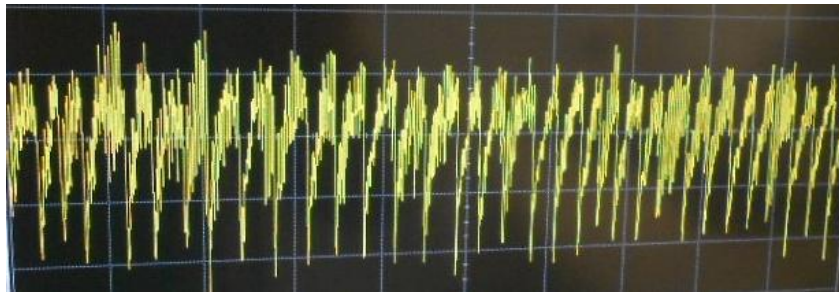
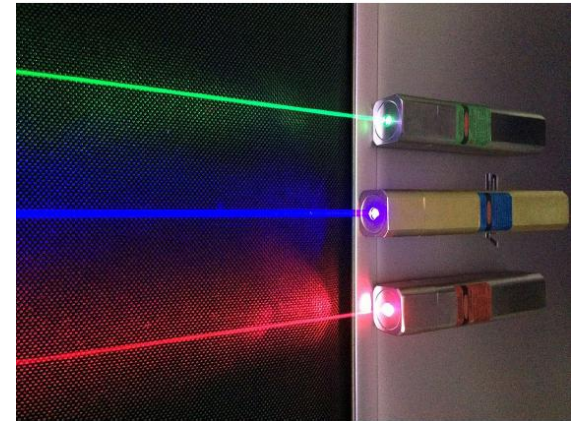


What are we doing and why?

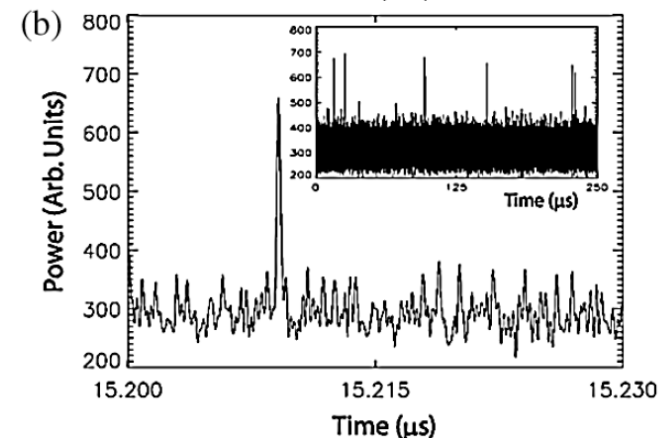
- We study nonlinear phenomena and complex behavior in various physical systems.
- For example, we are investigating extreme fluctuations in semiconductor lasers.
- Why? Potential results: a better understanding of the mechanisms that trigger laser instabilities could lead to more robust and reliable laser systems.



Optical spikes



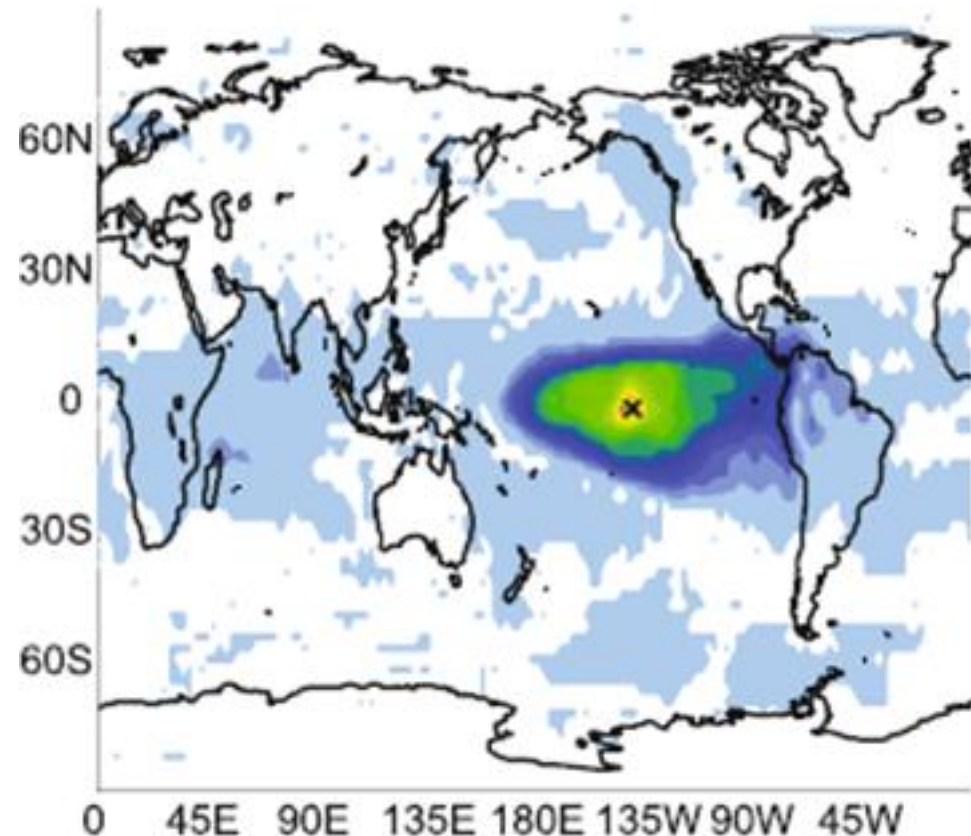
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Extreme optical pulses (rogue waves)

