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**2nd International Meeting on
Differential Equations and Applications**
Book of abstracts



Universidad Politécnica de Madrid
Dpto. Matemática Aplicada a las TIC
March 9-11, 2026 • Madrid (Spain)

This meeting has been partially supported by the **Departamento de Matemática Aplicada a las Tecnologías de la Información y las Comunicaciones**, located at the **Escuela Técnica Superior de Ingenieros Informáticos** of the **Universidad Politécnica de Madrid**, and by **Madrid Government (Comunidad de Madrid-Spain)** under the Multiannual Agreement 2023-2026 with Universidad Politécnica de Madrid in the Line A, Emerging PhD researchers. Grant agreement DOCTORES-EMERGENTES-24-UMDLRU-108-XVLWPC.



We would like to express our sincere gratitude to all the collaborating entities for making the **2nd International Meeting on Differential Equations and Applications** possible.

Contents

Preamble	1
Committees	3
Venue	5
Program	7
Abstracts	11
José M. Arrieta	
Boundedness of solutions of degenerate nonautonomous logistic equations	13
Vinicius Tavares Azevedo	
Existence, regularization and upper-semicontinuity of uniform attractors for a nonautonomous semilinear evolution equation of second order	15
Tomás Caraballo	
Dynamics of evolution PDE with memory	17
Paulo L. Dattori da Silva	
On global regularity for involutive systems on compact manifolds.....	19
Valeria Neves Domingos Cavalcanti	
Decay rates for the viscoelastic wave model	21
Marcio A. Jorge Silva	
On the Dynamics of Lamé Systems with Critical Vector Fields	23
Pedro Marín-Rubio	
Reaction-diffusion equations with nonlocal viscosity: from attractors to exponential attractors	25

Rodrigo Nunes Monteiro	
Unique continuation for variable-coefficient Timoshenko systems	27
Cristian Morales-Rodrigo	
On a chemotaxis system with low regularity at the boundary	29
Aníbal Rodríguez Bernal	
How much heat can be lost through the boundary?	31
Carlos Takaessu Jr	
Shadowing Lemma for Morse-Smale dynamical systems on Hilbert spaces	33
Lourdes Tello	
A two-layer green roof mathematical model	35
Ma To Fu	
Plagiarism and self-plagiarism in mathematical scientific production	37
Contact	39



Welcome to the **2nd International Meeting on Differential Equations and Applications**, to be held on **March 9–11, 2026**, at the Departamento de Matemática Aplicada a las Tecnologías de la Información y las Comunicaciones, located at the Escuela Técnica Superior de Ingenieros Informáticos of the Universidad Politécnica de Madrid, in Boadilla del Monte (Madrid, Spain).

This second international meeting is dedicated to **celebrate** the **65th birthday** of **Prof. Ma To Fu**, bringing together researchers and students from around the World to share the **latest scientific advancements** concerning both ordinary and partial **differential equations** as well as their **applications** in real life.

The event will feature a series of **plenary lectures** and **interactive discussions**, providing a platform to explore new methodologies, innovative solutions, and emerging trends in the theory of differential equations and their applications.

With contributions from leading researchers, the conference will cover a **wide range of topics**, including mathematical modeling, numerical analysis, and applications to engineering, physics, biology, and other sciences.

The goal of this meeting is to create an inspiring and collaborative environment for the **exchange of knowledge**, fostering interdisciplinary dialogue and promoting the integration of theoretical developments with practical applications.

We look forward to welcoming you to this exciting event, where new ideas, collaborations, and opportunities for future research will emerge.

ommittees

You can find below the committees of the **2nd International Meeting on Differential Equations and Applications**, to be held on **March 9–11, 2026**.

