Emanuel Vicente Chimanski

Chimanski, E. V.; Emanuel V. Chimanski; E. V. Chimanski

Ph.D. Student

Education

2015–present **Ph.D. in progress in Science (Physics)**, *Aeronautics Institute of Technology – ITA*, Preliminary Thesis: Chaos in quantum systems, Advisor: Prof. Dr. Brett V. Carlson.

2013–2015 **Master in Science (Physics)**, *Aeronautics Institute of Technology – ITA*, Thesis: Route to hyperchaos in Rayleigh-Bénard convection, Advisor: Prof. Dr. Erico L. Rempel, Co-advisor: Dr. Roman Chertovskih.

2009–2013 **Licentiate degree in Physics**, *Universidade Estadual do Centro Oeste – UNICENTRO*, Thesis: Estatística de níveis em bilhares quânticos, Advisor: Prof. Dr. Eduardo Vicentini.

Complentary Education

2009–2015 **English Course**, *Wizard Brasil*.

Masters Thesis

Title *Route to hyperchaos in Rayleigh-Bénard convection*

Advisor Prof. Dr. Erico L. Rempel

Co-advisor Dr. Roman Chertovskih

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Description The route to hyperchaos is studied by direct numerical simulation of Rayleigh-Bénard convection in the Boussinesq approximation. The fluid is confined between two planes in a square periodicity cell and convective attractors are obtained for the Rayleigh number varying from 1760 to 2500, for which the hyperchaotic regime emerges; all other parameters of the system are fixed. The temperature of the upper and bottom planes are held constant and the horizontal boundaries are stress-free and isothermal. In the range of parameter considered, 9 convective attractors were found. The three largest Lyapunov exponents were computed in order to characterize all the attractors. For this, two different numerical methods were employed, one considering hypervolumes deformation (standard method) and the other the linearized system of equations (linearization method). Both numerical methods used to compute Lyapunov exponents produce similar results. While the linearization one can be applied to spatially extended systems with no dimension limit the standard is faster but restricted to low dimension dynamical systems. There is coexistence of attractors in almost all range of the parameter and intermittency is found before the hyperchaotic regime. The results suggest that the hyperchaotic attractor is created in a crisis involving an chaotic attractor and a hyperchaotic saddle. This work, is the first study of transition from periodicity to hyperchaos in three-dimensional Rayleigh-Bénard convection, an important step in understanding the onset of turbulence.

Languages

Portuguese **native**

English **writing: good, reading: good, speaking: good**

Computer skills

Operational system.

- GNU/Linux.

Programming.

- FORTRAN90, GNU Octave, LaTeX.

Research experience

2013–present **Aeronautics Institute of Technology – ITA**, *Chaos, nonlinear dynamics, mathematical modelling, bifurcation analysis, quantum chaos, quantum billiards, dynamical systems, nuclear physics*.

2011–2013 **Universidade Estadual do Centro Oeste – UNICENTRO**, *Quantum chaos and quantum billiards*.

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Teaching experience

2012 **Fundamental Physics I**, *Assistant teacher under supervision of Prof. Dr. Ricardo Yoshimitsu Miyahara, Universidade Estadual do Centro Oeste – UNICENTRO.*

Publications

Jornal Articles - In preparation.

- J. H. Alvarenga Nogueira, E. V. Chimanski. Two and three body problems for bound states with singular potential.

Jornal Articles.

- R. Chertovskih, E. V. Chimanski and E. L. Rempel. Route to hyperchaos in Rayleigh-Bénard convection, *EPL*, **112** (2015) 14001.
- Emanuel V. Chimanski, Erico L. Rempel, Roman Chertovskih. On-off intermittency and spatiotemporal chaos in three-dimensional Rayleigh-Bénard convection, *Advances in Space Research*, **57** (2016), 1440-1447.

Others

Scientific Societies.

- Brazilian society of Physics

Conferences, schools, meetings and workshops.

- National Meeting of Statistical Physics†, 2015.
- Tenth Latin American Conference on Space Geophysics†, 2014.
- Brazilian National Meeting on Condensed Matter Physics†, 2012.
- Physics meeting†, 2011.

† **Talk and poster contributions**.

- Leaking square quantum billiards.
- Route to hyperchaos in Rayleigh-Bénard convection.
- Influence of obtuse and acute angles in statistic of energy levels of quantum polygonals billiards.
- Energy levels statistics in quantum obtuse triangular billiards.

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