finite-element schemes for the steady Navier-Stokes problem in polyhedra. *Portugaliae Mathematica*, 58(1):25–58, 2001.

[68] Girault, V. and Lions, J.-L. Two-grid finite-element schemes for the transient Navier-Stokes problem. *ESAIM: Mathematical Modelling and Numerical Analysis*, 35(5):945–980, 2001.

[69] Girault, V. and Raviart, P.-A. *Finite Element Approximation of the Navier-Stokes Equations*, volume 749. Springer Berlin, 1979.

[70] Girault, V. and Rivière, B. DG approximation of coupled Navier–Stokes and Darcy equations by Beaver–Joseph–Saffman interface condition. *SIAM Journal on Numerical Analysis*, 47(3):2052–2089, 2009.

[71] Girault, V., Rivière, B., and Wheeler, M. A discontinuous Galerkin method with nonoverlapping domain decomposition for the Stokes and Navier-Stokes problems. *Mathematics of Computation*, 74(249):53–84, 2005.

[72] Girault, V., Rivière, B., and Wheeler, M. F. A splitting method using discontinuous Galerkin for the transient incompressible Navier-Stokes equations. *ESAIM: Mathematical Modelling and Numerical Analysis*, 39(6):1115–1147, 2005.

[73] Goswami, D. *Finite Element Approximation to the Equations of Motion Arising in Oldroyd Viscoelastic Model of Order One*. PhD thesis, Ph. D. Dissertation, Department of Mathematics, IIT Bombay, 2011.

[74] Goswami, D. and Damázio, P. D. A two-grid finite element method for time-dependent incompressible Navier-Stokes equations with non-smooth initial data. *Numerical Mathematics: Theory, Methods and Applications*, 8(4):549–581, 2015.

[75] Goswami, D. and Pani, A. K. A priori error estimates for semidiscrete finite element approximations to the equations of motion arising in Oldroyd fluids of order one. *International Journal of Numerical Analysis & Modeling*, 8(2): 324–352, 2011.

[76] Goswami, D., Damázio, P. D., Yuan, J.-Y., and Bir, B. Two-grid finite element galerkin approximation of equations of motion arising in Oldroyd fluids of order one with non-smooth initial data. *Computational Mathematics and Mathematical Physics*, 63(4):659–686, 2023.

[77] Gronwall, T. H. Note on the derivatives with respect to a parameter of the solutions of a system of differential equations. *Annals of Mathematics*, pages 292–296, 1919.

[78] Guo, Y. and He, Y. An efficient and accurate fully discrete finite element method for unsteady incompressible Oldroyd fluids with large time step. *International Journal for Numerical Methods in Fluids*, 80(6):375–394, 2016.

[79] Guo, Y. and He, Y. On the Euler implicit/explicit iterative scheme for the stationary Oldroyd fluid. *Numerical Methods for Partial Differential Equations*, 34(3):906–937, 2018.

[80] Guo, Y. and He, Y. Crank–Nicolson extrapolation and finite element method for the Oldroyd fluid with the midpoint rule. *Journal of Computational and Applied Mathematics*, 415:114453, 2022.

[81] He, Y. and Li, K. Convergence and stability of finite element nonlinear Galerkin method for the Navier-Stokes equations. *Numerische Mathematik*, 79(1):77–106, 1998.

[82] He, Y., Lin, Y., Shen, S. S., and Tait, R. On the convergence of viscoelastic fluid flows to a steady state. *Advances in Differential Equations*, 7(6):717–742, 2002.

[83] He, Y., Lin, Y., Shen, S. S., Sun, W., and Tait, R. Finite element approximation for the viscoelastic fluid motion problem. *Journal of Computational and Applied Mathematics*, 155(2):201–222, 2003.

[84] Hecht, F. New development in FreeFem++. *Journal of Numerical Mathematics*, 20(3-4):251–266, 2012.

[85] Hendry, J. and Delves, L. The global element method applied to a harmonic mixed boundary value problem. *Journal of Computational Physics*, 33(1):33–44, 1979.

[86] Heywood, J. G. and Rannacher, R. Finite element approximation of the non-stationary Navier–Stokes problem. I. Regularity of solutions and second-order error estimates for spatial discretization. *SIAM Journal on Numerical Analysis*, 19(2):275–311, 1982.