Scientific committee

Luís Sanchez Rodrigues	Univ. de Lisboa (Portugal)
Irena Lasiicka	Univ. of Virginia (EEUU)
Tomás Caraballo	Univ. de Sevilla (Spain)
Jinyun Yuan	Univ. Federal do Paraná (Brazil)

Organizing committee

Paulo N. Seminario-Huertas	Univ. Politécnica de Madrid (Spain)
Javier López-de-la-Cruz	Univ. Politécnica de Madrid (Spain)
Lito E. Bocanegra Rodríguez	Univ. Politécnica de Madrid (Spain)
Maykel Boldrin Belluzi	Univ. Federal de São Carlos (Brazil)



The **2nd International Meeting on Differential Equations and Applications**, to be held on **March 9–11, 2026**, will take place in the **conference room H-1003** located on the ground floor of **Building 1** at the Escuela Técnica Superior de Ingenieros Informáticos (Campus de Montegancedo) of the Universidad Politécnica de Madrid (you can find it on Google maps by clicking [here](#)).

There are different ways to arrive at the Escuela Técnica Superior de Ingenieros Informáticos, either by **private vehicle** or by **public transport** (both by **metro, light rail, RENFE local trains** and **bus**).

By private vehicle

To reach the campus by private vehicle, the most convenient option is to access it via the **A-6 highway** or the **M-40 ring road**. Since the campus is located in the middle of nature, it is possible to park in a large parking located [here](#). From there, Building 1 (where the conference room H-1003 is located) is around three minutes on foot [here](#).

By public transport

It is possible to reach the campus by public transport, both by **metro, light rail, RENFE local trains** and **bus**. You can find below a list with the options we consider most convenient for you. Additionally, you can also download the map of **metro and light rail network** [here](#) as well as the map of **Renfe local trains** [here](#) for your convenience.

► Bus - Line 591

This bus operates between **Madrid (Aluche)** and **ETSI Informáticos stops**. To reach the campus, you can get the bus next to **Metro - Line 5 (Aluche station)** [here](#), next to **Metro - Line 5 (Empalme station)** [here](#) or next to **Metro – Line 10 (Colonia Jardín station)** [here](#). Then, you have to get off the bus at the last stop inside the campus

[here](#). From there, Building 1 (where conference room H-1003 is located) is around one minute on foot [here](#). You can find the outbound timetable [here](#) and the return timetable [here](#).

► **Bus - Line 865**

This bus operates between **Madrid (Intercambiador de Moncloa)** and **Centro de Empresas** stops. To reach the campus, you can get the bus next to **Metro - Lines 3 or 6 (Moncloa station)** [here](#). Then, you have to get off the bus at the ETSI Informáticos stop inside the campus [here](#). From there, Building 1 (where conference room H-1003 is located) is around five minutes on foot [here](#). You can find the outbound timetable [here](#) and the return timetable [here](#).

► **Bus - Line 571**

This bus operates between **Madrid (Av. de Las Águilas)** and **Boadilla del Monte (Avenida Monte Segovia)** stops. To reach the campus, you can get the bus next to **Metro - Line 5 (Aluche station)** [here](#), next to **Metro - Line 5 (Empalme station)** [here](#) or next to **Metro - Line 10 (Colonia Jardín station)** [here](#). Then, you have to get off the bus at the Av. Montepíncipe – Facultad Informática stop next to the campus [here](#). From there, Building 1 (where conference room H-1003 is located) is around three minutes on foot [here](#). You can find the outbound timetable [here](#) and the return timetable [here](#).

► **Bus - Line 573**

This bus operates between **Madrid (Ruperto Chapí/P.º Moret)** and **Boadilla (Miguel Ángel Cantero Oliva)** stops. To reach the campus, you can get the bus next to **Metro - Lines 3 or 6 (Moncloa station)** [here](#). Then, you have to get off the bus at the Av. Montepíncipe – Facultad Informática stop next to the campus [here](#). From there, Building 1 (where conference room H-1003 is located) is around three minutes on foot [here](#). You can find the outbound timetable [here](#) and the return timetable [here](#).

► **Light Rail - Line 3**

This light rail line operates between **Colonia Jardín** station (connected with Metro - Line 10) and **Puerta de Boadilla** station. To reach the campus, you can get on the train at Colonia Jardín station (connected with Metro - Line 10) and then you have to get off the train at Montepíncipe station [here](#). From there, the campus is around fifteen minutes on foot [here](#). You can find the timetable [here](#).



