

## 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-Ongoing** 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-Ongoing** Staff meteorologist, Spanish Meteorological Agency (AEMET), Palma (Mallorca), Spain

### 3. Academic qualifications

**2018** PhD in Physics. University of Balearic Islands (Spain). Grade: Outstanding *Cum Laude*.

**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

**2020-2026** PhD co-direction, Jorge Medina, PhD in Physics, University of Balearic Islands, Spain. Grade: Outstanding *Cum Laude*.

**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

**2026** 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, Scientific Reports 16, 297, doi: [10.1038/s41598-025-29520-2](https://doi.org/10.1038/s41598-025-29520-2)

**2026** VanCompernelle, 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 40, e70147, doi: [10.1111/cobi.70147](https://doi.org/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](https://doi.org/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](https://doi.org/10.1038/s41597-025-05551-2)

**2025** Sequeira, A.M.M.<sup>⚭</sup>, Rodríguez, J.P.<sup>⚭</sup>, 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](https://doi.org/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](https://doi.org/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](https://doi.org/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](https://doi.org/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](https://doi.org/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](https://doi.org/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](https://doi.org/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](https://doi.org/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](https://doi.org/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](https://doi.org/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](https://doi.org/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](https://doi.org/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](https://doi.org/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](https://doi.org/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](https://doi.org/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](https://doi.org/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](https://doi.org/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](https://doi.org/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](https://doi.org/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](https://doi.org/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](https://doi.org/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](https://doi.org/10.1038/s41598-017-00165-0)

## 7. Citation Statistics

Number of citations: 877 (Google Scholar)

h-index: 13 (Google Scholar)

## 8. Awards

- 2<sup>nd</sup> 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”. 8<sup>th</sup> 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)