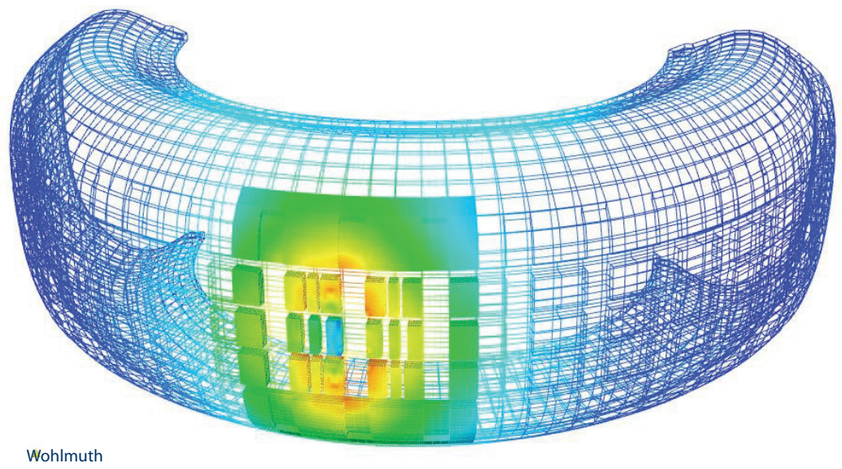
Berlin Mathematical School

BMS Kovalevskaya Colloquium

Friday 12 July 2013 at 14:15

Tea & Cookies starting at 13:00

BMS Loft, Urania, An der Urania 17, 10787 Berlin



Wohlmuth

Barbara Wohlmuth

(TU München)

Numerical Analysis for Computational Science

In many multi-physics applications, coupled models and dimension-reduced PDE systems play an important role in the mathematical modelling of physical effects on different scales, e.g., fractures of co-dimension 1 in porous media systems, networks of co-dimension 2 or point sources. Although these simplified models seem very attractive from the computational point of view, for coupled problems they may result in a solution of reduced regularity. Mathematically, transmission problems with piecewise smooth solutions or PDEs in a distributional sense with singular solutions arise.

The global accuracy is often dominated by local effects at the interfaces, and local singularities can pollute the numerical solution. Here we discuss several issues such as stability, local energy corrections and optimal estimates for the flux variables. The coupling is controlled by pairs of balance equations providing a very flexible framework. But stability and accuracy do not come for free.

Different numerical examples illustrate the abstract concepts, with special focus on surface-based coupling techniques and highly non-linear dimension-reduced systems.

Barbara Wohlmuth is a professor of mathematics at Technische Univerisität München (TUM) and specializes in the numerical simulation of PDEs. She completed her doctorate at TUM in 1995 and habilitation at Universität Augsburg in 2000. After posts at the Courant Institute and in France, Hong Kong and Stuttgart, she began her current position at TUM in 2010. In 2012 she received the DFG Leibniz Prize.

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