You can find below the program of the **2nd International Meeting on Differential Equations and Applications**, to be held on **March 9–11, 2026**.

Monday – March 9, 2026

8:30 – 9:15	Registration
9:30 – 10:00	Opening
10:00 – 10:45	Marcio A. Jorge Silva On the Dynamics of Lamé Systems with Critical Vector Fields
10:45 – 11:30	Tomás Caraballo Dynamics of evolution PDE with memory
11:30 – 12:00	Coffee break
12:00 – 12:30	Vinicius Tavares Azevedo Existence, regularization and upper-semicontinuity of uniform attractors for a nonautonomous semilinear evolution equation of second order
12:30 – 13:00	Lourdes Tello A two-layer green roof mathematical model
13:00 – 16:00	Lunch
21:00 – 23:30	Conference dinner

Tuesday – March 10, 2026

10:00 – 10:45	Valéria N. Domingos Cavalcanti Decay rates for the viscoelastic wave model
10:45 – 11:30	Anibal Rodríguez-Bernal How much heat can be lost through the boundary?
11:30 – 12:00	Coffee break
12:00 – 12:30	Cristian Morales-Rodrigo On a chemotaxis system with low regularity at the boundary
12:30 – 13:00	Carlos R. Takaessu Junior Shadowing Lemma for Morse-Smale dynamical systems on Hilbert spaces
13:00 – 13:30	Paulo L. Dattori da Silva On global regularity for involutive systems on compact manifolds
13:30 – 13:45	Official photo
13:45 – 16:00	Lunch

Wednesday – March 11, 2026

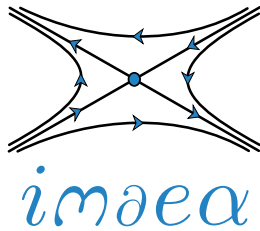
9:30 – 10:00	Ma To Fu Plagiarism and self-plagiarism in mathematical scientific production
10:00 – 10:45	Marcelo M. Cavalcanti The Quintic Wave Equation with Kelvin-Voigt Damping: Strichartz Estimates, Well-posedness and Global Stabilization
10:45 – 11:30	Pedro Marín-Rubio Reaction-diffusion equations with nonlocal viscosity: from attractors to exponential attractors
11:30 – 12:00	Coffee break
12:00 – 12:30	José M. Arrieta Boundedness of solutions of degenerate nonautonomous logistic equations
12:30 – 13:00	Antonio Suárez Nonlocal coefficient diffusion in Lotka-Volterra models
13:00 – 13:30	Rodrigo Nunes Unique continuation for variable-coefficient Timoshenko systems
13:30 – 13:45	Closing



The following pages compile the abstracts of the talks presented at the **2nd International Meeting on Differential Equations and Applications**.

The meeting featured contributions from **several distinguished speakers**, whose lectures covered a broad spectrum of topics related to differential equations and their relevance in the modeling of real-world phenomena.

The abstracts included herein offer a concise overview of the central ideas and results discussed by each speaker, providing valuable insights into current advances and methodologies in the field.



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**Boundedness of solutions of degenerate
nonautonomous logistic equations**

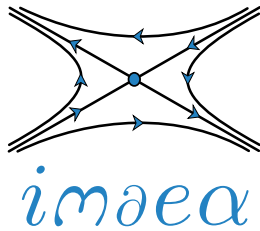
José M. Arrieta

Universidad Complutense de Madrid

We consider a reaction-diffusion equation in a bounded domain with logistic reaction term of the type $\lambda u - n(t, x)u^p$ and nonnegative initial data where the function $n(t, x)$ is nonnegative but vanishes in a time dependent subset $K(t)$. We are interested in understanding how the behavior of the set $K(t)$ affects the boundedness of the solutions. It turns out that not only the size and geometry of the moving set $K(t)$ is important, but also its velocity affects the boundedness of the solutions.

