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Obata's rigidity theorem on manifolds with boundary

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Abstract

We study the Obata equation with Robin boundary condition $\frac{\partial f}{\partial \nu} + af = 0$ on manifolds with boundary Dirichlet boundary and Neumann boundary conditions were previously studied by Reilly and Escobar, respectively. Unlike their resutls, the sign of a plays a role here. The new discovery shows besides spherical domains, there are other manifolds for both $a > 0$ and $a < 0$. We also considered the non-vanishing Neumann condition $\frac{\partial f}{\partial \nu} = 1$ and give a full discussion of the manifolds. This is joint work with Mijia Lai and Xuezhang Chen.