

# 2015 ECNU Winter-Workshop on Geometry and Analysis on Manifolds

There will be a mini-workshop on geometry and analysis on manifolds held in the Department of Mathematics at East China Normal University during the two days of December 17 and December 18, 2015.

The purpose of the workshop is to disseminate current research development in differential geometry, geometric analysis and related fields to graduate students, postdoctoral fellows, and mathematicians who are interested in these topics. We hope to bring students and experts together in an inspiring environment, which facilitates the beginning and the continuing of research collaborations and dissemination.

The workshop has planned several talks each day on December 17 and December 18. Participants are encouraged to engage in informal discussions between and after the lectures. According to the participants' interests, some informal talks may be arranged on demand.

**Date : December 17, 2015**

**Place : Room 401  
Department of Mathematics at East China Normal University  
500 Dongchuan Road, Minhang Campus  
Shanghai, 200241  
P. R. China**

**Date : December 18, 2015**

**Place : Room 1414, Science Building A  
Department of Mathematics at East China Normal University  
3663 Zhongshan North Road  
Shanghai, 200062  
P. R. China**

## Organizing Committee

Xianzhe Dai  
University of California, Santa Barbara  
East China Normal University  
[dai@math.ucsb.edu](mailto:dai@math.ucsb.edu)

Guofang Wei  
University of California, Santa Barbara  
East China Normal University  
[wei@math.ucsb.edu](mailto:wei@math.ucsb.edu)

Yu Zheng  
East China Normal University  
[zhyu@math.ecnu.edu.cn](mailto:zhyu@math.ecnu.edu.cn)

Linfeng Zhou  
East China Normal University  
[lfzhou@math.ecnu.edu.cn](mailto:lfzhou@math.ecnu.edu.cn)

## Secretary

Hongyan Zhang, East China Normal University [hyzhang@math.ecnu.edu.cn](mailto:hyzhang@math.ecnu.edu.cn)

## Participants List

Han, Fei	National University of Singapore, Singapore
Hong, Minchun	University of Queensland, Australia
Li, Yi	Shanghai Jiaotong University, China
Pan, Shengliang	Tongji University, China
Wu, Jiayong	Shanghai Maritime University, China
Wang, Linfeng	Nantong University, China
Wu, Guoqiang	East China Normal University, China
Yang, Yihu	Shanghai Jiaotong University, China
Fu, jixiang	Fudan University, China
Ding, Qing	Fudan University, China
Xu, Deliang	Shanghai Jiaotong University, China
Zhou, Chunqing	Shanghai Jiaotong University, China
Lu, Zhiqin	University of California, Irvine, USA
Wu, Peng	East China Normal University, China
Wang, Fang	Shanghai Jiaotong University, China
Xi, Dongmeng	Shanghai University, China
Liu, Jiancheng	Northwest Normal University
Lai, Mijia	Shanghai Jiaotong University, China
Liao, Caisheng	East China Normal University, China
Liu, Pan	East China Normal University, China
Shen, Chunli	East China Normal University, China
Wang, Lili	East China Normal University, China
Guo, Fangcheng	Longdong University, China
Yu, Jianqing	University of Science and Technology of China

## 2015 ECNU Winter-Workshop on Geometry and Analysis on Manifolds

		December 17	December 18
<b>Morning Session</b>	09:00-09:50	Minchun Hong	Jixiang Fu
	10:10-11:00	Yi Li	Qing Ding
	11:20-12:10	Fang Wang	Jiayong Wu
<b>Lunch Break</b>			
<b>Afternoon Session</b>	14:00-14:50	Peng Wu	Shengliang Pan
	15:10-16:00	Zhiqin Lu	Jiancheng Liu
	16:20-17:10	Fei Han	Yihu Yang
	17:30-18:20		Dongmeng Xi
<b>Dinner</b>			

## December 17, Thursday

### Morning Session

09:00-09:50	Minchun Hong A parabolic gauge fixing theorem and its application to the Yang-Mills flow
10:10-11:00	Yi Li Long time existence and bounded scalar curvature in the Ricci-harmonic flow
11:20-12:10	Fang Wang On the scattering operators for ACHE metrics of Bergman type

### Afternoon Session

14:00-14:50	Peng Wu On the rigidity and first eigenvalue upper bound of Einstein four-manifolds with positive curvature
15:10-16:00	Zhiqin Lu On the $L^2$ estimates on moduli space of Calabi-Yau manifolds
16:20-17:10	Fei Han T duality, loop spaces and twisted Bismut-Chern character

Place: Room 401, Department of Mathematics, Minhang Campus  
500 Dongchuan Road

## December 18, Friday

### Morning Session

09:00-09:50	Jixiang Fu 具有 PMY 渐近性的 CSCK 度量的局部模型
10:10-11:00	Qing Ding On the Dirichlet partial-boundary problem at infinity
11:20-12:10	Jiayong Wu Classification of 4-dim gradient shrinking Ricci solitons with half harmonic Weyl tensor

