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**Analysis of linear and quadratic simplicial finite volume methods for elliptic equations.** (English)

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The present paper provides us with an analysis of some convergence properties of two classes of finite volume methods (FVMs). The first class considered is the linear finite volume methods in any dimension, and the second class is a quadratic simplicial finite volume method in two dimensions.

Concerning the first class, the authors first derived a simple identity between the stiffness matrix of the linear FVM and that of the corresponding finite element methods (FEMs) for Poisson equations. Thanks to this identity, the inf-sup condition of the FVM schemes for elliptic equations with variable coefficient is proved, and a superconvergence result is presented. As consequences of the previous stated identity, some a posteriori error estimates are presented and also algebraic solvers for FEM are extended to FVM.

Concerning the second class presented in this paper, the authors constructed and analyzed a general class of two dimensional quadratic simplicial grid FVM schemes. Under some weak condition on the grid, inf-sup condition is established for this class of quadratic simplicial grid FVM schemes.

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*Keywords* : linear finite volume methods; linear finite element methods; quadratic finite volume methods; elliptic equations; inf-sup condition; arbitrary dimension; two dimensions

*Classification* :

\*65N30 Finite numerical methods (BVP of PDE)

65N06 Finite difference methods (BVP of PDE)

65N12 Stability and convergence of numerical methods (BVP of PDE)