References

- [1] J. M. Arrieta, M. Molina, L. A. Santos, Boundedness of solutions of nonautonomous degenerate logistic equations, *Journal of Dynamics and Differential Equations*, **37** (2025).
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**Existence, regularization and upper-semicontinuity
of uniform attractors for a nonautonomous
semilinear evolution equation of second order**

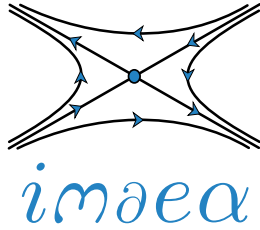
Vinicius Tavares Azevedo

Department of Mathematics
Federal University of São Carlos, Brasil

We investigate the forward dynamics of a nonautonomous semilinear wave-type evolution problem, which models propagation phenomena in nonlinear elastic rods and ion-acoustic waves. We establish global well-posedness and prove the existence of a family of uniform attractors under appropriate growth and dissipativity conditions. Additionally, we demonstrate upper semicontinuity in a suitable space and derive regularity results in a more refined space. Finally, we characterize the uniform attractor through kernel sections for the problem under consideration.

References

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Dynamics of evolution PDE with memory

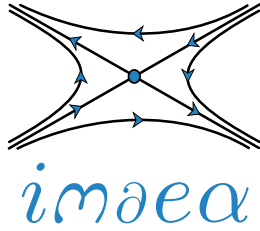
Tomás Caraballo

Department of Mathematics
Universidad de Sevilla (Sevilla, Spain)

In this talk, the asymptotic behavior of a semilinear heat equation as well as a damped wave equation containing long time memory are analyzed. We set up the problems in the usual framework for dynamical systems generated by differential equations with delay terms. This approach is different from the previous published literature on the long time behavior of heat and wave equations with memory, which were investigated in an extended space after having used the well-known Dafermos transformation. As a consequence, the obtained results provide complete information about the attracting sets for the original problem, instead of the transformed extended one (see [1, 2]).

References

- [1] S. Yan, J. H. Xu, T. Caraballo, J. Valero, Dynamics of damped wave equations with long time memory, *Commun. Nonlinear Sci. Numer. Simul.*, **156** (2026), 109631.
- [2] J. H. Xu, T. Caraballo, J. Valero, Asymptotic behavior of a semilinear problem in heat conduction with long time memory and non-local diffusion, *J. Differential Equations*, **327** (2022), 418–447.



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**On global regularity for involutive
systems on compact manifolds**

Paulo L. Dattori da Silva

Department of Mathematics

University of Sao Paulo at Sao Carlos (ICMC-USP) - Brazil

In this talk we will deal with global hypoellipticity of involutive structures defined on a smooth product manifold $M \times \mathbb{T}^m$, where $\mathbb{T}^m \simeq \mathbb{R}^m / 2\pi\mathbb{Z}^m$ is the m -dimensional torus.

Given a compact n -dimensional manifold M and closed 1-forms $\omega_1, \dots, \omega_m$ over M , consider the product manifold $\Omega = M \times \mathbb{T}^m$ and the subbundle $\mathcal{V} \subset \mathbb{C}T\Omega$ annihilated by all the forms

$$\zeta_k = dx_k - \omega_k, \quad k \in \{1, \dots, m\},$$

where (x_1, \dots, x_m) are angular coordinates on \mathbb{T}^m . Such a bundle is involutive, and gives rise to a complex of vector bundles over Ω and first-order differential operators between them.

Let Λ^1 be the bundle of complex 1-forms over M , and $\Lambda^{0,1}$ be its pullback to Ω via the natural projection $\Omega \rightarrow M$; we denote their spaces of smooth sections by $\Lambda^1 C^\infty(M)$ and $\Lambda^{0,1} C^\infty(\Omega)$, respectively. We define $\mathbb{L} : C^\infty(\Omega) \rightarrow \Lambda^{0,1} C^\infty(\Omega)$ by the formula

$$\mathbb{L}f = d_t f + \sum_{k=1}^m \omega_k \wedge \partial_{x_k} f,$$

where $t \in M$ and d_t is the exterior derivative on M ; hence, \mathbb{L} is a first-order differential operator.

