BOOK OF ABSTRACTS

SS25 - Geometric Analysis

2nd Joint Meeting Brazil-Italy in Mathematics

September 7, 2026

Messina, Italy

Organizers:

Alberto Roncoroni, Polytechnic University of Milan
Allan Freitas, Federal University of Paraíba

2nd Joint Meeting Brazil-Italy
in Mathematics
Messina, 7–11 September 2026

SS25

p-Laplace Serrin problem on planar annuli

Virginia Agostiniani
Department of Mathematics, University of Trento
Chiara Bernardini
Department of Mathematics, University of Roma Tor Vergata

We prove a symmetry result for the solution to $\Delta_p u = -2$ in a ring-shaped planar domain, under homogeneous Dirichlet boundary conditions, for $p \in (1, 2)$. This problem has a natural physical interpretation, as it models the steady laminar flow of a shear-thinning non-Newtonian fluid through a pipe with annular cross-section. Our symmetry result is obtained under the assumptions that the wall shear stress is locally constant along the pipe wall, that the set Σ of maximum points of u is a smooth closed curve, and that no critical points occur away from Σ. We also require a suitable asymptotic expansion of the solution near Σ. The proof is inspired by the comparison-geometry strategy developed in the linear setting in [1] and [2]. Its extension to the p-Laplacian framework requires several new ideas and techniques.

References

[1] V. Agostiniani, S. Borghini, L. Mazzieri, *On the Serrin problem for ring-shaped domains*, J. Eur. Math. Soc., 27 (2025), 2705–2749.

[2] S. Borghini, *Symmetry results for Serrin-type problems in doubly connected domains*, Math. Eng., 5 (2023), 1–16.

E–mail: virginia.agostiniani@unitn.it.

2nd Joint Meeting Brazil-Italy
in Mathematics
Messina, 7–11 September 2026

SS25

Critical points of the total σ_2-curvature functional

Maria Andrade [1]
Department of Mathematics, Universidade Federal de Sergipe - Brazil

Almir Silva Santos
Department of Mathematics, Universidade Federal de Sergipe - Brazil

Tiarlos Cruz
Department of Mathematics, Universidade Federal de Alagoas - Brazil

In this talk, we present results concerning deformations of the σ_2-curvature and volume. More precisely, for closed manifolds, we establish a relationship between critical points of the total σ_2-curvature functional and σ_2-Einstein metrics. This is based on joint work with A. Silva Santos (UFS, Brazil) and T. Cruz (UFAL, Brazil)

References

[1] M. Andrade, T. Cruz, A. Silva Santos. *On the σ_2-curvature and volume of compact manifolds*, Annali di Matematica Pura ed Applicata, (2023).

[1] Aknowledgements: M. Andrade was partially supported by the Brazilian National Council for Scientific and Technological Development (CNPq, grants 408834/2023-4, 403869/2024-2, and 400078/2025-2), ICTP/CIMPA, FAPITEC/SE/Brazil (grants 019203.01303/2024-1 and 019203.02471/2026-7), Sociedade Brasileira de Matemática (SBM) and Institute for Mathematical Sciences of the Americas (IMSA).

E–mail: maria@mat.ufs.br.

2nd Joint Meeting Brazil-Italy
in Mathematics
Messina, 7–11 September 2026

SS25

3D scalar curvature bounds through the inverse mean curvature flow in low regularity

Mattia Fogagnolo [1]
Department of Mathematics, University of Padova

I will discuss recent and forthcoming advances in the understanding of the inverse mean curvature flow on manifolds endowed with a metric tensor that is merely continuous. I will explain how in dimension 3 curvature lower bounds can be read through the behaviour of such flow, in particular without the need of taking any derivative of the metric. The emerging nonsmooth notion of nonnegative scalar curvature will be shown to be stable along uniform convergence of metric tensors.

[1]Joint works with Gatti and Pluda
E–mail: mattia.fogagnolo@unipd.it.

2nd Joint Meeting Brazil-Italy
in Mathematics
Messina, 7–11 September 2026

SS25

On Rigidity of Sub-Static Systems

Allan Freitas [1]
Department of Mathematics, Federal University of Paraíba

Giulio Colombo, Luciano Mari, Marco Rigoli
Department of Mathematics, Università degli Studi di Milano

Sub-static manifolds can be viewed as special solutions to the Einstein equations in the presence of stress-momentum fields satisfying a certain dominant energy condition. In this talk, we address the rigidity problem for such manifolds, possibly with a non-empty boundary. First, we establish certain integral inequalities that extend the works of Chrúsciel and Boucher-Gibbons-Horowitz to sub-static manifolds. Even in the static vacuum case, the obtained inequalities improve on the previously known ones. Next, we present local and global splitting theorems under the assumption of the existence of compact minimal hypersurfaces. Finally, we analyze the system arising from static solutions to the Einstein field equations coupled with a σ-model.

References

[1] G. Colombo, A. Freitas, L. Mari, M. Rigoli, *Some splitting and rigidity results for sub-static spaces*, J. Lond. Math. Soc., 113 (2026), e70590.

