Stable Multiscale Bases and Adaptive Techniques for Elliptic Problems

Wolfgang Dahmen, RWTH Aachen

This talk is concerned with the analysis of adaptive multiscale techniques for the solution of a wide class of elliptic operator equations covering, in principle, singular integral as well as partial differential operators. The central objective is to derive reliable and efficient a-posteriori error estimators for Galerkin schemes which are based on stable multiscale bases. By means of the characterization of Sobolev spaces in terms of certain weighted sequence norms it is shown that local error estimators based on wavelet coefficients of residuals provide tight lower and upper bounds for the error in the energy norm. This gives rise to an adaptive space refinement scheme which under mild assumptions on the input date can be proved to converge in the above mentioned range of cases, including operators of negative order. It should be noted that the *saturation property* is *not* assumed beforehand but shown to be enforced by the adaptive scheme.