

# Carlos Granero Belinchón

*PhD in Physics and Signal Processing  
from ENS de Lyon*

Nationality: Spanish  
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## Employment

- 01/08/2020 - **Associate professor (PhD)**, *IMT-Atlantique, Signal and Communications department, Lab-STICC, nowadays research group Ocean Signal and Environment, Brest.*
- 01/11/2018 - **Postdoctoral researcher (PhD)**, *ONERA: The french aerospace lab, Département Optique et Techniques Associées (DOTA), Toulouse.*

## Education

- 2015 - 2018 **Ph.D in physics and signal processing: Multiscale Information Transfer in Turbulence**, *Laboratoire de Physique de l'École Normale Supérieure de Lyon (ENS de Lyon), École doctorale Phast, Advisor: Stéphane G. Roux.*
- 2014 - 2015 **M2.Sc. in fundamental physics "Optics, Matter, Plasma: plasmas from space to laboratory"**, *Université Pierre et Marie Curie (Paris VI), Université Paris-Sud (Paris XI) et École Polytechnique.*
- 2010 - 2014 **Bachelor in physics**, *Universidad Autónoma de Madrid.*

## Projects

- 2021-2024 **ANR Project SCALES**, *Statistical Characterization of multi-scale complex Systems with information theory, P.I: C. Granero Belinchon.*

## Teaching

- 2015-2018 **École Normale Supérieure de Lyon**, *Fluid Physics and Signal Processing.*
- 2019-2020 **ISAE-SUPAERO: Institut Supérieur de l'Aéronautique et de l'Espace**, *Applied Mathematics and Signal processing.*
- 2020-2021 **IMT Atlantique: École Mines-Télécom Bretagne-Pays de la Loire**, *Probability and Statistics ; Analysis, Signal processing and Automation ; Equations for physics of transfert ; Introduction to machine Learning ; Big data and cloud computing for oceanography.*

## Supervision

- 2021-2024 **Daria Botvynko**, *PhD co-supervision: Deep Learning Representations for Lagrangian Dynamics at sea surface, IMT Atlantique, Mercator Ocean Toulouse, ENIB.*
- 2022-2025 **Ewen Frogé**, *PhD co-supervision: Characterization of causality relationships between the scales of turbulence, IMT Atlantique, ENS de Lyon.*

## Administration

- 07/2016 **Contribution to the Statphys26 conference organisation**, *Lyon.*
- 06/2023 **Organisation of Brest workshop on Environmental Physics and Signal Processing (EPSP 2023)**, *Brest.*

# Scientific production

- 15 publications in international peer-reviewed journals.
- 15 publications in conferences with peer-reviewed proceedings.
- 3 talks in schools and workshops.

## 1 Scientific publications

### Image processing applications to remote sensing

- 1 Pierre-Etienne Brilouet, Dominique Bouniol, Fleur Couvreur, Alex Ayet, **Carlos Granero-Belinchon**, Marie Lothon and Alexis Mouche *Trade Wind Boundary Layer Turbulence and Shallow Precipitating Convection: New Insights Combining SAR Images, Satellite Brightness Temperature, and Airborne In Situ Measurements*, **Geophysical Research Letters**, **50** (2023), e2022GL102180 (I.F. 4.72)(<https://doi.org/10.1029/2022GL102180>).
- 2 **Carlos Granero-Belinchon**, Stéphane G. Roux, Nicolas B. Garnier, Pierre Tandeo, Bertrand Chapron and Alexis Mouche *Two-dimensional structure functions for characterizing convective rolls in the marine atmospheric boundary layer from Sentinel-1 SAR images*, **Remote Sensing Letters**, **13** (2022), 946–957 (I.F. 2.369)(<https://doi.org/10.1080/2150704X.2022.2112107>).
- 3 Aurélie Michel, **Carlos Granero-Belinchon**, Charlène Cassante, Paul Boitard, Xavier Briottet, Karine Adeline, Laurent Poutier, and José A. Sobrino *A New Material-Oriented TES for Land Surface Temperature and SUHI Retrieval in Urban Areas: Case Study over Madrid in the Framework of the Future TRISHNA Mission*, **Remote Sensing**, **13**(11) (2021), 5139 (I.F. 4.118) (<https://doi.org/10.3390/rs13245139>).
- 4 **Carlos Granero-Belinchon**, Karine Adeline, Xavier Briottet, *Impact of the number of dates and their sampling on a NDVI time series reconstruction methodology to monitor urban trees with Vens satellite*, **International Journal of Applied Earth Observation and Geoinformation**, **95** (2021), 102257 (I.F. 4.650)(<https://doi.org/10.1016/j.jag.2020.102257>).
- 5 **Carlos Granero-Belinchon**, Aurélie Michel, Veronique Achard, Xavier Briottet, *Spectral unmixing for thermal infrared multi-spectral airborne imagery over urban environments: day and night synergy*, **Remote Sensing**, **12**(11) (2020), 1871 (I.F. 4.118)(<https://doi.org/10.3390/rs12111871>).
- 6 **Carlos Granero-Belinchon**, Karine Adeline, Aude Lemonsu, Xavier Briottet, *Phenological dynamics characterization of alignment trees with Sentinel-2 imagery: A vegetation indices time series reconstruction methodology adapted to urban areas*, **Remote Sensing**, **12**(4) (2020), 639 (I.F. 4.118)(<https://doi.org/10.3390/rs12040639>).
- 7 **Carlos Granero-Belinchon**, Aurélie Michel, Jean-Pierre Lagouarde, Jose Sobrino, Xavier Briottet, *Multi-resolution study of thermal unmixing techniques over Madrid urban area: case study of TRISHNA mission*, **Remote Sensing**, **11**(10) (2019), 1251 (I.F. 4.118)(<https://www.mdpi.com/2072-4292/11/10/1251>).
- 8 **Carlos Granero-Belinchon**, Aurélie Michel, Jean-Pierre Lagouarde, Jose Sobrino, Xavier Briottet, *Night thermal unmixing for the study of microscale Surface Urban Heat Islands with TRISHNA-like data*, **Remote Sensing**, **11**(12) (2019), 1449 (I.F. 4.118)(<https://www.mdpi.com/2072-4292/11/12/1449>).

