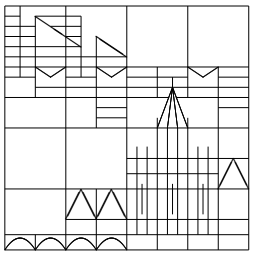
Universität Konstanz

Fachbereich
Mathematik und Statistik



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Konstanz, den 16. September 2011

Program of the Conference on Geometric Evolution Equations (21st - 23rd September 2011)

Wednesday

10:00 **Knut Smoczyk** (Universität Hannover):
Evolution of spacelike hypersurfaces in anti-De Sitter space by the Lagrangian angle of their Gauss maps
We study spacelike hypersurfaces M in an anti-De Sitter spacetime N of constant sectional curvature $-\kappa$, $\kappa > 0$ that evolve by the Lagrangian angle of their Gauss maps. In the two dimensional case we prove a convergence result to a maximal spacelike surface, if the Gauss curvature K of the initial surface $M \subset N$ and the sectional curvature of N satisfy $|K| < \kappa$.

11:30 **Roberta Alessandroni** (AEI Potsdam):
Graph solutions for curvature flows
The general properties of the geometric flows of graphs of smooth functions are studied when the speed is given by a symmetric function of the principal curvatures. In the first part we consider the flow by square root of the scalar curvature and prove that if the initial surface has linear growth at infinity, then the solutions asymptotically approach a selfsimilar solution. In the second part we consider axially symmetric solutions. We analyse the asymptotic behavior of convex translating solution for flows with speed given by positive powers of the mean curvature and of the scalar curvature. We make an interesting analogy between the two types of speeds.

14:00 **Thomas Marquardt** (MPI Potsdam):
A Neumann Problem for Inverse Mean Curvature Flow
In this talk we consider hypersurfaces with boundary which evolve in the direction of the unit normal with speed equal to the reciprocal of the mean curvature. We choose Neumann boundary conditions, i.e. the hypersurface moves along but stays perpendicular to a fixed supporting hypersurface. First we will concentrate on the case where the supporting hypersurface is a convex cone. In this case we obtain long time existence and convergence to a piece of a round sphere. Next we will present an approach to define weak solutions using a level set formalism which leads to a mixed Dirichlet-Neumann problem.

15:30 **Peter Topping** (WMI Warwick):
Flowing to minimal surfaces

Thursday

09:30 **Esther Cabezas Rivas** (Universität Münster):
How to produce a Ricci Flow via Cheeger-Gromoll exhaustion
We prove short time existence for the Ricci flow on open manifolds without requiring upper bounds on the curvature. We ask the starting manifold M to have non-negative complex sectional curvature to ensure that M admits a Cheeger-Gromoll convex exhaustion, which is the main tool to prove our theorem. Furthermore, we find a optimal volume growth condition which gives long time existence, and we construct an explicit example of an immortal non-negatively curved solution of the Ricci flow with unbounded curvature for all time.

11:30 **Miles Simon** (IAN Magdeburg):
Ricci flow of non-negatively curved cones. (Joint work with F.Schulze)
We show that the Ricci flow of a spherical cone with non-negative curvature operator exists and is a expanding gradient soliton. We construct examples of expanding solitons with non-negative curvature operator which do not have bounded asymptotic scalar curvature ratio.

14:00 **Reto Müller** (Scuola Normale Superiore Pisa):
Central blow-ups of Ricci flow singularities
We study central blow-up limits of finite time Ricci flow singularities. In the first part of the talk, we explain two different ways of proving that such rescaling limits are nontrivial shrinking Ricci solitons if the singularity is of Type I. In the second part, we give an outlook to the Type II case and explain some partial results obtained during the last year.

16:00 **Tom Ilmanen** (ETH Zürich):
New Results in Mean Curvature Flow in $\mathbb{R}^3$
I will report on numerous new results for the evolution of surfaces by mean curvature flow in $\mathbb{R}^3$, particularly when the density ratios are less than two. It includes a structure theorem for self-similar shrinking solutions, a new partial regularity theorem, monotonicity formula for self-expanding solutions, isolation of the cylinder, positive mean curvature in the neighborhood of a neckpinch, and progress toward the genericity conjecture for positive mean curvature singularities.

17:15 **Problem session**
Everybody is invited to contribute to the problem session.

Friday

09:00 **Carlo Sinestrari** (Universität Rom):
Convex hypersurfaces evolving by curvature flow
A well known result by Huisken in 1984 says that closed convex hypersurfaces evolving by mean curvature flow contract to a round point in finite time. Since then, many authors (e.g. B. Chow, B. Andrews, F. Schulze, O. Schnürer) have investigated whether the same behaviour occurs for flows driven by other symmetric homogeneous functions of the principal curvatures. It turns out that the analysis of the problem depends much on the degree of homogeneity of the speed and the dimension of the hypersurface. Here we give a survey of the known results on the problem, and we present in particular a recent work dealing with powers of the scalar curvature by R. Alessandroni and myself.

10:30 **Mariel Sáez** (PUC Chile):
Multiple-layer solutions to the Allen-Cahn equation on hyperbolic space (joint with R. Mazzeo)
In this work we study the existence of multiple-layered solutions to the elliptic Allen-Cahn equation in Hyperbolic Space. More precisely, we consider the equation

$$-\Delta_{\mathcal{H}} u + W'(u) = 0, \tag{1}$$

where $\Delta_{\mathcal{H}}$ is the Laplace-Beltrami operator in Hyperbolic space and W is a positive potential with two minima. We prove that for any given collection of non-intersecting hyperplanes in $\mathcal{H}$ there is a solution to (1) that has these hyperplanes as interfaces. Our result provides a Riemannian generalization of the work of M. del Pino, M. Kowalczyk, F. Pacard and J. Wei.

12:00 **Gerhard Huisken** (AEI Potsdam):
Evolution of hypersufaces and isoperimetric inequalities on manifolds with nonnegative Ricci curvature
We discuss estimates for mean cuvature flow and inverse mean cuvature flow on manifolds with nonnegative Ricci curvature with applications to isoperimetric inequalities.

14:00 **Felix Schulze** (FU Berlin):
Uniqueness of compact tangent flows in Mean Curvature Flow
In this talk we show, for mean curvature flows in Euclidean space, that if one of the tangent flows at a given spacetime point consists of a closed, multiplicity-one, smoothly embedded self-similar shrinker, then it is the unique tangent flow at that point. That is the limit of the parabolic rescalings does not depend on the chosen sequence of rescalings. Furthermore, given such a closed, multiplicity-one, smoothly embedded self-similarly shrinker Σ, we show that any solution of the rescaled flow, which is sufficiently close to Σ, with Gaussian density ratios greater or equal to that of Σ, stays for all time close to Σ and converges to a possibly different self-similarly shrinking solution Σ'. The central point in the argument is a direct application of the Simon-Łojasiewicz inequality to Huisken's monotone Gaussian integral for Mean Curvature Flow.

(All talks are given in **F 426**).