



CURRICULUM VITAE (CVA)

IMPORTANT – The Curriculum Vitae cannot exceed 4 pages. Instructions to fill this document are available in the website.

Part A. PERSONAL INFORMATION

CV date (dd/mm/yyyy) 12/01/2022

First name	Pere		
Family name	Colet Rafecas		
Gender (*)	Male	Birth date (dd/mm/yyyy)	21/04/1964
Social Security, Passport, ID number	77299824K		
e-mail	pere@ifisc.uib-csic.es	URL Web	https://ifisc.uib-csic.es/en/people/pere-colet/
Open Research and Contributor ID (ORCID)(*)	0000-0002-5992-6292		

(*) Mandatory

A.1. Current position

Position	Research Professor (Profesor de Investigación)		
Initial date	21/05/2007		
Institution	Consejo Superior de Investigaciones Científicas		
Departament/Center	Instituto de Física Interdisciplinar y Sistemas Complejos, IFISC		
Country	Spain	Teleph. number	+34 971 173382
Key words	Complex systems, non-linear dynamics, emergent behavior, stochastic processes, chaos, synchronization, pattern formation, lasers, opto-electronic systems, delay systems, human mobility, socio-technical systems, power grid.		

A.2. Previous positions (research activity interruptions, art. 45.2.c))

Period	Position/Institution/Country/Interruption cause
21/06/2005-20/05/2007	Investigador Científico/CSIC/Spain
06/06/1995-20/06/2005	Científico Titular/CSIC/Spain
01/10/1994-05/05/1995	Titular de Univ. Interino/Univ. Illes Balears/Spain
01/04/1994-30/09/1994	Postdoctoral Fulbright fellow/Georgia Institute of Technology/USA.
16/02/1993-30/03/1994	Ayudante de Universidad/Univ. Illes Balears/Spain
01/09/1991-15/02/1993	Postdoctoral Fulbright fellow/Georgia Institute of Technology/USA.
01/01/1988-31/08/1991	PhD fellow MEC-FPI/Univ. Illes Balears/Spain

A.3. Education

PhD, Licensed, Graduate	University/Country	Year
Licenciatura en Física	Universitat de Barcelona	1987
PhD in Physics	Universitat de les Illes Balears	1991

Part B. CV SUMMARY (*max. 5000 characters, including spaces*)

My research, of theoretical and interdisciplinary character, can be framed within the context of statistical and nonlinear physics. I have worked on several topics including fluctuations in nonlinear optical systems, switch-on time in lasers, synchronization of nonlinear oscillators, delay feedback effects on lasers and optoelectronic systems, encoded communications based on chaotic lasers, coherence in laser arrays, instabilities in extended systems, pattern formation, quantum fluctuations in optical patterns, noise-sustained structures, front dynamics, localized structures, use of dissipative solitons for information processing, generation of high spectral purity microwaves with opto-electronic oscillators, coupled systems with multiple delays and systems with state-dependent delay.

My recent work, in the context of socio-technical systems, focuses on the analysis of human mobility and of power grid frequency fluctuations. In the first topic he has worked on a field theory for the recurrent mobility in cities (Nat. Comm. **10**, 2895) and in the analysis of migrants flows using on-line social networks data (PLoS One, **15**, e0230264). In the second topic he has worked on the effect of dynamic demand control on power grid frequency fluctuations (Phys. Rev. E **96**, 022302; Int. J. Elec. Power & Energy Sys, **108**, 145), effect of secondary control on stability (New J. Physics **20**, 083005) and resilience to blackouts (Chaos **30**, 113121, IEEE Access **9**, 132663).

The most cited of the topics I have worked is that of encoded communications using chaotic lasers. A first proposal was using a model for solid state lasers (Opt. Lett. **19**, 2056; 309 cites WoS). Later we theoretically demonstrated that can be done with semiconductor lasers (Phot. Tech. Lett. **8**, 299; 329 cites). These articles inspired theoretical and experimental groups and lead to the European project OCCULT of which he was PI for CSIC and responsible of modeling, and which resulted in a field test (Nature **438**, 343; 1158 cites).

