Title:

Higher Order Calderon-Zygmund Estimates for the p-Laplace Equation

Abstract:

We consider non-linear, degenerate p-Poisson equation

$$-\mathrm{div}(A(\nabla u)) = -\mathrm{div}(|\nabla u|^{p-2}\nabla u) = -\mathrm{div}F.$$

In recent years it has been discovered that such equations allow for optimal regularity. The non-linear mapping $F \mapsto A(\nabla u)$ satisfies surprisingly the linear, optimal estimate $\|A(\nabla u)\|_X \le c\,\|F\|_X$ for several choices of spaces X. In particular, this estimate holds for Lebesgue spaces L^q (with $q \ge p'$), spaces of bounded mean oscillations and Hölder spaces $C^{0,\alpha}$ (for some $\alpha > 0$).

In this talk we show that we can extend this theory to Sobolev and Besov spaces of (almost) one derivative. Our result are restricted to the case of the plane, since we use complex analysis in our proof. Moreover, we are restricted to the super-linear case $p \ge 2$, since the result fails if $p < 2$.

The talk is based on joint work with Lars Diening and Marcus Weimar.