### Afternoon Session

14:00-14:50	Shengliang Pan Positive centre sets of convex curves
15:10-16:00	Jiancheng Liu Classification of hypersurfaces satisfying in pseudo-Riemannian
16:20-17:10	Yihu Yang A new proof of a theorem of Petersen
17:30-18:20	Dongmeng Xi Dar's conjecture and the logarithmic Minkowski problem

Place: Room 1414, Science Building A, Zhongbei Campus  
3663 Zhongshan North Road

# Abstracts

## **The Yang-Mills alpha-flow in vector bundles over four manifolds and its applications**

**Minchun Hong**

University of Queensland, Australia

**Abstract:** In this talk, we introduce an alpha-flow for the Yang-Mills functional in vector bundles over four dimensional Riemannian manifolds, and establish global existence of a unique smooth solution to the alpha-flow with smooth initial value. We prove that the limit of the solutions of the alpha-flow as  $\alpha \rightarrow 1$  is a weak solution to the Yang-Mills flow. By an application of the alpha-flow, we then follow the idea of Sacks and Uhlenbeck to prove some existence results for Yang-Mills connections and improve the minimizing result of the Yang-Mills functional of Sedlacek.

## **Long time existence and bounded scalar curvature in the Ricci-harmonic flow**

**Yi Li**

Shanghai Jiaotong University, China

yilicms@sjtu.edu.cn

**Abstract:** In this paper we study the long time existence of the Ricci-harmonic flow in terms of scalar curvature and Weyl tensor which extends Cao's result to the Ricci-harmonic flow. In dimension four, we also study the integral bound of the "Riemann curvature" for the Ricci-harmonic flow generalizing a recently result of Simon.

## **On the scattering operators for ACHE metrics of Bergman type**

**Fang Wang**

Shanghai Jiaotong University, China

**Abstract:** The scattering operators associated to an ACHE metric of Bergman type on a strictly pseudovonvex domain are a one-parameter family of CR-conformally invariant pseudodierntial operators of Heisenberg class with respect to the induced CR structure on the boundary. I will mainly talk about the positivity result and energy extension formulae for those operators.

**On the rigidity and first eigenvalue upper bound of Einstein four-manifolds with positive curvature**

**Peng Wu**

East China Normal University, China

**Abstract:** In this talk we will discuss some recent results on the rigidity and first eigenvalue upper bound of Einstein four-manifolds with positive curvature. The main arguments are curvature decompositions and the Weitzenbock formula for half Weyl curvature on Einstein four-manifolds. If time permitted, we will also discuss a Weitzenbock formula on "Einstein" smooth metric measure spaces.

**On the  $L^2$  estimates on moduli space of Calabi-Yau manifolds**

**Zhiqin Lu**

University of California, Irvine, USA

**T duality, loop spaces and twisted Bismut-Chern character**

**Fei Han**

National University of Singapore, Singapore

**Abstract:** T-duality, a fundamental symmetry in String theory, implies String theories on topologically different spacetime can be equivalent. In this talk, I will very roughly explain in a mathematical way what is T duality. I will also explain how classical theories like de Rham cohomology, K-theory and etc can be related by T-duality if one considers the twisted versions of them. In particular, I will describe a new twisted equivariant cohomology theory for the loop spaces and the twisted Bismut-Chern character for the twisted K theory, which represents our joint work with Mathai Varghese.

具有 PMY 渐近性的 CSCK 度量的局部模型

**Jixiang Fu**

Fudan University, China

majxfu@fudan.edu.cn

**On the Dirichlet partial-boundary problem at infinity**

**Qing Ding**

Fudan University, China

[qding@fudan.edu.cn](mailto:qding@fudan.edu.cn)

**Classification of 4-dim gradient shrinking Ricci solitons with half harmonic Weyl tensor**

**Jiayong Wu**

Shanghai Maritime University, China

jywu81@yahoo.com

**Abstract:** In this talk, I first review previous classifications of gradient shrinking Ricci solitons under various curvature assumptions. Then, we give our complete classification of 4-dimensional gradient shrinking Ricci solitons with half harmonic Weyl tensor. This is joint work with Peng Wu and William Wylie.

**Positive centre sets of convex curves**

**Shengliang Pan**

Tongji University, China

sliangpan@tongji.edu.cn

**Classification of hypersurfaces satisfying  $\tau_2(\phi) = \eta\tau(\phi)$  in pseudo-Riemannian space forms**

**Jiancheng Liu**

Northwest Normal University, China  
liujc@nwnu.edu.cn

**A new proof of a theorem of Petersen**

**Yihu Yang**

Shanghai Jiaotong University, China  
yhyang@mail.tongji.edu.cn

**Abstract:** In this talk, I will give a new proof of a theorem of P. Petersen (Inventiones, 1999), which says that for a complete Riemannian manifold with  $\text{Ricci} \geq n-1$ , if its first  $n+1$  eigenvalues are sufficiently close to  $n$ , then it is sufficiently close to the standard  $n$ -sphere in the sense of Gromov-Hausdorff, by using some techniques developed by T. Colding (Inventiones, 1996). This is a joint work with my student Y. Zhang.