What are we doing and why?

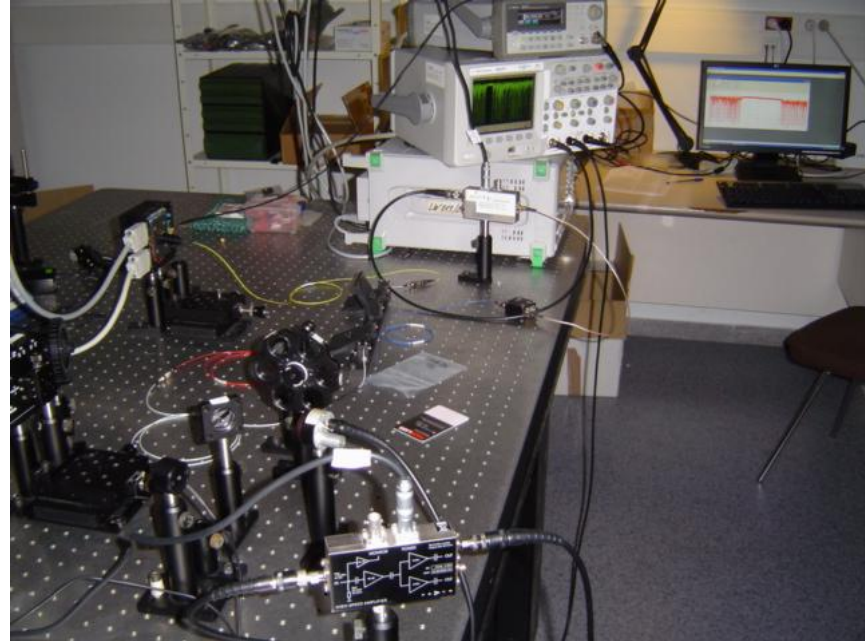
- Another research line is focused on the statistical analysis of climatological data.
- Potential results: developing advanced tools of data analysis could improve climate predictions.



Teleconnections of El Niño region

Why doing an internship with us?

- You will learn to work with sophisticated lab equipment and data analysis tools
- You will gain programming skills (C, Fortran, matlab)
- You will learn to apply engineering techniques to advance science, and you will contribute to solve real-world problems with socio-economic impact.



You will work with an international and multicultural team of young researchers



PhD thesis A. Aragoneses (june 2014)



PhD thesis L. Maygite (july 2014)



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Example: research done by two visiting undergrad students from India



Jatin Ahuja



Dhananjay Bhiku

- 3 months internship in 2014 to study control of extreme optical pulses

Rogue waves in injected semiconductor lasers with current modulation: role of the modulation phase

Jatin Ahuja,^{1,2} Dhananjay Bhiku Nalawade,^{1,2} Jordi Zamora-Munt,¹ Ramon Vilaseca¹ and Cristina Masoller^{1,*}

¹ *Departament de Física i Enginyeria Nuclear, Universitat Politècnica de Catalunya, Colom 11, 08222 Terrassa, Barcelona, Spain*

² *Indian Institute of Technology Guwahati, Guwahati, Assam, India*

- Example: Nicolas Rubido (graduate student at the University of Aberdeen, United Kingdom) visited our group in 2014 to develop a new method for detecting interacting units in a complex network.

