

# TWO-GRID WEAK GALERKIN METHOD FOR SEMILINEAR ELLIPTIC DIFFERENTIAL EQUATIONS

luoping chen<sup>1</sup>, fanyun wu<sup>1</sup>, and guoyan zeng<sup>1</sup>

<sup>1</sup>Southwest Jiaotong University

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## Abstract

In this paper, we investigate a two-grid weak Galerkin method for semilinear elliptic differential equations. The method mainly contains two steps. First, we solve the semi-linear elliptic equation on the coarse mesh with mesh size  $H$ , then, we use the coarse mesh solution as a initial guess to linearize the semilinear equation on the fine mesh, i.e., on the fine mesh (with mesh size  $h$ ), we only need to solve a linearized system. Theoretical analysis shows that when the exact solution  $u$  has sufficient regularity and  $h=H^2$ , the two-grid weak Galerkin method achieves the same convergence accuracy as weak Galerkin method. Several examples are given to verify the theoretical results.

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