

Settlement behavior of creep loaded mudstone in dry-wet cycles

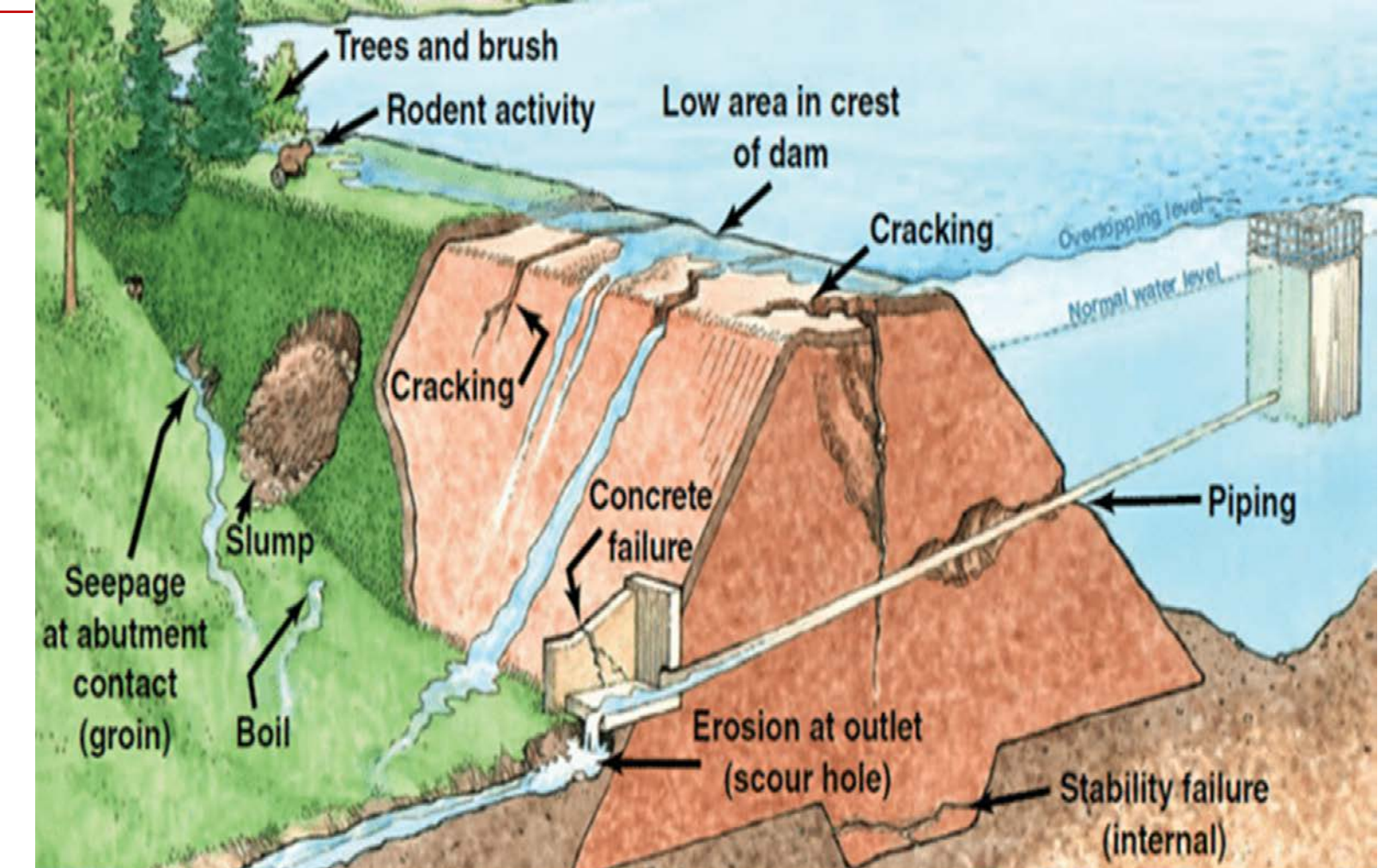
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Introduction

Mudstone dams are widely available across the world because of its wide availability and financial feasibility. The mudstone is susceptible for slaking at the exposure of the dry and wet cycles, by which settlement, suffusion and piping susceptibility could be increased in the dam embankment along the occurrence of fluctuation of the water level.

