Modelação Matemática de Fenómenos de Aglomeração.

11 de julho 17h00-18h30

Jorge Tiago
José Luís da Silva
Hugo G. Silva

12 de julho, 11h00-12h30

Michael Grinfeld
Jean-Paul Chehab
Nabil Bedjaoui
Mohammed Guedda

Jorge Tiago, CEMAT, IST, Universidade de Lisboa.

Título: Modelo matemático para o crescimento de uma placa de aterosclerose.

Resumo: A aterosclerose é uma doença inflamatória que afecta especialmente o sistema arterial. Resulta de uma acumulação de factores bioquímicos e biomecânicos que podem levar a um estado patológico de elevado risco para o paciente. Entre os principais riscos encontram-se o estreitamente excessivo do vaso sanguíneo bem como a ruptura da placa com subsequente obstrução dos vasos a jusante. A compreensão deste processo através de um modelo matemático pode permitir a previsão da evolução da patologia e ajudar na escolha de terapias adequadas. Nesta apresentação mostraremos alguns avanços na modelação do crescimento de uma placa de aterosclerose e discutiremos aspectos matemáticos e computacionais associados.

José Luís da Silva, CCM, Universidade da Madeira.

Título: Fractional Poisson process.

Abstract: In this talk we define and show some properties of the fractional Poisson process. Its representation as a product of process and as a subordination will be studied. In addition the connection with fractional SDE's is presented.

Hugo G. Silva, Departamento de Física, ECT, Instituto de Ciências da Terra, IIFA, Universidade de Évora.

Título: Aerosol hygroscopic growth and the dependence of atmospheric electric field measurements with relative humidity.

Autores: H.G. Silva, R.Conceição, M.D.Wright, J.C.Matthews, S.N. Pereira, D.E.Shallcross.

Abstract: A simple formulation is developed to model the influence of the aerosol hygroscopic growth in the dependence of the atmospheric electric field measurements with relative humidity. The formulation uses the Petters and Kreidenweis's model for the hygroscopic growth factor of aerosols with relative humidity and assumes that the ion-aerosol attachment coefficient is linearly proportional to the particle radius according to Gunn's calculation. A formula which describes the atmospheric electric field increase with relative humidity in the regime expected for the aerosols to grow hygroscopically is found; between 60 % to 90 %. It also relates the microphysical parameter of aerosol hygroscopicity, k, with the macrophysical measure of the atmospheric electric field. Historical data of atmospheric electric field and relative humidity recorded in the meteorological station of Portela (near Lisbon airport, Portugal) are used to fit the model. The electrical measurements were done with a Benndorf electrograph and the 1980-1990 period was considered. Due to the high pollution levels the atmospheric electric field measurements were divided in four wind sectors, NW, NE, SE, and SW. The sector least affected by pollutant aerosols, NW, was used in the fitting and the goodness found is r^2 ~ 0.97, the aerosol concentration number is ~ 3280 cm^{-3} and the hygroscopic growth parameter k ~ 0.094. These are very reasonable values consistent with an urban environment, which typically has high aerosol number concentration with small hygroscopicity. The limitations of the model are presented throughout the sections.

Michael Grinfeld, Department of Mathematics and Statistics, University of Strathclyde, Glasgow, UK.

Title: Mathematical Challenges in Submonolayer Deposition.

Abstract: Submonolayer deposition (SD) is a term describing the initial stages of

processes, such as molecular beam epitaxy, in which material is deposited onto a surface, diffuses and forms large-scale structures. It is easy to simulate using Monte Carlo methods, but theoretical results are few and far between. I will discuss various approaches to SD, mainly in the 1-dimensional situation, focusing on open mathematical problems.

Jean-Paul Chehab, Université de Picardie Jules Verne, Amiens, France
Title: Very Weakly damped KdV Equations

Abstract: We introduce a family of frequency based damping for KdV equations and present numerical study of the long time behavior of the solutions. Particular attention is given on the rate of the damping, the nontrivial long time dynamics for the forced equation and the prevention of the blow up in the supercritical case.

Nabil Bedjaoui, LAMFA, Université de Picardie Jules Verne, Amiens, France.
Title: Diffusive-dispersive effects on a hyperbolic equation.

Abstract: We consider a perturbed model of hyperbolic equation with viscosity and capillarity terms, and we study the existence of such solutions and their convergence when the perturbations tend to zero.

Mohammed Guedda, LAMFA, Université de Picardie Jules Verne, Amiens, France.
Título: A reaction-nonlinear diffusion competition system: explicit wavefronts and patterns.
Autores: R. Kersner, M. Klincsik et E. Logak.

Abstract: The model we deal with is a nonlinear, non–uniformly parabolic reaction-diffusion system containing four parameters. We prove the existence of a non-constant periodic stationary solution, under suitable restrictions on the parameters. More precisely, we find explicit stationary, spatially periodic solutions. In a particular case, we also provide a time-dependent solution that approximates this periodic solution.