Berlin Mathematical School

BMS Women In Mathematics

Lecture Series

Friday 27 January 2012 at 14:30

Tea and cookies will be served after the lecture

TU Berlin, MA 004, Straße des 17. Juni 136, 10623 Berlin

Verena Bögelein

(Friedrich-Alexander Universität Erlangen-Nürnberg)

Global Lipschitz regularity of the parabolic *p*-Laplacian system

Partial differential equations involving a degenerate diffusion part have been of huge interest for mathematicians and also other natural scientists for a long time. The most prominent models for this kind of PDEs are the elliptic and parabolic *p*-Laplacian equation, respectively system. They naturally arise in geometry, quasiconformal mappings, fluid dynamics and image restoration. Apart from applications these problems are also of huge mathematical interest because of their particular structure. The question for regularity of solutions was a longstanding open problem. Even up to now there are still unsolved problems. The first breakthrough was achieved by Ural'tseva in 1968 who proved local $C^{1,\alpha}$ regularity for solutions of the elliptic *p*-Laplacian equation. The analogous result for the elliptic *p*-Laplacian system - which cannot be treated by the techniques used by Ural'tseva for equations - was achieved only ten years later in the famous paper of Uhlenbeck. Once again, the techniques did not apply in order to treat the time dependent parabolic case and therefore it took almost another ten years until Dibenedetto & Friedman proved a similar result for the parabolic *p*-Laplacian system.

With respect to the boundary regularity the situation is quite different. In the elliptic as well as in the parabolic case it is only known for the equations that solutions are of class $C^{1,\alpha}$ up to the boundary. In this talk, Verena Bögelein will present a new global Lipschitz regularity result for solutions to the parabolic *p*-Laplacian system. The result also applies to a larger class of parabolic systems, the so called asymptotically regular systems. The somewhat surprising fact is that no quasi-diagonal structure has to be assumed.

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