DK Seminar

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University of Vienna,
Oskar-Morgenstern-Platz 1, HS 2.

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Mathematical scandal – Euler equations

In the recent years a significant attention has been directed again to Euler system, which was derived more than 250 years ago by Euler. The system describes the motion of an inviscid fluid. The main attention has been directed to incompressible fluids. Nevertheless, also the system of compressible fluids is an emerging topic, however still very far from a complete understanding. The classical results of Scheffer and Schnirelman pointed out the problem of non-uniqueness of distributional solutions to incompressible Euler system. However the crucial step appeared to be an application of methods arising from differential geometry, namely the celebrated theorem by Nash and Kuiper. This brought Camillo De Lellis and Laszlo Szekelyhidi Jr. in 2010 to the proof of existence of bounded nontrivial compactly supported in space and time solutions of the Euler equations (obviously not conserving physical energy!), basing on the Baire category method, which was highly non-standard kind of proof used in the theory of PDEs. Without a doubt this result is a first step towards the conjecture of Lars Onsager, who in his 1949 paper about the theory of turbulence asserted the existence of such solutions for any Hoelder exponent up to 1/3. As a result very much related to the Onsager conjecture one can find the result of P. Constantin, W. E and E. Titi for incompressible flow proving the energy conservation for any Hoelder exponent above 1/3. Our talk is based on several resent results

joint with Eduard Feireisl and Emil Wiedemann and concerns various notions of solutions to compressible Euler equations and some systems of a similar structure.