

# Cyclic degradation of Toyoura sand using advanced Torsional shear apparatus

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## Introduction

In 2011, The pacific coast Tohoku earthquake case great damage to many earth fill dams in Iwate, Miyagi and Fukushima prefectures. The primary cause of failure was low degree of compaction of sandy soil in the top fill o embankment which resulted in low undrained shear strength, that further deteriorated by the repeated undrained cyclic loading of long duration earthquake motion.

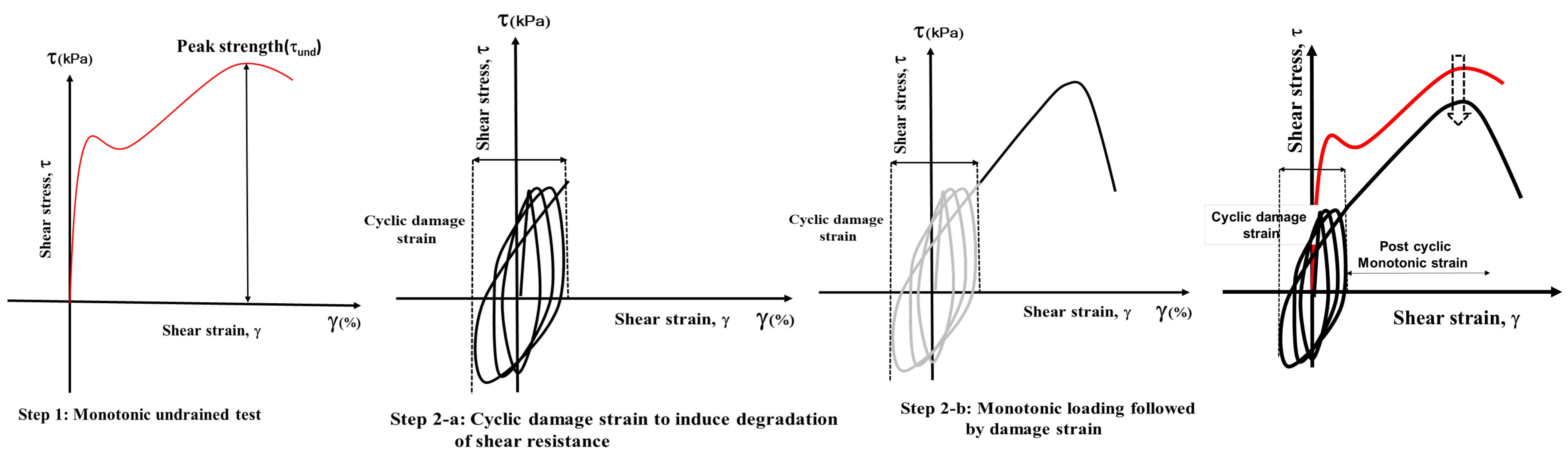


Fig. 1 Google earth view of Fujinuma Dam

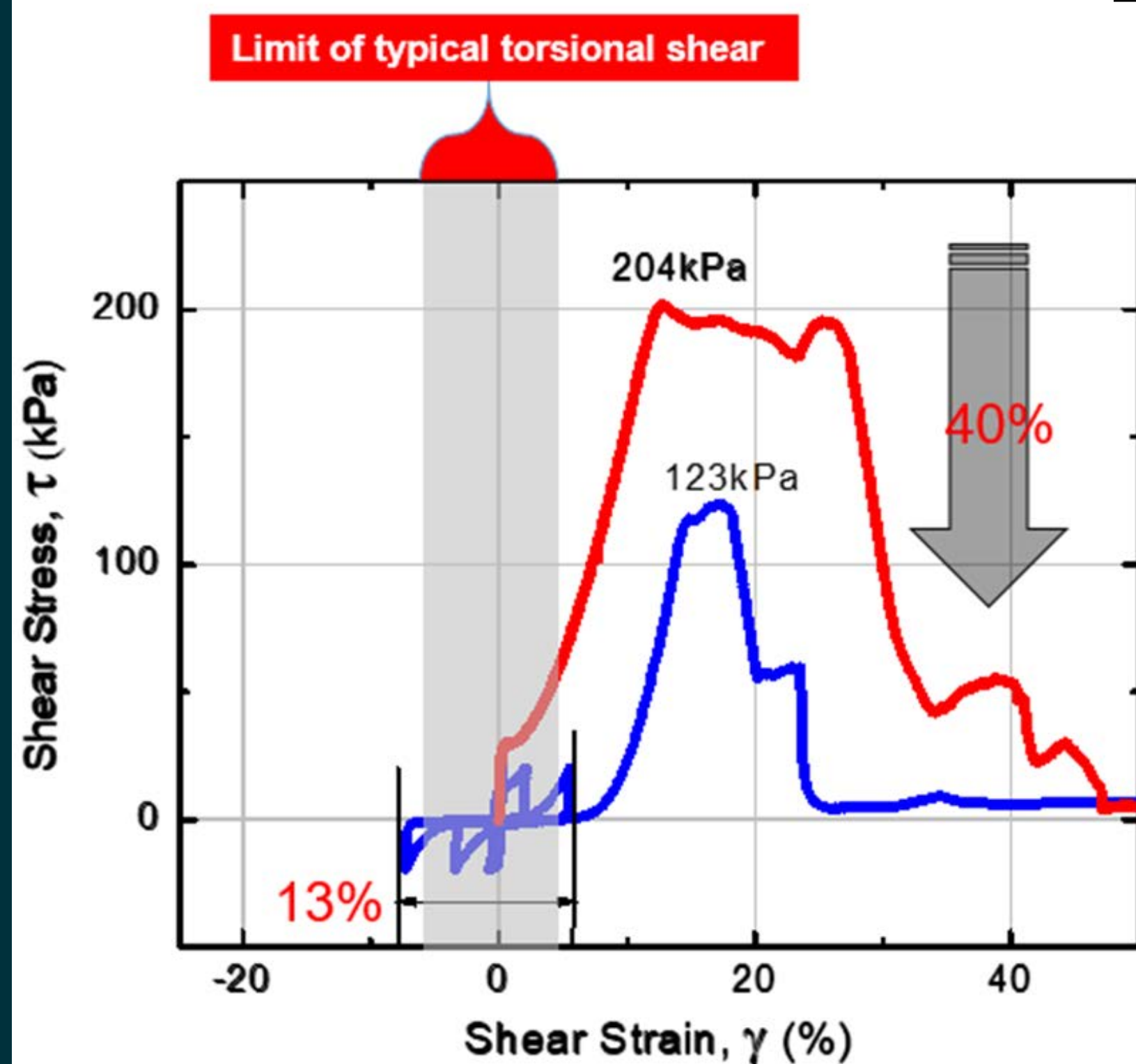


Fig. 2 Water from Fujinuma-ike flooded downstream area (Photo: NILM)

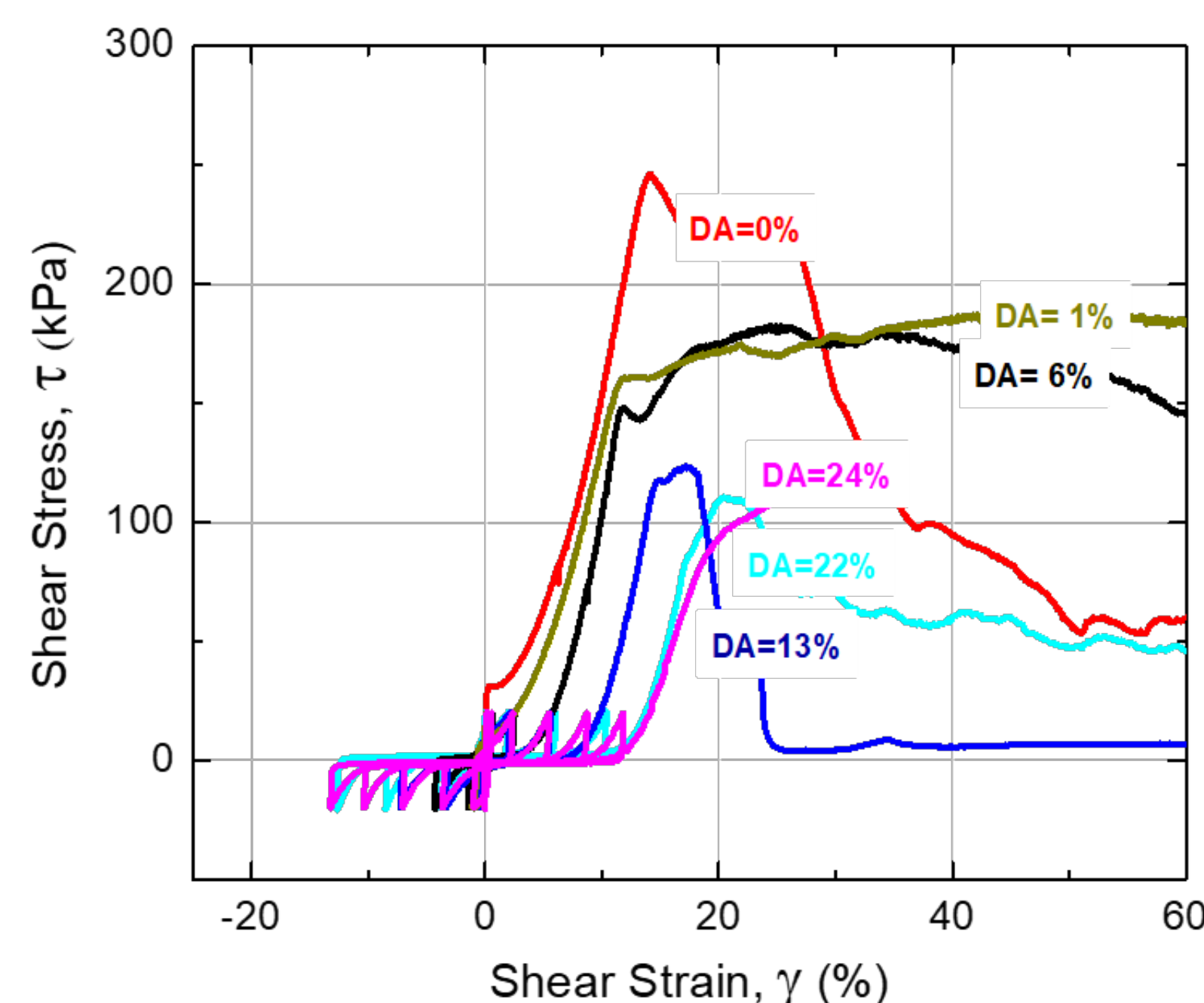
## Experimental procedure to study cyclic degradation



