Jorge P. Rodríguez

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Staff meteorologist, Balearic Islands Delegation, Spanish Meteorological Agency (AEMET), Palma (Mallorca), Spain

1. Keywords

Big data, complex networks, animal movement, marine megafauna, disease spreading, meteorology

2. Professional positions

2014-2018 PhD researcher. Formación de Profesorado Universitario (FPU) fellowship, Spanish Ministry of Education, Culture and Sport. Instituto de Física Interdisciplinar y Sistemas Complejos IFISC (CSIC-UIB), Palma (Mallorca), Spain

2018-2019 Postdoctoral researcher. Funding from project Coupled Animal and Artificial Sensing for Sustainable Ecosystems (CAASE). IFISC (CSIC-UIB), Palma (Mallorca), Spain

2019-2020 Postdoctoral researcher. Sociopatterns collaboration. ISI Foundation, Turin, Italy

2020- Tutoring lecturer. Associated center in Balearic Islands, National Distance University UNED, Palma (Mallorca), Spain

2020-2021 Postdoctoral researcher. Instituto de Biocomputación y Física de Sistemas Complejos BIFI, Universidad de Zaragoza, Spain

2021-2023 Postdoctoral fellow. Juan de la Cierva Formación fellowship, Spanish Ministry of Science and Innovation. Instituto Mediterráneo de Estudios Avanzados (CSIC-UIB), Esporles (Mallorca), Spain

2023-2024 Postdoctoral researcher/fellow. Projects Artificial Intelligence & Animal Movement (AIAM) and Modelling Island Ecological Complexity in the Context of Global Change (MISLAND), and Vicenç Mut fellowship (Govern de les Illes Balears). Instituto de Física Interdisciplinar y Sistemas Complejos IFISC (CSIC-UIB), Palma (Mallorca), Spain

2024- Staff meteorologist, Spanish Meteorological Agency (AEMET), Palma (Mallorca), Spain

3. Academic qualifications

2018 PhD in Physics. University of Balearic Islands (Spain)

2014 Master's Degree in Physics of Complex Systems (60 ECTS). University of Balearic Islands(Spain)

2013 5-year Degree in Physics (300 ECTS). University of Valencia (Spain). Erasmus at Imperial College London (9 months, United Kingdom)

2018 Degree in Social and Cultural Anthropology (240 ECTS, 2018). National Distance Education University (Spain)

4. Funded research projects (PI)

2023 "Artificial Intelligence & Animal Movement (AIAM)". Mar 2023-Jan 2024, funded by

Sustainable Ocean Alliance. Amount: 10,000 USD

5. Early-career researchers training

2025- Master Thesis co-direction, Lina E. Navarro, MsC in Marine Sciences, Bogotá Jorge Tadeo University, Colombia
2024- Master Thesis direction, Carlos Moreno, MsC in Advanced Physics, National Distance University (UNED), Spain
2020- PhD co-direction, Jorge Medina, PhD in Physics, University of Balearic Islands, Spain. Under external assessment (October 2025)
2021-2022 Master Thesis co-direction, Lina E. Navarro, Master's Degree in Physics of Complex Systems, University of Balearic Islands, Spain

6. Publications
=: equal contribution
CA: corresponding author

2025 Medina, J., Rodríguez, J.P., McMahon, C.R., Sequeira, A.M.M., Eguíluz, V.M. Improving Prediction Region Accuracy in Marine Animal Movement with Temporal Fusion Transformer, accepted for publication in Scientific Reports

2025 VanCompernolle, M., Morris, J., Calich, H.J., Rodríguez, J.P., Marley, S.A., et al. Vulnerability of marine megafauna to global at-sea anthropogenic threats, Conservation Biology, e70147, doi: 10.1111/cobi.70147

2025 Fernández-Gracia, J., Rodríguez, J.P., Peel, L.R., Klemm, K., Meekan, M.G., et al. Inferring leader-follower behavior from presence data in the marine environment: A case study on Reef Manta Rays, PLOS Complex Systems 2, e0000073, doi: 10.1371/journal.pcsy.0000073

2025 Rodríguez, J.P (CA)., Aleta, A., Moreno, Y. Multilayer networks describing urban interactions for building the digital twins of five cities in Spain, Scientific Data 12, 1227, doi: 10.1038/s41597-025-05551-2

2025 Sequeira, A.M.M.=, Rodríguez, J.P.=, Marley, S.A., Calich, H.J., van der Mheen, M., et al. Global tracking of marine megafauna space use reveals how to achieve conservation targets. Science 388, 1086, doi: 10.1126/science.adl0239

2024 Rodríguez, J.P. (CA), Arola-Fernández, L. Understanding following patterns among high-performance athletes, Journal of Physics: Complexity 5, 045007, doi: 10.1088/2632-072X/ad8854

2024 Rodríguez, J.P. (CA), Klemm, K., Duarte, C.M., Eguíluz, V.M. Shipping traffic through the Arctic Ocean: spatial distribution, temporal evolution and its dependence on the sea ice extent, iScience 27, 110236, doi: 10.1016/j.isci.2024.110236