New Journal of Physics

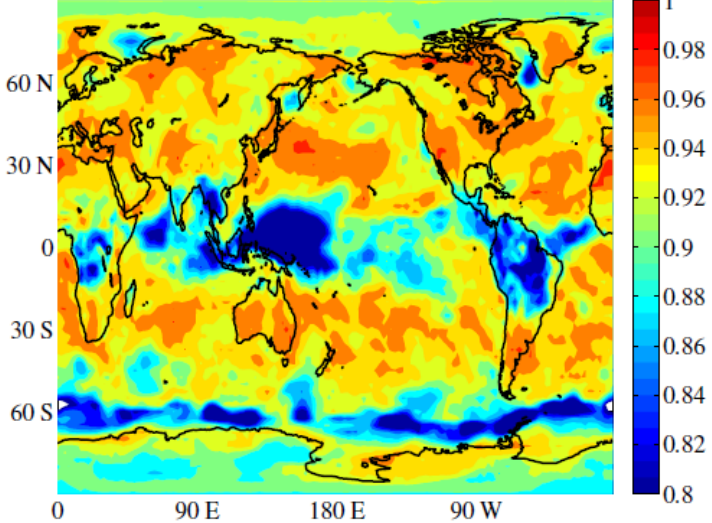
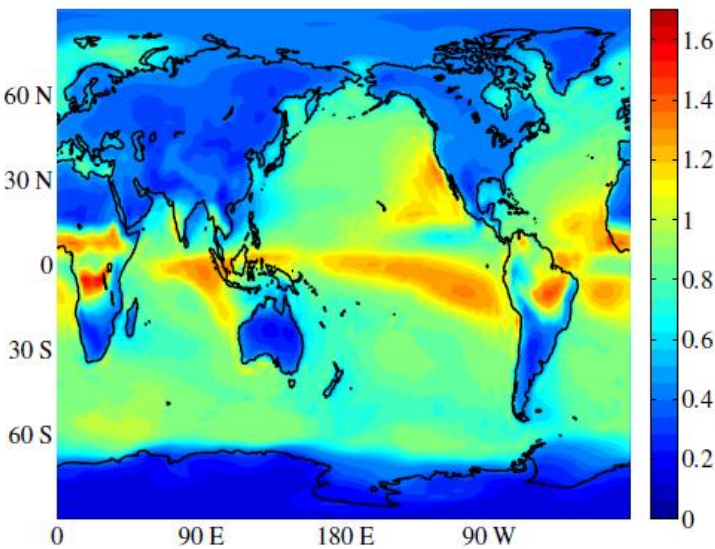
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Exact detection of direct links in networks of interacting dynamical units

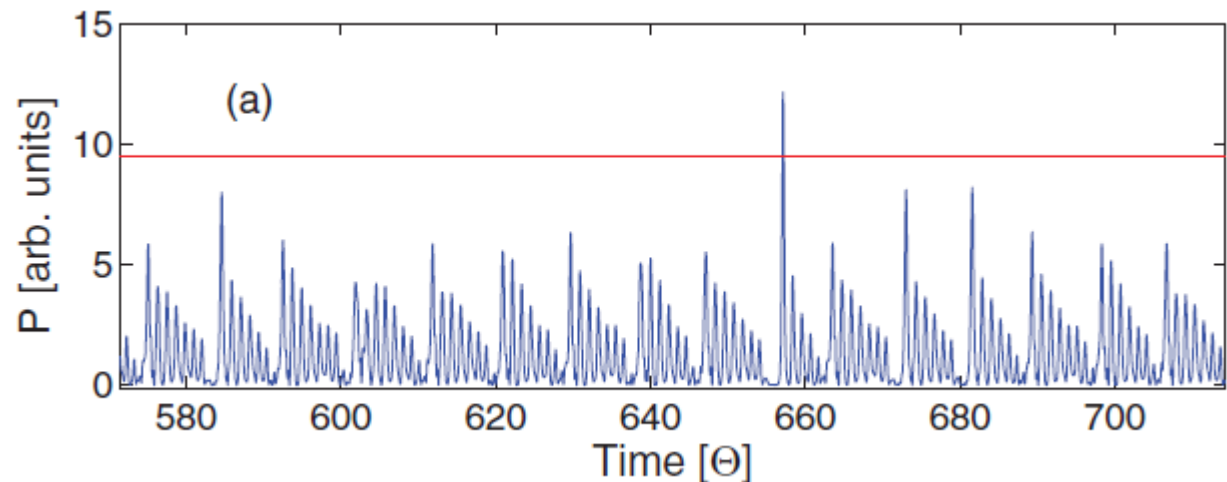
Nicolás Rubido^{1,2}, Arturo C Martí², Ezequiel Bianco-Martínez¹, Celso Grebogi¹, Murilo S Baptista¹ and Cristina Masoller³

- Example: Fernando Arismendi (graduate student at the Universidad de la República, Uruguay) did a 3 months internship in 2013 to identify the regions of Earth with highest nonlinearity and stochasticity



- Example: Jose M. Aparicio Reinoso (graduate student at UNED): did a 3 months internship in 2012 to study extreme pulses in external-cavity semiconductor lasers.

Article published in *Physical Review E* 87, 062913, 2013.



Pre-requisites?

- No previous knowledge of optics, lasers, programming or data analysis tools is required.
- Basic undergraduate knowledge of physics (electromagnetic waves) and mathematics (ordinary differential equations, basic statistics) is required.



More info?

- Don't hesitate to ask:

Cristina.masoller@upc.edu



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