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A weighted gradient estimate for nonlinear PDE associated to the Christoffel-Minkowski problem

The classical Christoffel-Minkowski problem is an inverse type problem in convex geometry. One wants to find a convex body with prescribed k th area measure. At one end $k = 1$, it's the Christoffel problem, at the other end $k = n$ it's the Minkowski problem. There is also a L^p version of this type of problem: the intermediate L^p Christoffel-Minkowski problem $0 < p$. The problem corresponds to a degenerate Hessian type equation on S^n . We will discuss a recent work on the weighted gradient estimate and its application to the existence and convexity of solution to this type of equations.