[87] Heywood, J. G. and Rannacher, R. Finite-element approximation of the non-stationary Navier–Stokes problem. Part IV: Error analysis for second-order time discretization. *SIAM Journal on Numerical Analysis*, 27(2):353–384, 1990.

[88] Hou, J., Hu, D., Li, X., and He, X. Modeling and a Domain Decomposition Method with Finite Element Discretization for Coupled Dual-Porosity Flow and Navier–Stokes Flow. *Journal of Scientific Computing*, 95(3):67, 2023.

[89] Jia, H., Jia, H., and Huang, Y. A modified two-grid decoupling method for the mixed Navier–stokes/Darcy model. *Computers & Mathematics with Applications*, 72(4):1142–1152, 2016.

[90] Jia, H., Zhang, Y., and Yu, J. Partitioned time stepping method for fully evolutionary Navier-Stokes/Darcy flow with BJS interface conditions. *Advances in Applied Mathematics and Mechanics*, 11:381–405, 2019.

[91] Jia, X., Li, J., and Jia, H. Decoupled characteristic stabilized finite element method for time-dependent Navier–Stokes/Darcy model. *Numerical Methods for Partial Differential Equations*, 35(1):267–294, 2019.

[92] Jing, F., Han, W., Yan, W., and Wang, F. Discontinuous Galerkin methods for a stationary Navier–Stokes problem with a nonlinear slip boundary condition of friction type. *Journal of Scientific Computing*, 76:888–912, 2018.

[93] Johnson, C. and Pitkäranta, J. An analysis of the discontinuous Galerkin method for a scalar hyperbolic equation. *Mathematics of Computation*, 46(173):1–26, 1986.

[94] Joseph, D. D. *Fluid dynamics of viscoelastic liquids*, volume 84. Springer-Verlag, New York, 1990.

[95] Kalantarov, V. K. and Titi, E. S. Global attractors and determining modes for the 3D Navier-Stokes-Voight equations. *Chinese Annals of Mathematics, Series B*, 30(6):697–714, 2009.

[96] Karakashian, O. A. and Jureidini, W. N. A nonconforming finite element method for the stationary Navier–Stokes equations. *SIAM Journal on Numerical Analysis*, 35(1):93–120, 1998.

[97] Karazeeva, N. A., Kotsiolis, A. A., and Oskolkov, A. P. Dynamical systems generated by initial-boundary value problems for equations of motion of linear viscoelastic fluids. *Trudy Matematicheskogo Instituta imeni VA Steklova*, 188: 59–87, 1990.

[98] Kaya, S. and Rivière, B. A Discontinuous Subgrid Eddy Viscosity Method for the Time-Dependent Navier–Stokes Equations. *SIAM Journal on Numerical Analysis*, 43(4):1572–1595, 2005.

[99] Kirk, K. L. A. and Rhebergen, S. Analysis of a pressure-robust hybridized discontinuous Galerkin method for the stationary Navier–Stokes equations. *Journal of Scientific Computing*, 81:881–897, 2019.

[100] Kirk, K. L. A., Çeşmelioğlu, A., and Rhebergen, S. Convergence to weak solutions of a space-time hybridized discontinuous Galerkin method for the incompressible Navier–Stokes equations. *Mathematics of Computation*, 92(339): 147–174, 2023.

[101] Kirk, K. L. A., Horváth, T., and Rhebergen, S. Analysis of an exactly mass conserving space-time hybridized discontinuous Galerkin method for the time-dependent Navier–Stokes equations. *Mathematics of Computation*, 92(340):525–556, 2023.

[102] Kotsiolis, A. A. and Oskolkov, A. P. Solvability of the fundamental initial-boundary value problem for the equations of motion of Oldroyd fluids on $(0, \infty)$ and the behavior of its solution as $t \to \infty$. *Zap. Nauchn. Sem. Leningrad. Otdel. Mat. Inst. Steklov.(LOMI)*, 150:48–52, 1986.

[103] Kotsiolis, A. A., Oskolkov, A. P., and Shadiev, R. D. A priori estimates on the semiaxis $t \geq 0$ for the solutions of the equations of motion of linear viscoelastic fluids with an infinite Dirichlet integral, and their applications. *Journal of Soviet Mathematics*, 62:2777–2788, 1992.

