

A simulation model for a telescope earthquake analysis: the VST primary mirror safety system

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Abstract The VST (VLT Survey Telescope) is a wide field survey telescope going to be commissioned at Cerro Paranal (Chile). Due to the geological nature of the area, telescopes in Chile can be submitted to unpredictable and sometimes severe earthquake conditions. The commonly used response spectrum analysis has proven to be not suitable to evaluate the behavior of the VST telescope during an earthquake, due to the high number of devices with a nonlinear force–displacement characteristic in the primary mirror cell. Therefore, a nonlinear transient analysis based on a mixed Finite Element–Simulink approach has been carried out. A linear Finite Element (FE) model of the telescope has been developed and exported to Simulink, using a space state model representation. Then all nonlinear devices have been properly modeled and artificial accelerograms based on seismic history of the site have been applied. The paper focuses on the Simulink model, while giving an overview of the whole procedure.

Keywords Telescope · Finite elements · Earthquake analysis · Matlab

1 Introduction

The VST is a 2.6-m F/5.5 modified Ritchey–Chrétien telescope installed at Cerro Paranal (Northern Chile), the European Southern Observatory (ESO) major optical observatory. Due to the geological conformation of the area it is likely that important seismic activities occur [8]. Therefore a considerable

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