Ramsès Djidjou-Demasse

Dynamical Systems, Population Biology of Infectious Diseases

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I focus on population dynamics to understand fundamental processes in epidemiology, ecology, and evolution of infectious disease. My works are based on a combination of Mathematical analysis and Modeling with a particular focus on Dynamical Systems.

Research experience & education

Since 2018 **Chargé de recherche IRD**, *(tenured researcher)*, Laboratoire MIVEGEC, Montpellier, France.

2018 **Post-Doc INSERM-Paris and consulting for the medical aid organization ALIMA**, *Decision analysis tools to evaluate interventions designed for infectious diseases prevention, control, and care*, Mentor: Pr Y. Yazdanpanah, Dr J. Guedj.

2015-2017 **Post-Doc, AgreenSkills fellow, INRAe & IMB Bordeaux**, *Mathematics applied to theoretical evolutionary epidemiology of plant diseases: data and models to sustainably manage varietal quantitative resistance*, Mentor: Dr F. Fabre, Dr J.B. Burie, Pr A. Ducrot.

2011-2015 **PhD student Mathematics/Modeling**, *Univ. of Yaoundé 1, Cameroon*, Supervisors: Pr S. Bowong (Univ. Douala, Cameroon), Pr J.J. Tewa (Univ. Yaoundé 1, Cameroon, Reporters: Pr J. Arino (Univ. Manitoba, Canada), Pr G. Ngwa (Univ. Buea, Cameroon), Pr N. Noutchegueme (Univ. Yaoundé 1, Cameroon). Defended: June 25, 2015.

2011,2012,2014 **PhD research internship**, *Institut Pasteur Paris, Mathematics Institute of Bordeaux, Lab. of Mathematics and Applications, Metz*, Mentors: Dr S. Cauchemez, Pr A. Ducrot, Pr G. Sallet.

2009-2011 **Magistère in Mathematics**, University of Yaoundé 1, Cameroon (Delay differential equations and Applications to ecology).

Teaching

2021 **Ouagadougou**, *Organizer & Trainer for the Structural Training Projects Mathematics and Modeling*, PSF-MOMA.

2020 **Bobo-Dioulasso**, *Organizer & Trainer of a one-week workshop*, Introduction to Mathematical Modeling of Infectious Diseases.

2019 **Conakry**, *Trainer during a one-week workshop*, Global Changes and Emerging Infectious Risks.

since 2017 **Montpellier, Bordeaux, Paris**, *Optional teaching on Dynamical Systems and Modelling*, Approximately 10h of lecture per year in French Universities.

2012-2015 **Yaoundé**, *Monitorat. Higher Teacher's Training College, University of Yaounde 1*, Level: Bacherlor degree. Scientific computing, On average, 32 hours of lectures per year (in two years) and 28 hours of practical work per year (in 3 years).

2011-2014 **Yaoundé**, *Monitorat. National Advanced School of Engineering, University of Yaounde 1*, Mathematical analysis, Statistics-Probability, On average, 100 hours of tutorials per year (in 3 years).

Publications

22 peer reviewed research articles since 2012 all according to the Web of Science and 1 book chapter.
List of publications (HAL) or details below.

Mentoring and supervision

- **Post-doctoral fellows**: *Quentin Richard* (2019-2021); *Moctar Kande* (2021); *Hyacinthe Ndongmo* (2022-)
- **PhD Students**: *Mboya Ba, UCAD, Dakar* (2018-2021).
- 5 **MSc students** supervised and co-supervised since 2016.

Invited speaker at international conferences

2020 **COVID-19 Dynamics & Evolution**, *UC San Diego School of Medicine*, Virtual conference.

2019 **Fifth Conference on Computational and Mathematical Population Dynamics**, *Florida, USA*.

2017 **Eighth Workshop Dynamical Systems Applied to Biology and Natural Sciences**, *Evora, Portugal.*

Funding

2015-2017 **AgreenSkills international postdoctoral fellow**.

2021-2023 **Structural Training Projects (PSF-MOMA)**, *Mathematical Modeling in Epidemiology*.

2022-2024 **Young team associated with the IRD (JEAI-DYNAMIsM)**, *DYNamique Adaptative des Maladies InfectieuseS*, Modélisation Mathématique en Écologie et Évolution.

2022-2025 **ANR-JCJC QUASAR**, *QUantitative Antimicrobial resistance*, control Strategies and evolutionary Adaptation of parasitical virulence and Resistance.

Conference organisation

2020 **Member of the scientific committee of the conference Ecology and Evolution of Infectious Diseases**, *Montpellier*.