My work involves the development of models, the use of analytical methods, numerical simulations and data analysis. On the analytical side, a very relevant work was the proof the relation between the prototypical Kuramoto model for coupled nonlinear oscillators with a physical system (a Josephson Junction array) (Phys. Rev. Lett. **76**, 404). I have also analyzed the coherence in coupled lasers (Phys. Rev. A **47**, 4287), quantum correlations and synchronization (Phys. Rev. A **85**, 052101), path integral formulation for stochastic processes (Phys. Rev. A **40**, 7312), noise sustained structures in optical cavities (Phys. Rev. Lett. **79**, 3633) and bifurcation diagrams for localized structures using spatial dynamics (Phys. Rev. E **89**, 012914). On the computational side I have used extensive numerical simulations of delay differential equations, stochastic differential equations or partial differential equations. Works on these aspects include pioneering characterization of hyperchaos in optoelectronic systems with nonlinear feedback (J. Quantum Elect. **41**, 541) and chaotic breathers (Phys. Rev. Lett. **95**, 203903). Resulting from a combination of numerical and analytical techniques, we have analyzed the stability of spatial patterns and localized structures using semi-analytical techniques and continuation methods (JOSA B **19**, 747; Phys. Rev. Lett. **94**, 063905; Phys. Rev. E **58**, 2992). Finally on the data side, we have analyzed Twitter geolocated data for road traffic (PLoS One, **9**, e105407) and, as indicated before, for migrant flows (PLoS One, **15**, e0230264).

Altogether I have 118 articles in journals indexed in the first quartile of JCR and a total of 6455 citations (6033 excluding self-citations) according to WoS with an h-index of 38.

According to google scholar <https://scholar.google.es/citations?user=7BD0a9YAAAAJ&hl=en> my articles have 9083 citations with h-index 49 and i10-index 112. Since 2017: 2408 citations, h-index 23 and i-10 index 46.

I have also coauthored a book on stochastic numerical methods oriented to Master students and researchers.

Currently I'm principal investigator of the European project VPP4ISLANDS, Virtual Power Plant for Interoperable and Smart isLANDS. Previously I have been principal investigator in two European projects and three national projects and I have participated as researcher in 11 European projects and 14 national projects.

I have advised or co-advised 9 PhD thesis and I'm currently advising another one.

Part C. RELEVANT MERITS (sorted by typology)

C.1. Publications. Selected articles in the last 10 years (Max. 10):

B.A. Carreras, E.B. Tchawou Tchuisseu, J. M. Reynolds-Barredo, D. Gomila, P. Colet, *Effects of demand control on the complex dynamics of electric power system blackout*, *Chaos* **30**, 113121 (2020).

Y.K. Chembo, A. Coillet, G. Lin, P. Colet, D. Gomila, *Fluctuations and correlations in Kerr optical frequency combs with additive Gaussian noise*, *Chaos* **30**, 083146 (2020).

M. Mazzoli, B. Diechtiareff, A. Tugores, W. Wives, N. Adler, *Migrant mobility flows characterized with digital data*, *Plos One*, **15**, e0230264 (2020).

M. Mazzoli, A. Molas, A. Bassolas, M. Lenormand, P. Colet, J.J. Ramasco, *Field theory for recurrent mobility*, *Nature Communications*, **10**, 3895 (2019).

E.B. Tchawou Tchuisseu, D. Gomila, P. Colet, *Reduction of power grid fluctuations by communication between smart devices*, *Int. J. Electrical Power Energy Sys.* **108**, 145 (2019).

E.B. Tchawou Tchuisseu, D. Gomila, P. Colet, D. Witthaut, M. Time, B. Schäfer, *Curing Braess' Paradox by Secondary Control in Power Grids*, *New J. Physics* **20**, 083005 (2018).

E.B. Tchawou Tchuisseu, D. Gomila, D. Brunner, P. Colet, *Effects of dynamic-demand-control appliances on the power grid frequency*, *Phys. Rev. E* **96**, 022302 (2017).

E.D. Dongmo, P. Colet, P. Wofo, *Power grid enhanced resilience using proportional and derivative control with delayed feedback*, *European Physical J. B* **90**, 6 (2017).

J. Martínez-Llinàs, X. Porte, M.C. Soriano, P. Colet, I. Fischer, *Dynamical properties induced by state-dependent delays in photonic systems*, *Nature Communications*, **6**, 8425 (2015).

M. Lenormand, A. Tugores, P. Colet, J.J. Ramasco, *Tweets on the road*, *PLoS ONE*, **9**, e105407 (2014).

C.2. Congress. Selected invited talks in last 10 years (Max. 10):

Resilience and efficiency of the power grid with high penetration of renewable energy sources: The Balearic Islands as a case study, Minisymposia on Control of Power Grids, PhysCon 2021, online, 4-8/10/2021.

Power grid frequency fluctuations in scenarios of large penetration of renewables, Workshop on Complexity in Power Grids - From Science to Practice, Potsdam, Germany 28-30/9/2021.