2024 Rodríguez, J.P. (CA), Irigoien, X., Duarte, C.M., Eguíluz, V.M. Identification of suspicious behaviour through anomalies in the tracking data of fishing vessels. EPJ Data Science 13, 23, doi: 10.1140/epjds/s13688-024-00459-0

2023 Belvís, F., Aleta, A., Pericas, J.M., Fernández-Gracia, J., Rodríguez, J.P., *et al*. Key epidemiological indicators and spatial autocorrelation patterns across five waves of COVID-19 in Catalonia. Scientific Reports 13, 9709, doi: 10.1038/s41598-023-36169-2

2023 Rodríguez, J.P. (CA), Eguíluz, V.M. Coupling between infectious diseases leads to

synchronization of their dynamics. Chaos 33, 021103, doi: 10.1063/5.0137380

2023 Rodríguez, J.P. (CA), Aleta, A., Moreno, Y. Digital cities and the spread of COVID-19: characterizing the impact of non-pharmaceutical interventions in five cities in Spain. Frontiers in Public Health 11, 1122230, doi: 10.3389/fpubh.2023.1122230

2022 Rodríguez, J.P., Paoluzzi, M., Levis, D., Starnini, M. Epidemic processes on self-propelled particles: Continuum and agent-based modeling. Physical Review Research 4, 043160, doi: 10.1103/PhysRevResearch.4.043160

2022 Lacasa, L., Rodríguez, J.P., Eguíluz, V.M. Correlations of network trajectories. Physical Review Research 4, L042008, doi: 10.1103/PhysRevResearch.4.L042008

2021 Bates, A.E., Primack, R.B., Biggar, B.S., Bird, T.J., Clinton, M.E., *et al.* Global COVID-19 lockdown highlights humans as both threats and custodians of the environment. Biological Conservation 263,109175, doi: 10.1016/j.biocon.2021.109175

2021 Calich, H., Rodríguez, J.P., Eguíluz, V.M., Hammerschlag, N., *et al*. Comprehensive analytical approaches reveal species-specific search strategies in sympatric apex predatory sharks. Ecography 44, 1544, doi: 10.1111/ecog.05953

2021 Ozella, L., Paolotti, D., Lichand, G., Rodríguez, J.P., Haenni, S., *et al*. Using wearable proximity sensors to characterize contact patterns in a village of rural Malawi. EPJ Data Science 10, 46, doi: 10.1140/epjds/s13688-021-00302-w

2021 Rodríguez, J.P. (CA), Fernández-Gracia, J., Duarte, C.M., Irigoien, X., *et al*. The global network of ports supporting high seas fishing. Science Advances 7, eabe3470, doi: 10.1126/sciadv.abe3470

2021 Kazimierski, L.D., Rodríguez, J.P., Eguíluz, V.M. Design of deployment strategies to monitor the movement of animals with passive electronic devices. Sensors 21, 236, doi: 10.3390/s21020326

2020 Eguíluz, V.M., Fernández-Gracia, J., Rodríguez, J.P., Pericas, J.M., Melián, C.M. Risk of secondary infection waves of COVID-19 in an insular region: the case of the Balearic Islands, Spain. Frontiers in Medicine 7, 563455, doi: 10.3389/fmed.2020.563455

2019 Sequeira, A.M.M., Hays, G.C., Sims, D.W., Eguíluz, V.M., Rodríguez, J.P., *et al*. Overhauling ocean spatial planning to improve marine megafauna conservation. Frontiers in Marine Science 6, 639, doi: 10.3389/fmars.2019.00639

2019 Rodríguez, J.P. (CA), Ghanbarnejad, F., Eguíluz, V.M. Particle velocity controls phase transitions in contagion dynamics. Scientific Reports 9, 6463, doi: 10.1038/s41598-019-42871-x

2018 Melián, C.J., Matthews, B., de Andreazzi, C.S., Rodríguez, J.P., Harmon, L.J., *et al.* Deciphering the interdependence between ecological and evolutionary networks. Trends in Ecology & Evolution 33, 504, doi: 10.1016/j.tree.2018.04.009

2018 Sequeira, A.M.M.[=], Rodríguez, J.P.[=], Eguíluz, V.M., Harcourt, R.G., *et al*. Convergence of marine megafauna movement patterns in coastal and open oceans. Proceedings of the National Academy of Sciences 115, 3072, doi: 10.1073/pnas.1716137115

2018 Rodríguez, J.P., Liang, Y.H., Huang, Y.J., Juang, J. Diversity of hysteresis in a fully cooperative coinfection model. Chaos 28, 023107, doi: 10.1063/1.4996807

2017 Rodríguez, J.P., Ghanbarnejad, F., Eguíluz, V.M. Risk of coinfection outbreaks in temporal networks: a case study of a hospital contact network. Frontiers in Physics 5, 46, doi:

10.3389/fphy.2017.00046

2017 Rodríguez, J.P. (CA), Fernández-Gracia, J., Thums, M., Hindell, MA., *et al*. Big data analyses reveal patterns and drivers of the movements of southern elephant seals. Scientific Reports 7, 112, doi: 10.1038/s41598-017-00165-0

