FIM Minicourse

Philip Gressman (University of Pennsylvania)

The Boltzmann Equation and Harmonic Analysis

March 7 - 14, 2013

Thursday, March 7, 14:00 - 16:00
Friday, March 8, 13:00 - 15:00
Wednesday, March 13, 15:00 - 17:00
Thursday, March 14, 14:00 - 16:00

HG G 19.1, ETH Zürich, Rämistrasse 101

Abstract

This course will introduce students to the Boltzmann Equation. Despite having been written down over 140 years ago and having played a central role in statistical mechanics and thermodynamics, there are still many fundamental mathematical features of this equation which are poorly understood. The course will give a brief history of the mathematical work on this equation and its close relative, the Landau equation. The rest of the course will be devoted to a detailed walkthrough of a 2009 theorem, joint with R. M. Strain, which establishes global existence of solutions of the Boltzmann equation which are initially close to equilibrium (in a sense to be made precise). One of the key ingredients of the proof is a specially adapted, geometrically-inspired, Littlewood-Paley decomposition which will be discussed in detail. As time permits, we will also discuss more recent developments in this direction and point out avenues for future research.

Students need only have basic training in analysis to fully benefit from this course - no prior experience with the Boltzmann Equation or Littlewood-Paley theory will be required.

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