In this talk, we will discuss how some modern harmonic analysis methods can be applied to the study of nonlinear PDE modeled by the quasilinear $p$-Laplace and fully nonlinear $k$-Hessian operators.

In particular, we will focus on describing the global behavior of solutions to the following nonlinear equations:

$$-\Delta_p u = \sigma u^{p-1} + \omega, \quad \text{and} \quad F_k(-u) = \sigma u^k + \omega,$$

where $\sigma$ and $\omega$ are nonnegative Borel measures. Here $\Delta_p$ is the quasilinear $p$-Laplacian operator, defined by $\Delta_p u = \text{div}(|\nabla u|^{p-2} \nabla u)$, and $F_k(u)$ is the fully nonlinear $k$-Hessian operator, defined by $F_k(u) = \sum_{1 \leq i_1 < \cdots < i_k \leq n} \lambda_{i_1} \cdots \lambda_{i_k}$, where $\lambda_1, \ldots, \lambda_n$ are the eigenvalues of the Hessian matrix of $u$. The results presented are joint work with Igor E. Verbitsky. (Received February 15, 2010)