[104] Kundu, S. and Pani, A. K. Stabilization of Kelvin–Voigt viscoelastic fluid flow model. *Applicable Analysis*, 98(12):2284–2307, 2019.

[105] Kundu, S., Bajpai, S., and Pani, A. K. Asymptotic behavior and finite element error estimates of Kelvin-Voigt viscoelastic fluid flow model. *Numerical Algorithms*, 75:619–653, 2017.

[106] Ladyzhenskaya, O. A. and Uraltseva, N. N. *Linear and quasilinear elliptic equations.* Academic Press, 1968.

[107] Lasis, A. and Suli, E. Poincaré-type inequalities for broken Sobolev spaces. 2003.

[108] Layton, W. and Lenferink, H. A multilevel mesh independence principle for the Navier–Stokes equations. *SIAM Journal on Numerical Analysis*, 33(1):17–30, 1996.

[109] Layton, W. and Tobiska, L. A two-level method with backtracking for the Navier–Stokes equations. *SIAM Journal on Numerical Analysis*, 35(5):2035–2054, 1998.

[110] Layton, W. J., Schieweck, F., and Yotov, I. Coupling fluid flow with porous media flow. *SIAM Journal on Numerical Analysis*, 40(6):2195–2218, 2002.

[111] Lederer, P. L. and Schöberl, J. Polynomial robust stability analysis for $H(div)$-conforming finite elements for the Stokes equations. *IMA Journal of Numerical Analysis*, 38(4):1832–1860, 2018.

[112] Lesaint, P. and Raviart, P.-A. On a finite element method for solving the neutron transport equation. *Publications mathématiques et informatique de Rennes*, (S4): 1–40, 1974.

[113] Li, Q. and Du, G. Local and parallel finite element methods based on two-grid discretizations for a transient coupled Navier-Stokes/Darcy model. *Journal of Scientific Computing*, 92(3):76, 2022.

[114] Li, R., Sun, Z., and Yang, Z. A discontinuous Galerkin method for Stokes equation by divergence-free patch reconstruction. *Numerical Methods for Partial Differential Equations*, 36(4):756–771, 2020.

[115] Liu, C. and Si, Z. An incremental pressure correction finite element method for the time-dependent Oldroyd flows. *Applied Mathematics and Computation*, 351: 99–115, 2019.

[116] Masri, R., Liu, C., and Riviere, B. A discontinuous Galerkin pressure correction scheme for the incompressible Navier–Stokes equations: Stability and convergence. *Mathematics of Computation*, 91(336):1625–1654, 2022.

[117] Masri, R., Liu, C., and Riviere, B. Improved a priori error estimates for a discontinuous Galerkin pressure correction scheme for the Navier–Stokes equations. *Numerical Methods for Partial Differential Equations*, 2023.

[118] McLean, W. and Thomée, V. Numerical solution of an evolution equation with a positive-type memory term. *The ANZIAM Journal*, 35(1):23–70, 1993.

[119] Mohan, M. T. Deterministic and stochastic equations of motion arising in Oldroyd fluids of order one: existence, uniqueness, exponential stability and invariant measures. *Stochastic Analysis and Applications*, 38(1):1–61, 2020.

[120] Mohan, M. T. A central limit theorem and moderate deviation principle for the stochastic 2D Oldroyd model of order one. *Stochastics and Partial Differential Equations: Analysis and Computations*, 9(2):510–558, 2021.

[121] Nassehi, V. Modelling of combined Navier–Stokes and Darcy flows in crossflow membrane filtration. *Chemical Engineering Science*, 53(6):1253–1265, 1998.

[122] Nguyen, N. C., Peraire, J., and Cockburn, B. An implicit high-order hybridizable discontinuous Galerkin method for the incompressible Navier–Stokes equations. *Journal of Computational Physics*, 230(4):1147–1170, 2011.

[123] Nitsche, J. Über ein Variationsprinzip zur Lösung von Dirichlet-Problemen bei Verwendung von Teilräumen, die keinen Randbedingungen unterworfen sind. In *Abhandlungen aus dem mathematischen Seminar der Universität Hamburg*, volume 36, pages 9–15. Springer, 1971.