7. Citation Statistics

Number of citations: 807 (Google Scholar)
h-index: 12 (Google Scholar)

8. Awards

- 2nd National End-Of-Degree Award. Degree in Physics. Spanish Ministry of Education, Culture and Sport
- Selected photography "El árbol pendular" (The pendular tree) for national scientific photography exhibition, Fotciencia 14 (2017)

9. Conference presentations (oral communications)

2024 "Leveraging acoustic telemetry data to understand spreading processes on marine animal populations", European Tracking Network Symposium, Palma (Spain)

2022 "Epidemic processes on self-propelled particles". Conference on Complex Systems, CCS22, Palma (Spain)

2022 "Digital cities and COVID-19: modeling the impact of non pharmaceutical interventions". International Conference BIFI (online)

2021 "Fishing at the High Seas: the Global Network Connecting Ports to Fishing Areas". Conference on Complex Systems, CCS21, Lyon (France)

2021 "Big Data analytics for marine movement tracking data: a global picture". I Annual Meeting of the Spanish Tracking Network, Palma (Spain)

2021 "The global network of ports supporting high seas fishing". FisEs Joven '21 (online)

2019 "Structure and dynamics of contact patterns among structured populations in South Africa". Conference on Complex Systems, CCS19, Singapore

2019 "Genome networks and the stability of diversification". Conference on Complex Systems, CCS19, Singapore

2018 "Cooperative disease spreading in networks of mobile particles: how mobility can speed up, slow down and change the nature of the epidemic phase transition". Conference on Complex Systems, CCS18, Thessaloniki (Greece)

2018 "Inferring intraspecific tracing behaviour in animal movement". Conference on Complex Systems, CCS18, Thessaloniki (Greece)

2017 "Coinfection in the space: cooperative disease spreading in geometric and contact networks". COSTNET17 (Palma de Mallorca)

2017 "Cooperative spreading diseases in temporal networks". 8th Conference on Complex Networks, CompleNet'17, Dubrovnik (Croatia)

10. Service to scientific community

2023 Organizer and lecturer in a training workshop on the analysis of movement data, CA UNED Illes Balears, Palma de Mallorca, Spain

2021 Member of the organizing committee of the V Symposium on Ecological Networks, ECONET2021, Palma de Mallorca (Spain)

2020-2023 Elected member for the Council of the Complex Systems Society

2017 Member of the organizing team of the COSTNET 17 conference, Palma de Mallorca (Spain)

Reviewing activity for peer-review journals: Communications Physics, PLOS Computational Biology, Physical Review Research, PRX Life, PLOS ONE, JSTAT, Physical Review E, Journal of Physics: Complexity, Scientific Reports, PeerJ, Chaos, Complexity, Entropy, Frontiers in Marine Science, Science Progress, Social Science Computer Review, Frontiers in Physics, Chaos, Solitons and Fractals, Frontiers in Public Health, Ecological Complexity

11. Stays in research centers

2018 Indian Ocean Marine Research Centre, University of Western Australia (Australia). Research stay with Dr. Ana Sequeira.

2018 Department of Engineering Mathematics, University of Bristol (United Kingdom). Research stay with Dr. Naoki Masuda. Funding: COSTNET (EU COST Action)

2016-2017 Eawag (Switzerland). Research stays with Dr. Carlos Melián. Funding (2016): Obra Social la Caixa

2016 National Chiao-Tung University (Taiwan). Research stay with Prof. Jonq Juang. Funding: Ministry of Science and Technology of Taiwan

2016 University of Western Australia (Australia). Research stay with Dr. Ana Sequeira

12. Invited seminars and talks

2024 “New questions on epidemic spreading suggested by the COVID-19 pandemic”, Department of Applied Mathematics, National Kaohsiung University (Kaohsiung, Taiwan)

2024 “Understanding following patterns among Olympic medallists”, Institute for Cross-Disciplinary Physics and Complex Systems (IFISC, Palma de Mallorca, Spain)

2024 “Analysis of marine fishing using vessels trajectories: global structure, suspicious behavior and emergent pathways”, Institute for Cross-Disciplinary Physics and Complex Systems (IFISC, Palma de Mallorca, Spain)

2023 “Oceanic big data for marine megafauna conservation”, Institute for Cross-Disciplinary Physics and Complex Systems (IFISC, Palma de Mallorca, Spain)

2019 “Animal movement in the Big Data era”, ISI Foundation (Turin, Italy)

2019 “Velocity-controlled phase transitions in contagion dynamics: single vs cooperative infections”, Department of Applied Mathematics, National Chiao-Tung University (Hsinchu, Taiwan)

2018 “Animal movement in the Big Data era: from data analysis to forecast and control”, The UWA Oceans Institute (Perth, Australia)

2016 “Movement patterns at aggregated, collective and individual scales”, Swiss Federal Institute of Aquatic Science and Technology (EAWAG, Kastanienbaum, Switzerland)