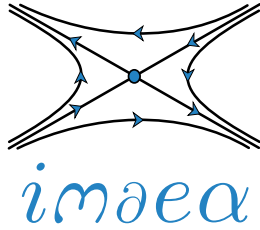
We will investigate the regularity of solutions of the equation $\mathbb{L}u = f$.

We will give special attention in the case where M is also a torus \mathbb{T}^n ; also, in the case where M is a compact Lie group.

Partially supported by CNPq and FAPESP.

References

- [1] G. Araújo, P. L. Dattori da Silva, and B. de Lessa Victor, Global Analytic Solvability of Involutive Systems on Compact Manifolds, *Journal of Geometric Analysis*, **33** (2023), 151.
- [2] G. Araújo, P. L. Dattori da Silva, and B. de Lessa Victor, Global analytic hypoellipticity of involutive systems on compact manifolds, *Mathematische Annalen* (2022).
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- [4] I. V. Coelho da Silva, P. L. Dattori da Silva, and F. M. Simão, Regularity of solutions for a class of involutive systems of vector fields (preprint).



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March 9-11, 2026 • Madrid (Spain)

Decay rates for the viscoelastic wave model

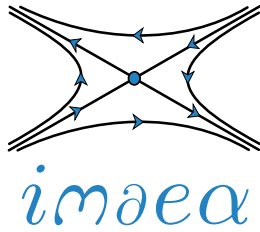
Valeria Neves Domingos Cavalcanti

Department of Mathematics
Universidade Estadual de Maringá

We are concerned with the global existence as well as the asymptotic behavior of the viscoelastic wave equation in the past history framework. In the presence of a memory term, we establish the global existence of solutions and the uniform decay rates of those solutions. We quote the seminal works [1, 2], [3] and [4, 5].

References

- [1] L. E. Boltzmann, Zur Theorie der elastischen Nachwirkung, *Wien. Ber.* **70** (1874), 275–306.
- [2] L. E. Boltzmann, Zur Theorie der elastischen Nachwirkung, *Wien. Ber.* **5** (1878), 430–432.
- [3] C. M. Dafermos, Asymptotic stability in viscoelasticity, *Arch. Rational Mech. Anal.* **37** (1970), 297–308.
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- [5] V. Volterra, *Leçons sur les fonctions de lignes*, Gauthier-Villars, Paris, 1913.



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March 9-11, 2026 • Madrid (Spain)

**On the Dynamics of Lamé Systems
with Critical Vector Fields**

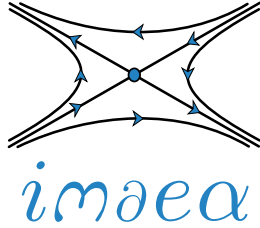
Marcio A. Jorge Silva

State University of Londrina
Brazil

The asymptotic behavior of Lamé systems with frictional damping and uncoupled vector fields coordinates are well-known, see [1, 4–7]. In the current presentation, it is addressed results on the dynamics for the Lamé system in elasticity with frictional damping and fully coupled vector fields under critical growth. More specifically, the Lamé problem will be addressed with a general coupled vector-valued nonlinearity under Sobolev-critical growth in 3-dimensional bounded domains according to [2], and then the exponential-type growth case in the 2-dimensional setting as given in [3].

References

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- [2] R. G. Camara, P. F. M. Damazio, M. A. Jorge Silva, F. Natali, The Lamé system with fully coupled vector nonlinearity in the critical regime, submitted (2025).
- [3] R. G. Camara, P. F. M. Damazio, M. A. Jorge Silva, F. Natali, Dynamics of the Lamé system with exponential vector fields in two dimensions, submitted (2025).
- [4] A. L. C. Costa, M. M. Freitas, R. Wang, Asymptotic behavior of non-autonomous Lamé systems with subcritical and critical mixed nonlinearities, *Nonlinear Anal. Real World Appl.* **67** (2022), 103603.
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- [6] R. Wang, M. M. Freitas, B. Feng, A. J. A. Ramos, Global attractors and synchronization of coupled critical Lamé systems with nonlinear damping, *J. Differential Equations* **359** (2023), 476–513.
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**2nd International Meeting on
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**Reaction-diffusion equations with nonlocal viscosity:
from attractors to exponential attractors**

