Positive solutions of singular elliptic problems in exterior domains

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We consider the following elliptic problem

$$\begin{cases} div(a(||x||)\nabla u(x)) + f(x, u(x)) - (u(x))^{-\alpha}||\nabla u(x)||^{\beta} + g(x)x \cdot \nabla u(x) = 0, \\ \lim_{||x|| \to \infty} u(x) = 0, \end{cases}$$

discussed in the exterior domain $\Omega_R = \{x \in \mathbb{R}^n, ||x|| > R\}$, where $n > 2$. We give quite general assumptions which allow us to prove the existence of at least one positive solution u of our equation with the asymptotic decay $u(x) = O(||x||^{2-n})$ as $||x|| \to \infty$. Our approach is based on the subsolution and supersolution method. These results cover both sublinear and superlinear cases of f.

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