In this study, the creep loaded crushed mudstone was subjected to dry and wet with water gradient cycle. An axial strain was measured after each and every dry and wet cycle.



Modified oedometer for dry-wet cycles

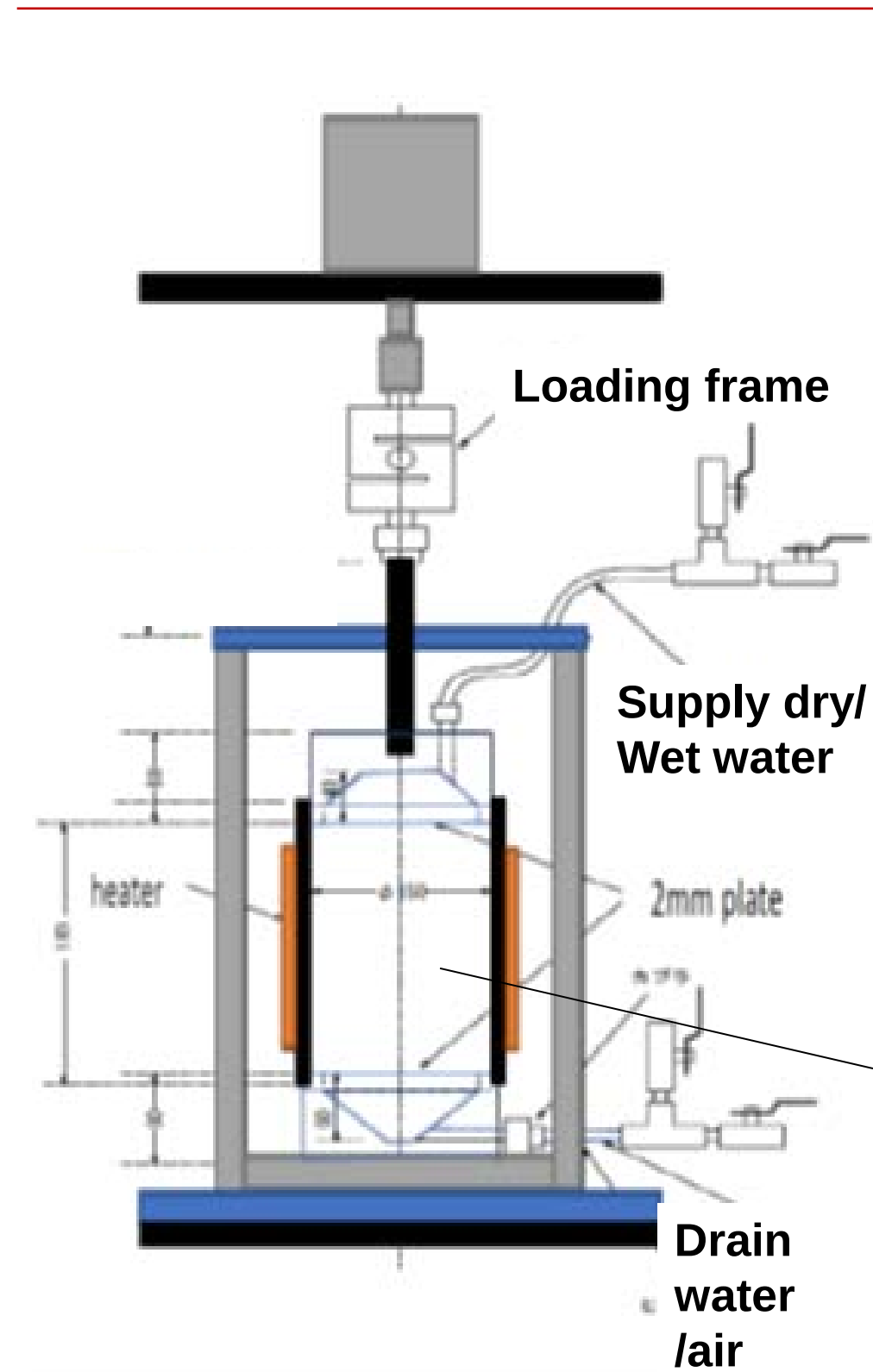
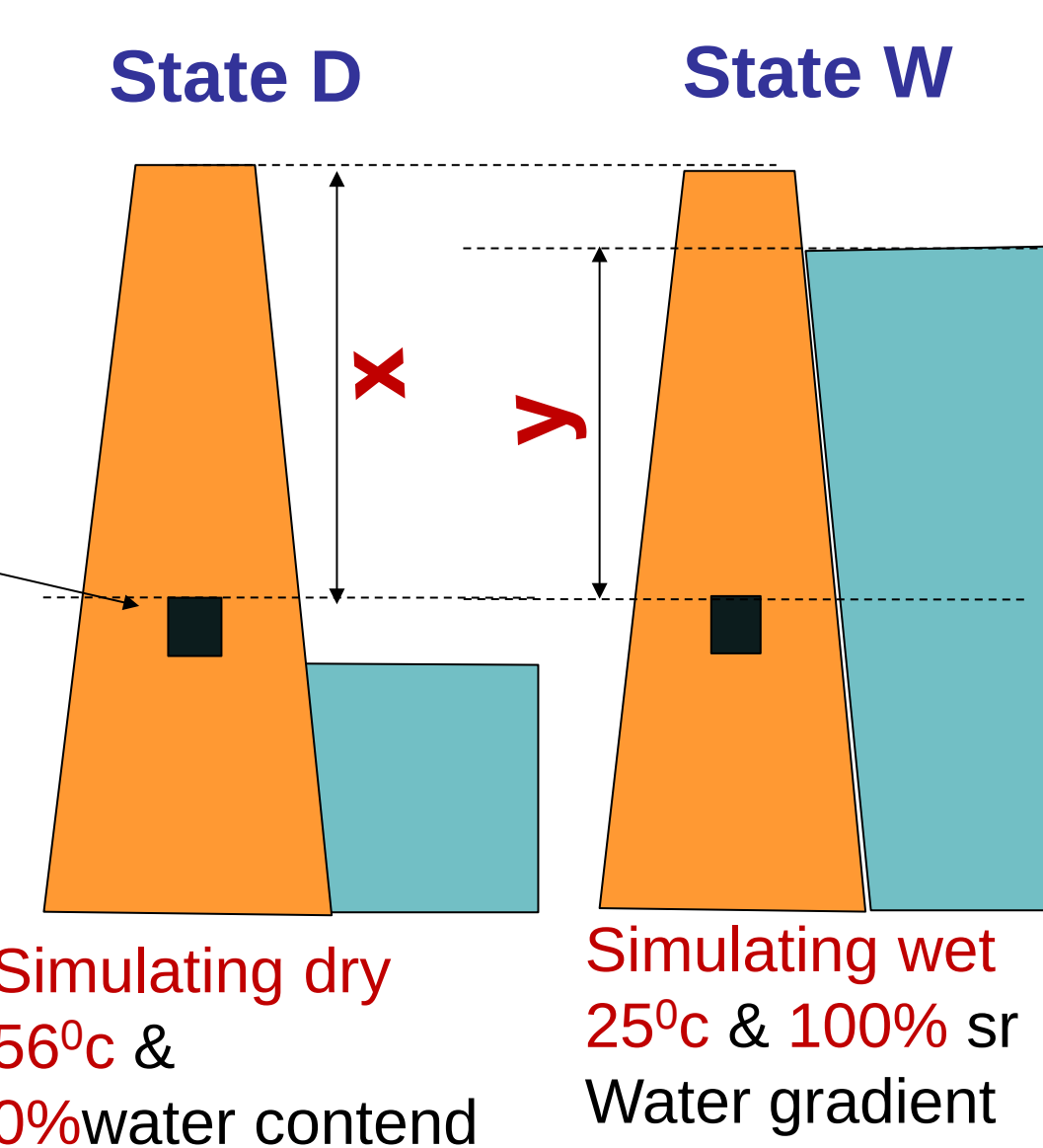


