



Nonlinear Static Analysis by Finite Elements of a Fujian Hakka Tulou

Bruno Briseghella

University of Fuzhou, China

Valeria Colasanti, Luigi Fenu

University of Cagliari, Italy

Camillo Nuti

University of Roma Tre, Italy

Enrico Spacone

University of Chieti-Pescara, Italy

Humberto Varum

University of Porto, Portugal

Contacting author: lfenu@unica.it

Abstract

Hakka Tulous are massive circular earth constructions of the Fujian Province, China, included in the UNESCO World Heritage list. They are subjected to earthquakes of medium magnitude, but their response to the seismic action is not yet investigated in depth. The seismic response of Fujian Tulous was herein investigated through pushover analysis modelling the Tulou structure by finite elements. Although the Tulou is a big construction with a circular earth wall of about fifty meters in diameter, a micromechanical approach was used to model the earth nonlinear behaviour. Even if no binder is added to the earthen material, the Concrete Damaged Plasticity model can be adopted and has shown to be effective in modelling its nonlinear behaviour, as well as the nonlinear response of the Tulou earth wall. Performing pushover analysis of a big earth structure using a micromechanical approach seems to give reliable results, that must be proved by future research.

Keywords: Hakka Tulou; seismic response; non-linear static analysis; finite elements; Concrete Damage Plasticity model; Capacity cure.

1. Introduction

Hakka Tulous are big circular earth constructions typical of the Fujian Province, China. They are very

important by both a cultural and architectural point of view and, for this reason, included in the UNESCO World Heritage list.