Pedro Marín-Rubio

Dpto. Ecuaciones Diferenciales y Análisis Numérico
Universidad de Sevilla

In recent works we studied the nonlocal problem

$$u_t - a \left(\int_{\Omega} g(x)u(x,t)dx \right) \Delta u = f(u) + h(t) \quad \text{in } \Omega \times (\tau, \infty)$$

fulfilled with homogeneous Dirichlet boundary conditions in a bounded domain Ω with smooth boundary. The extra term in the viscosity represent the dependence on the *overall* population, allowing different diffusion effects.

The existence of (semi-)flows (if autonomous) or (semi-)processes (if non-autonomous) and their long time behavior in terms of attractors were analyzed in several papers, mainly in terms of pullback attractors. Some robustness properties were also considered.

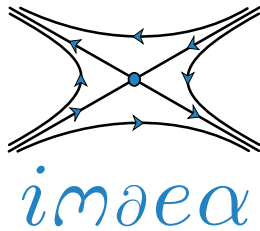
We aim to go a step further, considering now the possible construction of exponential attractors for these kind of models.

This is a joint work with Tomás Caraballo and Marta Herrera-Cobos (Universidad de Sevilla) in the first part, and with Álvaro Aguilar-Reyes (Universidad de Sevilla) in the more recent part.

References

- [1] Á. Aguilar-Reyes, P. Marín-Rubio, Exponential attractors for a reaction-diffusion problem with nonlocal viscosity (submitted).
- [2] T. Caraballo, M. Herrera-Cobos, P. Marín-Rubio, Long-time behaviour of a non-autonomous parabolic equation with nonlocal diffusion and sublinear terms, *Nonlinear Anal.*, **121** (2015), 3–18.

- [3] T. Caraballo, M. Herrera-Cobos, P. Marín-Rubio, Robustness of nonautonomous attractors for a family of nonlocal reaction-diffusion equations without uniqueness, *Nonlinear Dyn.*, **84** (2016), 35–50.
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- [5] T. Caraballo, M. Herrera-Cobos, P. Marín-Rubio, Asymptotic behaviour of nonlocal p -Laplacian reaction-diffusion problems, *J. Math. Anal. Appl.*, **459** (2018), 997–1015.
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**Unique continuation for variable-coefficient
Timoshenko systems**

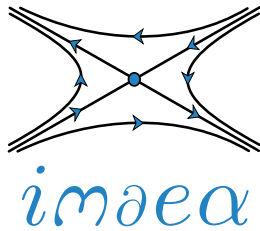
Rodrigo Nunes Monteiro

Department of Mathematics
Universidade Estadual de Londrina

We consider a Timoshenko system with non-homogeneous coefficients and localized frictional damping. Our main result is a Unique Continuation Property (UCP) for the associated resolvent equation, implying that solutions vanishing on the damped region are identically zero and excluding imaginary eigenvalues, which yields strong stability of the contraction semigroup. Using suitable observability inequalities together with resolvent estimates, we derive decay rates, which are exponential or polynomial depending on the interaction between the variable coefficients and the damping support.

References

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**On a chemotaxis system with
low regularity at the boundary**

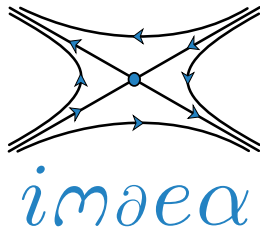
Cristian Morales-Rodrigo

Dpto. Ecuaciones Diferenciales y Análisis Numérico
Universidad de Sevilla

In this talk, we will show in a two dimensional domain the global existence of weak solution for a parabolic-parabolic Keller-Segel model with a non-homogeneous boundary condition for the chemical concentration.

References

- [1] C. Morales-Rodrigo, N. Piña-León and M. A. Rodríguez-Bellido, Chemo-attraction 2D model with non-homogeneous low regularity data for chemical concentration, (almost submitted).



