

# Application of Brillouin-based distributed optical fibre sensing technology to measure strain development of a slope model

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**Abstract.** For almost two decades, distributed optical fibre sensors are well-known for an alternative to conventional instrumentation in geotechnical engineering applications. However, the technology is yet to be fully implemented due to uncertainties of attachment method or the best way to deploy optical fibre for geo-structure health monitoring. Thus, a project of a 1g model of soil slope was initiated and was constructed with three layers of optical fibre that were horizontally embedded in the soil slope mass in order to observe strain development due to a surcharge load. The strain mobilizations were measured by using Brillouin Optical Time-Domain Analysis (BOTDA) sensing system during the incremental loading on the slope crest until a failure feature had been initiated. The aim of study is to evaluate the development of horizontal strains from Brillouin-based optical fibre sensor subjected to soil slope deformation which lead to slope failures. The results showed that the measurands of optical fibre were highly accumulated at the position of 0.3m depth from the slope crest. The development of high strain at this position was because of soil-fibre interaction to the overburden imposed load in perpendicular direction of optical fibre placement. Therefore, it can be concluded that the optical fibre strain in the soil-strain field were well-responded to the particle soil movement. In addition, the significant trend of positive strain curves were illustrated when the soil was under compression due to external load from a surcharge load plus self-weight of the soil material.

## 1 Introduction

Optical fibre technology has been employed in structural health monitoring industry in more than two decades and seemed has been positively appraised by the users. It is due to

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