Programa / Schedule

JUEVES / THURSDAY 5

10:00—11:00

Pablo Mira (Universidad Politécnica de Cartagena): *Superficies de curvatura media constante en espacios homogéneos (Plenary talk).*

16:00—17:00

Harold Rosenberg (IMPA, Rio de Janeiro, Brazil): *Asymptotic values of minimal graphs in the disc.*

17:00—18:00

Martin Schmidt (Universität Manheim, Germany): *On constant mean curvature cylinders of finite type in* $\mathbb{S}^3$.

VIERNES / FRIDAY 6

9:00—10:00

Santiago Morales : *Superficies minimales completas y acotadas en* $\mathbb{R}^3$ *(Plenary talk).*

11:30—12:00

María Calle (Max Planck Institut für Gravitationphysik, Golm, Germany): *Width and Flow of hypersurfaces by curvature functions.*

12:00—12:30

César Rosales (Universidad de Granada): *Complete stable surfaces in the sub—Riemannian Heisenberg space.*

12:30—13:30

Paolo Piccione (Universidade de Sao Paulo, Brazil): *Infinitesimally homogeneous manifolds with G-structure and isometric immersions.*

ALMUERZO / LUNCH

16:00—16:30

Francisco Urbano (Universidad de Granada): *Stability of constant mean curvature surfaces in the Berger spheres.*

16:30—17:00

Laurent Hauswirth (Université de Marne-la-Vallée, France): *Remarks on constant mean curvature surfaces in homogeneous spaces.*

17:00—18:00

Antonio Ros (Universidad de Granada): *Stability of minimal and constant mean curvature surfaces.*

Resúmenes / Abstracts

Harold Rosenberg , Pascal Collin : *Asymptotic values of minimal graphs in the disc.*

In 1965, Nitsche posed the following problems. Is there a Fatou theorem for minimal graphs in the unit disk, i.e., do bounded solutions of the minimal surface equation have radial limits a.e.? What is the largest set on the unit circle such that a solution exists having no radial limit? We answer these two questions. We prove that a solution to the minimal surface equation in the open unit disk has radial limits a.e. (when the function is not bounded, the limits may be plus and minus infinity). We construct an example for which the finite radial limits are of measure zero. We conjecture the maximum measure for which plus infinity is possible is 1/2. We also consider the asymptotic values of minimal graphs over the hyperbolic plane.

Martin Schmidt : *On constant mean curvature cylinders of finite type in* $\mathbb{S}^3$.

Alexandrov extended his classification of closed CMC surfaces in the three-dimensional space forms to immersions, which extend to compact three-dimensional manifolds. The boundaries of these manifolds are the immersed surfaces. In order to classify tori of constant mean curvature embedded in $\mathbb{S}^3$ we consider immersions of a three-dimensional manifold N into $\mathbb{S}^3$, whose boundary ∂N has non-negative mean curvature with respect to the inner normal. If in addition N and ∂N are connected and complete with respect to the induced metric, we call the immersion 1-sided Alexandrov embedded. We prove that all 1-sided Alexandrov embedded CMC cylinders of finite type are surfaces of revolution. In particular all embedded CMC tori in $\mathbb{S}^3$ are Delaunay. First we show with a maximum principle at infinity of Rosenberg that the 1-sided Alexandrov embeddedness is preserved under continuous deformations. With the help of a parametrisation of the moduli space we are able to deform all 1-sided Alexandrov embedded CMC cylinders of finite type into flat 1-sided Alexandrov embedded cylinders. Finally we classify the 1-sided Alexandrov embedded flat cylinders and their connected component, containing only Delaunay surfaces.

María Calle : *Width and Flow of hypersurfaces by curvature functions*.

Given a Riemannian metric on the 2-sphere, sweep the 2-sphere out by a continuous one-parameter family of closed curves starting and ending at point curves. We can consider the curve of maximal energy in the sweepout, and then take the infimum of this energy over the class of sweepouts homotopic to the original one. The number obtained is called the width of the sweepout. The width is nonnegative, and positive if the sweepout represents a nontrivial homotopy class. A similar concept can be defined for closed hypersurfaces in $\mathbb{R}^{n+1}$. Sweepouts of a closed manifold by closed curves have been used to find closed geodesics on a given homotopy class. Colding and Minicozzi constructed a sweepout such that if a curve in the sweepout has energy close to the width, then the curve is closed to a geodesic. They used this result to give a bound on the extinction time for mean curvature flow. We generalize this bound to a broader class of geometric flows. This class of flows was proven by Andrews to behave similarly to mean curvature flow when evolving convex hypersurfaces.

César Rosales : *Complete stable surfaces in the sub—Riemannian Heisenberg space.*

We gather some advances about the classification of complete stable surfaces with or without a volume constraint in the sub-Riemannian Heisenberg group. Our main results are Heisenberg counterparts to the classical theorems by do Carmo and Peng, Fischer-Colbrie and Schoen, and Silveira, about the characterization of complete noncompact stable surfaces in Euclidean three-space.

Paolo Piccione : *Infinitesimally homogeneous manifolds with G-structure and isometric immersions.*

Let M be a differentiable manifold of dimension n, G a Lie subgroup of GL(n,$\mathbb{R}$), P a G-structure on M and ∇ a connection in M. The triple (M,P,∇) is called an affine manifold with G-structure. There are three tensors that are naturally associated with triples (M,P,∇), namely, the curvature R and the torsion T of ∇, and the covariant derivative I of the G-structure. The triple (M,P,∇) is infinitesimally homogeneous when these three tensors are constant in frames of P.

Examples of infinitesimally homogeneous structures are Riemannian manifolds of constant sectional curvature (G=O(n)), Kahler manifolds of constant holomorphic curvature (G=U(n)), Lie groups with left invariant metrics (G=1), sub-Riemannian contact manifolds of constant holomorphic curvature (G=U(n) x 1), all three-dimensional homogeneous Riemannian geometries appearing in Thurston classification, all three dimensional homogeneous Lorentzian geometries, and many others. In this talk I will briefly describe these G-structures, discuss a G-structure preserving immersion theorem in infinitesimally homogeneous manifolds, with a few applications.

Francisco Urbano, Francisco Torralbo : *Stability of constant mean curvature surfaces in the Berger spheres.*
The stability of the CMC spheres of the Berger spheres is studied. Examples of stable CMC tori in some Berger spheres are obtained. Finally, a stability theorem for compact CMC surfaces is proved.

Laurent Hauswirth : *Remarks on constant mean curvature surfaces in homogeneous spaces.*
We present some recent results on the geometry of minimal and constant mean curvature surfaces in three-dimensional manifolds.

Antonio Ros : *Stability of minimal and constant mean curvature surfaces.*
Stable minimal and constant mean curvature surfaces play an important role in Geometry. We will present recent progress in the study of these surfaces.

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ANALISIS GEOMETRICO Y GEOMETRIA DE SUBVARIEDADES

GEOMETRIC ANALYSIS AND SUBMANIFOLDS THEORY

4 al 7 de febrero, Oviedo