[124] Oden, J. T., Babuŝka, I., and Baumann, C. E. A discontinuous hp finite element method for diffusion problems. *Journal of computational physics*, 146(2):491–519, 1998.

[125] Oldroyd, J. Non-Newtonian flow of liquids and solids. In *Rheology*, pages 653–682. Elsevier, 1956.

[126] Oskolkov, A. P. Uniqueness and global solvability for boundary-value problems for the equations of motion of water solutions of polymers. *Zapiski Nauchnykh Seminarov POMI*, 38:98–136, 1973.

[127] Oskolkov, A. P. Theory of nonstationary flows of Kelvin–Voigt fluids. *Zapiski Nauchnykh Seminarov LOMI*, 115:191–202, 1982.

[128] Oskolkov, A. P. Initial-boundary value problems for equations of motion of Kelvin–Voight fluids and Oldroyd fluids. *Trudy Matematicheskogo Instituta Imeni VA Steklova*, 179:126–164, 1988.

[129] Oskolkov, A. P. Initial-boundary value problems for equations of motion of Kelvin–Voight fluids and Oldroyd fluids. *Trudy Matematicheskogo Instituta Imeni VA Steklova*, 179:126–164, 1988.

[130] Oskolkov, A. P. and Emel'yanova, D. V. Certain nonlocal problems for two-dimensional equations of motion of Oldroyd fluids. *Journal of Soviet Mathematics*, 62:3004–3016, 1992.

[131] Oskolkov, A. P. and Shadiev, R. D. Nonlocal problems in the theory of the motion equations of Kelvin-Voight fluids. *Journal of Soviet Mathematics*, 62: 2699–2723, 1992.

[132] Oskolkov, A. P. and Shadiev, R. D. Towards a theory of global solvability on $[0, \infty)$ of initial-boundary value problems for the equations of motion of oldroyd and KelvinVoight fluids. *Journal of Mathematical Sciences*, 68:240–253, 1994.

[133] Pani, A., Thomée, V., and Wahlbin, L. Numerical methods for hyperbolic and parabolic integro-differential equations. *The Journal of Integral Equations and Applications*, pages 533–584, 1992.

[134] Pani, A. K. and Yuan, J. Y. Semidiscrete finite element Galerkin approximations to the equations of motion arising in the Oldroyd model. *IMA Journal of Numerical Analysis*, 25(4):750–782, 2005.

[135] Pani, A. K., Yuan, J. Y., and Damázio, P. D. On a linearized backward Euler method for the equations of motion of Oldroyd fluids of order one. *SIAM Journal on Numerical Analysis*, 44(2):804–825, 2006.

[136] Pany, A. K. Fully discrete second-order backward difference method for Kelvin-Voigt fluid flow model. *Numerical Algorithms*, 78:1061–1086, 2018.

[137] Pany, A. K., Bajpai, S., and Pani, A. K. Optimal error estimates for semidiscrete Galerkin approximations to equations of motion described by Kelvin–Voigt viscoelastic fluid flow model. *Journal of Computational and Applied Mathematics*, 302:234–257, 2016.

[138] Pany, A. K., Paikray, S. K., Padhy, S., and Pani, A. K. Backward Euler schemes for the Kelvin-Voigt viscoelastic fluid flow model. *International Journal of Numerical Analysis and Modeling*, 14(1):126–151, 2017.

[139] Pavlovskii, V. To the question of theoretical description of weak aqueous polymer solutions. In *Soviet physics-Doklady*, volume 200, pages 809–812, 1971.

[140] Piatkowski, M., Müthing, S., and Bastian, P. A stable and high-order accurate discontinuous Galerkin based splitting method for the incompressible Navier–Stokes equations. *Journal of Computational Physics*, 356:220–239, 2018.

[141] Qiu, W. and Shi, K. A superconvergent HDG method for the incompressible Navier–Stokes equations on general polyhedral meshes. *IMA Journal of Numerical Analysis*, 36(4):1943–1967, 2016.

