

スーパーグローバルコース  
数学特別講演  
(偏微分方程式)

講義題名: 「Blow-up, compactness and (partial) regularity in Partial Differential Equations」

講師: Christophe Prange 氏 (CNRS研究員)

講義日程: 12月 11日(月) 9:45~10:45

11:00~12:00

14:45~15:45

16:00~17:00

場所: 理学部3号館110セミナー室

講義概要: 別紙参照

## 講義概要(偏微分方程式):

The question of whether solutions of Partial Differential Equations (PDEs) are regular or not is central in the field. One of the most famous problems is the existence of smooth solutions to the Navier-Stokes equations in fluid mechanics, or the finite time break down of regularity (millennium problem of the Clay Institute).

The scope of this lecture series is much more modest. Methods based on blow-up and compactness are powerful tools to establish regularity for linear PDEs or partial regularity for nonlinear PDEs. These methods, which originated in the study of the regularity of minimal surfaces in the 60's, have been successfully applied to other subjects: regularity in homogenization, in the calculus of variations or in fluid mechanics. More specifically, the lectures will focus on two topics: (i) uniform estimates in the homogenization of linear elliptic divergence form equations, (ii) epsilon-regularity results for the Navier-Stokes equations. The material presented in the course is well-known to the PDE community since the late 90's. However, the results have been celebrated as breakthroughs and are still inspiring new mathematical developments today, some of which will be outlined.

Summary of the content:

1. Improved regularity in homogenization: compactness methods for uniform Lipschitz regularity, Liouville type theorems for equations with periodic coefficients
2. Epsilon-regularity for Navier-Stokes equations

The lectures are based on works by Avellaneda and Lin (1987, 1989, 1991), Caffarelli, Kohn and Nirenberg (1982), Lin (1998), Ladyzhenskaya and Seregin (1999) and Kukavica (2009).

京都大学理学研究科数学教室