

Research Articles 2019:

Abdeljawad, T., Atangana, A., Gomez-Aguilar, J. & Jarad F. 2019. On a more general fractional integration by parts formulae and applications. *Physica A-Statistical Mechanics and its Applications* 536: 122494_1-122494_17.

Allwright, A.J. & Atangana, A. 2019. Augmented upwind numerical schemes for a fractional advection-dispersion equation in fractured groundwater systems. *Discrete and Continuous Dynamical Systems-Series S* 13(3): 443-466.

Alqahtani, R. & Atangana, A. 2019. Competition model in groundwater: Three boreholes tapping water out from same aquifer. *Chaos, Solitons & Fractals* 128: 98-103.

Atangana, A. & Alqahtani, R. 2019. A new approach to capture heterogeneity in groundwater problem: An illustration with an earth equation. *Mathematical Modelling Of Natural Phenomena* 14: 313_1-313_13.

Atangana A. & Araz, S. 2019. Analysis of a new partial integro- differential equation with mixed fractional operators. *Chaos, Solitons & Fractals* 127: 257-271.

Atangana, A. & Araz, S. 2019. Fractional stochastic modelling illustration with modified Chua attractor. *European Physical Journal Plus* 134: 160_1-160_23.

Atangana, A. & Bonyah, E. 2019. Fractional stochastic modeling: New approach to capture more heterogeneity. *Chaos* 29: 013118_1-013118_14.

Atangana, A. & Goufo, E. 2019. The Caputo-Fabrizio fractional derivative applied to a singular perturbation problem. *International Journal of Mathematical Modelling and Numerical Optimisation* 9(3): 241-253.

Atangana, A. & Hammouch, Z. 2019. Fractional calculus with power law: The cradle of our ancestors. *European Physical Journal Plus* 134: 429_1-429_15.

Atangana, A. & Jain, S. 2019. Models of fluid flowing in non- conventional media: New numerical analysis. *Discrete And Continuous Dynamical Systems-Series S* 12: 467-484.

Atangana, A. & Khan, K. 2019. Dynamics of Ebola disease in the framework of different fractional derivatives. *Entropy* 21: 303_1-303_32.

Atangana, A. & Khan, M. 2019. Validity of fractal derivative to capturing chaotic attractors. *Chaos, Solitons & Fractals* 126: 50- 59.

Atangana, A. & Mekkaoui, T. 2019. Capturing complexities with composite operator and differential operators with non-singular kernel. *Chaos* 29: 023103_1-023103_16.

Atangana, A. & Mekkaoui, T. 2019. Triniton the complex number with two imaginary parts: Fractal, chaos and fractional calculus. *Chaos, Solitons & Fractals* 128: 366-381.

Atangana, A. & Owolabi, K. 2019. On the formulation of Adams- Bashforth scheme with Atangana-Baleanu-Caputo fractional derivative to model chaotic problems. *Chaos* 29: 023111_1- 023111_13.