[142] Ray, K., Goswami, D., and Bajpai, S. Discontinuous Galerkin two-grid method for the transient Navier-Stokes equations. *Computational Methods in Applied Mathematics*, 2023. doi: 10.1515/cmam-2023-0035. URL `https://doi.org/10.1515/cmam-2023-0035`.

[143] Ray, K., Goswami, D., and Bajpai, S. A discontinuous Galerkin finite element method for the Oldroyd model of order one. *Mathematical Methods in the Applied Sciences*, 2024. doi: 10.1002/mma.9973. URL `https://doi.org/10.1002/mma.9973`.

[144] Reed, W. H. and Hill, T. R. Triangular mesh methods for the neutron transport equation. Technical report, Los Alamos Scientific Lab., N. Mex.(USA), 1973.

[145] Rhebergen, S. and Wells, G. N. A hybridizable discontinuous Galerkin method for the Navier–Stokes equations with pointwise divergence-free velocity field. *Journal of Scientific Computing*, 76(3):1484–1501, 2018.

[146] Rivière, B. *Discontinuous Galerkin methods for solving elliptic and parabolic equations: theory and implementation*. SIAM, 2008.

[147] Rivière, B. and Girault, V. Discontinuous finite element methods for incompressible flows on subdomains with non-matching interfaces. *Computer Methods in Applied Mechanics and Engineering*, 195(25-28):3274–3292, 2006.

[148] Riviere, B. and Sardar, S. Penalty-free discontinuous Galerkin methods for incompressible Navier–Stokes equations. *Mathematical Models and Methods in Applied Sciences*, 24(06):1217–1236, 2014.

[149] Rivière, B., Wheeler, M. F., and Girault, V. Improved energy estimates for interior penalty, constrained and discontinuous Galerkin methods for elliptic problems. Part I. *Computational Geosciences*, 3:337–360, 1999.

[150] Rivière, B., Wheeler, M. F., and Girault, V. A priori error estimates for finite element methods based on discontinuous approximation spaces for elliptic problems. *SIAM Journal on Numerical Analysis*, 39(3):902–931, 2001.

[151] Salinger, A. G., Aris, R., and Derby, J. J. Finite element formulations for large-scale, coupled flows in adjacent porous and open fluid domains. *International Journal for Numerical Methods in Fluids*, 18(12):1185–1209, 1994.

[152] Schötzau, D., Schwab, C., and Toselli, A. Mixed hp-DGFEM for incompressible flows. *SIAM Journal on Numerical Analysis*, 40(6):2171–2194, 2002.

[153] Shahbazi, K., Fischer, P. F., and Ethier, C. R. A high-order discontinuous Galerkin method for the unsteady incompressible Navier–Stokes equations. *Journal of computational physics*, 222(1):391–407, 2007.

[154] Si, Z., Li, W., and Wang, Y. A gauge-Uzawa finite element method for the time-dependent Viscoelastic Oldroyd flows. *Journal of Mathematical Analysis and Applications*, 425(1):96–110, 2015.

[155] Si, Z., Wang, Q., and Wang, Y. A modified characteristic projection finite element method for the Kelvin-Voigt viscoelastic fluid equations. *Computers & Mathematics with Applications*, 109:44–57, 2022.

[156] Sobolevskii, P. E. Stabilization of viscoelastic fluid motion (Oldroyd's mathematical model). *Differential Integral Equations*, 7(5-6):1597–1612, 1994.

[157] Sun, S. and Wheeler, M. F. Symmetric and nonsymmetric discontinuous Galerkin methods for reactive transport in porous media. *SIAM Journal on Numerical Analysis*, 43(1):195–219, 2005.

[158] Sun, S. and Wheeler, M. F. Discontinuous Galerkin methods for coupled flow and reactive transport problems. *Applied Numerical Mathematics*, 52(2-3):273–298, 2005.

[159] Temam, R. Une méthode d'approximation de la solution des équations de Navier-Stokes. *Bulletin de la Société Mathématique de France*, 96:115–152, 1968.

[160] Temam, R. *Navier-Stokes equations: Theory and numerical analysis*, volume 2. 1977.

[161] Temam, R. *Navier–Stokes equations and nonlinear functional analysis*, volume 66. SIAM, Philadelphia, 1995.