2nd International Meeting on Differential Equations and Applications March 9-11, 2026 • Madrid (Spain)

How much heat can be lost through the boundary?

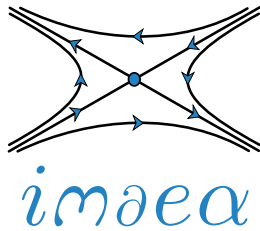
Aníbal Rodríguez Bernal

Departamento de Análisis Matemático y Matemática Aplicada
UCM

In this talk we discuss the problem of quantifying the amount of heat lost through the boundary for the linear diffusion in a solid body under general boundary conditions. We will discuss the case of an exterior domain and analyse the main differences with respect to the bounded domain case. The results depend very strongly on the dimension. This is a joint work with J. Domínguez de Tena (UCM).

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Shadowing Lemma for Morse-Smale dynamical systems on Hilbert spaces

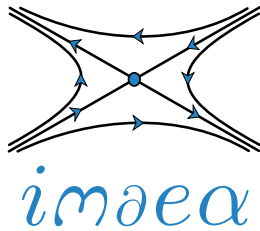
Carlos Takaessu Jr

Department of Mathematics
Universidade Federal de São Carlos

In this talk, we will present results concerning the Shadowing property. Our main goal is to extend known results about Shadowing from finite-dimensional compact manifolds to infinite-dimensional spaces. As far as we know, the Lipschitz Shadowing property in nonlinear systems typically requires some form of finite dimensionality, even when the phase space is infinite dimensional. For instance, if \mathcal{T} is a Morse-Smale dynamical system defined on a Hilbert space X that possesses an inertial manifold \mathcal{M} (which is finite dimensional), then \mathcal{T} exhibits the Shadowing property in a neighborhood of the attractor \mathcal{A} . Motivated by this, we show that it is still possible to obtain the Shadowing property in an infinite-dimensional setting, without relying on the existence of an inertial manifold or reducing the problem to a finite-dimensional.

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A two-layer green roof mathematical model

Lourdes Tello

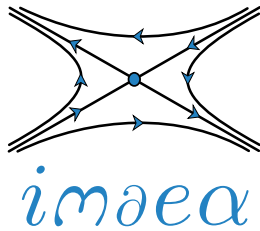
Universidad Politécnica de Madrid

We are concerned with the thermal behavior of extensive green roofs. The model is based on an energy balance for buildings with vegetation cover and it is applicable to roofs of various shapes. The two-layer model includes a vegetation layer and a substratum layer, as well as the energy exchange between the two. The unknowns in this problem are the temperatures of each layer which are described by a coupled system of two parabolic partial differential equations. One of the main feedback mechanisms is evapotranspiration, the combined process of plant transpiration and soil evaporation.

The modeling involves multivalued terms, and regularizing maximal monotone graphs is crucial to the mathematical treatment. We analyze the existence of solutions to this parabolic system of partial differential equations and present numerical results under fluctuations of some relevant parameters, including the leaf area index (LAI).

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**Plagiarism and self-plagiarism
in mathematical scientific production**

Ma To Fu

Universidade de Brasília

In addition to being honored at the event, Professor Ma To Fu, Full Professor at the University of Brasília, delivered this lecture on the morning of March 11, 2026.

In his talk, Professor Ma To Fu provided a rigorous discussion of the concepts of plagiarism and self-plagiarism within mathematical scientific production, highlighting the new challenges posed by the use of artificial intelligence tools. In particular, he emphasized the importance of transparency in the use of AI-generated content and the need to establish clear standards for authorship in mathematical research.

He also analyzed how certain contemporary practices, including the proliferation of digital content and academic writing services, contribute to the normalization of improper conduct. Through illustrative examples and case studies, he stressed the importance of promoting academic integrity, especially in the training of early-career researchers.

The lecture combined strong theoretical insight with practical guidance, offering conceptual tools and critical reflections that were very well received by the audience.



Please, do not hesitate to contact us if you have any **question** or need **assistance**. You can send us an email by scanning the **QR code** below or by clicking [here!](#)



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