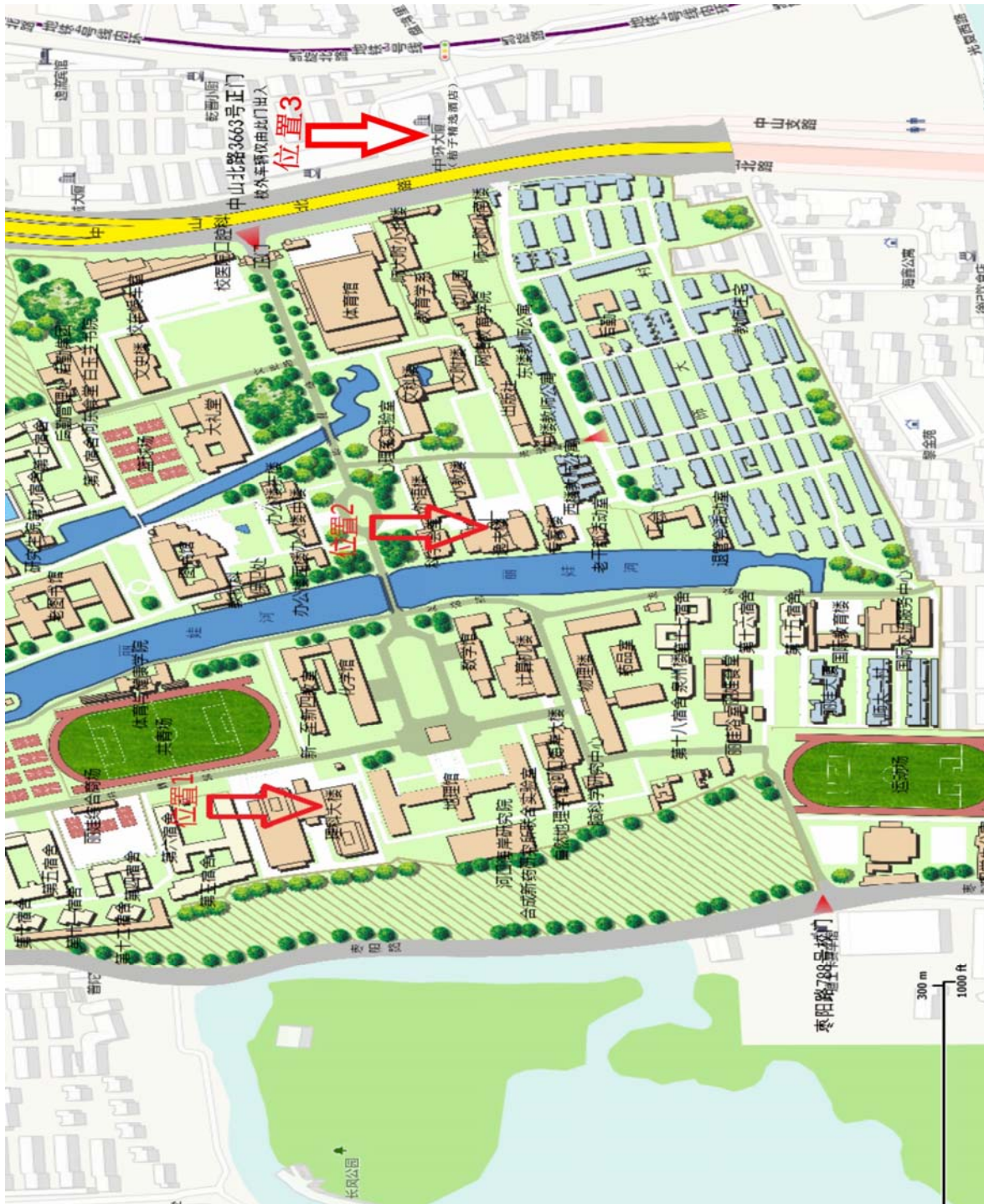
**Dar's conjecture and the logarithmic Minkowski problem**

**Dongmeng Xi**

Shanghai University, China



## Traffic and the map of hotel and Campus of Zhongshan North Road



- 位置1: Science Building A.
- 位置2: Yifu Building Hotel.
- 位置3: 中环大厦(桔子精选酒店)

# Traffic and the map of hotel and Campus of Minhang



位置1: Department of Math

位置2: Qiushi Ge