Fig01. Typical diagram of weathering apparatus

Modified oedometer was developed to provide the following condition on crushed mudstone in the specimen (r-7.5cm/ h-15cm).

1. Vertical stress up to 500kpa
2. Control temperature & water content
3. Fully saturation and water gradient from 0-300 kPa



Axial loading and water gradient were kept as follows

Depth (x m)	40 (500kPa)	16 (200 kPa)	8 (100kPa)
Water gradient (y m)	30 (300kPa)	12 (120 kPa)	6 (60kPa)



Test results

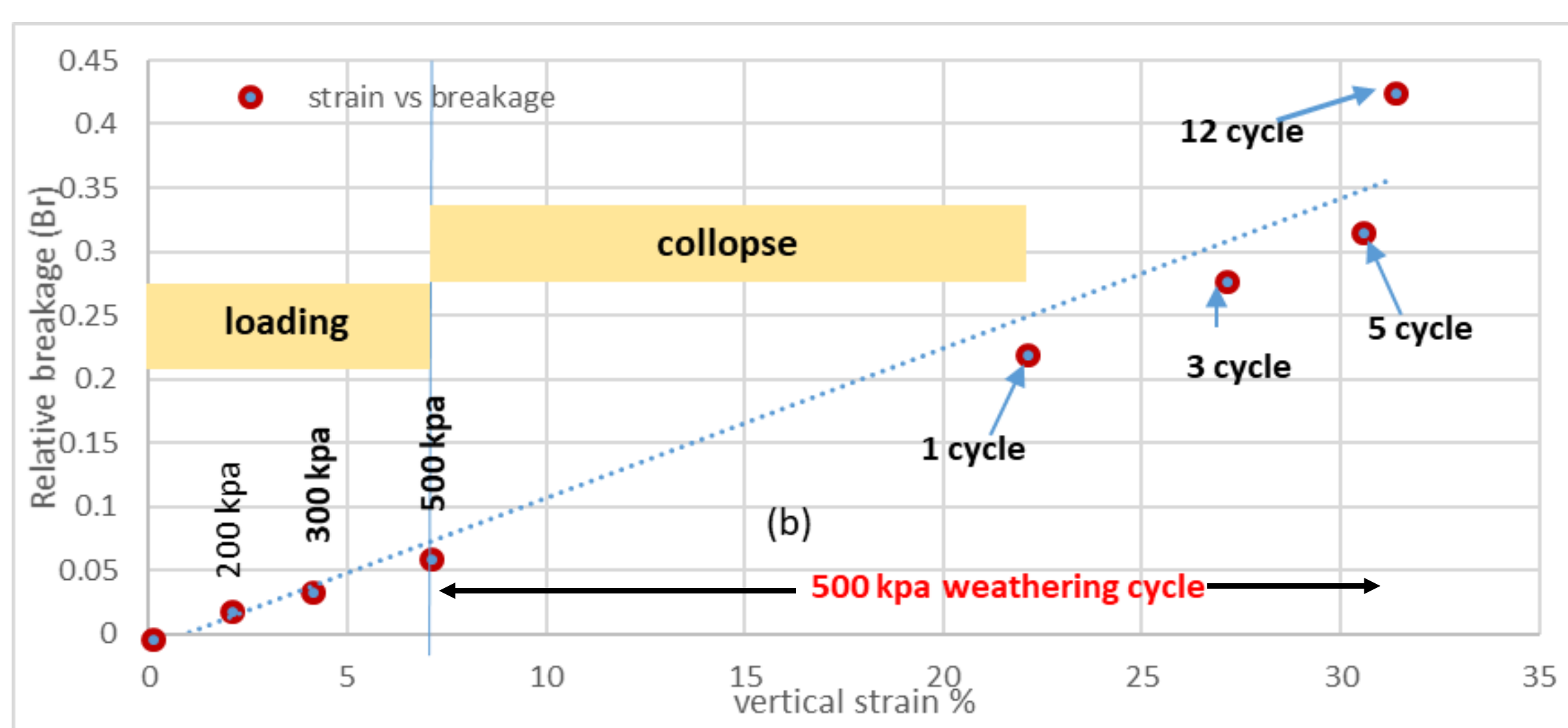


Fig 02. Vertical strain and breakage behavior

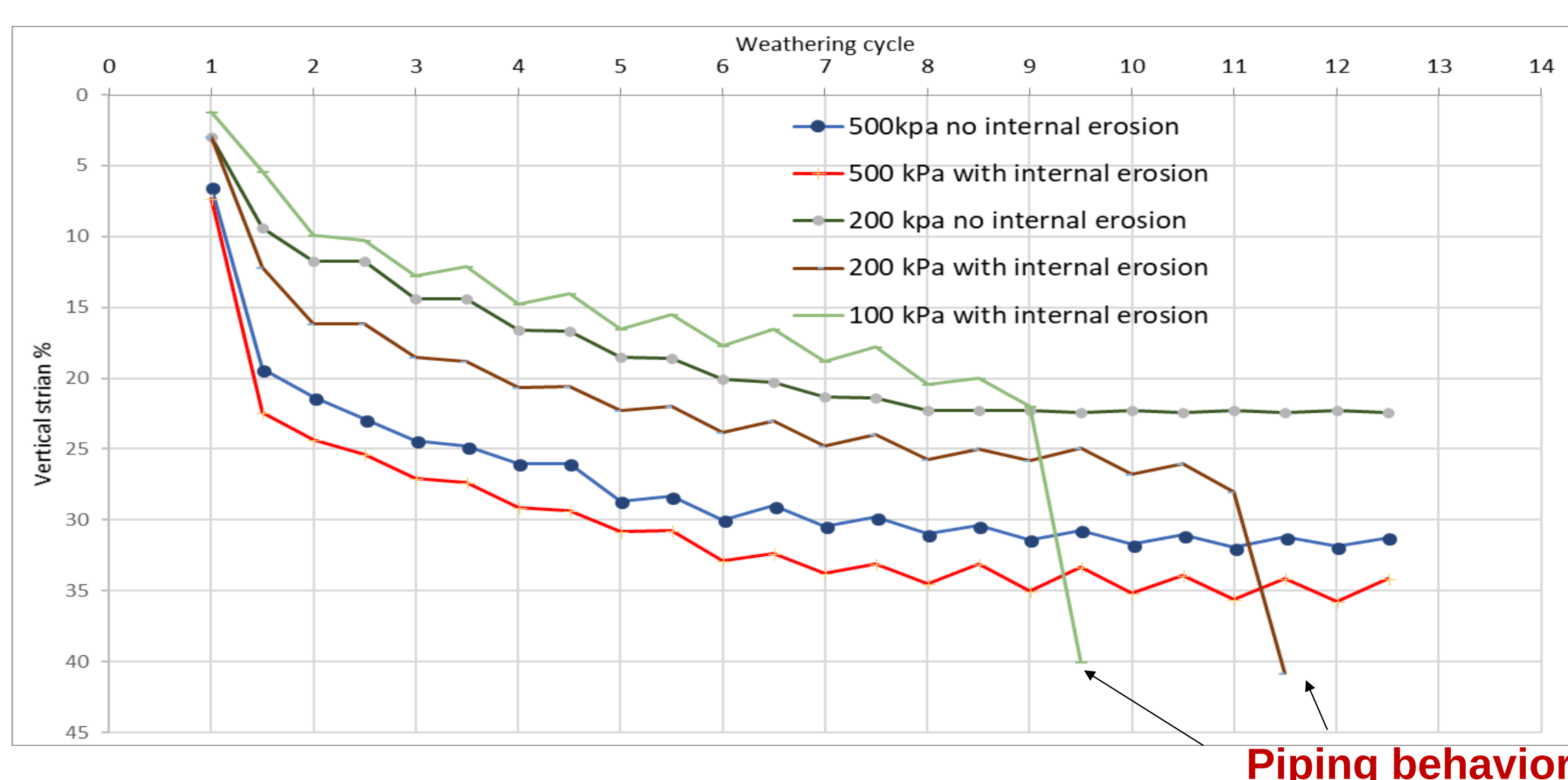


Fig 03. Vertical strain vs dry-wet cycles

Particle breakage and vertical strain (%) of the crushed mudstone were analyzed in the different vertical loading as well as the number of dry-wet cycles. The vertical strain and relative breakage (Br) shows a linear relation with vertical loading as well as dry-wet cycles. However, an increase in the dry-wet cycle led to an increase in the breakage significantly.

The vertical strain was monitored during dry-wet cycles with and without allowing the internal erosion at each stress state. In all the cases, first wetting caused severe settlement due to the collapse behavior. After that, drying caused settlement while wetting caused an expansion (swelling). When an internal erosion (suffusion) of the specimen is allowed, the increase in dry-wet cycles led to a piping, and a sudden settlement was observed.