[1] Acknowledgements: The author was partially supported by the Sociedade Brasileira de Matemática (SBM) and the Institute of the Mathematical Sciences of the Americas (IMSA) through the SBM–IMSA Travel Grant Program 2026 for participation in the II Joint Meeting Brazil–Italy in Mathematics. The author also acknowledges partial support from the Brazilian National Council for Scientific and Technological Development (CNPq), grants 308141/2025-3 and 406078/2025-4.

E–mail: allan.freitas@academico.ufpb.br.

2nd Joint Meeting Brazil-Italy
in Mathematics
Messina, 7–11 September 2026

SS25

Zoll families and Isosystolic Inequalities

Luciano Luzzi Junior
Department of Mathematics, University of Trento

As proved by Abbondandolo, Bramham, Hryniewicz, and Salomão in [1], the round metric on the two-sphere is a local maximizer of the systolic ratio. Combined with earlier work of Weinstein (see [3]), this result yields a local characterization of Zoll metrics as the local maximizers of the systolic ratio. In this talk, we will explore how the geometric and analytic framework developed by Ambrozio, Marques, and Neves in their study of higher-dimensional Zoll families (see [2]) can be used to investigate isosystolic inequalities on higher-dimensional spheres and complex projective spaces.

References

[1] A. Abbondandolo, B. Bramham, U.L. Hryniewicz, P.A.S. Salomão, *A systolic inequality for geodesic flows on the two-sphere*, Math. Ann. 367 (2017), 701–753.

[2] L. Ambrozio, F.C. Marques, A. Neves, *Riemannian metrics on the sphere with Zoll families of minimal hypersurfaces*, J. Differential Geom. 130 (2025), 269–341.

[3] A. Weinstein, *On the volume of manifolds all of whose geodesics are closed*, J. Differential Geom. 9 (1974), 513–517.

E–mail: luciano.luzzijunior@unitn.it.

2nd Joint Meeting Brazil-Italy
in Mathematics
Messina, 7–11 September 2026

SS25

Limits of manifolds and codimension 4 singularities

Ilaria Mondello
Department of Mathematics, University of Paris Est Créteil

In 1989, M. Anderson conjectured that the Gromov-Hausdorff limit of a sequence of complete manifolds with bounded Ricci curvature has only singularities of codimension larger than four. This was proven in 2015 by J. Cheeger and A. Naber. In this talk, I will present a joint work with G. Carron and D. Tewodrose in which we prove an analogue result under a Kato condition on the Ricci curvature.

E–mail: ilaria.mondello@u-pec.fr.

2nd Joint Meeting Brazil-Italy
in Mathematics
Messina, 7–11 September 2026

SS25

X–ADM mass and X–Positive Mass Theorem

Francesca Oronzio
Scuola Superiore Meridionale

In this talk, we introduce a geometric quantity for asymptotically flat 3–manifolds associated with a given admissible vector field X. We establish a relative positive mass theorem via a monotonicity formula along the level sets of a suitable Green's function. Under different assumptions on X, we recover the classical positive mass theorem, as well as the corresponding results for weighted manifolds and manifolds with charge, under some topological restrictions. Finally, we discuss the rigidity cases. This is based on a joint work with C. Mantegazza.

References

[1] V. Agostiniani, L. Mazzieri, F. Oronzio, *A Green's function proof of the positive mass theorem*, Comm. Math. Phys., 405 (2024), Paper No. 54, 23.

[2] C. Mantegazza, F. Oronzio, *X–ADM Mass and X–Positive Mass Theorem,* ArXiv Preprint Server–ArXiv:2602.11372, 2026.

E–mail: f.oronzio@ssmeridionale.it.

2nd Joint Meeting Brazil-Italy
in Mathematics
Messina, 7–11 September 2026

SS25

Some rigidity theorems for stable constant (anisotropic) mean curvature hypersurfaces

Barbara Nelli, Claudia Pontuale
Dipartimento di Ingegneria e Scienze dell'Informazione e Matematica, Università dell'Aquila

Do Carmo's problem ([1]) asks whether every complete, noncompact, stable hypersurface with constant mean curvature (CMC) in Euclidean space must be minimal ($H = 0$). In this talk, after briefly recalling some known results, we present a positive answer to this question, under a natural lower bound on the Ricci curvature ([2]).

We then consider an anisotropic counterpart of this problem. Under a natural ellipticity condition, we prove that stable constant anisotropic mean curvature (CAMC) hypersurfaces have only one end. This one-endedness result may be regarded as a first step toward rigidity in the anisotropic counterpart of Do Carmo's question.

References

[1] M. P. Do Carmo, *Hypersurfaces of Constant Mean Curvature*, Lecture Notes in Math., 1410, Differential geometry (Peñìscola, 1988), 128-144.

[2] B. Nelli, C. Pontuale *Finite Index and Do Carmo's Question for Constant Mean Curvature Hypersurfaces*, arXiv:2601.11456 (2025)

E–mail: claudia.pontuale@graduate.univaq.it.