Other collective duties

2021- Team leader (Population-Community-Dynamics) research group within MIVEGEC

2021-2023 Coordinator of the Structural Training Project MOMA on Mathematics and Modelling funded by the IRD for three years

2019- Member of a thesis committee, UCL Belgium

2018- Organiser of the weekly seminars in Modelling of Infectious Diseases, Montpellier

Popular science (in French)

Articles

- R Djidjou-Demasse, C Selinger, MT Sofonea. Épidémiologie mathématique et modélisation de la pandémie de Covid-19 : enjeux et diversité [Mathematical epidemiology and modeling of the Covid-19 pandemic: issues and diversity]. **Rev Francoph Lab.** 2020(526):63-69. PDF

Interviews

- *Science&Vie*, Confinement: comment en sortir?, Mar 2020.
- *ECHOSCIENCES Occitanie*, Casser la propagation du COVID : quelle est la stratégie optimale?
- *ECHOSCIENCES Occitanie*, COVID-19 : décrypter pour endiguer.

List of publications

Accepted, in press and published articles

1. (2021-7) R. Djidjou-Demasse, M. T. Sofonea, M. Choisy, S. Alizon. Within-host evolutionary dynamics of antimicrobial quantitative resistance. **Peer Community in Mathematical and Computational Biology**. PDF.
2. (2021-6) F. Fabre, J.B. Burie, A. Ducrot, S. Lion, Q. Richard, R. Djidjou-Demasse. An epi-evolutionary model for predicting the adaptation of spore-producing pathogens to quantitative resistance in heterogeneous environments. **Evolutionary Applications**. PDF.
3. (2021-5) Q. Richard, M. Choisy, T. Lefèvre, R. Djidjou-Demasse. Human-vector malaria transmission model structured by age, time since infection and waning immunity. **Nonlinear Analysis: Real World Applications**. PDF
4. (2021-4) M. T. Sofonea, B. Reyné, B. Elie, R. Djidjou-Demasse, C. Selinger, Y. Michalakis, S. Alizon. Memory is key in capturing COVID-19 epidemiological dynamics. **Epidemics**, 2021. PDF
5. (2021-3) M. Ba, R. Djidjou-Demasse, M. Lam, J-J Tewa. Optimal intervention strategies of staged progression HIV infections through an age-structured model with probabilities of ART drop out. **Mathematical Modelling of Natural Phenomena**, 16, 2021. PDF
6. (2021-2) Q Richard, S. Alizon, M Choisy, M. T. Sofonea, R Djidjou-Demasse. Age-structured non-pharmaceutical interventions for optimal control of COVID-19 epidemic. **PLOS Computational Biology**, 2021. PDF
7. (2021-1) R Djidjou-Demasse, Samuel Alizon, Mircea T. Sofonea. Within-host bacterial growth dynamics with both mutation and horizontal gene transfer. **Journal Of Mathematical Biology** 82, 16 (2021). PDF
8. (2020-1) G. J. Abiodun, B.. O. Adebiyi, R. O. Abiodun, O. Oladimeji, K. E. Oladimeji, A. M. Adeola, O. S. Makinde, K. O. Okosun, R Djidjou-Demasse, Y. J. Semegni, K. Y. Njabo, P. J. Witbooi, A. Aceves. Investigating the Resurgence of Malaria Prevalence in South Africa Between 2015 and 2018: A Scoping Review. **The Open Public Health Journal**, 13(1). PDF
9. (2019-3) R. Djidjou-Demasse, G. Abiodun, A. Adeola, J. Botai. Development and analysis of a malaria transmission mathematical model with seasonal mosquito life-history traits. **Studies in Applied Mathematics**, Wiley-Blackwell. PDF
10. (2019-2) J-B Burie, R Djidjou-Demasse, A Ducrot. Slow convergence to equilibrium for an evolutionary epidemiology integro-differential system. **Discrete and Continuous Dynamical Systems - Series B**, American Institute of