[162] Wang, H., Liu, Y., Zhang, Q., and Shu, C.-W. Local discontinuous Galerkin methods with implicit-explicit time-marching for time-dependent incompressible fluid flow. *Mathematics of Computation*, 88(315):91–121, 2019.

[163] Wang, J., Meng, L., and Jia, H. Numerical analysis of modular grad-div stability methods for the time-dependent Navier-Stokes/Darcy model. *Electronic Research Archive*, 28(3):1191, 2020.

[164] Wang, K., He, Y., and Feng, X. On error estimates of the penalty method for the viscoelastic flow problem I: Time discretization. *Applied Mathematical Modelling*, 34(12):4089–4105, 2010.

[165] Wang, K., He, Y., and Shang, Y. Fully discrete finite element method for the viscoelastic fluid motion equations. *Discrete & Continuous Dynamical Systems-B*, 13(3):665, 2010.

[166] Wang, K., He, Y., and Feng, X. On error estimates of the fully discrete penalty method for the viscoelastic flow problem. *International Journal of Computer Mathematics*, 88(10):2199–2220, 2011.

[167] Wang, K., Lin, Y., and He, Y. Asymptotic analysis of the equations of motion for viscoelastic oldroyd fluid. *Discrete & Continuous Dynamical Systems*, 32(2): 657–677, 2012.

[168] Wang, K., Si, Z., and Yang, Y. Stabilized finite element method for the viscoelastic Oldroyd fluid flows. *Numerical Algorithms*, 60(1):75–100, 2012.

[169] Wang, S., Deng, W., Yuan, J., and Wu, Y. Characteristic local discontinuous Galerkin methods for incompressible Navier-Stokes equations. *Communications in Computational Physics*, 22(1):202–227, 2017.

[170] Wang, X., Du, G., and Zuo, L. A novel local and parallel finite element method for the mixed Navier–Stokes–Darcy problem. *Computers & Mathematics with Applications*, 90:73–79, 2021.

[171] Wang, Y., Li, S., and Si, Z. A second order in time incremental pressure correction finite element method for the Navier-Stokes/Darcy problem. *ESAIM: Mathematical Modelling & Numerical Analysis*, 52(4), 2018.

[172] Wheeler, M. F. An elliptic collocation-finite element method with interior penalties. *SIAM Journal on Numerical Analysis*, 15(1):152–161, 1978.

[173] Wilkinson, W. L. *Non-Newtonian fluids: fluid mechanics, mixing and heat transfer*, volume 1. Pergamon, 1960.

[174] Xu, J. A novel two-grid method for semilinear elliptic equations. *SIAM Journal on Scientific Computing*, 15(1):231–237, 1994.

[175] Xu, J. Two-grid discretization techniques for linear and nonlinear PDEs. *SIAM Journal on Numerical Analysis*, 33(5):1759–1777, 1996.

[176] Yang, J. Error analysis of a two-grid discontinuous Galerkin method for nonlinear parabolic equations. *International Journal of Computer Mathematics*, 92 (11):2329–2342, 2015.

[177] Yang, J. and Xing, X. A two-grid discontinuous Galerkin method for a kind of nonlinear parabolic problems. *Applied Mathematics and Computation*, 346: 96–108, 2019.

[178] Yang, J. and Zhang, T. The Euler implicit/explicit FEM for the Kelvin–Voigt model based on the scalar auxiliary variable (SAV) approach. *Computational and Applied Mathematics*, 40(4):133, 2021.

[179] Yang, J. and Zhou, J. A two-grid method for discontinuous Galerkin approximations to nonlinear Sobolev equations. *Numerical Algorithms*, 86:1523–1541, 2021.

[180] Yang, J., Zhou, J., and Chen, H. Analysis of a full-discrete two-grid discontinuous Galerkin method for nonlinear parabolic equations. *Computational and Applied Mathematics*, 42(4):149, 2023.

[181] Yang, Y., Lei, Y., and Si, Z. Unconditional stability and error estimates of the modified characteristics FEM for the time-dependent viscoelastic Oldroyd flows. *Advances in Applied Mathematics and Mechanics*, 13(2):311–332, 2020.

[182] Yi, Q. and Yanren, H. Optimal error estimates of a decoupled scheme based on two-grid finite element for mixed Navier-Stokes/Darcy model. *Acta Mathematica Scientia*, 38(4):1361–1369, 2018.