Effects of high penetration of renewables in power grid synchronization and frequency fluctuations, Topical Problems in Nonlinear Wave Physics NWP-2021, Nizhny-Novgorod, Russia, and online, 19-22/9/2021.

Data analysis of frequency fluctuations in the Balearic grid before and after coal closure, special track Modeling Dynamics of Power Grids in Energy 2021, online, 30/5-3/6 2021.

Effects of fluctuations and demand control on the complex dynamics of electric power system blackouts, Satellite on Complexity in Energy Systems, CCS2020, online, 9-10/12 (2020).

Power grid frequency fluctuations and smart devices with dynamic demand control, Minisymposium on Structure and dynamics of future power grids, Dynamic Days Europe 2019, Rostock, Germany, 2-6/9/2019.

Synchronization of nonlinear oscillators, Winter Workshop on Complex Systems, WWCS2019, Zakopane, Poland 4-8/2/2019.

Frequency Combs Shaped by Eckhaus Instabilities, Femto-ST Institute workshop, Besançon, France, 23/11/2017.

Collective firing induced by noise or diversity in coupled excitable systems and detuning induced synchrony in multilayer coupled nonlinear oscillators, Dynamics of Coupled Oscillators. 40 years of the Kuramoto Model, Dresden, Germany, 27-31/6/2015.

Oscillatory and excitable dynamics of dissipative solitons in optical cavities, Minisymposium on Nonlinear Dynamics in Lasers, Dynamic Days Europe 2013, Madrid, 3-7/6/2013.

C.3. Research projects. Selected projects granted in last 10 years (Max. 10):

P.I. of VPP4ISLANDS, Virtual Power Plant for Interoperable and Smart isLANDS, European project Horizon 2020. 1/11/2020-30/10/2024. Budget IFISC: 309.902 €.

Coordinator of COOPB20476, Reinforcement of research and training on power grid instability control, Program i-COOP. CSIC. 1/01/2020-31/12/2021. Budget: 22.308 €.

Coordinator of EsoTECoS, also PI of sub-project 1, Emergent Social, Technical and Ecological Complex Systems, (FIS2015-62628-C2). Prog. Estatal I+D+I Orientada a los Retos de la Sociedad. Funded by Agencia Estatal de Investigación. 1/1/2016–31/12/2018. Budget sub-project 1: 187.500 €.

Researcher responsible for CSIC of INSIGHT, Innovative Policy Modeling and Governance Tools for Sustainable Post-Crisis Urban Development (FP7-ICT-2013-10-611307), STREP funded by EU. PI of Joint Research Unit UIB-CSIC: J.J. Ramasco. 1/10/2013-30/09/2016. Budget IFISC-CSIC: 80.530 €.

Researcher responsible for CSIC of EUNOIA, Evolutive User-centric Networks for Intraurban Accessibility (FP7-ICT-2011-8-318367), STREP funded by EU. Coordinator: M. San Miguel. 1/10/2012-30/09/2014. Budget IFISC (UIB-CSIC): 493.757 €.

Researcher of INTENSE@COSYP, *Complex Systems Physics: Information, Technology, Society and Ecology* (FIS2012-30634), Plan Nacional. Ministerio de Economía y Competitividad. PI: M. San Miguel. 1/1/2013 -31/12/2015. Budget: 515.460 €

Researcher of TRIPHOP, *Hacia un procesamiento de información eficiente utilizando un dispositivo neuro-inspirado* (TEC2012-36335). Plan Nacional. Ministerio de Economía y Competitividad. PI. Fischer. 1/1/2013-31/12/2015. Budget: 287.980 €

Researcher of PACSS, Physics approach to Complexity in Socio-Technical Systems (RTI2018-093732-B-C22), Programa Estatal I+D+I Orientada a los Retos de la Sociedad. Funded by Agencia Estatal de Investigación. 1/1/2019–31/12/2021. IP subproject 2: J.J. Ramasco. Budget sub-project 2: 133.100€.

Researcher of NouLloguer, Influence of new models of vacation renting on residential housing: ICT Data economic analysis (PED2018/43). Ajuts Especials a la Recerca, Govern de les Illes Balears. PI IFISC: J.J. Ramasco. 1/7/2020-30/6/2023. Budget IFISC: 60.670 €.

Researcher of MOREHOUSE, Modeling hOusing maRkets dynamics thanks to Emerging and HeterOgeneoUs data SourcEs. PICS project (CNRS-CSIC). PI for IFISC: J.J. Ramasco. 1/05/2019-31/12/2021. Budget: 20.000 €.