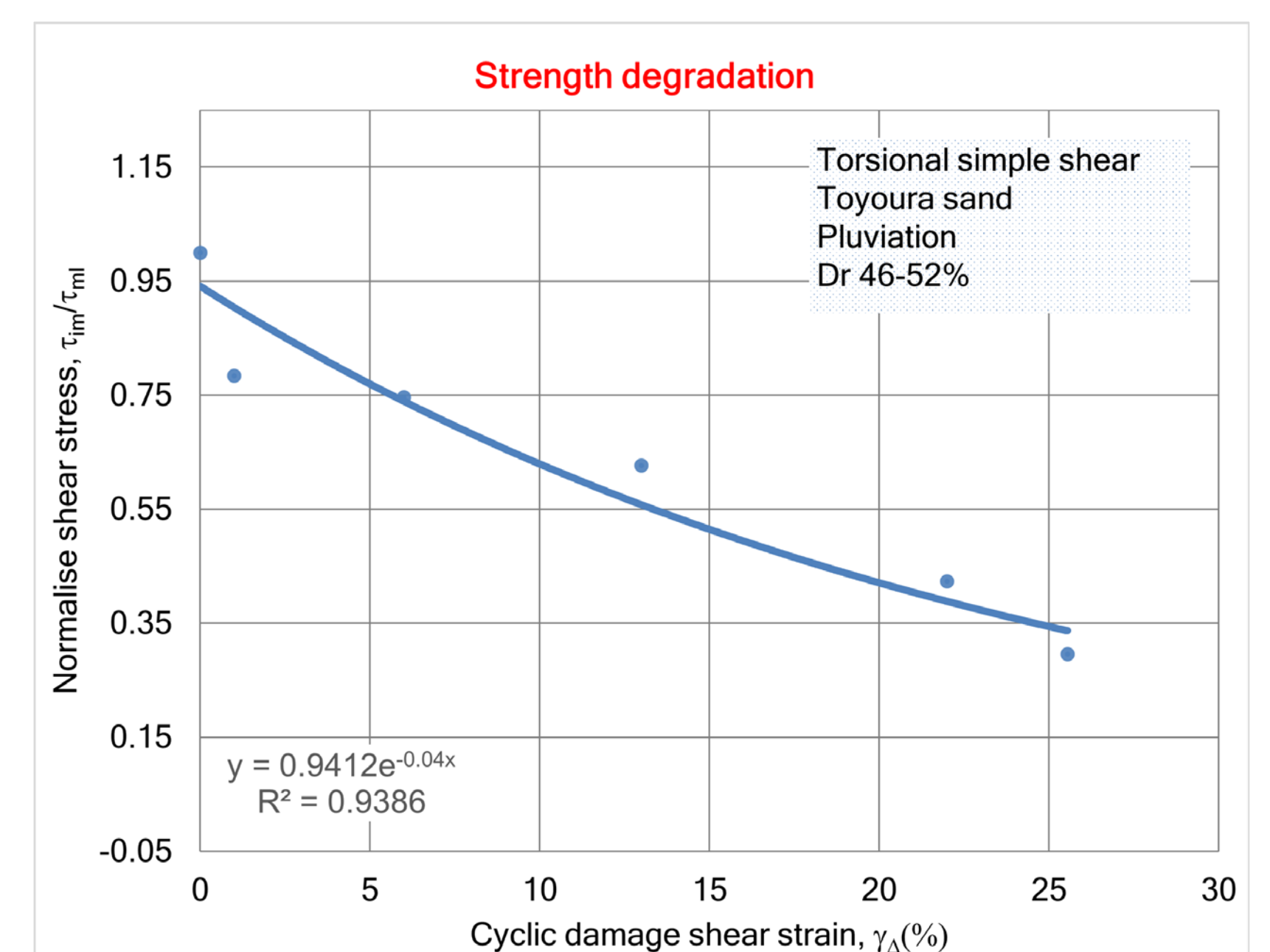
## Cyclic degradation of Toyoura Sand



Toyouura sand showed drastic reduction in Undrained peak shear strength by cyclic damage strain



A series of Torsional shear test were performed with different level of cyclic damage strain 1% to 24%



Peak shear strength is normalized by the peak undrained resistance of monotonic test