WORKSHOP

GEOMETRIC ANALYSIS IN GEOMETRY AND TOPOLOGY 2013

Date   October 15th − 17th, 2013
Place   Room #002, Graduate School of Mathematical Science
   The University of Tokyo
   Komaba, Meguro, Tokyo, JAPAN

Invited speakers (Survey lecturers)
   Clara Lucia Aldana (Université de Nantes)
   Ben Andrews (Australian National University)
   Emmanuel Hebey (Université de Cergy-Pontoise)
   Rafe Mazzeo (Stanford University)

Program

October 15th (Tue.)

10:00–11:00
   Ben Andrews (Australian National University)
   " Isoperimetric profile comparison in Ricci flow and curve shortening flow "

11:30–12:30
   Rafe Mazzeo (Stanford University)
   " Kähler-Einstein edge metrics I "

12:30–14:00   **Lunchtime**

14:00–15:00
   Emmanuel Hebey (Université de Cergy-Pontoise)
   " Elliptic stability for stationary Schrödinger equations I "

15:30–16:30
   Clara Lucia Aldana (Université de Nantes)
   " Determinants of Laplacians and compactnes of isospectral closed surfaces "
      (I will explain the results of Osgood, Phillips and Sarnak from 1989)

October 16th (Wed.)

10:00–11:00
  Ben Andrews (Australian National University)
  " Bounds on modulus of continuity and the fundamental gap "

11:30–12:30
  Rafe Mazzeo (Stanford University)
  " Kähler-Einstein edge metrics II "

12:30–14:00   **Lunchtime**

14:00–15:00
  Emmanuel Hebey (Université de Cergy-Pontoise)
  " Elliptic stability for stationary Schrödinger equations II "

15:30–16:30
  Clara Lucia Aldana (Université de Nantes)
  " Determinants of Laplacians on surfaces with singularities "

October 17th (Thu.)

10:00–11:00
  Ben Andrews (Australian National University)
  " Non-collapsing and the Lawson and Pinkall-Sterling conjectures "

11:30–12:30
  Rafe Mazzeo (Stanford University)
  " Kähler-Einstein edge metrics III "

12:30–14:00   **Lunchtime**

14:00–15:00
  Emmanuel Hebey (Université de Cergy-Pontoise)
  " Elliptic stability for stationary Schrödinger equations III "

15:30–16:30
  Clara Lucia Aldana (Université de Nantes)
  " Isospectrality for open manifolds and compactness "

Abstract

- Ben Andrews :

<u>Abstract</u>   Overall theme : Maximum principles involving functions of several points. In these lectures I will describe a collection of related ideas centred around the idea of applying maximum principles to functions involving several points, to obtain sharp control on the behaviour of geometric equations.

Lecture 1 : Isoperimetric profile comparison in Ricci flow and curve shortening flow

I will describe a remarkably powerful method involving comparing isoperimetric profiles, which allows easy proofs of the convergence of Ricci flow on a two dimensional sphere to constant curvature (modulo scaling) and of Grayson's theorem for the curve shortening flow of embedded closed curves in the plane. This is based on joint work with Paul Bryan.

Lecture 2 : Bounds on modulus of continuity and the fundamental gap

In this lecture I will show how a simple maximum principle can be applied to get sharp control on the modulus of continuity for solutions of heat equations. While the initial motivation for this method was to get short time regularity results for nonlinear heat equations, some very interesting consequences can be obtained also from the long-term behaviour: Sharp lower bounds on the first nontrivial eigenvalue follow in several contexts. By extending the ideas to control the 'modulus of concavity' of an eigenfunction, we also prove a sharp lower bound on the 'fundamental gap'. This is joint work with Julie Clutterbuck.

Lecture 3 : Non-collapsing and the Lawson and Pinkall-Sterling conjectures

In this lecture I will describe some ideas which led to Brendle's recent proof of the Lawson conjecture: The only embedded minimal torus in S^3 is the Clifford torus. The key estimate arises from work on mine on 'non-collapsing' in the mean curvature flow. I will describe this estimate and its proof, which is similar in spirit to the ideas discussed in the previous two lectures, and then show how Brendle modified it to give the Lawson conjecture. Haizhong Li and I also used these ideas to prove a conjecture made by Pinkall and Sterling about constant mean curvature tori in the three-sphere. If time allows I will also discuss more recent results for more general classes of Weingarten surfaces.

- Rafe Mazzeo : Kähler-Einstein edge metrics

<u>Abstract</u>   This series of talks will focus on the existence of Kähler-Einstein metrics with edge singularities, a key step in Donaldson's program for establishing KE metrics on Fano manifolds. This relies on an interesting blend of linear and nonlinear techniques: the linear ones are drawn from geometric microlocal analysis and the nonlinear ones involve some new ways of obtaining a priori estimates for complex Monge-Ampere equations.

- Emmanuel Hebey : Elliptic stability for stationary Schrödinger equations

<u>Abstract</u>   TBA

- Clara Lucia Aldana :

<u>Abstract</u>   TBA

Organizers

Shu Nakamura (University of Tokyo)
Mikio Furuta (University of Tokyo)
Osamu Kobayashi (Osaka University)
Shinichiroh Matsuo (Osaka University)
Rafe Mazzeo (Stanford University, Foreign adviser)
Kazuo Akutagawa (Tokyo Institute of Technology)