# A STABILIZED FINITE ELEMENT METHOD FOR THE STOKES–TEMPERATURE COUPLED PROBLEM

RODOLFO ARAYA, CRISTIAN CÁRCAMO, AND ABNER H. POZA

Abstract. In this talk, we introduce and analyze a new stabilized finite element scheme for the Stokes–Temperature coupled problem. This new scheme allows equal order of interpolation to approximate the quantities of interest, i.e. velocity, pressure, temperature, and stress. We analyze an equivalent variational formulation of the coupled problem inspired by the ideas proposed in [2]. The existence of the discrete solution is proved, decoupling the proposed stabilized scheme and using the help of continuous dependence results and Brouwer's theorem under the standard assumption of sufficiently small data. Optimal convergence is proved under classic regularity assumptions of the solution. Finally, we present some numerical examples to show the quality of our scheme, in particular, we compare our results with those coming from a standard reference in geosciences described in [5].

**Keywords**: Coupled Stokes–Temperature problem, Stabilized finite element method, A priori error analysis.

**Mathematics Subject Classifications (2010)**: 65L60.

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Departamento de Ingeniería Matemática & CI$^2$MA, Universidad de Concepción, Concepción, Chile.

*Email address*: rodolfo.araya@udec.cl

Weierstrass Institute, Germany.

*Email address*: email@second.author.org

Departamento de Matemática y Física Aplicadas and Grupo de Investigación en Análisis Numérico y Cálculo Científico, GIANuC$^2$ Universidad Católica de la Santísima Concepción, Concepción, Chile.

*Email address*: apoza@ucsc.cl