### Information theory to study complex systems

- 9 **Carlos Granero-Belinchon**, Stéphane G. Roux, Nicolas B. Garnier, *Quantifying non-stationarity with Information Theory*, **Entropy**, **23**(12), 1609 (2021) (I.F. 2.738) (<https://www.mdpi.com/1099-4300/23/12/1609>).
- 10 **Carlos Granero-Belinchon**, Stéphane G. Roux, Nicolas B. Garnier, *Information theory for non-stationary processes with stationary increments*, **Entropy**, **21**(12), 1223 (2019) (I.F. 2.419) (<https://doi.org/10.3390/e21121223>).

- 11 **Carlos Granero-Belinchon**, Stéphane G. Roux, Patrice Abry, Nicolas B. Garnier, *Probing high order dependencies with information theory*, **IEEE Transactions on Signals Processing**, **67(14)**, **3796-3805 (2019)** (I.F. 4.203) (<https://ieeexplore.ieee.org/document/8727943>).
- 12 **Carlos Granero-Belinchon**, Stéphane G. Roux, Nicolas B. Garnier, *Kullback-Leibler divergence measure of intermittency: application to turbulence*, **Physical Review E**, **97 (2018)**, **013107** (I.F. 2.284) (<https://journals.aps.org/pre/abstract/10.1103/PhysRevE.97.013107>).
- 13 **Carlos Granero-Belinchon**, Stéphane G. Roux, Patrice Abry, Muriel Doret, Nicolas B. Garnier, *Information Theory to probe Intrapartum fetal Heart Rate Dynamics*, **Entropy**, **19(12)**, **640 (2017)** (I.F. 2.305) (<http://www.mdpi.com/1099-4300/19/12/640>).
- 14 **Carlos Granero-Belinchon**, Stéphane G. Roux, Nicolas B. Garnier, *Scaling of information in turbulence*, **EPL (Europhysics letter)**, **115 (2016)**, **58003** (I.F. 1.957) (<http://dx.doi.org/10.1209/0295-5075/115/58003>).

## Materials of interest in renewable energy

- 15 M. Barawi, **C. Granero**, P. Díaz-Chao, C. V. Manzano, M. Martín-González, D. Jiménez-Rey, I. J. Ferrer, J. R. Ares, J. F. Fernández, C. Sánchez, *Thermal decomposition of non-catalysed MgH<sub>2</sub> films*, **International Journal of Hydrogen Energy**, **39 (2014)**, **9865-9870** (I.F. 3.313) (<http://dx.doi.org/10.1016/j.ijhydene.2014.01.030>).