[183] Zhang, T. and Duan, M. One-level and multilevel space-time finite element method for the viscoelastic Kelvin-Voigt model. *Mathematical Methods in the Applied Sciences*, 43(7):4744–4768, 2020.

[184] Zhang, T. and Duan, M. Stability and convergence analysis of stabilized finite element method for the Kelvin-Voigt viscoelastic fluid flow model. *Numerical Algorithms*, 87:1201–1228, 2021.

[185] Zhang, T. and Qian, Y. Stability analysis of several first order schemes for the Oldroyd model with smooth and nonsmooth initial data. *Numerical Methods for Partial Differential Equations*, 34(6):2180–2216, 2018.

[186] Zhang, T. and Yuan, J. A stabilized characteristic finite element method for the viscoelastic Oldroyd fluid motion problem. *International Journal of Numerical Analysis & Modeling*, 12(4):617–635, 2015.

[187] Zhao, J. and Zhang, T. Two-grid finite element methods for the steady Navier-Stokes/Darcy model. *East Asian Journal on Applied Mathematics*, 6(1):60–79, 2016.

[188] Zhao, J., Zhang, T., and Qian, Y. Stability and convergence of second order time discrete projection method for the linearized Oldroyd model. *Applied Mathematics and Computation*, 316:342–356, 2018.

[189] Zhong, L., Zhou, L., Liu, C., and Peng, J. Two-grid IPDG discretization scheme for nonlinear elliptic PDEs. *Communications in Nonlinear Science and Numerical Simulation*, 95:105587, 2021.

[190] Zhong, L., Xuan, Y., and Cui, J. Two-grid discontinuous Galerkin method for convection–diffusion–reaction equations. *Journal of Computational and Applied Mathematics*, 404:113903, 2022.

Publications

(Provided as per university requirement)

List of Papers Published/Accepted

1. Bajpai, S., Goswami, D., and Ray, K. A priori error estimates of a discontinuous Galerkin method for the Navier-Stokes equations. *Numerical Algorithms*, 94: 937–1002, 2023.

2. Bajpai, S., Goswami, D., and Ray, K. Fully discrete finite element error analysis of a discontinuous Galerkin method for the Kelvin-Voigt viscoelastic fluid model. *Computers & Mathematics with Applications*, 130:69–97, 2023.

3. Ray, K., Goswami, D., and Bajpai, S. Discontinuous Galerkin two-grid method for the transient Navier-Stokes equations. *Computational Methods in Applied Mathematics*, 2023. doi:10.1515/cmam-2023-0035.

4. Ray, K., Goswami, D., and Bajpai, S. A discontinuous Galerkin finite element method for the Oldroyd model of order one. *Mathematical Methods in the Applied Sciences*, 2024. doi:10.1002/mma.9973.

List of Papers Communicated/Under Preparation

1. Ray, K., Goswami, D., and Bajpai, S. A three steps two-grid discontinuous Galerkin method for the Kelvin-Voigt viscoelastic fluid model, *Under Preparation.*

2. Ray, K., Goswami, D., and Bajpai, S. On a two-grid finite element scheme combined with discontinuous Galerkin approximations for the Oldroyd model of order one, *Under Preparation.*

List of Conference Presentations

1. Ray, K. and Goswami, D. Discontinuous Galerkin methods for the equations of motion arising in Oldroyd model of order one. *2nd International Conference on Applied Mathematics in Science and Engineering (AMSE-2022)*, Siksha 'O' Anusandhan, Bhubaneswar, Odisha, India, March 24-26,2022.

2. Ray, K. and Goswami, D. A two-grid discontinuous Galerkin method for time-dependent incompressible Navier-Stokes equations. *International Conference on Emerging trends in Pure and Applied Mathematics*, Tezpur University, Sonitpur, Assam, India, March 12-13, 2022.

3. Ray, K. and Goswami, D. A three step two-grid method for discontinuous Galerkin approximations to the time-dependent incompressible Navier-Stokes equations. *International Conference on Computational Partial Differential Equations and Applications (ICCPDEA-2022)*, BML Munjal University, Gurgaon, India, September 06-08,2022.