Mathematical Sciences, 2019, 22 (11). PDF

11. (2019-1) Abiodun, G.J.; Makinde, O.S.; Adeola, A.M.; Njabo, K.Y.; Witbooi, P.J.; R. Djidjou-Demasse; Botai, J.O. . A Dynamical and Zero-Inflated Negative Binomial Regression Modelling of Malaria Incidence in Limpopo Province, South Africa. **International Journal of Environmental Research and Public Health, MDPI**, 2019, 16 (11), pp.2000. PDF
12. (2018-2) J.B. Burie, R. Djidjou-Demasse, A. Ducrot. Asymptotic and transient behaviour for a nonlocal problem arising in population genetics. **European Journal of Applied Mathematics**. PDF
13. (2018-1) A. Rezgui, J. Vallance, A. Ben Ghnaya-Chakroun, E. Bruez, M. Dridi, R. Djidjou-Demasse, P. Rey, and N. Sadfi-Zouaoui. Study of Lasidiodiplodia pseudotheobromae, Neofusicoccum parvum and Schizophyllum commune, three pathogenic fungi associated with the Grapevine Trunk Disease (GTDs) in the North of Tunisia. **European Journal of Plant Pathology**, DOI: 10.1007/s10658-018-1458-z, 2018.
14. (2017-) R. Djidjou-Demasse, B. Moury, F. Fabre. Mosaics of are a more versatile means of achieving disease control than pyramids in most agricultural landscapes. **New Phytologist**, 216(1), 239-253, 2017. PDF
15. (2016-2) R. Djidjou-Demasse, A. Ducrot, F. Fabre. Steady state concentration for a phenotypic structured problem modelling the evolutionary epidemiology of spore producing pathogens. **Mathematical Models and Methods in Applied Sciences**, 2016. PDF
16. (2016-1) R. Djidjou Demasse, J.J. Tewa, S. Bowong, Y. Emvudu. Optimal control of an age-structured model for the transmission of hepatitis B with differential infectivity. **Journal Of Mathematical Biology**, Vol. 73(2):305-33, 2016. PDF
17. (2015-) P. Tchinda, R. Djidjou-Demasse, J.J. Tewa, M.A. Aziz-Alaoui. Bifurcation analysis and optimal harvesting of a delayed predator-prey model. **International Journal of Bifurcation and Chaos**, Vol. 25 (1), 2015.
18. (2014-) R. Djidjou-Demasse, J.J. Tewa, S. Bowong. Analysis of an Age-structured SIL model with demographics process and vertical transmission, **ARIMA Journal**, Vol. 17:23-52, 2014. PDF
19. (2013-2-) R. Djidjou Demasse, A. Ducrot. An age-structured within-host model for multi-strain malaria infections. **SIAM Journal on Applied Mathematics**, Vol. 73(1):572-593, 2013. PDF
20. (2013-1-) Y. Emvudu, R. Djidjou-Demasse, D. Djeudeu. Optimal control using state dependent Riccati equations in a tuberculosis model. **Computational and Applied Mathematics**, 32(2), 191-210,2013. PDF
21. (2012-) J.J.Tewa, R. Djidjou-Demasse, S. Bowong. Predator-prey model with prey harvesting, Holling response function of type III and SIS disease. **Biomath 1**, 2012. PDF
22. (2011-) Y. Emvudu, R. Djidjou-Demasse, D. Djeudeu. Optimal Control of the Lost to Follow Up in a Tuberculosis Model. **Computational and Mathematical Methods in Medicine**, Vol. 2011. PDF

Book chapter

R. Djidjou-Demasse, A. Mendy, Lam Mountaga, J. J. Tewa. Analysis of an Age-Structured SEIL Model with Demographics Process and Lost of Sight Individuals. **R. Brewer (Ed.). (2015). Ordinary and Partial Differential Equations** [Chapter 2].

Preprints

1. B. Reyné, Q. Richard, C. Noûs, C. Selinger, M. T. Sofonea, R. Djidjou-Demasse, S. Alizon. The importance of the population age-structure: insights from Covid-19 dynamics model structured by age, time since infection and acquired immunity PDF
2. R. Djidjou-Demasse, C. Lemdjo, O. Seydi. Global dynamics of a spore producing pathogens epidemic system with nonlocal diffusion process PDF
3. R. Djidjou-Demasse, M. Mann-Manyombe, O. Seydi, I. Yatat-Djeumen. Differential preferences for RBCs is key for Plasmodium species evolutionary diversity within human host PDF
4. R Djidjou-Demasse, A Ducrot, N Mideo, G Texier. Understanding dynamics of Plasmodium falciparum gametocytes production: Insights from an age-structured model PDF.
5. M T Sofonea, B Reyné, B Elie, R Djidjou-Demasse, C Selinger, Y Michalakis, S Alizon. Epidemiological monitoring and control perspectives: application of a parsimonious modelling framework to the COVID-19 dynamics in France PDF
6. R Djidjou-Demasse, Y. Michalakis, M Choisy, M. T. Sofonea, S. Alizon. Optimal COVID-19 epidemic control until vaccine deployment PDF.
7. V. Madelain, C. Passaes, A. Millet, V. Avettand-Fenoel, R. Djidjou-Demasse, N. Dereuddre-Bosquet, R. Le Grand, C. Rouzioux, B. Vaslin, A. Saez-Cirion, J. Guedj. Modeling acute SIV infection suggests that early establishment of cytotoxic response drives the virological control, and unravels heterogeneous infected cells populations PDF.
8. R. Djidjou-Demasse, S. Lion, A. Ducrot, J.B. Burie, Q. Richard, F. Fabre. Evolution of pathogen traits in response to quantitative host resistance in heterogeneous environments PDF.