## 2 Communications in Congresses

### Image processing applications to remote sensing

- 1 D. Botvynko (speaker), C. Granero-Belinchon, S. Van Gennip, A. Benzinou and R. Fablet, *Deep learning for Lagrangian drift simulation at the sea surface*, **Accepted in IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP)**, 4-10 June 2023, Rhodes island, Greece.
- 2 B. M. Nguyen, G. Tian, M.-T. Vo, A. Michel, T. Corpetti and C. Granero-Belinchon (speaker), *Convolutional Neural Network Modelling for MODIS Land Surface Temperature Super-Resolution*, **30th European Signal Processing Conference (EUSIPCO)**, 29 August-02 September 2022, Belgrade, Serbia, pp. 1806-1810, Oral.
- 3 P.-E. Brilouet (speaker), D. Bouniol, F. Couvreur, A. Ayet, C. Granero-Belinchon, M. Lothon and A. Mouche, *Combining satellite and in situ data to investigate the marine atmospheric boundary-layer structure and trade-wind cumuli organization*, **EGU General Assembly**, 23-27 May 2022, Vienna, Austria, EGU22-10489, Oral.
- 4 S. Rama, J. Michel (speaker), V. Rivalland, A. Michel and C. Granero-Belinchon, *Assessing the usefulness of Land Surface Temperature spatial disaggregation for water stress mapping in the frame of the preparation of the Trishna mission*, **'6th International Symposium on Recent Advances in Quantitative Remote Sensing: RAQRSVI'**, 21-25 September 2022, Valencia, Spain, Poster.
- 5 C. Granero-Belinchon, X. Briottet (speaker), A. Michel, L. Roupioz, J.-P. Lagouarde and J. Sobrino, *Recent results in the estimation of urban land surface temperature for TRISHNA mission*, **'6th International Symposium on Recent Advances in Quantitative Remote Sensing: RAQRSVI'**, 21-25 September 2022, Valencia, Spain, Oral.
- 6 A. Michel (speaker), C. Granero-Belinchon and X. Briottet, *Mapping of urban land surface temperatures by the future THRISHNA mission: Focus on inversion and sharpening methods*, **EARSEL Joint Workshop Urban Remote Sensing**, 30 Mars - 01 April 2021, Liege, Belgium, Oral.
- 7 L. Roupioz (speaker), A. Michel, C. Granero-Belinchon and X. Briottet, *Current and future challenges in land surface temperature estimation over urban areas from upcoming high-resolution TIR satellite missions*, **Living Planet Symposium**, 13-17 May 2019, Milan, Italy, Oral.
- 8 A. Michel, L. Roupioz, C. Granero-Belinchon, J.-P. Lagouarde, J.A. Sobrino and X. Briottet (speaker), *Land Surface Temperature retrieval over urban areas from simulated TRISHNA data*, **JURSE**, 22-24 May 2019, Vannes, France, Oral, <https://ieeexplore.ieee.org/document/8808979>.

### Information theory to study complex systems

- 9 C. Granero-Belinchon (speaker), S.G. Roux, N.B. Garnier, *Kullback-Leibler divergence measure of intermittency: application to turbulence*, **Entropy 2018**, Topic S6: Entropy in action (applications), 14-16 May 2018, Barcelone, Spain, Oral.
- 10 C. Granero-Belinchon, S.G. Roux (speaker), N.B. Garnier, *Un estimateur du taux d'entropie basé sur l'Information Mutuelle*, **Gretsi 2017**, Topic 1.3: Parcimonie et graphes, 05-08 September 2017, Nice, France, Poster.

- 11 C. Granero-Belinchón, S.G. Roux, N.B. Garnier, P. Abry (speaker), M. Doret, *Mutual Information for Intrapartum fetal Heart Rate Analysis*, **EMBC17**, Topic 1: Biomedical Signal Processing, 11-15 July 2017, JeJu Island, South Korea, Oral, <https://ieeexplore.ieee.org/document/8037247>.
- 12 C. Granero-Belinchón (speaker), S.G. Roux, N.B. Garnier, *Information scaling in fully developed turbulence*, **StatPhys26**, Topic 7: Nonlinear Physics, 18-20 July 2016, Lyon, France, Oral.

### Materials of interest in renewable energy

- 13 C. Granero, C.V. Manzano, M. Martín-González, D. Jiménez-Rey, S. Yoda, M. Barawi, J. R. Ares (speaker), I. J. Ferrer, J. F. Fernández y C. Sánchez, *Descomposición de láminas delgadas de hidruro de magnesio sin catalizador*, **Bienal XXIV R.S.E.F**, 15-19 Juillet 2013, Valencia, Spain, Oral.
- 14 M. Barawi (speaker), C. Granero, C. V. Manzano, M. Martín-González, D. Jiménez-Rey, S. Yoda, J. R. Ares, I. J. Ferrer, J. F. Fernández and C. Sánchez, *Decomposition of magnesium hydride thin films without catalyst*, **EMRS-Fall meeting**, Symposium C: Nanostructured materials for solid state hydrogen storage, 16-20 September 2013, Warsaw, Poland, Poster.
- 15 J. F. Fernández (speaker), M. Ooro, C. Granero, D. Jiménez-Rey, A. Muñoz-Martín, J. R. Ares, I. J. Ferrer and C. Sánchez, *Mg-Ti thin films as a play ground for Hydrogen absorption/desorption kinetic studies*, **EMRS-Fall meeting**, Symposium C: Nanostructured materials for solid state hydrogen storage, 16-20 September 2013, Warsaw, Poland, Oral.

### Communications in workshops and schools

- 1 C. Granero-Belinchón (speaker), S.G. Roux, N.B. Garnier, *What is the meaning of transfer entropy measures?*, **VII GEFENOL Summer School on Statistical Physics of Complex Systems**, 19-30 Juin 2017, Palma de Mallorca, Spain, Oral.
- 2 C. Granero-Belinchón (speaker), S.G. Roux, N.B. Garnier, *What is the meaning of transfer entropy measures?*, **VII GEFENOL Summer School on Statistical Physics of Complex Systems**, 19-30 Juin 2017, Palma de Mallorca, Spain, Poster.
- 3 C. Granero-Belinchón (speaker), S.G. Roux, N.B. Garnier, *Multiscale information transfer in turbulence*, **Mediterranean School and Workshop of Complex Networks**, 28 Août-3 Septembre 2016, Sicily, Italy, Oral.