- Atangana, A. & Qureshi, S.** 2019. Modeling attractors of chaotic dynamical systems with fractal-fractional operators. *Chaos, Solitons & Fractals* 123: 320-337.
- Atangana, A. & Shafiq, A.** 2019. Differential and integral operators with constant fractional order and variable fractional dimension. *Chaos, Solitons & Fractals* 127: 226-243.
- Atangana, A., Spannenberg, J.M. & Vermeulen, P.D.** 2019. New approach to groundwater recharge on a regional scale: uncertainty analysis and application of fractional differentiation. *Arabian Journal of Geosciences* 12: 511_1- 511_12.
- Atangana, E.& Chiweshe, T.T.** 2019. Metal adsorbance in abattoir wastewater using cross-linked chitosan derivatives. *Journal of Polymers and the Environment* 27: 2624-2636.
- Atangana, E., Chiweshe, T.T. & Roberts, H.** 2019. Modification of novel chitosan-starch cross-linked derivatives polymers: Synthesis and characterization. *Journal of Polymers and the Environment* 27: 979-995.
- Avalos-Ruiz, L., Gomez-Aguilar, J., Atangana, A. & Owolabi, K.** 2019. On the dynamics of fractional maps with power-law, exponential decay and Mittag-Leffler memory. *Chaos, Solitons & Fractals* 127: 364-388.
- Chiweshe, T.T.** 2019. Characterization of molybdenum and tungsten phosphates compounds prepared using ammonium phosphate salt as flux bulletin of the chemical. *Society of Ethiopia* 33: 103-112.
- Djida, J., Feulefack, P. & Atangana, A.** 2019. A new model of groundwater flow within an unconfined aquifer: Application of Caputo-Fabrizio fractional derivative. *Discrete and Continuous Dynamical Systems-Series B* 24(7): 3227-3247.
- Esterhuysen, S., Vermeulen, P.D. & Glazewski, J.** 2019. Regulations to protect groundwater resources during unconventional oil and gas extraction using fracking. *Wiley Interdisciplinary Reviews-Water* 6 (e1382): 1-19.
- Fourie, F.D., Huber, M.S. & Kovaleva, E.** 2019. Geophysical characterization of the Daskop granophyre dyke and surrounding host rocks, Vredefort impact structure, South Africa. *Meteoritics & Planetary Science* 54(7): 1579-1593.
- Gomez-Aguilar, J. & Atangana, A.** 2019. Power and exponentials laws: Theory and application. *Journal of Computational and Applied Mathematics* 354: 52-65.
- Gomez-Aguilar, J. & Atangana, A.** 2019. Time-fractional variable-order telegraph equation involving operators with Mittag-Leffler kernel. *Journal of Electromagnetic Waves And Applications* 33(2): 165-177.
- Gomo, M.** 2019. On the interpretation of multi-well aquifer- pumping tests in confined porous aquifers using the Cooper and Jacob (1946) method. *Sustainable Water Resources Management* 5: 935-946.
- Gomo, M., Kotze, Y.L. & Vermeulen, P.D.** 2019. Large diameter hand-dug wells in South Africa. *Water Policy* 21:197-205.
- Heydari, M. & Atangana, A.** 2019. A cardinal approach for nonlinear variable-order time fractional Schrödinger equation defined by Atangana-Baleanu-Caputo derivative. *Chaos, Solitons & Fractals* 128: 339-348.

Hohne, D., De Lange, S.S., Esterhuyse, S. & Sherwood Lollar, B. 2019. Case study: methane gas in a groundwater system located in a dolerite ring structure in the Karoo Basin, South Africa. *South African Journal Of Geology* 122(3): 357-368.

Morales-Delgado, V., Gomez-Aguilar, J. & Atangana A. 2019. Modelling the oxygen diffusion equation within the scope of fractional calculus. *Thermal Science* 23(2B): 1279-1287.

Owolabi, K. & Atangana A. 2019. Computational study of multi- species fractional reaction-diffusion system with ABC operator. *Chaos, Solitons & Fractals* 128: 280-289.

Owolabi K. & Atangana A. 2019. Mathematical analysis and computational experiments for an epidemic system with nonlocal and nonsingular derivative. *Chaos, Solitons & Fractals* 126: 41- 49.

Qureshi, S. & Atangana, A. 2019. Mathematical analysis of dengue fever outbreak by novel fractional operators with field A-Statistical Mechanics and Its Applications 526: 121127_1-121127_19.

Qureshi, S., Shaikh, A. & Atangana, A. 2019. Strange chaotic attractors under fractal-fractional operators using newly proposed numerical methods. *European Physical Journal Plus* 134: 523_1-523_21.

Sakala, E., Fourie, F.D., Gomo, M. & Coetzee, H. 2019. Groundwater vulnerability mapping of Witbank coalfield in South Africa using deep learning artificial neural networks. *South African Journal of Geomatics* 8(2): 282-293.

Shakhane, T. & Fourie, F.D. 2019. An investigation into structural discretisation as a first-order and pilot framework to understand groundwater-stream water connectivity at a reach scale. *Sustainable Water Resources Management* 5: 883-900.

