Research

Dynamical Systems Seminar Seminar

The dynamics of interacting magnetic particles

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14:15
Place: https://tinyurl.com/y5qak6wl
(MS Teams Videoconference)

Abstract. In this seminar, we will discuss some results of an ongoing work that aims to understand the dynamics of the interaction of magnetic particles at a macroscopic level. In addition to the pure understanding of the underlying physical phenomena involved, the ultimate goal of this ongoing work is to understand the consequences of the interaction of the magnetic particles on the macroscopic dynamical properties of assemblies of many magnetic particles.

This seminar is divided in two parts: in the first part, we will discuss the mathematical model of the interaction of two magnetic particles placed at fixed positions, but that are free to rotate under the effect of the magnetic field of the neighbouring particle and under the effect of an external magnetic field. In the second part, we will study the aggregation patterns that we observe in systems composed of two and three magnetic particles that interact magnetically and that are free to move and to rotate. In the case of two particles, we will briefly discuss and additional case in which there is an intersticial fluid in which the particles move.

Several concepts broadly used in the theory of dynamical systems, such as bifurcation diagrams, phase planes and Poincaré sections, will be used as tools to characterise the dynamics of the interacting magnetic particles.

References

[1] Cunha, F.R., Gontijo, R.G., Sobral, Y.D.: *Symmetry breaking of particle trajectories due to magnetic interactions in a dilute suspension*, Journal of Magnetism and Magnetic Materials, **326** 240-250, 2013.

[2] Santos, C.H.M.: *Dinâmica e estabilidade da interação de dois dipolos magnéticos*, Dissertação de Mestrado, Departamento de Matemática, UnB, 2019.

[3] Modesto, J.A.C, Cunha, F.R., Sobral, Y.D.: *Aggregation patterns in systems composed of few magnetic particles*, J. of Magn. and Magn. Mat. , **512**, 166664, 2020.

More info at the WhatsApp group of the Dynamical Systems Seminar Seminar:
https://chat.whatsapp.com/HbF8Gf4Vz05FP32oI8lxoJ