Solis-Pérez, J., Gomez-Aguilar, J. & Atangana, A. 2019. A fractional mathematical model of breast cancer competition model. *Chaos, Solitons & Fractals* 127: 38-54.

Zielke-Olivier, J.S.D.R. & Vermeulen, P.D. 2019. A geochemical weathering profile of a fine ash tailings dam and its impact on the rlying aquifers. *Journal of Environmental Management* 242: 162-170.

Books

Owolabi, K.M. & Atangana, A. 2019. *Numerical Methods for Fractional Differentiation*. Singapore: Springer.

Chapters in Books

Atangana, A. 2019. A new numerical approximation of fractional differentiation: Upwind discretization for Riemann-Liouville and Caputo Derivatives. Edition: 24. In: *Mathematical Methods in Engineering, Nonlinear Systems and Complexity*. K. Tas, D. Baleanu & T. Machado (Eds.). Cham: Springer. pp. 193-212.

Gomo, M., & Magner, J. 2019. Sustainability of human, plant, and aquatic life: A theoretical discussion from recharge to discharge. In: *Groundwater Resource Characterisation and Management Aspects*. M. Gomo (Ed.). London: IntechOpen. pp. 53-69.

Conference Contributions

Conference Papers/Posters

Allwright, A. *Groundwater transport modelling: A fractional/fractal perspective*. Paper delivered at the GWD Conference, Port Elizabeth, South Africa. 21-23 October 2019.

Fourie, F.D., Kovaleva, E. & Huber, M. 2019. Geophysical surveys across the Daskop Granophyre Dyke. Paper delivered at the 16th SAGA Biennial Conference & Exhibition 2019, Durban, South Africa. 7-9 October 2019.

Gomo, M. 2019. *Emerging Contaminants (ECs) in water resources in Southern Africa*. Paper delivered at the Water Resources Dialogue: China-Africa Water Forum Series No 7 Conference, Windhoek, Namibia. 22-24 July 2019.

Gomo, M. 2019. *Groundwater sampling: Measurement uncertainties and their implications for decision making*. Paper delivered at the GWD Conference, Port Elizabeth, South Africa. 21- 23 October 2019.

Gomo, M. 2019. *On the methods to estimate borehole sustainable yield*. Paper delivered at the GWD Conference, Port Elizabeth, South Africa. 21-23 October 2019.

Gomo, M. 2019. *Preliminary site investigation of a petroleum hydrocarbon contaminated aquifer*. Paper delivered at ICAEGES 2019: International Conference on Applied Environmental Geology and Environmental Systems. Dubai, UAE. 7-8 November 2019. [Award for Best Presentation].

Gomo, M. 2019. *Water balance model as a preliminary tool to assess groundwater-surface water interaction: Technical note*. Paper delivered at ISER 585th International Conference on Chemical and Environmental Science (ICCES-2019), Dubai, UAE. 14-15 May, 2019.

Mazibuko, J.C. & Fourie F.D. 2019. *Estimating hydraulic conductivities through the measurement of streaming potentials*. Paper delivered at 16th Biennial Groundwater Division Conference and Exhibition, Port Elizabeth, South Africa. 21-23 October 2019.

Mukhwathi, U. & Fourie F.D. 2019. *The impact of angled survey lines on ERT surveys using the Wenner (α) array*. Paper delivered at 16th Biennial Groundwater Division Conference and Exhibition, Port Elizabeth, South Africa. 21-23 October 2019.

Sekiba, M. & Fourie F.D. 2019. *Airborne and ground geophysical surveys to investigate the deep geology and geohydrology in the Beaufort West Area, Western Karoo, South Africa*. Paper delivered at 16th Biennial Groundwater Division Conference and Exhibition, Port Elizabeth, South Africa. 21-23 October 2019.

Conference Proceedings

Vermeulen, P.D. & Zielke-Olivier, J.S.D.R. 2019. Developing a risk assessment for local groundwater degradation by mine waste storage facilities. In: *Proceedings of IMWA 2019 Conference – Mine water: Technological and Ecological Challenges 2019*. Perm, Russia, 15-19 July 2019. pp 711-718.